

WAYSIDE TREES
OF MALAYA

Wayside Trees of Malaya

IN TWO VOLUMES

BY

E. J. H. CORNER, M.A., F.L.S.,
(Assistant Director of Gardens, Straits Settlements, 1929–1945)
University Lecturer in Botany
Cambridge

VOLUME I

TEXT AND TEXT-FIGURES (259)

FIRST EDITION JULY 1940
SECOND EDITION 1952

PRINTED AT THE GOVERNMENT PRINTING OFFICE, SINGAPORE,
BY V. C. G. GATRELL, GOVERNMENT PRINTER

1951

“Oh, thou poor panting little soul! The very finest tree in the whole forest, with the straightest stem, and the strongest arms, and the thickest foliage, wherein you choose to build and coo, may be marked for what you know, and may be down with a crash ere long. What an old, old simile that is, between man and timber.”

Vanity Fair

CONTENTS OF VOLUME I

PART I

	<i>Page</i>
Preface	1
Introduction	3
Arrangement and Names	5
Malay Names	6
Descriptions	7
How to identify a tree	7
Keys (how to use them)	8
A Key to some common Flowering Trees	9
Descriptive Terms	10
General Terms	10
Roots	11
Bark	11
Branches	12
Buds	13
Leaves	13
Flowers	19
Fruit	23
General Remarks about Trees	24
Shapes of Trees	25
Classification of tree-shapes :—	
Leaves spirally arranged	27
Leaves alternate	28
Leaves opposite	28
Leaves whorled	29
Pagoda-Trees and Terminalia-Branching	30
Ant-Trees	33
Buttresses	33
Flowering and Leafing	35
Everflowering Trees	37
Trees flowering intermittently	37
Temperature Trees	38

CONTENTS

	<i>Page</i>
Malayan Vegetation	39
Immigrant Elements	40
Indigenous and Exotic Plants	40
Secondary Jungle and Virgin Forest	41
Lowland and Mountain Forest	41
Soil and Situation	41
Saraca-streams	42
<i>Neram</i> -rivers	42
<i>Rassau</i> -rivers	42
Mangrove-forest	43
Terminalia-Barringtonia Formation	44
Trees of Local Interest	44
Perlis	44
Kedah	44
Penang	45
Province Wellesley	45
Perak	45
Pahang	47
Fraser's Hill	47
Cameron Highlands	48
Selangor	48
Negri Sembilan	48
Malacca	48
Johore	49
Singapore	49
Kelantan	50
Trengganu	51
Railway-Line Trees	51
Reference-Books	52

PART II

Keys to the Identification of Trees	55
--	----

PART III

Descriptions of Families, Genera and Species

Acanthaceæ (Acanthus-family)	95
Ampelidaceæ (Grape-Vine family)	96
Anacardiaceæ (Mango-family)	98
Anisophylleaceæ (Leechwood-family)	122
Annonaceæ (<i>Kenanga</i> -family)	125

CONTENTS

	<i>Page</i>
Apocynaceæ (Periwinkle-family)	137
Araliaceæ (Ivy-family)	152
Asclepiadaceæ (Asclepiad-family)	159
Bignoniaceæ (Bignonia-family)	160
Bixaceæ (Anatto-family)	173
Boraginaeræ (Heliotrope-family)	175
Burseraceæ (<i>Kedondong</i> -family)	177
Capparidaceæ (Cat's Whisker family)	179
Caprifoliaceæ (Honeysuckle-family)	182
Caricaceæ (Papaya-family)	183
Casuarinaceæ (Casuarina-family)	184
Celastraceæ (Spindle-tree family)	189
Combretaceæ (Terminalia-family)	191
Compositæ (Sunflower-family)	195
Crypteroniaceæ (<i>Bekoi</i> -family)	197
Cunoniaceæ	199
Dilleniaceæ (<i>Simpoh</i> -family)	201
Dipterocarpaceæ (<i>Meranti</i> -family)	208
Ebenaceæ (Ebony-family)	213
Epacridaceæ (Epacris-family)	218
Ericaceæ (Heather-family)	218
Erythroxylaceæ (Cocaine-family)	220
Euphorbiaceæ (Rubber-tree family)	222
Fagaceæ (Oak-family)	290
Flacourtiaceæ (<i>Rukam</i> -family)	305
Goodeniaceæ (Sea-Lettuce family)	309
Guttiferæ (Mangosteen-family)	310
Hamamelidaceæ (Witch-Hazel family)	321
Hernandiaceæ (Sea-Hearse family)	323
Hypericaceæ (St. John's Wort family)	324
Illicaceæ (Holly-family)	327
Juglandaceæ (Walnut-family)	330
Lauraceæ (Laurel-family)	334
Lecythidaceæ (Brazil Nut family)	349
Leguminosæ (Bean-family)	358
Papilionaceæ (Bean-subfamily) ... ..	... 361, 365
Cæsalpiniaceæ (Cæsalpinia-subfamily) ... ..	... 361, 377
Mimosaceæ (Mimosa-subfamily) ... ..	... 362, 405

CONTENTS

	Page
Loganiaceæ (Strychnine-family)	422
Lythraceæ (Henna-family)	426
Magnoliaceæ (<i>Chempaka</i> -family)	432
Malvaceæ (Mallow-family)	434
Melastomaceæ (<i>Sendudok</i> -family)	445
Meliaceæ (<i>Sentol</i> -family)	453
Moringaceæ (Horse-Radish tree family)	470
Myricaceæ (Gale-family)	470
Myristicaceæ (Nutmeg-family)	472
Myrsinaceæ (<i>Ardisia</i> -family)	478
Myrtaceæ (Myrtle-family)	482
Nyctaginaceæ (<i>Bougainvillea</i> -family)	510
Oleaceæ (Olive-family)	511
Opiliaceæ (<i>Chemperei</i> -family)	514
Oxalidaceæ (<i>Belimbing</i> -family)	516
Pittosporaceæ (Splay-Berry family)	517
Proteaceæ (Silky Oak family)	518
Rhamnaceæ (Jujube-family)	519
Rhizophoraceæ (Mangrove-family)	520
Rosaceæ (Rose-family)	524
Rubiaceæ (<i>Ixora</i> -family)	530
Rutaceæ (Orange-family)	565
Salicaceæ (Willow-family)	580
Sapindaceæ (Soap-Nut family)	581
Sapotaceæ (<i>Chiku</i> -family)	597
Simarubaceæ (Tree of Heaven family)	602
Solanaceæ (Potato-family)	605
Sterculiaceæ (Cacao-family)	606
Symplocaceæ (Alum-tree family)	622
Ternstroemiaceæ (Tea-family)	624
Thymelæaceæ (<i>Daphne</i> -family)	632
Tiliaceæ (Jute-family)	634
Urticaceæ (Fig-family)	646
Verbenaceæ (Verbena-family)	695
Gymnospermæ (Flowerless Seed-Plants)	711
Coniferæ (Pine-family)	713, 715
Gnetaceæ (<i>Meninjau</i> -family)	713, 725

CONTENTS

	<i>Page</i>
Appendix	727

PART IV

Index to English Names	729
Index to Malay Names	746
Index to Botanical Names	767
Index to Botanical and Descriptive Terms	771

PREFACE

To write a book about Malaya for all who find beauty and inspiration in the life of the country has been my object. We sorely need books about natural history, whether they be for schools or for grown-ups because, in our exploitation and destruction of natural resources, we must not forget that one mark of civilisation is the regard men bestow on wild things. It has always seemed to us the duty of biologists to prepare from time to time books on natural history which will serve as guides and companions above all to amateurs, in whom the flame of knowledge burns brightest, that each generation may play its part in preserving the natural scenery and the wild life of the country. We have chosen trees as our subject because all the native richness of Malaya depends on the integrity of its forests. If a delight in trees and a respect for their majesty can be created, even among a small body of persons, our country will never suffer the tragic domestication which many lands have tamely undergone. Botanists know too well that when forest is destroyed the ancient verdure of the earth is lost for ever; trees depart in flames and no mantle descends to clothe our ignorance. Think, too, of another way in which we employ trees. Why do we plant them in our parks and gardens but for the satisfaction of shape, size, colour and variety? All the wistfulness of existence disappears from prairies, deserts and barren lands. Now arboriculture can hardly be said to have been begun in Malaya. Of our native trees but a sprinkling has been brought into cultivation, yet, whether we look for great trees or miniature ones, shady crowns or airy, weeping limbs or upright, vivid flowers and fruits or soft foliage, smooth trunks or rugged, there is in our forests an inconceivable diversity. Who has seen in flower *Jackia*, *Epiprinus*, *Mussændopsis*, *Deplanchea*, *Saraca palembanica*, or a tree-*Gardenia*—the very jargon bespeaks their unfamiliarity—the orange trunks of *Pometia* and *Tristania*, the coppered and feathered crown of *Amoora rubiginosa*, or the great lambs' tails of *Engelhardtia spicata*? There are even funny trees, like the Midnight Horror and the Ivy Palms, at which we cannot forbear a smile.

The first criticism of this book will be about its size. There are descriptions of some 950 species¹. This is the difficulty with all initial undertakings in the natural history of tropical countries situated in the region of the rain-forest, the fauna and flora of which are incredibly luxuriant, intricate and varied. Of some 8,000 species of flowering plants in Malaya, at least 2,500 are trees arranged in the forest at a rate of a hundred genera to an acre. To describe so many accurately is impossible except in hard scientific terms. We have therefore limited the subject to the common trees outside of the high forest and how numerous they are can be realised from a walk along the main thoroughfare of Singapore, from the Esplanade to the far end of Orchard Road; 96 kinds can be seen. To overcome the difficulty of identifying trees without previous botanical knowledge, we have illustrated by photographs or drawings the whole tree or a twig of all the commoner kinds in cultivation and in waste places. From a perusal of these there should be no difficulty in naming the trees of towns and villages; and after an acquaintance with them, for they make the best introduction to the Malayan flora, it will not be difficult

(1) arranged in 392 genera and 76 families.

PREFACE

to identify the wild ones from our descriptive keys. We have also made drawings of many characteristic fruits because the fallen fruits often supply the only ready means of identifying large trees, *e.g.* the Oaks and Chestnuts, Dipterocarps, Figs, Mangosteens, Nutmegs and so on. Collections of these would be useful in schools whence spring the artists of the future.

We have limited our remarks, which accompany the descriptions of the trees, to their biological aspect and we have made only passing reference to their history, cultivation and economic uses because these matters have now been exhaustively and excellently compiled by BURKILL in his Dictionary (ref. 5, p. 52). Likewise for horticultural information we refer to Mrs. GOUGH'S book and to the M.A.H.A. magazine.

Through the advice of friends in various countries, numerous small corrections have been made in this second edition. In a brief appendix, three more trees have been added, one wild and two introduced. It has not been possible, however, either to remedy specific uncertainties in critical genera or to find out which wayside trees, that were landmarks until 1941, came down in the crash.

INTRODUCTION

In the scope of this work come the trees of gardens, roadsides, orchards, rice-field, waste ground, seashores, riverbanks and secondary jungle both of the lowlands and the mountains—the trees, that is, of waysides. Forest trees have been omitted on principle because they are so numerous and they cannot be classified without recourse to their detailed botanical structure. Nevertheless we have mentioned by their vernacular and botanical names most, if not all, of the timber trees so that their affinities with the more familiar ones of garden and orchard may be understood, and we have incorporated briefly in the descriptive section the mangrove trees so as to complete the list of woody plants of the seashores: by this means it is hoped that the works of FOXWORTHY, SYMINGTON, and WATSON (cited on p. 52, 53) may be used in connection with our less technical account. Certain forest-trees, moreover, like the *Tualang* and *Kempas* (*Koompassia*), *Seraya* (*Shorea*), *Kapur* (*Dryobalanops*), *Pelong* (*Pentaspadon*), *Pauh Kijang* (*Irvingia*), *Kembang Samangkok* (*Scaphium*), *Ipoh* (*Antiaris*), Oaks (*Quercus*), and Jungle Holly (*Taxotrophis*), have been included either for their unmistakable appearance or for their abundance in opened country or for their remarkable and fascinating flowers, fruits or leaves. And we have made two excursions into the forest, the one up the Saraca-streams with picnic and bathing parties (p. 42), the other up the *Neram*-rivers which are the highways of the National Park and larger game-reserves (p. 42).

It often happens that it is impossible to decide whether a plant is a tree or shrub, for instance the Leechwood (*Anisophyllea disticha*), *Lada Pahit* (*Brucea*) and Tree-Vines (*Leea*). All such doubtful cases have been included in our book and, also, for a purpose, many other shrubs like the *Ixoras*, *Sendudok* (*Melastoma*), White Gardenia and Rose Myrtle (*Rhodomyrtus*), because they introduce groups of trees which would otherwise be strangely unfamiliar. It must be remembered that botany has grown up in temperate countries and that, in studying tropical vegetation, so many new ideas must be assimilated that it is better to start afresh from our tropical gardens. The families of the *Sendudok*, *Kenanga*, Mangosteen, Nutmeg, *Ixora*, *Rambutan* and *Sento!* are examples.

PART I

ARRANGEMENT AND NAMES

The second criticism of this book will concern the botanical names. To many persons they are repellant because they are unfamiliar and their usefulness is misunderstood, even though many of them like chrysanthemum, dahlia and rhododendron are willingly admitted. Naturalists found long ago that for their requirements in naming the multitude of plants and animals inhabiting the earth a living tongue was too fluid: not only do words vary locally in the same country, as in the case of the Malay names of the Common Bur-Flower tree (*Anthocephalus*), but the same plant or animal has a different vernacular name in every country in which it occurs, e.g. the English names of the Peacock Flower (*Casalpinia pulcherrima*). It is clearly preferable, for accuracy and universal understanding, to have a rigid, artificial system of nomenclature whereby naturalists in all parts of the world can refer to each kind of plant and animal by one name only. It was decided in Europe, in the 18th century, to adopt the dead languages of Latin and Greek because they had become the universal medium for the expression of philosophic thought: and the system evolved was this.

Plants which are obviously related to each other through having, for instance, the same kind of flower and fruit and which differ among themselves only in details of the size, shape and colour of the flowers, fruits or leaves, are considered to form a *genus*¹ which is given a Greek or Latin name with a capital letter. Thus, the wild Fig-trees (*Ara*, *Bunut*, *Jerai*, *Kelumpang* of Malays) make the genus *Ficus*; the *Jambu*, *Kelat* and *Krian* make the genus *Eugenia*; and the various kinds of Oak (*Mempening* or *Berangan Babi*) make the genus *Quercus*. Within a genus the different kinds of Fig, *Kelat* or Oak, for instance, are called each a *species* and a *specific name* is written after the *generic name* either as an adjective qualifying it or as a noun in the genitive case if the species is named in honour of some person. Thus, in the genus *Eugenia*, the *Jambu Bol* is the species *Eugenia malaccensis*, the *Jambu Ayer* is the species *Eugenia aquea*, the *Jambu Laut* is the species *Eugenia grandis*, the *Krian* is *Eugenia pseudosubtilis* and the *Kelat Hitam* is *Eugenia cymosa*: the species *Eugenia Ridleyi* is named in honour of its discoverer H. N. RIDLEY, and the specific name is spelt with a capital letter. When there is no doubt from the context what genus is intended the generic name is abbreviated for convenience to its initial letter, thus *E. malaccensis* or *E. Ridleyi*: on the other hand if the specific name of a plant is not known, it is called *Eugenia* sp., that is an unidentified *species* of *Eugenia* (*Eugenia* spp., in the plural, referring to more than one species of the genus). Every plant has therefore a double scientific name—a generic name followed by a specific epithet—and this binomial system, devised by the Swedish naturalist CARL VON LINNÉ or LINNÆUS, is now universally accepted. To facilitate the use of the names we have given their derivations under the descriptions of the genus and species.

Another concept of botanical classification is the idea of the family. Just as species of plants can be grouped into genera so genera can be grouped into families which differ from each other in yet more fundamental structure of flower, fruit, seed, wood or leaf. The nutmeg-like fruit, for instance, distinguishes the Nutmeg-family (*Myristicaceæ*); the pod with a single cavity and a single row of seeds distinguishes the Bean-family (*Leguminosæ*); and, more complicated, the Tulip Tree (*Spathodea*)², the Jacaranda, the Yellow Bells (*Stenolobium*)², the *Tui* (*Dolichandrone*)² and the *Chichak* (*Stereospermum*)²

(1) In the *plural*, genera.

(2) Generic names.

MALAY NAMES

can be grouped into the Bignonia-family (Bignoniaceæ) because of their opposite pinnate leaves, their tubular corolla and their pod-like fruit with two cavities and winged seeds. The family-name is formed, in most instances, by adding the suffix-*aceæ* to the stem of the generic name of the most representative genus of the family.

Any study of a large number of flowering plants necessitates the arrangement of them into families. Hence, in this book, we have grouped the trees into their families which we have arranged alphabetically from their botanical names. The genera are arranged alphabetically in each family and, likewise, the species in the genus. The plates in the second volume have been arranged accordingly. We have given English names to the families and, wherever possible, English and Malay names to the species: many of the English names have been invented because they are desirable if the appreciation of our flora is to become general.

The greater part of the book deals with flowering plants. On p. 711, after the Verbena-family, we have placed the flowerless seed-trees or Conifers because they constitute a different order of plants.

Palms, cycads, bamboos, pandans and tree-ferns have been omitted, partly because they are not trees in the same sense as the flowering trees and Conifers, partly because they can be described together more conveniently in another book.

MALAY NAMES

The Malay names which we give are those advocated by the Forest Department in its list of preferred vernacular names¹ and those which we have checked carefully from our own enquiries. Contrary to what is often stated, it is surprising how accurately Malay peasants apply their local names so that these afford the simplest way of identifying the trees. *Senkuang* (*Dracontomelum*), *Sentang* (*Melia excelsa*), *Chichah* (*Stereospermum fimbriatum*), *Chenderai* (*Grewia paniculata*), *Kenanga* (*Canarium*), *Tempinis* (*Sloetia*), *Mensirah* (*Ilex cymosa*), *Membulan* or *Sendok Sendok* (*Endospermum*), *Tualang* and *Kempas* (*Koompassia*) and *Ketapang* (*Terminalia catappa*) are known throughout the country and refer each to one species of tree. On the other hand, names like *Kelat* (*Eugenia*), *Pulai* (*Alstonia*), *Ara* (*Ficus*), *Mempening* (*Quercus*), *Mali-Mali* (*Leea*) and *Machang Utan* (*Mangifera*) refer each to a genus, and such as *Mempisang* (*Kenanga*-family) and *Rengas* (*Mango*-family) refer to groups of allied genera: (it is remarkable how Malays recognise the natural groups of plants). Yet other names must be treated with caution. Such as *Medang*, *Balek Angin*, *Tinjau Belukar*, *Kedondong*, *Merlimau*, *Selunchur*, *Batai*, *Batu* or *Merbatu* and *Puding* refer to a character of the tree like soft wood, white undersides to the leaves, upright growth, hard fruit, Citrus-like aspect, peeling bark and so on, and accordingly they are bestowed on many unrelated species of tree. A good example is *Tangisong Burong*: it is given to any tree, shrub, climber or epiphyte the fruit of which is yellow or red and has large, often pulpy seeds so that it is attractive to birds, yet because it is poisonous or unpalatable, the birds weep with disappointment! Allowances must be made, too, for local variations in pronunciation, e.g. *Mengkudu* and *Kemudu* (*Morinda*), *Serentang* and *Terentang* (*Camnosperma*), *Simboh* and *Chimboh* (*Dillenia*), *Remigu* and *Merigu* (*Calotropis*) and the names of *Sterculia*, *Anthocephalus* and *Moringa*. And care must be taken not to confuse names which sound alike to Western ears but which have no similar ring to Malays, e.g. *Geringgong* (*Nephelium*) and

⁽¹⁾ List of Botanical and Vernacular Equivalents. *Govt. Gazette*, F.M.S., Dec. 10th, 1937, No. 26, Vol. XXIX, Not. 5884.

Geronggang (Cratoxylon), *Terentang* (Campnosperma) and *Teruntum* (Lumnitzera), *Chenerai* (Grewia) and *Jenerek* (Millettia). In Trengganu and Kelantan it will be found that even such common plants as Tamarind, Mangosteen and Cashew-nut have special local names.

We have not given the meanings of the Malay names. They can be found in WILKINSON'S Malay Dictionary and in WATSON'S Malay Plant Names. On consulting this second work it will often be found that several Malay names are given for certain trees other than what we have listed: it must be realised that Watson's work is a compilation and that many names need to be checked both in their botanical reference and their Malay use.

DESCRIPTIONS

The following outline will explain the arrangement of the specific descriptions:

Botanical Name	Plate or Figure	English Name
(Derivation)		<i>Malay Name</i>
Shape of tree: bark: twigs, etc.		
Leaves		
Flowers		
Fruits and seeds		
General distribution: distribution in Malaya		
General remarks		

The characters mentioned in the description are only such as are useful in giving a sketch of the tree's appearance and the means of distinguishing it from related kinds: the more important characters are italicised.

By the "general distribution" of a tree is meant its natural occurrence as a wild plant throughout the world. It is always interesting to know whether a native plant is widespread or local in its natural distribution or from what country an exotic plant has been introduced. For instance, the Sea Hibiscus (*H. tiliaceus*) occurs naturally on the seashores of the tropics throughout the world but the Yellow Saraca (*S. thaipingensis*) and the *Putat Gajah* (*Barringtonia Scortechinii*) have been found only in our Malayan forests, the *Kechupu* (*Garcinia Prainiana*) and *Beka Griong* (*Pajanelia*) only in Lower Siam and the northern half of Malaya, and the *Amherstia* only in a part of Burma. The Shrubby *Simpoh* (*Wormia suffruticosa*) occurs naturally in Malaya, Sumatra and West Borneo but the genus *Wormia* is distributed from Queensland through tropical Asia to Madagascar, having species in all the countries included in this area. The Mountain *Gelam* (*Leptospermum*) is the only species of a large genus of Australian plants which reaches Malaya. The *Jacaranda* is a native of South America, the *Flame of the Forest* (*Delonix*) of Madagascar, the Cashew-nut (*Anacardium*) of the West Indies and the common *Acacia-tree* (*A. auriculiformis*), like the orchid *Dendrobium superbiens*, of Thursday Island in the Torres Straits. This study of the natural distribution of plants, called Plant Geography, deals not only with the present occurrence of plants and their means of distribution but also with such problems as the former land-connections between continents and islands at remote geological periods whereby the floras of countries now separate were able to mingle.

HOW TO IDENTIFY A TREE

There are four methods:—

1. Bring or send a twig, preferably with flower or fruit, to the Singapore Botanical Gardens: If there are only a few specimens they can be rolled in newspaper. If there are many, they should be laid flat between sheets of

KEYS

newspaper and the bundle protected by a sheet of cardboard on one or both sides. It is preferable to number the specimens and to keep a duplicate for reference so that the names can be returned against the numbers. If the specimens are despatched without delay, they can be sent fresh; if not, they must be dried partially or completely to prevent them from becoming mouldy. *This is the surest method.*

2. Look through the illustrations until one is found that seems to fit the tree in question, whether from its habit of growth or from its leafy twig. This tentative name must then be checked by consulting not merely the description of the species but the genus and also the family to which it belongs. If there are obvious discrepancies, the identification is wrong and another must be sought. If the tree belongs to a large genus such as *Eugenia*, *Ficus* or *Macaranga*, it is not sufficient to prefer the name given to the picture but it is necessary to work through the key to the species (*see* below) wherein their characters are distinguished, and to select the one which fits best. By this method it should be possible to identify all the trees of cultivation.

3. Ask the vernacular name from a Malay villager or from a forest-guard. Look up the name in the index (p. 744) and then read critically the description of the species (and its genus) to which the name is applied. If there is more than one reference it is because the vernacular name is given to more than one kind of tree, *i.e.* *Medang*: then the descriptions of all the references must be consulted and compared. It will be a surprise how successful this method is. It should lead to the generic, if not the specific name, of more than half the trees described in the book. And, as our knowledge of Malay names increases, particularly in the less frequented parts of the country, and as their use is stabilised not only by such means as the publication of preferred lists of vernacular names by the Forest Department but also through the teaching of nature-study in the schools, the method will become more widely applicable and more valuable, as well as being the easiest. Malay villagers are good botanists. They know the names of nearly all the plants in their *kampung* and surrounding country, which may amount to several hundred. The young boys and the old women have been our best instructors for the traditional names are handed down through the mothers who teach their children and as they grow up in the modern world the sons forget these things. Needless to say, here, as in other lands, enquiry from townfolk will often call forth the humiliating reply "Perhaps it is a tree, Tuan". (*see* p. 6, on Malay names).

4. This is the botanical method in which the salient features of the plant are selected one by one and then, through a sort of questionnaire, or "key" as it is called, the name of the plant is obtained by a process of elimination. It is the most instructive method because it opens the eyes to the details of the plant and impresses its characters upon the mind; and, though it is laborious, we recommend the effort to identify a tree by working through the keys, even when its name is known. We now explain their use.

KEYS

A key is merely a device used by naturalists for the ready identification of plants and animals. Instead of having to read through many descriptions and carry their differences in mind, the differences are set forth concisely in the form of a table. The plants, for instance, with which the botanist is concerned, are put repeatedly into contrasting groups so that the number of plants in successive groupings is diminished and ultimately the individual species are set forth (or their genera, if the key deals only with genera). The groups are indicated by stating pairs of contrasting characters which define them and, in

order to facilitate reading, the contrasting statements are spaced the same distance from the left of the page: as the groups are subdivided, so the spacing from the left increases and, finally, the species (or genera) are read off on the right hand margin. Further, the contrasting statements of the major groups are set far apart so that the subdivisions of each group can be written on the page immediately below each statement: after it has been decided, therefore, to which major group the plant belongs it is necessary merely to read through the subdivisions of that group. If the number of plants to be "keyed out" is large, a slight complication may be introduced by using a double key, firstly a key to the major groups (indicated by letters a, b, c, d, etc.) and secondly a key to each of these major groups. The process can, of course, be repeated as often as necessary. In our main key, starting on p. 55, we have had to introduce several intermediary keys before the final ones relating to the species, genera and families.

For example,

A Key to some common Flowering Trees

Flowers white, cream or yellow

Flowers white or cream

Flowers fluffy with many stamens: leaves opposite ... *Jambu Laut*
(*Eugenia grandis*)

Flowers not fluffy

Flowers star-like: leaves alternate or spirally
arranged, wavy *Tanjong*
(*Mimusops*)

Flowers like small funnels: leaves opposite ... *Tembusu*
(*Fagraea*)

Flowers yellow

Flowers 3" wide: leaves palmate *Buttercup Tree*
(*Cochlospermum*)

Flowers smaller: leaves pinnate

Leaflets rather large: flowers very fragrant ... *Angsana*
(*Pterocarpus*)

Leaflets small or medium size: flowers scentless

Leaflets very small: flowers rich yellow: pods
short, dark brown, with few seeds ... *Yellow Flame*
(*Peltophorum*)

Leaflets medium-size: flowers pale yellow: pods

long, many seeded *Johar*
(*Cassia siamea*)

Flowers pink, red, purple or bluish

Flowers lilac-purple or bluish: leaves pinnate,
opposite *Jacaranda*

Not so

Flowers pink or pinkish purple

Flowers pink in small fluffy clusters: leaves
pinnate *Rain Tree*
(*Enterolobium*)

Flowers 1-3" wide, pinkish purple: leaves simple,

opposite *Bungor*
(*Lagerstroemia*)

Flowers red

Leaves trifoliolate: twigs prickly *Dadap*
(*Erythrina*)

DESCRIPTIVE TERMS

- Leaves pinnate : twigs not prickly
- Leaflets large : flowers large, cup-like, with golden rim *Tulip Tree* (Spathodea)
- Leaflets very small : flowers with 5 large petals ... Flame of the Forest (Delonix)

To identify a plant from our main key it is necessary to have a leafy twig and, if possible, flower and fruit, although we have drawn our distinguishing characters so far as possible from the leaves themselves. It is also necessary to note, when looking at a tree, its shape (*see* p. 25) and its bark (p. 11), whether it has latex in the twigs (*below*) and, which may be most helpful, whether its leaves wither red. The leaves of most trees wither yellow or brown but in a relatively small number of species they turn red, from which character one can always recognise an Oil-Fruit (*Elæocarpus*), a Pin-Flower Tree (*Glochidion*), a true Croton or the *Bungor* (*Lagerstrœmia*).

On p. 55, there will be found a key to several special groups distinguished either by the situation where they grow (seashores or riversides) or by such peculiarities as orange bark, leaves withering red and so on. The trees in these special groups are also entered in the main key but the special keys serve as short cuts to their identification.

DESCRIPTIVE TERMS

A tree is composed of trunk, roots, branches, leaves, buds, flowers and fruits. Different kinds of trees are distinguished by differences in the structure, size and colour of these parts and for their description we use the following terms:—

General Terms

CROWN is the leafy canopy of the tree upheld by the trunk. Its shape is generally distinctive of the species.

ARMED, UNARMED, indicate whether the trunk or twigs are armed with thorns or not.

HAIRY, GLABROUS indicate whether twigs, leaves or fruits, for instance, are hairy or without hairs, *i.e.* glabrous.

STALKED, SESSILE, indicate whether leaves or flowers, for instance, have stalks or are without them, *i.e.* sessile.

AXILLARY means born in the axil of a leaf (on the side of a twig), in contrast with terminal.

TERMINAL means born at the end of a twig, in contrast with axillary, or *lateral*.

LATEX is the coloured sap of the living tissues of many plants. It may be white, pink, red, yellow, orange or even brown and it may turn colour on exposure to the air. It is generally sticky, rubbery, resinous or gummy but in some cases it is watery *e.g.* the *Ipo*-tree (*Antiaris*) and the Nutmegs (*Myristicaceæ*). It may occur in all parts of the plant or only in certain parts such as the twigs or leaves or bark or, even, the fruit (*e.g.* in *Thespesia* and *Mangifera*). The presence of the latex can be found only by breaking the tissues: it is very useful in the identification of many plants. A key to the latex-bearing plants is given on p. 58.

RESINOUS indicates that a part of the plant is coated with varnish or resin or that it smells of resin when crushed, *i.e.* has the resin in the tissues.

GLAUCCOUS with a greyish green, white or bluish sheen.

Roots

TAP-ROOT is the root which grows vertically into the soil and is in line with the trunk. It is generally the original enlarged root of the seedling.

LATERAL ROOTS are the roots which grow more or less horizontally into the soil and are at an angle to the trunk.

STILT-ROOTS are lateral roots which arise from the lower part of the trunk above ground and, in arching outward and downward into the soil, give the tree the appearance of standing upon stilts. Examples are the *Bakau* (*Rhizophora*), stilted *Simpoh*-trees (*Dillenia grandifolia*, *D. reticulata*), stilted Oil-Fruit (*Elæocarpus littoralis*), the Strangling Figs (Text-Fig. 250) and many pandans. Stilt-roots occur in many trees growing in swampy forest. *Jangkang* is the Malay name describing the appearance: it is given to any tree with stilt-roots though especially to two stilted trees of the *Kenanga*-family (Annonaceæ) called *Xylophia fusca* and *X. ferruginea* and to a *Nyatoh*-tree called *Palaquium xanthochyllum*. (Only *X. ferruginea* is described in this book).

BREATHING-ROOTS are short roots which project vertically into the air from the underground lateral roots of many kinds of trees which grow in swampy, muddy places. Examples are such mangrove trees as *Nyireh* (*Carapa*), *Api Api* (*Avicennia*), *Beremban* and *Perepat* (*Sonneratia*) and many trees of the fresh-water swampy forest such as the stilted Oil-Fruit (*Elæocarpus littoralis*) and some *Bintangor*-trees (*Calophyllum*). The breathing-roots are generally peg-like and have a light, spongy structure because of the abundant air-spaces in their soft tissues. These air-spaces assist in bringing air to the normal feeding roots which penetrate the water-logged mud in which the trees grow. Breathing-roots are well-provided with large lenticels (*see below*).

BUTTRESSES (*see p. 33*).

Bark

The colour and appearance of the bark on the trunk of a tree is so characteristic that the bark affords a useful subsidiary, if not primary, means of identification, and note should always be taken of it in the study of trees. The bark is the outer layer of the trunk, branches or roots which can be separated from the wood. It consists of the living sappy *inner bark*, which may be white, red or yellow though generally pinkish, and the dull, hard and often corky *outer bark*, which is the more distinctive. In some trees, especially of the Bean and Laurel-families, the bark grows evenly throughout the life of the tree and has a smooth appearance. But, in most cases, it does not grow rapidly enough to keep pace with the thickening of the woody core of the trunk so that it is stretched and the dead outer layer splits, cracks or peels in a characteristic way. A special feature of the bark is the *lenticels* which are small knobs, 1-10 mm. wide, often lighter in colour than the rest of the bark and rather powdery. They are air-holes which enable air to diffuse through the bark, the corkiness of which makes it impervious to air and water, and thus they ventilate the living tissues of the interior of the tree. The lenticels are most conspicuous on the twigs.

We have used the following terms in describing the bark:—

SMOOTH BARK is even, thin, and unbroken though it may be bumpy or pimply from the *lenticels*. It is generally grey, as in the Flame of the Forest (*Delonix*), *Albizia*, Oaks and Fig-trees but it is dark brown in the *Tiup-Tiup* (*Adinandra*) and various shades of yellow-brown in many Laurels. [Compare the Flame of the Forest (*Delonix*) with smooth grey bark and the Rain-Tree (*Enterolobium*) with brownish fissured bark].

BRANCHES

FISSURED BARK is cracked lengthwise into fissures separated by ridges: the ridges anastomose rather irregularly. The *Tembusu* (*Fagraea*) has deeply and coarsely fissured, brown bark. The Rain-Tree (*Enterolobium*) has shallowly fissured bark. Several species of *Deleh* (*Memecylon*) and *Tebangau* (*Glochidion*) have very finely and closely fissured bark.

CRACKED BARK is cracked lengthwise and crosswise as in some wild Mangosteens (*Garcinia*) or irregularly as in the Schima (*S. Noronhæ*).

SCALY or **FLAKY BARK** has irregular patches, scales or flakes of dead outer bark which become detached, e.g. the *Sentol* (*Sandoricum*) and *Durian*. It is the commonest form of bark but it varies much in detail. The size, shape and abundance of the flakes is characteristic of each kind of tree. The *Kapur* (*Dryobalanops*) has large, coarse flakes: the Guava (*Psidium*) has thin peeling flakes: and some kinds of *Eugenia* with orange bark have papery flakes. Many trees have fissured bark with scaly ridges, e.g. the Mountain *Gelam* (*Leptospermum*).

DIPPLED-SCALY BARK has small, round, thin, very numerous flakes like irregular discs, the closely set scars of which make the bark appear dipped. Such bark is characteristic of the *Kasai* (*Pometia*), *Rambai* (*Baccaurea*) and the *Rengas* (*Melanorrhæa malayana*).

PEELING BARK sheds its deal outer layers in long scroll-like pieces. It is characteristic of the *Pelawan* or *Tristania*-trees and of the mangrove *Nyireh* (*Carapa granatum*).

STRIPPING BARK can be torn or peeled from the wood in shreds or strips, e.g. the Hibiscus-trees, *Kayu Gaharu* (*Aquilaria*) and *Eugenia*s. In contrast, that of the *Tiup Tiup* (*Adinandra*), Oaks and many kinds of Laurel merely breaks off in irregular pieces and will not strip. The distinction can be appreciated at once on chipping the trunks with a parang.

A few precautions must be taken in studying barks. Trunks of living trees are often more or less overgrown with lichens the grey, green, pink, yellow or brownish colours of which may obscure that of the bark and lead to false impressions. Wet bark has a deeper or richer colour than dry bark: our descriptions refer to the dry bark. In the case of buttressed trees (p. 33), the bark of the buttresses is generally smooth and thin and often different from that of the trunk: our notes always refer to the bark of the trunk unless we have stated otherwise. Also we refer only to the bark of mature trees for that of saplings may not be fully formed.

On p. 85 is a key to trees with striking orange-coloured bark.

Branches

The branches of trees may be considered as composed of two parts. The stout portions connecting with the trunk and with other main branches are the *limbs* and the finer portions which bear the leaves near their ends are the *twigs*. It is convenient to distinguish, also, the leafy part of the twigs from the leafless parts immediately behind and from which the leaves have fallen. Many trees, like the *Kenanga*, *Durian*, *Rambai* and *Duku* flower mainly or entirely on the leafless parts of the twigs or on the branches (see *ramiflorous* p. 20).

NODES are the parts of the twigs where the leaves are attached, e.g. Text-Figs. 1, 7.

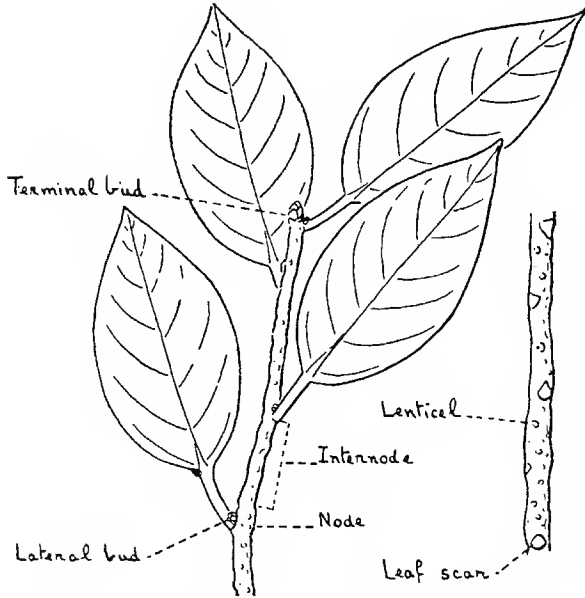
INTERNODES are the leafless parts of the twigs between the nodes. In trees with spirally arranged leaves (p. 18) as the Mango and *Ketapang* (*Terminalia*), the leaves are set so closely that the internodes cannot be distinguished.

SEPTATE PITH is a term used to describe the pith of twigs of certain trees which is divided into tiny compartments by fine cross-partitions *e.g.* in the *Kenanga*-Family (Annonaceæ) and in the thorny trees called *Zanthoxylum*.

LEADER-SHOOT is the terminal shoot which continues the main growth of the branch or trunk.

Buds

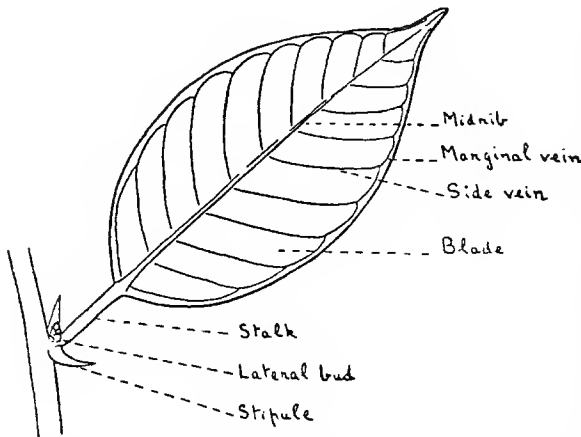
Every twig ends in a bud, which is called the *terminal bud* of that twig, and in the axil of every leaf, where it is joined to the stem, there is also a bud which is called a *lateral or axillary bud* (see Text-Figs. 1, 2, 3). In a few trees there are several axillary buds in each leaf-axil *e.g.* *Anisophyllea* and several trees of the *Bigonia*-family as the *Midnight Horror* (*Oroxylon*) and the *Dagger Tree* (*Pajanelia*). The conspicuous terminal buds of the *Mangrove* family (*Rhizophoraceæ*) and pointed lateral buds of the *Bungor*-trees (*Lagerstroemia*) are often useful in identification.



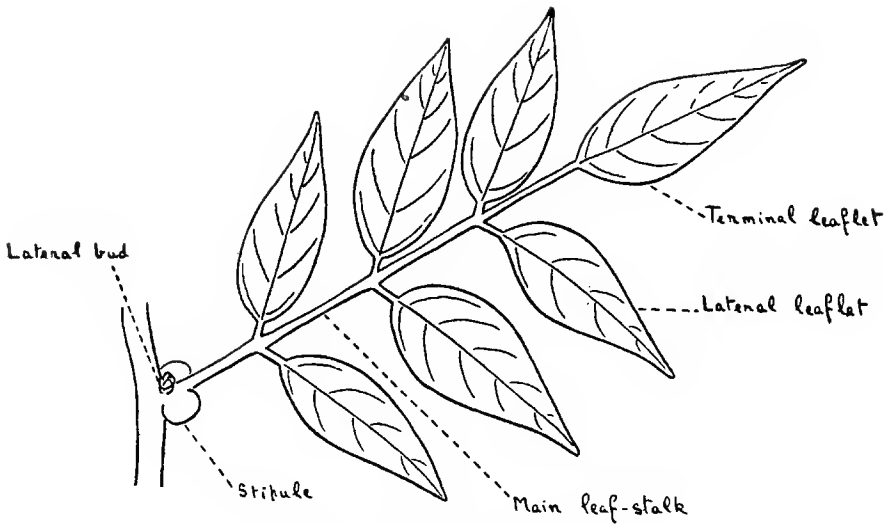
Text-Fig. 1. Twig with spirally arranged, simple leaves.

Leaves

There are so many differences in the leaves of our trees that it is essential that we should be able to describe them with some degree of accuracy, particularly if we wish to be able to recognise trees in the absence of flower and fruit. It is possible to recognise every tree described in this book from its leafy twig alone; and it is no exaggeration to say that the shape of the leaf is generally reflected in the shape of the tree—a fact well known to artists in the portrayal of trees by line-drawings. To this end we must consider not merely the *shapes* of leaves but their *arrangement* and their *venation*, that is the arrangement of the veins in the blade of the leaf.



Text-Fig. 2. Simple, elliptic leaf with 10 pairs of side-veins.



Text-Fig. 3. Simply pinnate leaf.

Leaf-shape

To the botanist, a leaf has four features, namely a *stalk*, a *blade*, a pair of *stipules* at the base of the stalk and an axillary *bud* in the leaf-axil where the leaf is attached to the stem, e.g. Text-Figs. 2, 3. A typical leaf is that of the Hibiscus. But not all leaves have stipules, e.g. the Mangosteen, and not all have stalks, i.e. leaves which are *sessile*.

SIMPLE LEAVES have a stalk and one blade, as in Text-Fig. 2.

TRIFOLIATE LEAVES have a stalk and three blades as in Text-Fig. 6. Each blade is called a *leaflet* and it may or may not have a stalk of its own. Examples:—*Dadap* (*Erythrina*), Plate 99; *Sentol* (*Sandoricum*), Plate 141.

PALMATE LEAVES have a stalk and four or more blades arranged at the end of it like the fingers of a hand as in Text-Fig. 6. Each blade is called a leaflet. Example:—Australian Ivy Palm (*Brassaiopsis*), Plate 24.

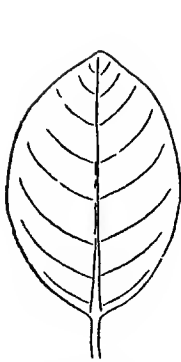
PINNATE LEAVES⁽¹⁾ (or simply pinnate leaves) have a stalk, two or more lateral leaflets on either side of it and, in many cases, a terminal leaflet at the end, as in Text-Figs. 3, 5. Examples:—*Sesban*, Plate 118; *Hog-Plum* (*Spondias*) Plate 14; *Nim* (*Melia indica*), Plate 139. The leaflets near the base of the leaf are the lower leaflets, those near the apex are the upper leaflets.

DOUBLY PINNATE LEAVES have a main stalk bearing several *side-stalks* on each side of it and the leaflets are borne on these side stalks, as in Text-Fig. 5. Examples:—*Jacaranda*, Plate 28; *Albizia*, Plate 76.

TREBLY PINNATE LEAVES are like doubly pinnate leaves but the side-stalks do not bear the leaflets directly but on shorter side-stalks, as in Text-Fig. 5. A few trees, like the *Midnight Horror* (*Oroxylon*), have quadruply pinnate leaves i.e. they have three sets of side-stalks. In one Ivy Palm, *Schefflera heterophylla*, there is the curious condition of leaves which are four times palmate, i.e. with three sets of side-stalks, the ultimate ones bearing the leaflets palmately.

COMPOUND LEAF is the name given generally to trifoliate, palmate and pinnate leaves, because they have more than one blade in contrast to the ordinary

(1) Lat., *pinna*—a feather; because the leaves often look feathery.



Elliptic, petiole
8 pairs of side-veins



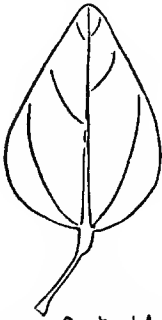
Asymmetric
5 pairs of side-veins



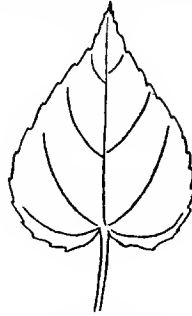
Oblong, tipped
3-veined



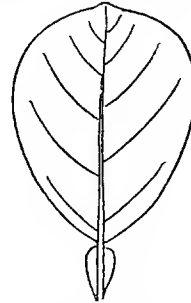
Lanceolate, sessile
7-veined



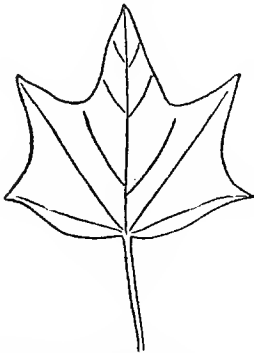
Ovate, blunt
3 pairs of side-veins: stalk with knee
3 basal veins



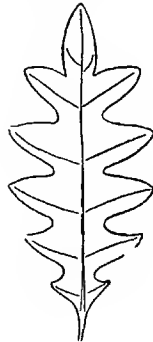
Heart-shaped, toothed
5 basal veins



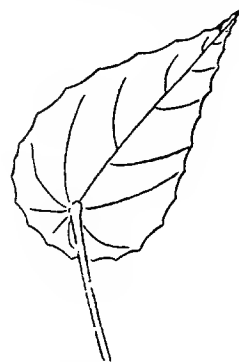
Ovate, bluntly tipped
leaf-stalk winged; 5 pairs of
side-veins



Palmately lobed, with
5 lobes and 5 basal veins



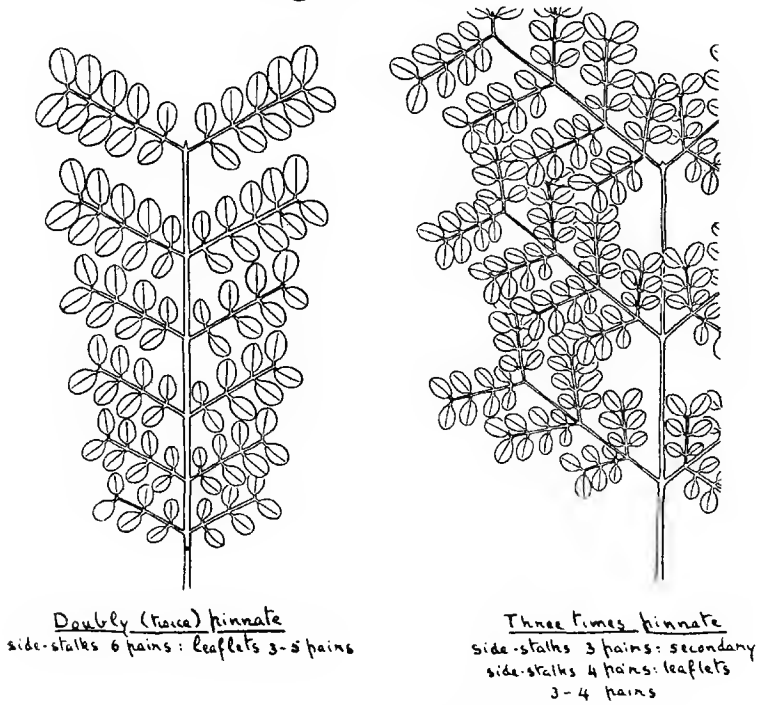
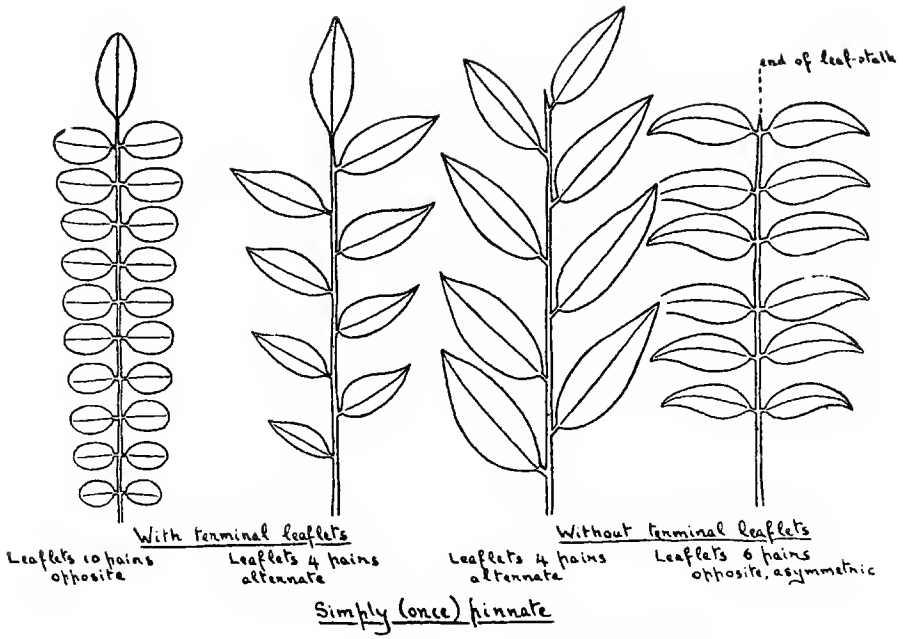
Pinnately lobed



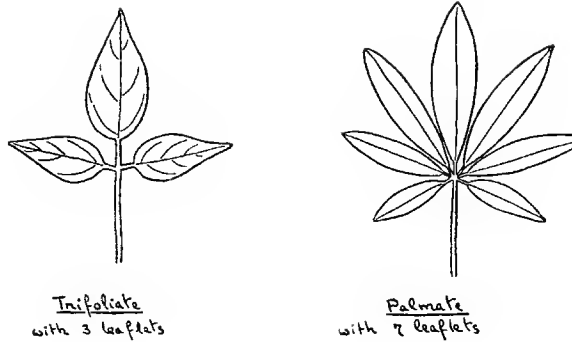
Peltate, ovate, toothed
8 basal veins
4 pairs of side-veins

Text-Fig. 4. Shapes and venation of simple and lobed leaves.

LEAF-SHAPE



Text-Fig. 5. Pinnate leaves.



Text-Fig. 6.

simple leaf which has the single blade. The several blades are always called leaflets. Pinnate leaves are in most cases easy to recognise because they give the tree a feathery appearance, *i.e.* plates 89, 95, 106, 119, 134, 138, but in some, like the *Rambutan* (*Nephelium*), *c.f.* Plate 179, and *Saraca* (Plate 117), the leaflets are few and large and suggest simple leaves. In such cases it is necessary to look for the axillary and terminal buds in order to decide which is twig and which is leaf: a compound leaf never has buds in the axils of its leaflets or at the end of its leaf-stalk. Moreover the leaflets of a pinnate leaf are usually asymmetric at the base *e.g.* Plates 139, 178.

ELLIPTIC describes a blade which is broadest in the middle and not unduly long *e.g.* Text-Fig. 4.

OBOVATE, or inversely egg-shaped, describes a blade which is broadest near to appear rather parallel-sided, Text-Fig. 4.

OVATE, or egg-shaped, describes a blade which is broadest near the base, *e.g.* Text-Fig. 4.

OBOVATE, or inversely egg-shaped, describes a blade which is broadest near the apex, *e.g.* Text-Fig. 4, Plates 2, 3, 45.

LANCEOLATE describes a blade which is long and narrow, *e.g.* Text-Fig. 4.

HEART-SHAPED refers to a blade the base of which is shaped like the conventional drawing of a heart, *e.g.* Text-Fig. 4, Plates 47, 133, 213 (left).

PALMATELY LOBED describes a blade which has three or more lobes suggesting the fingers of a hand *e.g.* Text-Fig. 4, Plate 35.

PINNATELY LOBED describes a blade which has several lobes arranged like the leaflets of a pinnate leaf, as in Text-Fig. 4, Plates 194, 196.

PELTATE refers to a leaf in which the stalk is attached not to the base of the blade but to its underside at a greater or less distance from the base, as in a *Lotus*-leaf; *e.g.* Text-Fig. 4, Plate 61.

SCALE-LEAVES are leaves so reduced and small that they appear like scales, *e.g.* bud-scales, Text-Figs. 89, 90, Plate 224.

TOOTHED refers to a blade which is cut, notched or jagged round the edge, *e.g.* Text-Fig. 4, Plates 52, 139, 184.

ENTIRE refers to a blade which is not toothed.

ASYMMETRIC refers to a blade the two halves of which on either side of the midrib are not symmetrical; it generally indicates that the base of the blade is asymmetric, particularly in the case of leaflets *e.g.* Text-Figs. 4, 5, Plates 15, 139, 184.

LEAF-ARRANGEMENT

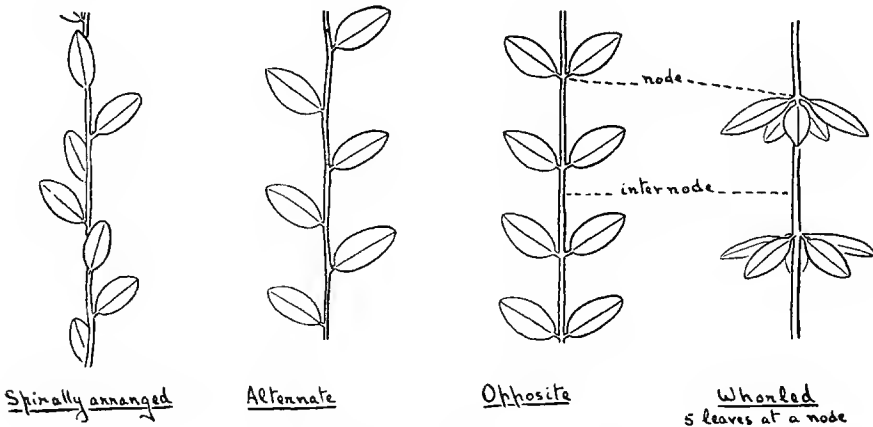
TIPPED implies that the blade has a sudden, not tapered, point, e.g. Text-Fig. 4, Plates 206 (right), 208, 211.

WINGED means that the leaf-stalk has a thin green flange or flat, blade-like extension on each side, e.g. Text-Figs. 4, 201.

WITH A KNEE means that the leaf-stalk has a knee-like swelling at the top, e.g. Text-Fig. 4, Plate 188 (right). The blade can be moved by the enlargement and contraction of opposite sides of this knee and thus it can be set in different positions, e.g. p. 28.

PHYLLODE is the botanical name for a leaf-stalk which has become flattened and leaf-like in place of the normal blade (see remarks under *Acacia* p. 405).

INTERPETIOLAR STIPULES* are the stipules placed between the pairs of leaves of plants with opposite leaves, e.g. the Mangrove and *Ixora* families (*Rhizophoraceæ*, *Rubiaceæ*), Text-Figs. 8, 189, 190, 197.



Text-Fig. 7. Leaf-arrangement.

Leaf-arrangement

SPIRALLY ARRANGED LEAVES are leaves which are set singly all round the twig, as in the *Hibiscus*, *Mango*, *Rambutan* or *Flame of the Forest*, e.g. Text-Fig. 7, Plates 3, 23, 37, 104.

ALTERNATE LEAVES are leaves which are set singly in two rows one on either side of the twig as in the *Cherry Tree*, *Durian*, many *Cassias*, *Sesban*, *Mexican Lilac*: e.g. Text-Fig. 7, Plates 18, 84, 88, 184. Such leaves are "staggered" along the twigs which are more or less horizontal or drooping. But the upright twigs of such plants always have the leaves spirally arranged, e.g. p. 28.

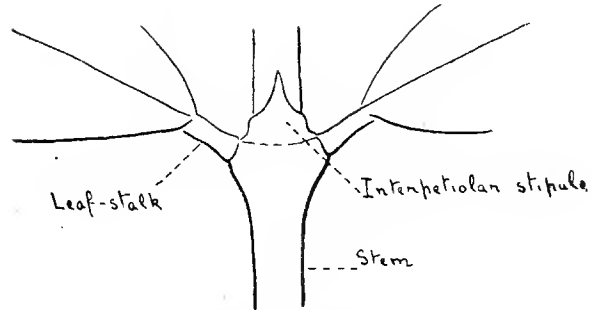
OPPOSITE LEAVES are leaves which are set in pairs on the twigs, two leaves at each node, as in the *Jambu*, *Kelat*, *Ixora*, *Mangosteen*, and *Henna-plant*: e.g. Text-Fig. 7, Plates 21, 28, 128, 149-154.

WHORLED LEAVES are leaves which are set three or more together in a circle (or whorl) at each node, as in the *Pulai* and *Oleander*: e.g. Text-Fig. 7, Plate 22.

* Petiole is the botanical name of the leaf-stalk.

Leaf-venation

Just as human beings can be recognised from the lines of their thumbs so can plants be recognised from the arrangement of the veins in the leaf. Given a leaf from any plant in the world, it should be possible to identify it after a close study of the arrangement of its veins, *i.e.* its *venation*. For our purpose there are only a few obvious characters of the veins which need be mentioned, because they provide short-cuts to the recognition of many plants. The veins are seen best on the underside of the leaf, especially of a dried leaf.



Text-Fig. 8. Interpetiolar stipules.

MID-RIB is the central vein of the leaf, *e.g.* Text-Fig. 2.

SIDE-VEINS are the stronger veins which arise from the midrib throughout its length. Generally there are the same number of side-veins on each side of the midrib, and it is useful to be able to count them as so many pairs. Thus the leaf in Text-Fig. 1 has 7 pairs of side-veins, that in Text-Fig. 2 has 10 pairs. Some leaves have only one or two pairs of side-veins, others have 30-40 pairs.

BASAL VEINS are the stout veins arising from the base of the blade, particularly noticeable in leaves with a broad or heart-shaped base *i.e.* Text-Fig. 4. The midrib is counted as a basal vein in numbering them.

MARGINAL VEINS are the veins connecting the outer ends of the side-veins, as in Text-Fig. 2. Only a few plants have marginal veins but they are very characteristic of *Eugenia*-leaves and of the leaflets of the Hog-Plum (*Spondias*), (Plates 14, 149-154).

LONGITUDINAL VEINS are veins which lie parallel with the midrib and on either side of it. They occur only in a few kinds of plants but they are most characteristic. The simplest case is the *3-veined leaf* which has a midrib and a longitudinal vein on each side, *e.g.* Text-Fig. 4, Plates 71, 157, 158, 190. In the *Gelam* (*Melaleuca*) Plate 156, the leaf has several longitudinal veins and the midrib can hardly be distinguished.

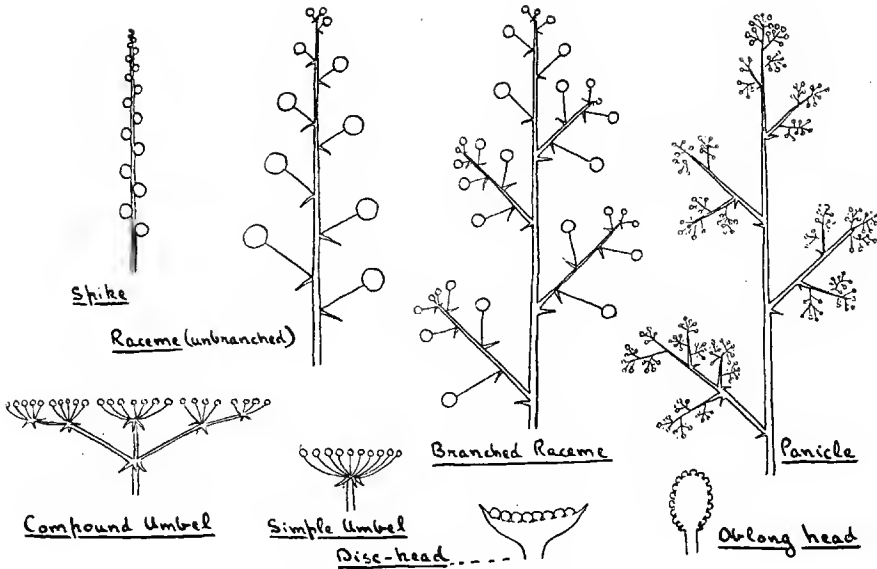
SPIDER-WEB VEINING occurs in many plants of the Rubber-tree family (*Euphorbiaceae*), *e.g.* Text-Fig. 86, Plate 61. The little veins joining the main-veins are arranged to give the appearance of a spider-web.

Flowers

The botanical classification of plants depends mainly on the structure of the flowers and fruits. Though we have striven to avoid technical details as much as possible, there are a few such structural features which must be mentioned, especially the *corolla-tube* and the *position of the ovary of the flower*.

FLOWER-ARRANGEMENT

Flowers are borne singly on stalks, as in the Garden Hibiscus, or they are clustered in what are termed *inflorescences*, *e.g.* *Ixora*, *Mango*. Generally these



Text-Fig. 9. Inflorescences.

flowers or inflorescences are borne on the leafy twigs, in the leaf axils or at the ends of the twigs. But the following are two exceptional states:—

*Ramiflorous** means that the flowers are borne on the bare twigs behind the leaves or on the branches, as in the *Durian*, *Rambai* (*Baccaurea*) and *Langsat* (*Lansium*).

Cauliflorous† means that the flowers are borne on the trunk, as in some fig-trees, Plate 205, the *Nam-Nam* (*Cynometra*) and the *Bilimbing* (*Averrhoa*).
FORMS OF INFLORESCENCE

Raceme is a stalk, branched or unbranched, which bears the flowers along it, each flower on its own stalk, e.g. Text-Fig. 9 and Plates 81, 83, 100, 188.

Spike is like the raceme but the flowers are almost or quite sessile, e.g. Text-Fig. 9, Plates 37, 45, 49, 73, 74.

Catkin is a hanging spike.

Panicle is a branched inflorescence with the flowers borne in clusters along it, as in the *Mango* and *Rambutan*: Text-Fig. 9, Plates 14, 38, 178, 179.

Cluster is a convenient term for a bunch of flowers such as that of the *Ixora* (Plate 168), *Saraca* (Plate 117) or *Rhodammia* (Plate 157).

Umbel is a cluster of flowers each placed on its own stalk and the stalks so arranged that the flowers lie at the same level e.g. Text-Fig. 9.

Head or *flower-head* is a very dense, short, round or oblong cluster of flowers which are generally sessile. The core of the head is often rather fleshy and the flowers are then set closely on it. The flowers are commonly very small. Heads occur in the *Bur-Flower* and *Mengkudu-trees* (*Morinda*) Plate 170, the *Jack-fruit* and its allies (*Artocarpus*) Plates 194-199, and in a peculiar form in the *Tree Daisy* (*Montanoa*) and *Vernonia* (see p. 195). A flower-head can be likened to a very short swollen flower-spike, e.g. Text-Fig. 9.

Bracts are the small, often scale-like, green or coloured leaves which are often produced on inflorescences at the base of the branches or of the flower stalks, for example the red leaves in the flower-clusters of *Poinsettia*, Text-Fig. 9. The flower-stalk of the *Amherstia* has a pair of big pink bracts (Plate 78).

* Lat. ramus—a branch. † Lat. caulis—a stem.

FLOWER-STRUCTURE

A typical flower, like that of the *Simpoh*, *Sendudok* or Cherry Tree, consists of four parts, namely the outer, green and protective *calyx* composed of *sepals*, the coloured *corolla* composed of *petals*, the *pollen-bearing stamens* and the *ovule-bearing ovary*. The sepals are generally smaller than the petals and they cover the unopened flower-bud: in some cases like the *Ixora*, *Kelat* (*Eugenia*) and *Delek* (*Memecylon*), the sepals may be reduced to minute teeth, or points. In other cases the petals may be very small, e.g. the *Pelawan* (*Tristania*) and *Chenerai* (*Grewia*). In a great many small flowers, such as those of the Laurels, Figs, Oaks and many members of the Rubber-tree family (*Euphorbiaceæ*), there are no petals but only small green, white or yellowish sepals. If it is impossible to distinguish sepals from petals in a flower, then it is considered generally that the sepals are present and the petals absent.

Regular (or *radially symmetrical*) flowers are ones which can be cut in any orientation through the centre into equal halves e.g. *Simpoh* (*Dilleniaceæ*), *Mangosteen* (*Garcinia*), *Hibiscus*, *Ixora*, *Cherry Tree* (*Muntingia*). Text-Fig. 11.

Bilaterally symmetrical flowers are ones which can be cut only in one direction through the centre so as to divide them into equal halves e.g. *Sendudok* (*Melastoma*, with long stamens in the lower half of the flower), flowers of the Bean-family (p. 358) and flowers of the *Bignonia-family* (p. 160). See also the two-lipped flowers mentioned below. Text-Fig. 11.

Bisexual flowers have both stamens and ovary.

Unisexual flowers have either stamens or ovary.

Male flowers have only stamens, in some cases with a rudimentary or sterile ovary, e.g. the *Mangosteens* (*Garcinia*).

Female flowers have only an ovary, in some cases with rudimentary stamens, e.g. the *Mangosteens* (*Garcinia*).

Free means having the parts of the flower separate from each other, i.e. free sepals, free petals, free stamens, in contrast to flowers with the sepals or the petals or the stamens joined together.

Calyx-tube is the short or long tube to which the sepals are joined in many flowers, e.g. *Hibiscus*.

Corolla-tube is the short or long tube to which the petals are joined in many flowers, e.g. *Ixora*. Text-Fig. 11. A corolla-tube can be picked off in one piece.

Staminal tube is the short or long tube to which the stamens are joined in some flowers, e.g. *Hibiscus* and *Sentol* (*Sandoricum*) p. 467, Text-Fig. 156.

Anther is the knob at the end of the stamen which contains the pollen. The pollen consists of microscopic grains which represent the male cells of the plant and are called *pollen-grains*.

Numerous means having many parts—too many to count easily, e.g. the numerous stamens of the *Hibiscus*, *Buttercup-tree* (*Cochlospermum*) or *Cherry Tree* (*Muntingia*).

Two-lipped flowers have a corolla-tube the mouth of which is compressed so as to give the appearance of having two lips, e.g. the *Bignonia-family*, Text-Fig. 43.

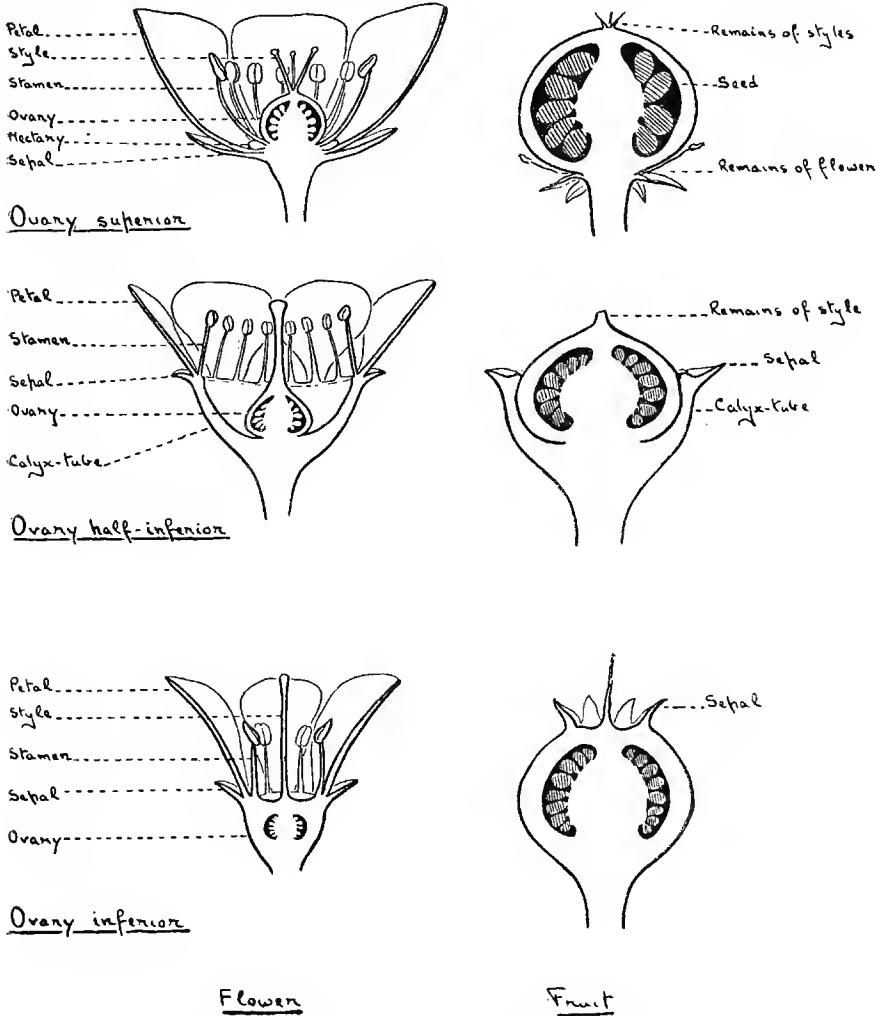
Nectary is the part of the flower which forms the *nectar* or sugary liquid, for which insects and birds generally visit flowers. The nectary is usually between the stamens and ovary as a ring of tissue or a set of brightly coloured knobs.

STRUCTURE AND POSITION OF THE OVARY

The ovary is a sort of box containing one or more compartments in which are attached one or more grain-like bodies: these are the *ovules* or unfertilised rudimentary seeds. The ovary has generally one or more stalks at the top

FLOWERS

called the *styles* each of which bears at its apex a sticky knob called the *stigma*. In some cases like the Cherry Tree (*Muntingia*) and the Mangosteens, there is no style and the stigma is sessile on the vary. Pollen-grains placed on the stigma send down microscopic tubes into the ovary and fertilise the ovules, which then develop into the seeds.

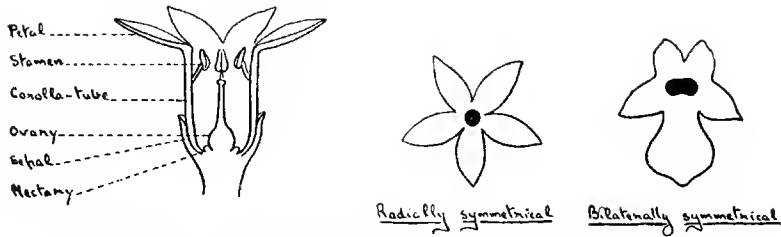


Text-Fig. 10. The structure of three kinds of flowers, with their fruits, to show the position of the ovary.

A *superior ovary* is one which is placed above the attachment of the stamens, petals and sepals, e.g. Text-Figs. 10, 244.

An *inferior ovary* is one which is contained in the flower-stalk and is below the attachment of the sepals, petals and stamens, e.g. Text-Figs. 10, 167.

A *half-inferior ovary* is one which is surrounded by the calyx-tube bearing the sepals, petals and stamens above it, Text-Figs. 10, 140.



Text-Fig. 11. The structure of flowers with a corolla-tube.

Fruit

The fruit is developed from the ovary of the flower after pollination. It contains one or more *seeds* which are the ovules that have enlarged and developed each an embryo as a result of their fertilisation by the pollen-tubes. One pollen-grain produces one pollen-tube: it fertilises one ovule which then develops into one seed containing one embryo or unsprouted seedling.

The shape and structure of fruits are important because each genus of trees and, even, some families of plants have their particular kind of fruit. Thus the pod with one cavity and a single row of seeds distinguishes the Bean-family (*Leguminosæ*); the pod with two cavities and a double row of seeds distinguishes the *Bignonia*-family (*Bignoniaceæ*) and the pair of bean-like pods developed from one flower distinguishes many genera of the *Periwinkle*-family (*Apocynaceæ*).

A feature to notice is the position of the withered remains of the flower because it indicates the position of the ovary in the flower, *e.g.* Text-Fig. 10. If the remains are round the stalk of the fruit, as in the *Cherry* (*Muntingia*), then the ovary must have been superior; if at the top of the fruit as in the *Jambu* (*Eugenia*), then the ovary must have been inferior. In many cases the sepals and even the petals of the flower enlarge after pollination and envelop the fruit as it sets (*e.g.* the *Simpoh*-trees, *Dilleniaceæ*) or at least protect it when young (as in the *Mangosteen*, *Garcinia*), or they may develop into wings which assist the fruits in their dispersal by the wind. In the *Dipterocarp* trees (Text-Fig. 53, p. 209) and *Parishia* (Text-Fig. 23, p. 112) the wings of the fruit are the enlarged sepals; but in the *Rengas*-trees (Text-Fig. 27, p. 120) the wings are the enlarged petals.

It is convenient to regard fruits in the first place according as they split open when they are ripe (so that the seeds can drop out) or as they do not split open. From this distinction we can derive the following kinds of fruits, the recognition of which is important for the identification of trees, particularly wild ones:—

Dehiscent fruits, splitting open at maturity

PODS.—These are typically long fruits containing one or two cavities and one or two rows of seeds, *e.g.* Text-Figs. 39, 126, 127. They split into *two* parts.

CAPSULES.—These are short or round fruits which split into two, three, four or more parts when ripe. They generally contain many seeds set in different cavities in the fruit (generally as many cavities as the parts into which the fruit splits), *e.g.* Text-Figs. 60, 152, 236.

* In some plants, like the *Mango* (*Mangifera indica*), a seed contains more than one embryo, and each embryo sprouts into a separate seedling.

Indehiscent fruits, not opening

FLESHY FRUITS OR BERRIES.—These have fleshy walls or leathery rind and fleshy pulp. They contain one or more seeds which may be small or large, hard or soft and so on, *e.g.* Mangosteen, *Rambutan*, Orange, *Tembusu*, Papaya, Mango, Soursop. The pulp around a seed in a fruit is called the *aril* of the seed.

DRY FRUITS OR NUTS.—These have leathery or woody rinds which are not pulpy or edible, though the kernel of the seed may be edible, *e.g.* the *Ketapang* (*Terminalia*). These fruits often have wings which serve as parachutes, *e.g.* Text-Figs. 23, 27, 53.

GENERAL REMARKS ABOUT TREES

Our larger plants can be classified conveniently under ten headings, namely trees, shrubs, herbs, climbers, palms, cycads, bamboos, pandans, tree-ferns and ordinary ferns. Strictly, our book should deal only with the first but, as we have explained in the introduction, it includes many of the larger and commoner shrubs. A tree differs from a shrub in its greater size and in possessing a trunk, but there are many intermediate states variously called large shrubs, shrubby trees or treelets. A red *Ixora* or a *Sendudok* (*Melastoma*) will develop a slender trunk in the forest although it remains a bush in the open. The Mountain *Gelam* (*Leptospermum*), the False *Ru* (*Bæckia*) and the *Mentigi* (*Pemphis*) are most certainly trees when grown on good soil but in poor soil, as on rocky ground or in bogs, they are dwarf shrubs flowering at a height of six to twelve inches. Nor are these the only complications. There are such plants as the *Mengambir* (*Mæsa*), the Thorny Tree-Vine (*Leea angulata*) and the Giant Mimosa (*Mimosa sepiaria*) which throw out scrambling limbs and can be regarded as climbers like the brambles and roses of temperate countries. And under what heading shall we class the strangling figs which stand on trunks of roots which have grown down through the air? Even the Fig Pear (*Pyrus granulosa*) may be anomalous.

Concerning the size of trees, the tallest found in Malaya was a *Tualang* (*Koompassia excelsa*), 265 ft. in height. The average of the big trees in the forest, however, is about 170 ft; in the swampy forest it is about 120 ft. and in the mid-mountain forest, at 4,000 ft. altitude, it is 80 ft. Trees exceeding 200 ft. in height are scattered in the lowland forest and are mostly found in the sheltered valleys of foothills. Under the forest-canopy there is every gradation to the perfect miniature tree, the Leechwood (*Anisophyllea disticha*). It often happens, too, that large trees begin to flower when only four or five feet in height, *e.g.* the *Tiuh Tiuh* (*Adinandra dumosa*) and *Grewia laurifolia*. But of such occurrences or of the age which Malayan trees reach we know little or nothing. Some of them show markings in their wood like the annual rings of temperate trees but the absence of clear seasons in Malaya and our ignorance of the local conditions producing these rings prevent us from computing the age of the tree from their number. It seems that a ring in a Malayan tree signifies a crop of new leaves, and the frequency with which the leaves develop varies considerably: some trees develop new leaves three or four times a year, others twice a year or once a year or at even longer stretches, and the leaves of some wild nutmegs may last for two or three years. Whenever we have such information, it is mentioned under the specific descriptions.

Meranti trees (*Dipterocarpaceæ*) are said to grow to a girth of 7 feet (c. 2 ft. in diameter) in 70 years, and the harder *Chengal* trees to a girth of 8 feet (c. 2½ ft. in diameter) in 130 years.

The Shapes of Trees

The shapes of trees depend on the shapes of their crowns which can be classified in these general terms:—

(a) round and bushy: *e.g.* Mango, *Kundangan* (Bouea), Tamarind, Cinnamon, Rose of India (Lagerstrœmia), *Tanjong* (Mimusops), *Guncheh* (*Antidesma ghæsembilla*), *Mempoyan* (Rhodamnia): (Plates 11, 56, 119, 124, 180).

(b) oblong or cylindric (taller than broad): *e.g.* Sea Apple (*Eugenia grandis*), *Sentol* (Sandoricum), *Tui* (Dolichandrone), Purple Millettia (*Millettia atropurpurea*), *Meninjau* (Gnetum): (Plates 26, 140, 148, 222).

(c) umbrella-shaped or flat-topped: *e.g.* Rain Tree (Enterolobium), Flame of the Forest (Delonix), Yellow Flame (Peltophorum), Albizzia, old *Ketapang* tree (*Terminalia catappa*): (Plates 75, 95, Text-Fig. 12).

(d) conical *e.g.* *Ru* (Casuarina), Cryptomeria, Thuja, *Kenanga* (Canarium), Ceylon Iron Wood (Mesua), sapling *Tembusu* (*Fagræa fragrans*), wild Nutmegs (Myristica), most saplings: (Plates 41, 67, 218, 222).

(e) broken or interrupted: *e.g.* Kapok (Ceiba), *Pulai* (Alstonia), young *Ketapang* trees (*Terminalia catappa*): (Plates 44, 131, 221).

(f) weeping, with drooping twigs or drooping lower limbs: *e.g.* Weeping Willow (Salix), *Angsana* (Pterocarpus), Stinking Mahogany (Cedrela), Jujube (*Zizyphus*).

Some trees, also, are bushier than others and this difference appears to rest on the ability of the leaves to withstand shade. If, as in the *Kundangan* and *Rumenia* (Bouea), the leaves can tolerate deep shade, they remain on the twigs though they are overshadowed by the new ones and the crown becomes exceedingly dense. At the other extreme is the Albizzia the leaves of which are spread out in a light canopy through which the sky can be seen as though through feathered tracery, and the branching takes place mostly at the lower edge of the crown which becomes umbrella-shaped. The pagoda-trees, described on p. 30. offer another solution of this problem of internal shading. There is the difference, too, between trees with big leaves, like the *Terap* and Bread-fruit (Artocarpus), and those with fine leaves like the *Nenasi*-trees (Eurya, Eugenia spp., Symplocos), big-leaved trees have rather few stout twigs, fine-leaved trees many slender twigs, and, likewise, large pinnate leaves have stout stalks, fine ones slender stalks: which all contribute to the appearance of the trees.

When we begin to recognise trees from their shapes, however, and analyse the reasons, we find that the branching of the tree is the significant factor. Branches develop from buds in the leaf-axils. Consider a sapling, every bud of which developed a twig. It would be round and so exceedingly bushy that it would be likely to choke itself. We do not know such a plant but the Pink Kopsia (*K. fruticosa*) gives an idea of what its appearance would be. In the majority of plants most buds never develop but remain dormant and only a few, in special positions, grow into twigs and, of these twigs, only a few thicken into limbs. In every tree we find a particular arrangement whereby many buds are suppressed so that the twigs develop in a relatively sparse, symmetrical pattern and, also, a process of self-pruning by which most of the old twigs are cast off as the branches grow longer. It often happens that the suppressed buds develop into flowering shoots or inflorescences, as in the *Ketapang* (*Terminalia*) and *Tembusu* (*Fagræa*) and such trees as the Jack-fruit, *Durian* and *Duku* (*Lansium*) which flower on the trunk or branches; and the dead, discarded twigs can be found under the tree or be seen as rotting snags on the limbs. How these factors may be elaborated is shown by the *Tembusu* (*Fagræa*) adult specimens of which

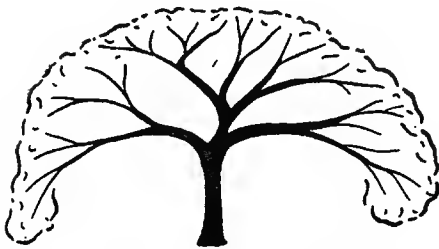
SHAPES OF TREES

have, perhaps, a more complicated manner of growth and branching than any other Malayan tree. In addition, buds are suppressed more often under shady conditions than in the open and thus it happens that forest trees develop lanky trunks, pruning off their limbs as they grow upward, until on reaching sufficient light, whether it be at the level of the canopy of the forest or beneath it, the limbs persist and the specific crown is constructed: in contrast, trees of secondary jungle tend to be short-stemmed and bushy from a low height. From their lofty crowns elevated on tall trunks, the primeval trees, or *tropical dendrons*, can therefore be recognised after their surrounding forest has disappeared, cf. Plates 19, 102, 200.

To analyse the shapes of trees critically, we must consider the growth of the main stem, because trees can be put into two categories according to the behaviour of the leader-shoot. If this continues vertically upward during the life of the tree a straight trunk is developed which tapers to the top of the crown and the crown itself is more or less steeply conical according to the distance which the lower branches grow out from the trunk in regular succession from below upwards, e.g. Text-Fig. 13. The fir of temperate climates is the example of such a tree: in Malaya, we may choose the *Ru* (*Casuarina*, Plate 41). In the other method, the upward growth of the leader-shoot of the sapling is arrested sooner or later and a twig, developed from some distance below the apex of the leader, occupies its place: the twig swells into the next portion of the main stem, then its growth is arrested and it is substituted by another: finally, instead of one twig there develop several which grow equally strongly and the trunk of the tree appears to break up, therefore, into several large limbs and it cannot be traced to the vertex of the crown, e.g. Text-Fig. 13. Curious as it may seem, this intermittent manner of growth is by far the commoner and is the principle of construction of the spreading, shady tree. The growth of the leader is arrested, generally, for one or other of two reasons.



Either it develops into a terminal inflorescence and the side-branches in their turn become inflorescences, as in the trees of the *Bignonia*- and *Verbena*-families, the *Yellow Flame* (*Peltophorum*), the *Bungor* (*Lagerstœmia*), the *Elder* (*Sambucus*) or the *Ixoras*; or it is weak and bends over and from its upper side a twig develops which in turn bends over and gives off another obliquely ascending twig so that the crown is built up of superimposed oblique sprays as in the *Cassia*- and *Angsana*-trees and most members of the *Bean*-family (Text-Fig. 12). Indeed, this *Cassia*-habit leads to the *umbrella-shaped trees* of the *Bean*-family, such as the *Rain-tree* (*Enterolobium*), *Albizzia*, *Petai* (*Parkia*) and *Flame of the Forest* (*Delonix*) in which the branching continues mainly at the periphery of the crown so that there is the least overshadowing and the crown grows in width more than it does in height.



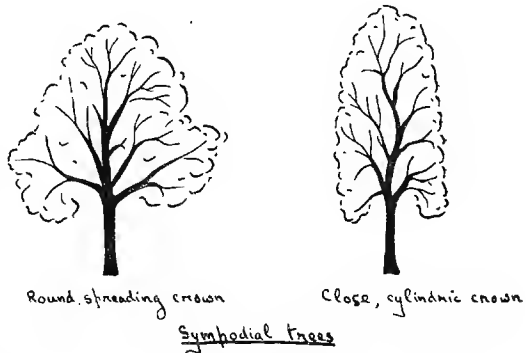
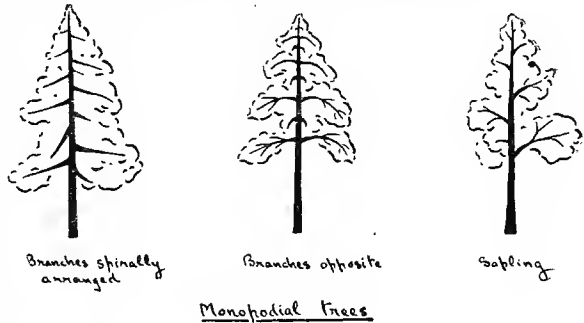
Text-Fig. 12. Diagram of the development of an umbrella-tree by sympodial branching.

To these two sorts of growth, distinguished by the behaviour of the leader-shoot, botanists give the technical names *monopodial* (having the trunk composed of one foot or leg, as in the fir-tree) and *sympodial* (having the trunk composed of several legs, as in the Tulip-tree, Spathodea, or Cassia). If we combine this distinction with the arrangement of the leaves on the twigs (as described on p. 18) we arrive at the following classification of tree-shapes.

1. LEAVES SPIRALLY ARRANGED

- (a) monopodial trees, e.g. *Prah* (Elateriospermum), *Senkuang* (Dracontomelum) (Plate 5), Persian Lilac (*Melia azedarach*), *Ketapang* (Terminalia) (Plate 44), Kapok (Ceiba) (Plate 131), Araucaria (Plates 146, 222).
- (b) sympodial trees, e.g. Mango (Mangifera) (Plates 9, 10, 11, 12, 13), *Rambutan* (Nephelium), Flame of the Forest (Delonix), Frangipanni (Plumiera), Buttercup Tree (Cochlospermum) (Plate 35), Wodier (Lansea) (Plate 7), *Sentang* (*Melia excelsa*) (Plate 138).

Most pinnate-leaved trees belong to the second of these subdivisions. Some members of the first, such as the *Prah* and *Senkuang*, have the least specialised shape of any of our trees, so much so that we can regard them as presenting the primitive shape of flowering trees from which the others have been evolved: their branches develop regularly round the trunk, the twigs round the branches and the leaves round the twigs so as to produce a dense, bushy, conical crown. This class of tree has three characteristic derivatives:



- (i) with obovate leaves (*widest near the apex*), shortly stalked and arranged equally round the twig, e.g. Mango-tree (Mangifera), *Terentang* (Camptosperma), Sparrow's Mango (Buchanania) (Plate 3), *Ketapang* (Terminalia) (Plate 45),

Text-Fig. 13. Diagrams of common shapes of trees. *Pelawan* (Tristania), *Chiku* (Achras), *Putat* (Barringtonia) (Plate 72). The widest portion of the leaf-blade is thus furthest from the twig and, the leaves being set radially in a regular rosette, the arrangement gives the least overlapping.

- (ii) with ovate or heart-shaped leaves (*widest near the base*), long-stalked and arranged unequally on the twig, the leaves on the lower side of the twig having larger blades and longer stalks than those on the upper side and so graded on each side of the twig that the uppermost leaf is the smallest and the lowermost the largest. The leaves are thus set in an *excentric* rosette and, through the

SHAPES OF TREES

length of the stalks, the blades are projected to overlap as little as possible: indeed, with this leaf-shape, on other arrangement would be satisfactory. Good examples are the *Kepayang* (Pangium), *Buah Kerah* (Aleurites) (Plate 55), Sterculia-trees, many kinds of Oil-Fruit (*Elæocarpus*) and the *Rambai*- and *Tampoi*-trees (*Baccaurea*). In most cases there is a joint or "knee" at the top of the leaf-stalk, in the form of an oblong swelling, by which the leaf-blade can be rotated and set at a suitable angle after it has expanded, thus reducing yet further the amount of overlapping (cf. *Elæocarpus petiolatus*, Plate 188).

(iii) Pagoda-trees (see p. 30).

2. LEAVES ALTERNATE (though spirally arranged on the main stem and on the almost vertical branches)

(a) monopodial trees: *Kenanga*-family (Annonaceæ), Nutmeg-family (Myristicaceæ) (Plate 218), *Tiup Tiup* (*Adinandra*), Eucalyptus (Plate 146), Shiny Laurel (*Lindera lucida*), many sapling trees such as the *Durian*, Oak-trees (*Quercus*) and Dipterocarp-trees.

(b) sympodial trees: Cherry Tree (*Muntingia*), *Chenerai* (*Grewia tomentosa*), Eurya, *Symplocos*, *Merbatu* (*Parinarium*) (Plate 165), *Angsana* (*Pterocarpus*) (Plates 114, 116), *Saraca*, *Brownea*, *Mason-Bee Tree* (*Commersonia*).

The striking feature about the trees of this class compared with the preceding is that they have developed oblique or horizontal *sprays of foliage*: in the preceding class, with spirally arranged foliage, all the twigs grow more or less upward so that the trees never thrust out sprays of green but have always a bushy or bunched appearance. How slight may be the distinction between the groups, is revealed, nevertheless, by many Oaks, Laurels, Willows, Figs, Eucalyptus-trees and so on, in which it is very difficult to decide whether the leaves are alternate or in a loose spiral (such we have always placed under both groups in our keys to identification).

Several trees of this group have the Cassia-type of growth (Text-Fig. 12), e.g. the Cherry Tree (*Muntingia*) and the *Angsana*. And many have drooping or weeping limbs, e.g. *Angsana*, *Brownea*, *Symplocos*, Eurya, *Merbatu*, *Kenanga*; *Drypetes*, *Anisophyllea disticha*, and the Weeping Willow (*Salix*. sp.). Such are, indeed, weeping trees *par excellence*.

A peculiar and complicated modification of this class of tree occurs in five genera of the Rubber-tree family, namely *Cicca*, *Emblica*, *Glochidion*, *Breynia* and *Phyllanthus*. It is described on page 278.

3. LEAVES OPPOSITE

(a) monopodial trees: Mangosteen-trees (*Garcina*) (Plate 66), *Bintangor* (*Calophyllum*), Ceylon Iron Wood (*Mesua*) (Plate 67), *Duabanga* (Plate 127), *Anthocephalus* (Plate 167), *Morinda* (Plate 169), sapling *Tembusu*, most members of the Mangrove-family (*Rhizophoraceæ*), *Gnetum* (Plate 227).

(b) sympodial trees: Bignonia-trees (*Bignoniaceæ*) (Plates 26, 31, 33), *Teak* (*Tectona*) (Plate 215), *Bungor* (*Lagerstroemia*) (Plate 124), *Eugenia* (Plates 147, 148, 152), *Ixora*, *Kopsia*, *Cratoxylon*, *Clerodendron*.

There is little to distinguish the general appearance of the trees of this class from those of the preceding, except that their branches are borne in pairs on the trunk and their twigs in pairs on the branches so that the shape of the tree is often more formal, especially when the foliage is not dense enough to obscure

the branching, e.g. Plates 66, 167. In many cases the branches make a characteristic angle or arch with the trunk. In the Mangosteen trees (*Garcinia*) and *Bintangor*-trees (*Calophyllum*), the limbs first point up at an acute angle from the trunk then curve out and down until they are horizontal or slightly drooping (Text-Fig. 13): in the *Kelempayang* (*Anthocephalus*) they stand stiffly from the first: but, in the *Beremban Bukit* (*Duabanga*) (Plate 127) they drop heavily.

There can be traced in this class, too, the evolution of the *flattened leafy spray* which is the bough that can be thrust so effectively in any direction through gaps in the forest across the path of light. The simplest arrangement of leaf and twig occurs in the Bignoniaceous trees with *pinnate* leaves and in those of other families with more or less obovate leaves, e.g. *Eugenia palembanica*, *E. subdecussata*, *E. punctulata*, *Tembusu* (*Fagraea fragrans*) (Plate 123), Lettuce Tree (*Pisonia*), *Penaga Laut* (*Calophyllum*) (Plate 65), *Api Api* (*Avicennia*) and the Teak-tree (*Tectona*). In them the leaves are set in four rows¹, the twigs being more or less four-sided and the leaves of a pair set at right angles to those of the pair above and below, and the twigs are directed more or less upward so that the leaves are exposed equally to the light. Such trees do not have proper leafy sprays but there are two modifications of this setting of paired leaves on the side branches which lead to the desired construction:

(i) the leaves are set in *two* rows because the terminal bud of the twig twists through a right angle immediately after forming a pair of leaves and thereby brings into the same plane the next pair, (which would have been set at right angles to the preceding pair owing to the fundamental arrangement of the leaves in four rows). The twisting is made alternately to the right and to the left and can be seen in the spiral direction of the grooves or angles on the leafy twigs. The result is a flat, leafy spray as elegant as that of any tree with alternate leaves. Examples are most species of *Eugenia*, the Guava (*Psidium*), the Mangosteen, the *Mempoyan* (*Rhodamnia*) (Plate 157), Cinnamon (Plate 71), Cursed Shade (*Pternandra*), Ceylon Iron Wood (*Mesua*), *Memecylon*, *Ixora*, *Rumenia* and *Kundangan* (*Bouea*), and coffee-bushes.

(ii) the leaves are kept in their original four rows but on the horizontal or inclined twigs (having distinct upper and lower sides) the leaves on the upper side are much smaller than those on the lower side or, even, are undeveloped: the leaves on the lower side may be correspondingly larger than those flanking the twig. The effect is a leafy spray with three rows of leaves. It is not a common arrangement but it is seen in such common small trees as the Wild Randa (*Randia anisophylla*) (Plate 171), and the Swaddling Flower (*Clerodendron laevifolium*) (Plate 213). It occurs also in some other species of *Randia*, very remarkably in *Randia exaltata* and *Callicarpa farinosa* and in the flowering shoots of the *Mengkudu*-trees (*Morinda*) on which the flower-heads develop only on the upper side of the shoots from the axils of the suppressed leaves (Plate 170).

4. LEAVES WHORLED

(a) monopodial trees: the Laurel-trees *Actinodaphne*, sapling *Jelutong*-trees (*Dyera*).

(b) sympodial trees: Oleander (*Nerium*), *Pulai*-trees (*Alstonia*, see p. 32).

In their shape and the direction of their twigs the trees of this small class resemble those of the first. Some may have rather upright leaves, like the *Pulai*-trees; others like the Laurels, *Actinodaphne*, have drooping leaves.

(¹) Decussately arranged.

PAGODA-TREES AND TERMINALIA-BRANCHING

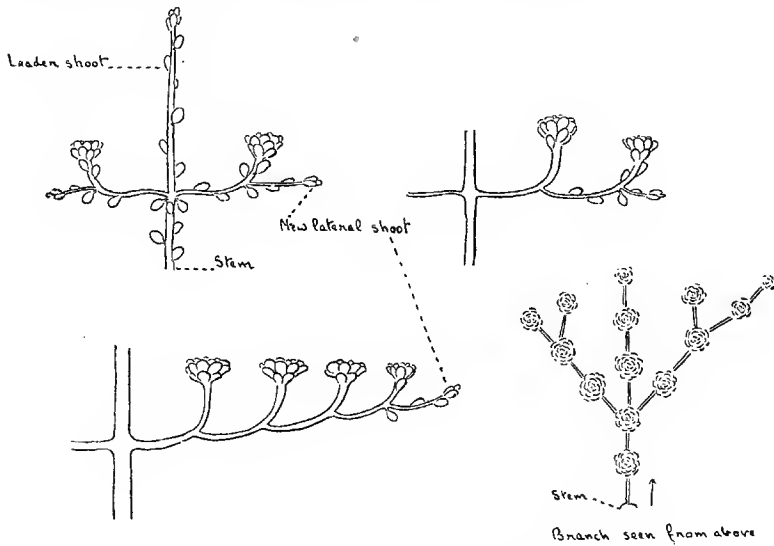
The main features which enable a tree to be distinguished by its shape can be summarised thus :

1. the manner of growth of the main stem,
2. the arrangement of the branches on the main stem and the angle which they make with the trunk,
3. the arrangement and direction of the twigs,
4. the arrangement of the leaves on the twigs,
5. the size, shape and direction of the leaf-blade.

The peculiar cases of the Strangling Fig-trees and of the Earth-Figs are described on pp. 664, 665.

Pagoda-Trees and Terminalia-Branching

Our photographs of the *Ketapang* (Plate 44), *Pulai* (Plate 221) and *Kapok* (Plate 131) show an open-crowned tree of formal aspect, with the limbs set in tiers on the straight trunk rather like the eaves of a pagoda : from this resemblance, we have named them *pagoda-trees*. Their striking shape depends not only on the spacing of the limbs on the trunk but on their own peculiar branching whereby the leaves are set together in upturned posses to form mats of foliage, there being one such mat for each tier of the crown : and, because this branching is typical of the genus of the *Ketapang*, we have called it *Terminalia-branching*. Many trees, such as the *Rambai* (*Baccaurea*) and the *Tembusu* (*Fagraea*), have *Terminalia-branching* but relatively few have evolved the pagoda-shape. We will describe firstly this kind of branching, then enumerate the peculiarities of the pagoda-tree, explain them by describing a *Ketapang* and, finally compare other trees of the same shape particularly the *Pulai* (*Alstonia*).



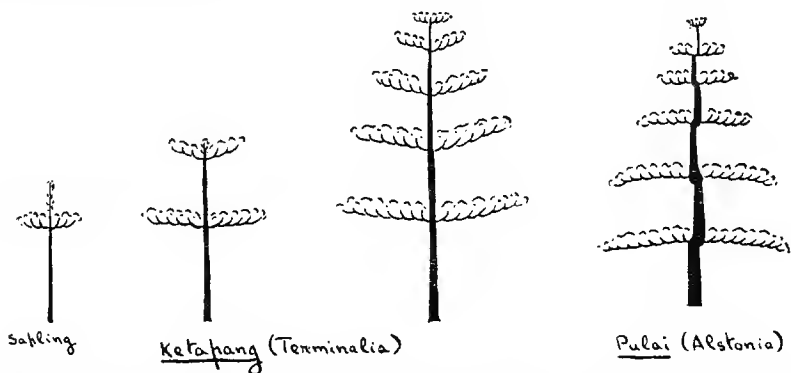
Text-Fig. 14. Diagram of Terminalia-branching.

Terminalia-branching is found mostly in trees with spirally arranged leaves, e.g. the *Chiku* (*Achras*) and *Ketapang*, less commonly in those with opposite leaves, e.g. the *Tembusu*. The leaves may be simple or palmate but, so far as

we have observed, they are never pinnate. The branching affects the twigs. Each twig which grows from the leader-shoot of the tree does so rapidly and at a wide angle from it; then, as its growth slackens, it turns up at the end and from its lower side, just at the bend, a branch arises to grow out as another twig which will follow the same course by turning up at the end and branching in its turn. Thus a limb of the tree comes to be built up of a succession of bent twigs, as shown in Text-Fig. 14¹. In the first horizontal part of such a twig the internodes are lengthened; the leaves, or their scars, are widely spaced on the slender stem; and growth has been rapid so that the new shoot has quickly been thrust beyond the parent rosette of leaves. In the second, vertical or upturned, part of the twig the internodes are very short or absent and the leaves, or their scars, are very crowded on a stout stem so that, while many more leaves are being produced than in the previous stage of the twig's development, its growth in length is much retarded: eventually the twig ceases growing, withers and falls off. When such a limb, as that shown in Text-Fig. 14, is growing out from the trunk of the tree, it diverges from its neighbours and begins to branch sideways: this it does by producing every now and again not one twig but a pair of twigs, or even three, which grow out from each other at a wide angle; and thus the limb develops into a fan-shaped leafy spray. How the tiers of a pagoda-tree are constructed will now be evident: a tier can be likened to a dense mat of foliage composed of rosettes of leaves set closely together at the same level on the upturned ends of slow-growing twigs, which are produced in a particular order to fill the spaces that repeatedly arise at the outgrowing edge of the mat. Hold a big spray of the *Chiku*-tree and, turning it about, note its remarkable regularity.

The peculiarities of pagoda-trees are these:—

1. The whorled, or apparently whorled, arrangement of the limbs on the trunk, giving the tiers of foliage,
2. The intermittent growth of the leader-shoot of the trunk, giving the long leafy but branchless portions of the trunk separating the tiers of branches and giving, intermittently, the flat-topped crown,
3. Terminalia-branching, giving the dense mat (or pile) of leaves on the upper side of the limbs.



Text-Fig. 15. Diagram of pagoda-trees, showing the monopodial development of Terminalia and the sympodial development of Alstonia.

(¹) The construction of such a limb is sympodial (*see* p. 27) in contrast with the ordinary monopodial limb of such trees as the *Durian*, *Mangosteen*, *Kenanga* or *Ru*, cf. Plates 66, 167.

If we examine a young *Ketapang*-tree about 15 ft. in height, we shall find that it is composed of several tiers of branches set at intervals of 3-6 feet and consisting each of 5-8 branches, e.g. Plate 44 which shows a larger sapling, and Text-Fig. 15. The branches spread stiffly at a wide angle from the straight stem the upper part of which, at least, is clothed with leaves. The arrangement of the leaves on the long portions of the stem between the branches is laxly spiral but closely spiral in the short swollen parts from which the branches arise. The crown is broken into tiers, but generally it is flat-topped because the branches of the uppermost tier are yet comparatively short. The leader-shot of the trunk is hidden in this uppermost tier and is condensed to a rosette of leaves. If such a sapling is watched at frequent intervals, it will be seen that after a time, when the uppermost tier of branches has reached a fair size, the leader-shot rather suddenly lengthens into a long vertical finger clothed with a lax spiral of leaves. When this finger has grown several feet beyond the uppermost tier, its growth slackens and the leaves on it are set more closely until, in a relatively short space, another terminal rosette is produced. From the base of this rosette several twigs soon grow out to form the next tier of branches and, in overtopping the condensed leader, render the crown again flat-topped until the leader will resume its activity. The positions of the branches in successive tiers usually alternate so that only those of every other tier are superimposed. When the tree is approaching maturity and has reached about two-thirds of its full height, the distance between the subsequent tiers gradually decreases. In old trees it may be impossible to make out the pagoda-habit without closely examining the crown because, as the branches grow outward and sag at their ends, the more central twigs die away and the tiers tend to coalesce at the periphery with those above and below and to give a rounded or umbrella-shaped crown.

All pagoda-trees have essentially this construction. They differ in such respects as the distance between the tiers, the number of branches in a tier and the angle between the branch and the trunk, which are generally constant features in each kind of tree. The same two differences in the shape and arrangements of the leaves occur, however, as we have described on p. 27 for trees with spirally arranged leaves. The *Kepayang* (Pangium), the *Sterculia*-trees and the *Mata Lembu* (Firmiana) have the heart-shaped leaf with long stalk and the *Ketapang*, *Pulai*, *Chiku* and several Oil-fruits (*Elaeocarpus*) have the obovate leaf with short stalk.

We must now mention some particulars about the *Pulai*-trees (*Alstonia*) because they are somewhat exceptional. They are pagoda-trees with whorled leaves and *sympodial* trunks. We used to think that the joined appearance of the trunk of a sapling *Pulai* was unnatural and had been caused by coppicing or by some injury to the leader so that its place had been taken by a side-shoot, but this is wrong. When a young *Pulai* is about to grow another tier, it is not the old leader-shoot which revives and forms the finger-like stem but a side-shoot which develops most unexpectedly from a bud on the stem a few inches below the uppermost tier. This side-shoot turns up and grows rapidly into the next vertical and leafy finger: and, when its growth has stopped, it puts out the new tier of branches from its apex while, at its base, it swells and pushes the previous tier slightly to one side thus making the rather ill-concealed joint which indicates that the portions of trunk above and below it were never directly continuous, Text-Fig. 15. These slight kinks can be seen at every tier on young *Pulai*-trees but they disappear from older ones as the trunk thickens and is rounded off. The branching of the twigs composing the tiers is also peculiar because it takes place before the twigs have turned up at the ends though the final effect of Terminalia-branching is achieved. A twig grows horizontally for

a short distance during which it produces 2-4 whorls of leaves; then it gives rise at the apex to 3-6 twigs, in a whorl, all of which, except the lowest, curve up and produce the condensed rosettes of leaves, but the lowest grows outward to repeat the process.

The following is a list of the common pagoda-trees of the country. It must be remembered that the shape is most characteristic of young trees and that it may disappear from the mature ones as the crown becomes fuller. Several trees like the *Kelempayang* (*Anthocephalus*), *Birah* and *Tembusu* (*Fagraea*) are excluded from the list, though their stiff limbs may suggest pagoda-trees at first sight: they have Terminalia-branching but they do not have tiers of branches elevated on leafy but branchless portions of trunk.

Apocynaceæ: *Pulai* (*Alstonia*), *Ochrosia*.

Combretaceæ: *Ketapang*, *Mentalun*, etc. (*Terminalia*).

Euphorbiaceæ: *Membulan* (*Endospermum*), a few kinds of *Mahang* (*Macaranga*).

Flacourtiaceæ *Kepayang* (*Pangium*).

Malvaceæ: *Kapok* (*Ceiba*), *Kekabu Utan* (*Salmalia*).

Sapotaceæ: *Chiku* (*Achras*), *Nyatoh* and *Taban* (*Palaquium*), *Suah* (*Manikara*).

Sterculiaceæ: many species of *Sterculia*, *Mata Lembu* (*Firmiana*).

Ternstroemiaceæ: *Riang Riang* (*Archytæa*).

Tiliaceæ: several species of Oil-fruit (*Elæocarpus*) as *E. pedunculatus*.

ANT-TREES

Some of our trees have hollow twigs in which ants dwell, or they have large buds or expanded leaf-bases in which ants make their nests. The association between the ants and the trees is so constant that there can be no doubt the ants habitually seek out these plants in which to live and, perhaps, that the plants in some way benefit from their tenants. The ants belong to a small black biting species, very ferocious and agile, and it may be that they protect the trees from marauding insects such as caterpillars, grubs, boring beetles and so on which would damage them. Like many of their kind, the ants keep scale-insects which they feed on the young sappy shoots and, as they lick up the sugary matter which exudes from the scale-insects in the abundance which they suck out of the plant, the ants derive no little nourishment from the plant in addition to obtaining free quarters. The *Mahang*-trees (*Macaranga*) even supply the ants with special food-packets (p. 263). We do not refer, of course, to the ordinary ants like the *Keringga* which stitch the leaves of plants into nests.

The following is a list of the commoner ant-trees:

ANT-TREES WITH HOLLOW TWIGS.—*Mahang* (*Macaranga*), Sabre Leaf (*Drypetes*): (see also under *Endospermum* and *Myristicaceæ* for mention of Bornean species).

ANT-TREES WITH SUITABLE LEAF-BUDS OR LEAF-BASES.—*Jenjulong* (*Agröstistachys*), Horse-Chestnut Teak (*Vitex peralata*), Ant Laurel (*Actinodaphne sesquipedalis*), Gardenia-trees (*G. tubifera*, *G. carinata*), *Kasai* (*Pometia*).

BUTTRESSES

These are the perpendicular flanges which develop over the main lateral roots and extend for some distance up the trunk in certain kinds of tree. They are not buttresses in the engineering sense but, as their thin, tough, taut substance

BUTTRESSES

suggests, *stays* which strengthen the junction of root with stem against the swaying or leaning of the trunk to the opposite side. Such big riverside trees as the *Neram* (*Dipterocarpus oblongifolius*), which lean across the water, always have a large buttress up the bank, on the tension-side of the trunk. The wood of a buttress has different properties from that of the trunk and not all trees are able, or have need, to develop buttresses. They are not present, for instance, in trees with strong tap-roots and small lateral roots, e.g. *Mengkudu*-trees (*Morinda*), Rubber-trees (*Hevea*) and Mango-trees (*Mangifera*), presumably because the strain of the trunk is taken up by the tap-root. On the other hand, by no means all trees without tap-roots are able to develop buttresses on their lateral roots, e.g. *Bintangor* (*Calophyllum*), *Sepetir* (*Sindora*), Oaks (*Quercus*), *Putat* (*Barringtonia*) in swampy forest. A tree like the Sea Apple (*Eugenia grandis*), with slight buttresses like fluttings or groining on the trunk, has both strong tap-root and lateral roots. Nevertheless the presence or absence of marked buttresses and their shape—whether steep or low and spreading, branched or unbranched—are characteristic of most species and several genera of trees, and they are points which should be observed especially in forest trees. Many examples of buttresses will be found among FOXWORTH'S illustrations of our timber-trees (ref. 7, p. 52). Among the large trees described in this book we may make the following selection:—

Trees with prominent buttresses

Anacardiaceæ	... <i>Rengas</i> -trees (<i>Gluta rengas</i> , <i>Melanorrhœa</i> spp.), <i>Pelong</i> (<i>Pentaspadon</i>), <i>Senkuang</i> (<i>Dracontomelum</i>).
Apocynaceæ	... <i>Pulai</i> (<i>Alstonia</i> , steeply buttressed).
Bignoniaceæ	... Tulip Tree (<i>Spathodea</i>).
Burseraceæ	... <i>Canarium</i> .
Combretaceæ	... <i>Terminalia</i> (except <i>T. catappa</i>).
Dipterocarpaceæ	... <i>Seraya</i> , <i>Kapur</i> , <i>Chengai</i> .
Flacourtiaceæ	... <i>Kepayang</i> (<i>Pangium</i>).
Juglandaceæ	... <i>Engelhardtia spicata</i> .
Leguminosæ	... <i>Keranji</i> (<i>Dialium</i>), <i>Kempas</i> and <i>Tualang</i> (<i>Koompassia</i>), <i>Ipil</i> and <i>Merbau</i> (<i>Intsia</i>), <i>Flame of Forest</i> (<i>Delonix</i>), <i>Petai</i> (<i>Parkia</i>).
Malvaceæ	... <i>Kapok</i> (<i>Ceiba</i>), <i>Durian</i> (<i>Durio sibethinus</i>), <i>Punggai</i> and <i>Krepal</i> (<i>Cœlostegia</i>).
Sapindaceæ	... <i>Kasai</i> (<i>Pometia</i>).
Sapotaceæ	... <i>Misi</i> (<i>Planchonella</i>), <i>Nyatoh</i> (<i>Palaquium</i>).
Simarubaceæ	... <i>Pauh Kijang</i> (<i>Irvingia</i>).
Sterculiaceæ	... <i>Bayur</i> (<i>Pterospermum</i>), <i>Kelumpang</i> (<i>Sterculia</i>), <i>Mengkulang</i> (<i>Tarrietia</i>), <i>Firmiana</i> , <i>Kembang Samangkoh</i> (<i>Scaphium</i>).
Urticaceæ	... <i>Terap</i> (<i>Ariocarpus elasticus</i>): such stem-figs as <i>Ficus glomerata</i> and <i>F. variegata</i> .

Trees without buttresses

Anacardiaceæ	... Mango and other species of <i>Mangifera</i> .
Annonaceæ	... most trees (? all Malayan species).
Apocynaceæ	... <i>Jelutong</i> (<i>Dyera</i>).
Fagaceæ	... most Oak-trees (<i>Quercus</i>).
Guttiferæ	... <i>Mangosteens</i> (<i>Garcinia</i>) and <i>Bintangor</i> -trees (<i>Calophyllum</i>).
Hypericaceæ	... <i>Cratoxylon</i> .
Lauraceæ	... most, if not all, Laurel-trees.
Lecythidaceæ	... <i>Putat</i> (<i>Barringtonia</i>).
Leguminosæ	... <i>Sepetir</i> (<i>Sindora</i>).
Myristicaceæ	... Nutmeg-trees.
Rubiaceæ	... <i>Mengkudu</i> (<i>Morinda</i>).

FLOWERING AND LEAFING

In countries with a winter or a dry season it is the cold of the winter or the lack of water in the dry season which arrests or slows down the growth of trees, so that on the return of favourable weather they renew their activity and unfold their new shoots. Spring and summer are the flowering seasons in temperate countries, the beginnings of the wet season in tropical monsoon countries. In Malaya, by contrast, where the temperature is even and, in most districts, the dry weather short and uncertain, plants grow throughout the year, the vegetation as a whole is evergreen and there is no pronounced flowering season. Yet, in the behaviour of our trees there is great variety which it is impossible to describe in a few sentences. Some, like the *Durian*, *Ketapang* (*Terminalia*) and *Petai* (*Parkia*) are able to defect certain factors in the climate to the annual recurrence of which they subject their leafing and flowering: others, like the *Bungor* (*Lagerstoræmia*) and Indian Laburnum (*Cassia fistula*), have evolved their own peculiar rhythms; and yet others, like the Shrubby *Simpoh* (*Wormia Suffruticosa*) and *Tiup Tiup* (*Acinandra dumosa*), independent of all periods and weather-conditions, produce new leaves and flowers day after day. Even the processes of flowering and leafing may be disconnected so that in studying our native plants we have to consider the two separately. There is, for instance, a forest-tree (*Homalium grandiflorum*) in the Singapore Botanical Gardens which changes its leaves roughly once a year but which flowers only at very long intervals of some 20 years, and the *Lanjut* (*Mangifera lagenifera*) is almost as tardy: on the other hand, the leaves of some wild Nutmegs, as the Great Woolly Nutmeg (*Knema Hookeriana*), remain on the tree for two or three years while the flowers are borne twice a year on the branches. Actually, very little is known about the habits of our native trees but what information there is we have given under the descriptions of the species or under the general remarks about the genus: the information refers mostly to Singapore. There is an immense field for research on this subject, to enter which the only qualification that is needed is patience in order to observe *individual* trees sufficiently often during the year, at intervals of a week or a fortnight, and to record their behaviour. Particularly do we require information on the common trees like the *Tembusu*, *Ketapang* and Sea Apple (*Eugenia grandis*) in all parts of the country. (Reference: R. E. Holttum, Gardens' Bulletin, S.S., vol. XI, 1940, p. 119-175).

When, in one district, all the trees of a kind come into flower or new leaf together, e.g. *Tembusu*, *Durian* or Mangosteen, some climatic condition must have influenced them. Generally it is a change from wet to dry weather or the effect of a dry spell, though as we will explain (p. 38) it may also be a sudden fall in temperature and, conceivably, there may be other meteorological events of which we have no cognisance. If we consider the relation between dry and wet weather, which is the chief climatic alternation in Malaya, we find that the country can be divided roughly into three regions and that, yet more roughly, a flowering season can be assigned to each: a flowering season, of course, precedes a fruiting, and the entry of local fruits into the market is a valuable indication of the local seasons. The division is this:—

1. Penang, Kedah, Perlis, Upper Perak: The climate approaches that of India, having wet weather from August to November and dry weather from December to February. The main flowering season is from January to March. Generally, however, there is a short dry spell about June which may or may not give a second flowering season in July or August according to its intensity.

TABLE OF SEASONS

	January	February	March	April	May	June	July	August	September	October	November	December
S. W. Monsoon												
N. E. Monsoon												
South of Malaya												
North of Malaya												
East Coast												
Fruit-trees {												
generally {												
North ..												
South ..												
Ever-flowering Trees ..												
<i>Angana</i> (<i>Pterocarpus</i>)												
<i>Terminalia subspatulata</i>												
Pink Cassia (<i>C. nodosa</i>)												
<i>Peleng</i> (<i>Pentaspadon</i>)												
<i>Tudang</i> (<i>Koompassia</i>)												
Burma <i>Simpoh</i> (<i>Dillenia</i>)												
<i>Petai</i> (<i>Pantia speciosa</i>)												
<i>Kerayong</i> (<i>Parlita javanica</i>)												
December Tree												
(<i>Erythrina subumbans</i>)												
Rubber Tree {												
North ..												
(Hovea) {												
South ..												
Yellow Flame (<i>Peltophorum</i>)												
<i>Ketapang</i> (<i>Torrealia</i>)												
<i>Ficus variegata</i>												
<i>Tembusu</i> (<i>Fagraea fragrans</i>)												
Sea Apple (<i>Eugenia grandis</i>)												
<i>Ficus caulocarpa</i>												
<i>Memponan</i> (<i>Rhodammia</i>)												

* Refers to trees in the South of Malaya, particularly in Singapore.

2. The East Coast (Johore to Kelantan):—The weather is wet during the first half of the N.E. monsoon, from October to January, and moderately dry during the rest of the year. The main flowering season lies between March and June.

3. The remainder of the country:—There tend to be two dry spells of 2–3 weeks (January–February and July–August) corresponding with the dry seasons in the monsoon countries on either side of the equator: and the chief rainy season occurs from October to December. Thus, there tend to be two flowering seasons in each year, February–April and July–September, with the first season in each year as the principal one because it follows the chief rainy season (of the preceding year); and there are two fruit-seasons (July and January), the July season being the heaviest. (It must be remembered, nevertheless, that there is much latitude in the seasons in the south of the peninsula: some years may be uniformly wet; one or other dry season may be absent; or an additional dry spell or two may be interpolated in almost any month).

On the opposite page, these seasons are shown diagrammatically in the form of a table in which have been incorporated the flowering and leaf-change (wintering!) of some common trees. There are doubtless many interesting correlations to be discovered in different parts of the country. We may mention the simultaneous flowering of the *Pelong* (*Pentaspadon*), *Tualang* (*Koompassia excelsa*), Pink Cassia (*Cassia nodosa*) and *Simpoh*-trees (*Dillenia aurea* and *D. ovata*) which is conspicuous between March and June in the middle of Pahang and in the neighbouring States, e.g. by the railway from Mentakab to Kuala Krai: the simultaneous flowering of the *Binjai* (*Mangifera cæsia*) and *Mata Kuching* (*Nephelium malaiense*) in Malacca and Singapore: the December flowering of the Coral Tree, *Erythrina subumbrans*: and the flowering of several forest trees at the height of the wet season, e.g. *Bintangor* (*Calophyllum*), *Rengas* (*Melanorrhoea* sp.).

To contrast the habits of our trees we have made the following classification.

1. Ever-flowering trees

Flowering and fruiting, continuously through the year.

(a) EVERGREEN, DEVELOPING NEW LEAVES CONTINUOUSLY

(i) with flowers and fruits developing at the same on the plant:—

Shrubby *Simpoh* (*Wormia suffruticosa*), Tulip Tree (*Spathodea*), *Tiup Tiup* (*Adinandra dumosa*), Johar (*Cassia siamea*), Common Hibiscus (*Hibiscus rosasinensis*); Sea Hibiscus (*H. tiliaceus*), Cerbera, *Petai Jawa* (*Leucaena*), Sesban (*Sesbania*), Giant Mimosa (*M. sepiaria*), Cherry Tree (*Muntingia*), Mason-Bee Tree (*Commersonia*), Frangipanni (*Plumiera*).

(ii) with flowers (and fruits) born in successive corps on all, or most shoots together, the new crop following the old at intervals of a few days to a few weeks: many fig-trees as *Ficus alba*, *F. fistulosa*, *Waringin* (*F. benjamina*), *Jejawi* (*F. retusa*).

(b) DECIDUOUS

Buttercup Tree (*Cochlospermum*), shedding the leaves on the flowering twigs, often deciduous by a few twigs at a time.

Common Red Stem-Fig (*Ficus variegata*), wholly deciduous twice a year (January, July) but flowering and fruiting continuously in successive corps.

2. Trees flowering intermittently for short periods during the year

(a) FLOWERING SEASONALLY ONCE A YEAR

(i) Evergreen, getting new leaves continuously: December Tree (*Erythrina subumbrans*), many forest trees.

TEMPERATURE TREES

(ii) Evergreen, getting new leaves in seasonal flushes, two or more times a year: some *Rambutan*, *Durian* and *Mangosteen* trees.

(iii) Deciduous: *Angsana* (*Pterocarpus*), *Jelawe* (*Terminalia subspathulata*), *Mentalun* (*T. pyrifolia*), *Petai* (*Parkia speciosa*), *Kerayong* (*P. javanica*), *Tualang* (*Koompassia excelsa*), *Pelong* (*Pentaspadon*), *Pink Cassia* (*Cassia nodosa*), *Burma Simpoh* (*Dillenia aurea*), *Wodier* (*Lannea grandis*).

(b) FLOWERING SEASONALLY TWICE A YEAR

(i) Evergreen, getting new leaves continuously: *Tembusu* (*Fagraea fragrans*), *Albizzia* (*A. falcata*), *Penaga Laut* (*Calophyllum inophyllum*).

(ii) Evergreen, getting new leaves in seasonal flushes, two or more times a year: many *Rambutan*, *Durian* and *Mangosteen* trees, *Mango*, *Kwini*, *Bachang*, *Rambai* and most fruit-trees in the south of the Peninsula, *Wild Cinnamon*.

(iii) Deciduous twice a year, flowering with the new leaves: *Rubber Trees*, *Ketapang* (*Terminalia catappa*), *Yellow Flame* (*Peltophorum*).

(c) FLOWERING SEASONALLY 3 TIMES A YEAR

(i) Evergreen, getting new leaves in seasonal flushes, usually before the flowers, *Sea Apple* (*Eugenia grandis*).

(ii) Deciduous: *Ficus caulocarpha* (a strangling fig).

(d) FLOWERING SEASONALLY MORE THAN 3 TIMES A YEAR

Mempoyan (*Rhodamnia*), evergreen, getting new leaves throughout the year, flowering four or five times a year.

Coffee-bushes, flowering at irregular intervals (see below, *Temperature Trees*).

(e) FLOWERING SEASONALLY BUT SELDOM, AT INTERVALS OF MORE THAN A YEAR

(i) evergreen, getting new leaves throughout the year: possibly some forest-trees as the *Kapur* (*Dryobalanops*) flower once in 3-4 years.

(ii) evergreen, getting new leaves in seasonal flushes: many kinds of forest tree as *Seraya* and *Meranti* (*Shorea*), *Chengai* (*Balanocarpus*), *Lanjut* (*Mangifera lagenifera*).

(iii) deciduous: some fig-trees as the *Johore Fig*.

(f) FLOWERING IN THEIR OWN RHYTHM, NEITHER GREGARIOUSLY NOR SEASONALLY

Flame of the Forest (*Delonix*), *Indian Laburnum* (*Cassia fistula*) and *Bungor* (*Lagerstæmia flos-reginæ*), changing their leaves and flowering at intervals of 9-10 months in Singapore.

Saga (*Adenantha pavonina*) changing its leaves and flowering at intervals of 7-8 months in Singapore.

The members of this last group (2f) can be recognised because they flower individually at any time of the year and not simultaneously in a district: each individual tree has its period of so many months' growth before it changes its leaves and renews its shoots. Thus, in Singapore, there are always some trees of the *Flame of the Forest* at the flowering stage while the rest are more or less in leaf, in contrast with the *Yellow Flame* or *Tembusu* the trees of which flower and leaf simultaneously with each other. In markedly seasonal climates, such as that of India or East Java, the trees of this group also become seasonal in their habits. What controls the innate rhythm which they develop in Singapore is unknown.

Temperature Trees.—The flowering of the *Angsana* (*Pterocarpus*), coffee-bushes (*Coffea*), *Angels Trumpets* (*Randia*) and several kinds of *Nyatoh* and *Taban* (*Palaquium*) seems to be controlled by the temperature of the air, as in

the case of the Pigeon Orchid (*Dendrobium crumenatum*), the opening of the flowers depending on a sudden drop in temperature such as accompanies a severe thunderstorm. We know very little about the mechanism of the process and understand still less. What is known of the behaviour of the trees we have described under each in the main section of the book, (see *Coffea* p. 536).

In addition to these general consideration on the flowering and leafing of trees, there are such particulars as the time of opening of the flowers, their succession on the inflorescence, the number of days (or hours) each lasts on the tree, the nature of the buds, the colour of the new leaves, whether they develop in limp tassels as in the *Saracas* and *Wild Cinnamon*, and so on. These details are mentioned wherever possible in the description.

MALAYAN VEGETATION

The vegetation of Malaya¹ is part of a much greater assemblage of plants called the Indo-Malaysian² flora because it extends over India, Siam, Indo-China the Malay Peninsula and Malay Archipelago: it reaches even into East Africa, South China, Formosa, New Guinea and Tropical Queensland. The limits of this great flora botanists recognise from the natural distribution of its typical representatives such as the Dipterocarp-trees (New Guinea to East Africa), the *Simpoh*-trees (*Dillenia* and *Wormia*: Tropical Australia, Asia and Madagascar), the Pitcher-plants (*Nepenthes*: S. China, Tropical Asia, Madagascar), the strangling-figs, the Bread fruit-trees (*Artocarpus*), the characteristic palms and so on. Recent studies on fossil plants have shown that it is, perhaps, the most interesting flora in the world because among the early flowering plants of which there is record in the rocks there are many related to its members. Fossil fruits, seeds, flowers, leaves and wood, dating from some sixty million years ago, have been discovered in England in the London Clay of the lower Thames valley, at the geological horizon of the Lower Tertiary or Eocene: and they resemble closely so many typical Malayan plants that the deposit in which they occur can be compared with such as may now be forming at the mouth of a Malayan or Bornean river from the flotsam and jetsam of vegetable debris brought down by it. It appears that at that epoch in the world's history a tropical sea (the *Tethys* Sea) extended from the Pacific Ocean across peninsular India and Asia Minor to the south of England, that it was bordered by the primitive Indo-Malayan flora and that, as the climate of Europe and North Africa changed in the ensuing epochs, the flora receded until it shrank to its present state.

The Indo-Malaysian flora, which is essentially tropical forest, can be subdivided into regional elements according to the climate and geographical position. There can be distinguished the northern monsoon-forests of India, Burma, Indo-China and Siam, which are more or less deciduous, the southern monsoon-forests of East Java, Timor and Flores (relating to the dryer forests of Australia) and the central evergreen rain-forest extending from Sumatra and Borneo through the Malay Archipelago to New Guinea and North Queensland. One part of this central rain-forest can be separated from the rest by the very close affinity of the vegetation throughout the region, which resemblance distinguishes it from that of the Philippines, Celebes and more easterly countries: it is the part which lies on the Sunda-shelf, or south easterly projection of the Asiatic continent, and which embraces Sumatra, Malaya, Java and Borneo. To the ordinary traveller

(¹) That is, British Malaya from Lower Siam to Singapore.

(²) Malaysia is the region covering the Malay Peninsula and Archipelago.

IMMIGRANT TREES

the vegetation of these countries appears identical: and it is often referred to as the Sundanese flora. The comparatively recent separation of these countries in geological time is the cause of their similarity not merely in flora but in fauna.

Our Malayan vegetation is thus part of the central section of the ancient Indo-Malaysian flora. It is predominantly unspecialised evergreen rain-forest because, in spite of the presence of many deciduous trees, there is no dry season marked enough to render the whole of it deciduous. In contrast the forest in the outlying parts of the Indo-Malaysian region has been modified to suit the conditions of the monsoon-climate and it has been modified also by the influx of plants from neighbouring floras such as the north temperate flora of China and the south temperate of Australia and New Zealand. The effect of these contacts can be traced in our own flora. Over and above the main body of Sundanese plants we can speak of the following immigrant elements:—

1. The monsoon-element from Burma and Siam, extending into the north of Malaya as far as Kuala Kangsar and Kuala Trengganu though occurring mainly in Perils, Kedah and the north of Kelantan. Representative trees are:—Burma *Simpoh* (*Dillenia aurea*), Kedah *Bungor* (*Lagerstrœmia floribunda*), Malayan Aspen (*Bucklandia*), Magnolia-trees, Rhododendrons, and such herbs *Mentalun* (*Terminalia pyrifolia*), *Lebbek* (*Albizia lebbek*), *Kelumpang* (*Sterculia fœtida*), *Village Kandis* (*Garcinia cowa*), *Kesinai* (*Streblus asper*), *Krekup* (*Flacourtia jangomas*), *Caper Thorn* (*Capparis micracantha*), *Tree Avens* (*Cratoxylon cochinchinense*), *Kedah Bush* (*Holarrhena*), *Guchek* (*Antidesma ghaesembilla*), *Wood Apple* (*Feronia*), *Kenapeh* (*Glycosmis pentaphylla*), *Great Sendudok* (*Melastoma sanguineum*) and the three thorny plants *Randia spinosa*, *R. tomentosa* and *Vangueria*.

A few of these, as the Burma *Simpoh*, occur as far south as Kuala Lipis, and the Great *Sendudok* can be found at Mersing on the East Coast.

2. The Himalayan South Chinese element in the mountain-vegetation, e.g. Malayan Aspen (*Bucklandia*), Magnolia-trees, Rhododendrons, and such herbs as the *Wood Sanicle* (*Sanicula europea*) and mountain *Violet*.

3. The Australian element, representing plants which have migrated westward through the Malay Archipelago from the southern hemisphere:—False *Ru* (*Bœckia*), *Mountain Gelam* (*Leptospermum*), *Rose-Myrtle* (*Rhodomyrtus*), *Pelawan* (*Tristania*), *Sea Lettuce tree* (*Scævola*), *Ru* (*Casuarina*), and the conifers *Agathis*, *Dacrydium* and *Podocarpus*:

Other aspects of the Malayan flora which we encounter in studying trees may be grouped briefly under these headings:—

1. Indigenous (or native) and Exotic (or introduced) Plants.—Indigenous plants are those which occur naturally in a country whereas exotic plants have been introduced by man. The *Tembusu* (*Fagræa*), *Yellow Flame* (*Peltophorum*) and *Bungor* (*Lagerstroemia*) are indigenous to Malaya; the *Flame of the Forest*, *Albizia* (*A. falcata*), *Guava* and *Cashew-Nut* are exotic. Plants which are known to occur only in one country are said to be *endemic* to that country. The *Yellow Saraca* (*S. thalpingensis*), *Ghost's Foot* (*Trevesia*), *Putat Gajah* (*Barringtonia Scortechinii*), *Krepal* (*Cœlostegia* sp.) and *Sentang* (*Melia excelsa*) are, far as we know, endemic to Malaya though it is possible they may occur in Lower Siam, West Borneo or part of Sumatra where they have not yet been discovered. The *Flame of the Forest* is endemic to Madagascar, the *Rubber-tree* to the Amazon Valley and the *Butter-fruit* (*Diospyros discolor*) to the Philippines.

2. Secondary Jungle (Belukar) and Virgin Forest (Utan).—Before the arrival of civilised man, Malaya must have been clothed entirely with high forest or virgin forest. Over big stretches of country, as along the main range and to the east of it, this continuous forest persists but in other parts it is broken up into patches preserved as Game Reserves, Forest Reserves and Catchment Areas. In contrast, secondary jungle is the tree-growth which establishes itself on land that has been cleared of virgin forest and allowed to revert to the wild state: it is a product of human interference. Secondary jungle is distinguished by its lower height, its denseness, its abundance of climbers, undergrowth and, often, of bamboos, the absence of tropical dendrons (p. 26), and the presence of such light-loving plants as *Macaranga*, *Mallotus*, *Glochidion*, *Adinandra*, *Eurya*, *Pithecellobium*, *Alstonia*, *Elæocarpus*, *Rhodamnia*, *Melastoma*, *Ficus*, *Trema*, *Anthocephalus* and so on. In course of time secondary jungle reverts to virgin forest after the seedlings of the big forest trees have established themselves in the shade of the secondary growth and their saplings have grown up and shaded out these light-loving trees. The plants of secondary jungle generally have small seeds which can be blown about by the wind, *e.g.* *Alstonia* and *Anthocephalus*, or succulent fruits the seeds of which are dispersed by birds, squirrels, monkeys, bats, musang and so on; thus their seeds are always being scattered over the country and thus their saplings spring up in all suitable places. Nowadays secondary jungle abounds, separating, as it were, the cultivated land from the virgin forest, but originally, when this forest covered the country, the trees of secondary jungle must have been relatively uncommon and have lived a precarious existence on land-slips, flood-damaged river-banks, sea-shores and like places where the high forest had been temporarily destroyed.

3. Lowland and Mountain Forest.—The altitude of 2,500 ft. is roughly a transitional zone in the Malayan flora. Below this level the forest is dominated by the big Dipterocarps and there occur all such characteristic, broad-leaved Malayan trees as the wild Durians, Bread-fruits, Mangosteens, Rambutans, Nutmegs, *Jelutong*, Gutta-percha trees (Sapotaceæ), *Kedondong*-trees (Burseraceæ and Meliaceæ), and those of the Mango- and Bean-families (Anacardiaceæ, Leguminosæ). Above this level, such plants disappear or occur in much reduced numbers and variety, and the forest is composed largely of Oaks, Laurels, Eugenias, Conifers and the mountain trees *Bucklandia*, *Weinmannia*, *Leptospermum*, *Bæckia*, *Schima* and so on. The mountain forest is often referred to as the Oak-Laurel forest in contrast with the lowland Dipterocarp-forest: and this Oak-Laurel forest is related with the subtropical forests of the lower slopes of the Himalayas and of South China, except for its conifers which are Australian (*see p. 715*).

4. Soil and Situation.—According to the nature of the soil and the situation of the land, the vegetation of any country differs in such details as the actual species of plants composing it. Thus forest in limestone differs in such respect from that on quartzite- or granite-soils; forest on swampy land differs from that on lowland plains or from that on ridges. We often speak, therefore, of swampy forest, lowland ridge-forest, limestone forest, forest of sandy soil or laterite soil and so forth. We know little about these differences in the composition of the Malayan forests but where they occur they are often easy to recognise. The *Kapur*-forests (*Dryobalanops aromatica*) are limited to parts of the East Coast between the Sedili and Trengganu rivers and on the west they occur only in the Ulu Selangor. The *Tualang* (*Koompassia excelsa*) and its associates the Pink Cassia (*C. nodosa*), *Pelong* (*Pentaspadon velutinum*) and *Beremban Bukit*

(Duabanga) occur chiefly, if not exclusively, to the east of the main range between the south of Pahang and Kedah. The Marsh Holly or *Mensirah* (*Ilex cymosa*), the Shrubby *Simpoh* (*Wormia suffruticosa*) and the *Basong* (*Alstonia spathulata*) indicate swampy ground. The *Sendudok* ((*Melastoma*) and *Mesebat* (*Macaranga javanica*) indicate poor acid soil such as laterite overlying quartzite rocks. If the limited occurrence of any tree is known, we have mentioned it the descriptions.

5. Saraca-streams.—These are the rocky streams which cascade in waterfalls down the hillsides and which flow in tunnels through the forest. They are the smaller tributaries and the headwaters of our rivers unless their source be at great altitudes. We call them Saraca-streams because they are bordered by Saraca-trees (p. 399) which must be counted among the more typical members of the Indo-Malaysian flora. With the Saracas we find associated the following characteristic trees and shrubs:—

Pelawan (*Tristania sumatrana*), *Kasai* (*Pometia pinnata*), Indian *Simpoh* (*Dillenia indica*), Mountain Teak (*Podocarpus neriifolius*), *Cynometra*, *Schoutenia*, *Radermachera*, *Neonuclea*, the riverside *Ixora* (*I. Lobbii* var. *stenophylla*) and the Fig-trees *Ficus lepigarpa*, *F. pomifera* and *F. pyriformis*.

6. Neram-rivers.—These are the major tributaries of the Pahang, Trengganu and Kelantan rivers. They are distinguished by the abundance of *Neram*-trees (*Dipterocarpus oblongifolius*) on their banks. They are fed by the Saraca-streams and they flow through the coastal plains to the tidal reaches of *Rassau* (*Pandanus helicopus*) which lead in turn to the Nipa and mangrove estuaries. The great flood of 1926 destroyed the *Neram*-forests in many of their lower reaches where the water rose to such incredible heights, particularly on the Tembeling, Jelai and Kemaman, but access to the National Park is still through these stately harbours. Associated with the *Neram*-trees are the following:—

Jada (*Millettia Hemsleyana*), *Chengal Pasir* (*Hopea odorata*), *Pelawan* (*Tristania sumatrana*), Mountain Teak (*Podocarpus neriifolius*), *Jambu Ayer* (*Eugenia densiflora* var. *angustifolia*), *Langga Ayer* (*Dysoxylon angustifolium*), *Mempenai* (*Antidesma salicina*, *Homonota riparia*), *Pelir Pelandok* (*Aglaia salicifolia*), the river-side *Ixora* (*I. Lobbii* var. *stenophylla*), *Beti Beti* (*Flueggia*), *Greenea* and the Fig-trees *F. glomerata*, *F. obpyramidata* and *F. pomifera*.

7. Rassau-rivers.—These are the freshwater tidal reaches flowing across the alluvial and coastal plains. They are distinguished by the abundance of the screw-pine *Rassau* (*Pandanus helicopus*) which stands in thickets in the water before the low, swampy, forested banks. They connect the rocky streams and rivers with the brackish estuaries of Nipa and mangrove. Traces of the original vegetation of the *Rassau*-rivers, where all the surrounding forest has disappeared, are commonly seen as thickets or scattered trees in the rice-fields, e.g. trees of *Pianggu* (*Horsfieldia irya*), *Mensirah* (*Ilex cymosa*), *Krian* (*Eugenia pseudosubtilis*), *Putat* (*Barringtonia* spp.), *Tui* (*Dolichandrone*), *Cerbera*, and *Jejawi* (*Ficus retusa*). Associated with the *Rassau* are the following trees and shrubs:—

Pelawan (*Tristania sumatrana*), *Pianggu* (*Horsfieldia irya*), *Penara* (*Myristica elliptica*), *Krian* (*Eugenia pseudosubtilis* and other *Eugenias* as *E. pachyphylla*, *E. punctulata*, *E. venulosa*, *E. spicata*, *Rengas* (*Gluta renghas*, only in Pahang, Trengganu, Kelantan), *Rengas Ayer* (*Gluta velutina*), *Putat* (several species of *Barringtonia*, especially *B. conoidea* and *B. racemosa*), *Gurak* (*Sapium indicum*), *Tui* (*Dolichandrone*), shrubby *Simpoh* (*Wormia suffruticosa*), *Cerbera odollam*, *Jejawi* (*Ficus retusa*), *Sparrow's Mango* (*Buchanania lucida*). River-side *Mempari* (*Pongamia*), *Medang Jangkang* (*Elæocarpus littoralis*), *Mensirah* (*Ilex cymosa*),

Kasai (*Pometia alnifolia*), *Gedemba* (*Nauclea subdita*), *Ixora grandifolia* and *Ixora javanica* in its narrow-leafed form, Water Gardenia (*G. tubifera*), River Tarena (*T. fragrans*), *Guioa bijuga*.

The *Rengas Ayer* (*Gluta velutina*) and *Putat Ayer* (*Barringtonia conoidea*) are bushes forming thickets in the water at the edge of the river, like the *Rassau* itself.

8. Mangrove-forest.—This is the evergreen forest that develops on the quiet, shelving sea-shores and along the brackish reaches of the rivers. It is composed of a small variety of trees known collectively as *Mangrove-trees*, able to grow in the salt-water. Some, as the *Bakau* or *Rhizophora*, actually require its saltness and tidal flow for their existence, while others, as *Avicennia* (*Api Api*), *Bruguiera* (*Berus*), and *Sonneratia* (*Berembang*), grow well in fresh water but require the combination of tide and brackishness for their survival in nature: many trees resembling them in their stilt-roots occur in the fresh water swamps of the *Rassau*-rivers. The mangrove-forest develops only in fairly quiet situations because the seedlings cannot withstand the surf, and in such places silting also progresses. It thus happens that mangrove is usually developed on dark foetid mud and the association gives the false impression that mangrove is inseparable from mud, but mangrove also occurs on clean sandy shores in protected bays such as may be found on several of the East coast islands and on St. John's Island, by the pier. On the West coast of Malaya the mangrove-forest is developed extensively along the shore whereas on the East coast it is restricted by the surf to the estuaries which are protected and obstructed by sand-bars. Inland the mangrove-forest merges gradually into the swampy forest round the *Rassau*-rivers, and stretches of *Nipa*-palm connect the river-frontage of *Rassau* (*Pandanus helicopus*) with that of mangrove near the river-mouth. The *Nibong*-palm (*Oncosperma tigillarum*) is typical of the mangrove-forest and the *Bayas*-palm (*Oncosperma horridum*) typifies the swampy and lowland forests. The mangrove-forest is essentially the same in all countries bordering the Indian and West Pacific Ocean in their tropical limits.

The mangrove-forest of Malaya has been excellently described and illustrated by WATSON in one of the Malayan Forest Records (*see* p. 53) and his book is indispensable to the Malayan botanist. We have not described the trees in detail therefore, but have mentioned them in their respective families, for they are of diverse affinity, and in our indexes to Malay and English names and in our keys to identification. Mangrove-forest consists mainly of the following trees and shrubs:—

Apocynaceæ:—*Cerbera odollam*.

Combretaceæ:—*Teruntum* (Lumnitzera).

Compositæ:—*Beluntas* (Pluchea).

Coniferæ:—*Podocarpus polystachyus*.

Leguminosæ:—*Ipil* (*Intsia retusa*).

Lythraceæ:—*Berembang*, *Gedabu*, *Pedada*, *Perepat* (*Sonneratia*).

Malvaceæ:—*Baru Baru* (*Hibiscus tiliaceus*, *Thespesia*).

Meliaceæ:—*Nyireh* (*Carapa*).

Myrsinaceæ:—*Myrsine*.

Rhizophoraceæ:—*Bakau* (*Rhizophora*), *Mata Buaya*, *Tumu*, *Berus*, *Lenggadi* (*Bruguiera*), *Tengar* (*Ceriops*), *Berus Berus* (*Kandelia*).

Rubiaceæ:—*Chingam* (*Scyphiphora*).

Sapotaceæ:—*Misi* (*Planchonell*).

Sterculiaceæ:—*Dungun* (*Heritiera*).

Tiliaceæ:—*Brownlowia*.

Verbenaceæ:—*Api Api* (*Avicennia*).

9. Terminalia-Barringtonia Formation.—This is the botanical phrase for the forest fringing the sandy or rocky shores where mangrove is in abeyance. It refers to the two most characteristic sea-shore trees, namely the *Ketapang* (*Terminalia catappa*) and the *Putat Laut* (*Barringtonia asiatica*), which never grow wild in the forest inland. Most of the sea-shore trees in our Key on page 86 belong to this coastal forest and the majority of them are limited to the shore in their natural distribution. Like the mangrove-forest, the coastal trees of this formation are wide-spread round the tropical shores of the Indian and West Pacific Oceans: some, like the Sea Hibiscus (*H. tiliaceus*), occur even in the West Indies, being pantropical. Their fruits or seeds are modified for transport by ocean currents and hence the wide distribution of this vegetation. It is interesting to try to identify the fruits and seeds in the flotsam and jetsam on the beach.

TREES OF LOCAL INTEREST

Perlis

In addition to the trees characteristic of the Burmese monsoon forest in the north of Malaya (p. 40), the following are noteworthy:—

Tui (*Dolichandrone*), so abundant in the rice-fields that they might be called *Tui*-fields: they distinguish the whole of Perlis.

Calabash-trees (*Crescentia*) in the garden beside the Mosque at Kangar: they are the finest in the country.

Wood Apple or *Gelinggai* (*Feronia*) abundant, especially at Kangar.

Temak (*Shorea cochinchinensis*) at Arau, in the village.

Komoi (*Diospyros*) in several villages.

Kedah

In addition to the trees characteristic of the Burmese monsoon-forest in the north of Malaya (p. 40), the following are noteworthy:—

Mentalun (*Terminalia pyrifolia*), on almost any horizon north of Alor Star.

Kranji (*Dialium indum*) at Kodiang, as a *Kranji-kampung*.

Lebbek (*Albizzia lebbek*), a fine tree at Jitra, and many trees in the bamboo-forests to the north. e.g. on the road joining Kodiang with the Singgora-road.

Kedah Oak (*Quercus Falconeri*), frequent in secondary jungle.

Randa (*Gardenia carinata*) frequent in villages.

Cekring (*Erythrina fusca*) common by rice-fields and planted along the main roads from Alor Star.

Krian (*Eugenia pseudosubtilis*) in the rice-fields.

Krian Duat (*Eugenia cumini*) at Alor Star.

Komoi (*Diospyros*) in some villages.

Senkuang (*Dracontomelum*) and *Millettia atropurpurea* are abundant in villages.

Temahau (*Kleinhovia*) abundant by streams and rice-fields on the road to Baling, especially near Kupang.

Sangah (*Elæocarpus robustus*) at Baling.

The following are planted by the roadsides:—

Cekring (*Erythrina fusca*),

Cassia siamea, *C. timoriensis*, *C. grandis*, *C. surattensis*, *C. biflora*,

Bauhinia acminata, *B. pupurea*,

Jacaranda, Yellow Flame (*Peltophorum*), Yellow Thevetia.

Penang

Angsana (*Pterocarpus*): many magnificent trees, the larger ones commonly pruned and developing an unusual upright habit, e.g. the trees in front of the General Hospital.

Clove-Trees (*Eugenia aromatica*) at Balek Pulau.

Gelam (*Melaleuca*), an avenue on Hospital Road.

Indian *Simpoh* (*Dillenia indica*), on York Road by the Residency.

Bael Tree (*Aegle*) in the Residency Grounds.

Baobab (*Adansonia*) at the junction of Macalister Road and Race Course Road.

Nim-trees (*Melia indica*), many fine specimens.

Kesinai (*Streblus*), *Kedah Bungor* (*Lagerstræmia floribunda*) and *Krian* (*Eugenia pseudosubtilis*) common in gardens.

Yellow Bells (*Stenolobium stans*), a large, tree-like form common in gardens.

Yellow Snake Tree (*Stereospermum chelonoides*), a fine specimen on the Glugor Road, a few miles out of the town.

Sterculia foetida, planted in avenue along Patani Road and Coolie Lines Road. (*Sterculia alata* has also been planted).

Indian Cork-trees (*Millingtonia*) on Jelutong Road.

THE CHRISTIAN CEMETERY.—Large trees of *Sentang* (*Melia excelsa*), Broad-leaved Mahogany (*Swietenia macrophylla*) and the Cemetery Tree (*Polyalthia longifolia*). (The Cemetery Tree occurs also in many gardens.)

SECONDARY JUNGLE.—*Crypteronia paniculata*, *Greenea*, *Sapium baccatum*, *Endospermum*, *Alstonia macrophylla*, *Alstonia latifolia*, *Ficus hispida* are especially noticeable: *F. hispida* is conspicuous from the Hill railway.

PENANG HILL GARDENS.—*Ru Bukit* (*Dacrydium elatum*), *Tibouchina*, Coral Tree (*Erythrina crista-galli*), Sausage-tree (*Kigelia*). By the Post Office is a large strangling Fig-tree (*Ficus glabella*).

PENANG HILL FOREST.—The following are conspicuous from their large size and abundance and seen to advantage from the Crag Hotel:—

Ru Bukit (*Dacrydium elatum*, grey green crowns of cord-like, upright twigs), *Seraya* (*Shorea Curtisii*, grey green crowns), *Schima* (pink new leaves, white flowers), *Rengas* (*Gluta elegans*, violet new leaves). By the Crag Hotel, is a large tree of *Schima* and one of *Engelhardtia nudiflora*. *Fagraea Wallichiana* is a notable small tree, though uncommon.

Penang is the most fascinating part of Malaya for the botanist, not only for the variety and luxuriance of the cultivated trees but for the accessibility and richness of the Hill-forest. Many named trees of local interest will be found in the Waterfall Gardens.

Province Wellesley

Province Wellesley Fig (*Ficus* sp.) planted on the main road from Parit Buntar to Butterworth.

The *Krian* (*Eugenia pseudosubtilis*) is common in the rice-fields.

Some unusual species of *Mangifera* occur round Parit Buntar.

Perak

UPPER PERAK.—The following trees are common in the Grik valley:—*Kasah* (*Sterculia alata*), *Tualang* (*Koompassia excelsa*), *Sentang* (*Melia excelsa*), *Senkuang* (*Dracontomelum*), *Dagger Tree* (*Pajanelia*), *Parkia*-trees, *Hibiscus*-trees (*H. fioccosus*, *H. macrophyllus*), *Temahau* (*Kleinhovia*) on the banks of

TREES OF LOCAL INTEREST

the Perak river, *Jada* (*Millettia Hemsleyana*) by the streams. At Grik, the padang is remarkable for the abundance of strangling figs on the trees, the most noteworthy being *Ficus pilosa*: a Hog-Plum (*Spondias mangifera*) occurs by the Rest House: *Gunchor*-trees (*Antidesma ghaesembilla*) occur by the Post Office: *Sarang Burong* (*Premna tomentosa*) is common in secondary jungle.

LENGGONG.—The trees of the Stinking Mahogany (*Cedrela Glaziovii*) are probably the finest in the country.

IPOH.—Teak-trees (*Tectona*) round the padang: a large strangling fig (*Ficus* sp.) by the Railway Station, another (*Ficus pruniformis*) opposite the Ipoh Club: a large *Ficus elastica* by the Post Office: *Elæocarpus robustus* by the entrance to the Institute of Medical Research: Yellow Flame (*Peltophorum ferrugineum*) is commonly planted.

TAIPING.—There are many beautiful avenues. It is perhaps, better supplied with roadside-trees than any town in the country. There is a fine avenue of Rain-trees (*Enterolobium*) on the far boundary of the Lake Gardens: there are good specimens of Stinking Mahogany (*Cedrela Glaziovii*) on Station Road, and of the Broad-leafed Mahogany (*Swietenia macrophylla*) on Museum Road. Fine specimens of Ceylon Iron Wood (*Mesua*) occur in the Lake Gardens and a tree of *Saraca Kunstleri* by the Residency. Large *Angsana*-trees (*Pterocarpus*) abound. Moreton Bay Chestnut (*Castanospermum*) off New Club Rd.

KUALA KANGSAR.—On Government Hill occur Ebony-trees (*Diospyros ebenum*), Iron Wood (*Chloroxylon*), and a fine Jujube (*Zizyphus*). *Temahau* (*Kleinhovia hospita*) is abundant on the Perak River. About two miles out on the Ipoh Road occur, side by side, a big *Sentang* (*Melia excelsa*) and a big *Kabu Utan* (*Salmalia*). The curious plant *Gohor* (*Paranephelium*) is common in the villages; so also is the Twin Seed (*Anaxagorea*). The *Gelugor* (*Garcinia atroviridis*) is abundant in the local orchards.

BATU GAJAH.—The Banyan (*Ficus bengalensis*) is planted by the market and on the road to the Post Office. A Wood Apple or *Gelinggai* (*Feronia*) occurs in the back-garden of a house on Brewster Road. At the junction of Club Road and Changkat Road are a big tree of *Menkatong* (*Cynometra inæquifolia*) and one of *Prah* (*Elaterospermum*). At the top of Hill Road, on the left as one ascends, is a specimen of the Orange-barked *Tampang* (*Artocarpus* sp.)

PORT WELD.—The *Krian* (*Eugenia pseudosubtilis*) is common in the rice-fields.

PANGKOR AND LUMUT.—Here the sea-shore trees can be studied under the most pleasant conditions on the rocky headlands or round the forested bays. Noteworthy are the Sea Hearse (*Hernandia*), the Sea Trumpet (*Cordia subcordata*), Black Kelat (*Eugenia cymosa*), *Nenasi* (*Eugenia grata*), *Mempari* (*Pongamia*), *Cerbera manghas*, *Ochrosia*, and a tree of *Sterculia foetida* about the middle of the shore round the main bay at Pangkor. The Sea Apple (*Eugenia grandis*) appears to be absent.

ULU BERNAM.—Sappan-trees (*Cæsalpinia sappan*) by the main road near the bridge.

BETWEEN TROLAK AND BIDOR.—A Gutta-Percha forest (*Palaquium gutta*) through which the main road passes.

TANJONG MALIM.—*Pauh Kijang* (*Irvingia*), the big tree by the old main road two miles south of the town.

The most noteworthy facts about the cultivated trees of Perak are the abundance of Stinking Mahogany (*Cedrela*) and of Teak (especially on the roads from Kuala Kangsar), and the absence of *Tembusu* (*Fagraea*).

The following are conspicuous in the deserted mining areas:—*Glochidion obscurum*, *Derris dalbergioides*, *Alstonia spathulata*, *Pellacalyx axillaris*, *Macaranga* spp., *Wormia suffruticosa*. The *Membulan* (*Endospermum*) is very common in ordinary secondary jungle.

Pahang

In Pahang botanical interest centres on the wild trees rather than the cultivated. The long roads through the forest-reserves give the opportunity to study the forest-trees which overhang them, particularly the *Tualang* (*Koompassia excelsa*), *Pelong* (*Pentaspadon velutinum*), *Kasai* (*Pometia pinnata*), Pink Cassia (*Cassia nodosa*) and so on.

PEKAN.—On the south bank of the river occur may Rengas-trees (*Gluta renghas*).

KUALA LIPIS.—Trees of the Burma *Simpoh* (*Dillenia aurea*) occur scattered in the town.

RAUB.—Just in front of the Rest House are trees of *Millettia atropurpurea*, to one side of it is a tree of Kedah *Simpoh* (*Dillenia ovata*) and behind are an Ipoh-tree (*Antiaris*), a Stinking Mahogany (*Cedrela*), two trees of *Ficus elastica* and one of *Ficus consociata*. There are many Stinking Mahoganies along the main street.

TEMERLOH.—A reserve of giant *Tualang* (*Koompassia excelsa*).

FRASER'S HILL.—Many conifers are planted, e.g. *Pinus Merkusii*, *Cryptomeria*, *Cupressus*, *Araucaria*.

Several Eucalyptus trees are planted, particularly *E. globulus* (which has two kinds of leaves).

Peppercorn Laurel (*Lindera pipericarpa*) occurs everywhere.

Geronggang (*Cratoxylon arborescens* var. *Miquelii*) is common and has been planted round the Gold Course.

Two kinds of *Tiup Tiup* (*Adinandra javanica* and *A. maculosa*) are common.

Dacrydium falciforme, an unusual conifer, is common in the forest. The tree-composite *vernonia javanica* is very common in secondary jungle. Saplings of the mountain tree, *Weinmannia*, abound everywhere. Three common small fig-trees are *Ficus hirta*, *F. fulva* and *F. fistulosa*. A very close ally of the true cinnamon, if not identical with it, occurs frequently in the forest; there is a big isolated tree by the coolie lines on the path to the Dairy Farm. The Oil-fruit trees, *Elæocarpus stipularis* and *E. pseudopaniculatus*, are common, as are the large Mountain Monkey Apple (*Glochidion* sp.) and the leathery-leaved *Keredas* (*Pithecellobium* ? *Kunstleri*).

Tibouchina is commonly planted and the fine mountain *Sendudok* (*Melastoma muticum*) is abundant.

The Mountain Ivy Palm (*Schefflera* sp.) is a weird and striking plant, if rather uncommon.

The Silky Oak, *Grevillea robusta*, is planted round the Golf Course.

The Malayan Aspen (*Bucklandia*) has been planted by the Forest Department on some hillsides, and specimens occur by the roads.

Many curious and little known trees occur in the forest, e.g. the Oaks *Quercus Burkillii*, *Q. Maingayi*, *Q. Scortechinii* and the mountain Fig Pear (*Pyrus granulosa*), which may be seen by the walks.

The so-called Pine-trees at Pine Tree Hill are *Dacrydium comosum* (4 specimens) and *D. Beccarii* (1 specimen).

TREES OF LOCAL INTEREST

CAMERON HIGHLANDS.—The forest is like that at Fraser's Hill. Big trees of *Bucklandia* are common. The Silky Oak (*Grevillea*) and an *Acacia* (*Acacia podalyriæfolia*) are commonly planted. The Peppercorn Laurel (*Lindera pipericarpa*) is very abundant. Large trees of the Mountain *Gelam* (*Leptospermum*) and False *Ru* (*Bæckia*) grow in Taman Sedia. The *Chempaka* (*Michelia champaca*) has been found wild in the forest. Splendid oaks occur on the hillsides.

Selangor

KUALA LUMPUR.—The most conspicuous tree is the Rain-tree (*Enterolobium*). In the Public Gardens are numerous interesting wild trees as well as such cultivated kinds as the Brazil Nut, Ceylon Iron Wood (*Mesua ferrea*), Cannon Ball tree (*Couroupita*: in front of the Agricultural offices) and a *Miku*-tree (*Artocarpus Lowii*) beside it.

The *Kesumba* (*Bixa*) and Madras Thorn (*Pithecellobium dulce*) are frequently grown as hedges.

KANCHING.—Young Kapur-trees (*Dryobalanops aromatica*) have been planted on the hillside: they look like a forest of "Noah's Ark trees".

KLANG.—The stiff, ungainly *Bira*-trees (*Fagraea crenulata*) are common in the surrounding country.

KUALA SELANGOR.—Fine specimens of the strangling fig *Ficus gibbosa* are common on the hill.

GINTING SIMPAH.—Many giant *Lipterocarp* trees have been kept as specimens beside the road.

Negri Sembilan

SERAMBAN.—The Lake Park contains many interesting wild trees, e.g. *Jelutong* (*Dera*), *Pulai* (*Alstonia*), wild Breadfruit trees as *Artocarpus dada*, *A. superbus*, *A. rigidus*, *A. elasticus* and *A. Scortechinii*, *Kempas* (*Koompassia malaccensis*), *Millettia atropurpurea*, *Grewia tomentosa*, *Vitex pubescens*, *Rhodamnia*, *Gironnieræ*, *Terminalia subspathulata*, *Adenantha bicolor*, *Tembusu* (*Fagraea*). Behind the Best House occur trees of the Chestnut (*Castanopsis inermis*), the Laurel (*Phœbe grandis*), the Ebony (*Diospyros Wallichii*) and the little Durian (*Durio Griffithii*). In the town are several of the Coral trees *Erythrina fusca*, and of the Malayan Spindle-tree (*Kurrimia paniculata*).

SRI MENANTI.—There are many fine trees in the Palace-grounds, notably of *Waringin* (*Ficus benjamina*), *Tempuni* (*Artocarpus rigidus*) and *Menkatong* (*Cynometra inæquifolia*).

TAMPIN.—The *Batai* (*Peltophorum dasyrachis*), *Menkudu Kechil* (*Morinda elliptica*), Purple *Millettia* (*M. atropurpurea*) and *Chichah* (*Stereospermum fimbriatum*) are common in the surrounding country.

Malacca

The villages of Malacca are distinguished by their lofty trees of the *Mango*-genus (*Mangifera*), especially the *Binjai* (*M. cæsia*) and *Lanjut* (*M. lagenifera*). The curious *Miku* (*Artocarpus Lowii*) occurs sporadically in some parts.

Gelam (*Melaleuca*) is planted by many roads through the rice-fields and it forms in some parts extensive thickets or swampy woodlands.

Membatu (*Parinari corymbosum*) has been planted by some roadsides and makes a magnificent tree.

Chichah (*Stereospermum fimbriatum*) keeps watch over the Christian cemetery.

Black *Kelat* (*Eugenia cymosa*) is common on the laterite hillocks.

On the Residency Hill, beside the old church, are a fine specimen of the Soap-Nut tree (*Saponaria*) and one of the Silky Oak (*Grevillea*).

At Tanjong Kling there are some fine Lebbek-trees (*Albizia lebbek*) and many interesting strangling figs.

The *Bira* (*Fagraea crenulata*) is common in the swampy ground near the coast. In Malacca-town, the old *Angsana*-trees (*Pterocarpus*) are the main glory.

Johore

SEGAMAT.—By the river are large trees of the Red River Fig (*Ficus glomerata*).

BATU PAHAT.—There are several *Bira*-tree (*Fagraea crenulata*). This is the southernmost record of their occurrence in Malaya.

BULOH KASAP.—There is a big specimen of *Pauh Kijang* (*Irvingia*) by the bridge.

JOHORE BAHRU.—There is a magnificent row of Rain-trees (*Enterolobium*), laden with epiphytes, fronting the Straits and, further along the main road, is the finest avenue of *Gelam* trees (*Melaleuca*) in the country. Opposite the Police parade-ground is a *Tui*-tree (*Dolichandrone*).

KOTA TINGGI-MERSING ROAD.—Conspicuous forest-trees on this road are the *Kapur* and *Keladan* (*Dryobalanops*), the *Krepal* and *Punggai* (*Cœlostegia*), *Kasai* (*Pometia alnifolia*), scaly-barked *Rengas* (*Melanorrhœa* sp.), *Kempas* (*Koompassia malaccensis*).

SEDILI RIVER.—This river gives the best opportunity in Malaya of studying a *Rassau*-river (p. 42) and the *Tristania*-banks.

MERSING.—In the tidal creeks are many trees of the Rat-tailed Croton (*Croton heterocarpus*), noticeable from its orange-red withering leaves. The coastal trees can be studied on the neighbouring islands: we recommend Pulau Setindan.

On Tebrau Estate, near Johore Bahru, is the biggest specimen of *Ficus elastica* in the country.

Singapore

The *Tembusu*-trees (*Fagraea fragrans*) in the Tanglin-district of the town are the finest specimens in the country. There are in the district a few trees, also, of the Giant *Tembusu* (*Fagraea gigantea*).

The Hop-tree (*Arfeuillea*) is planted on Orchard Road, Edinburgh Road and Balestier Road.

The Broad-leafed Mahogany (*Swietenia macrophylla*) is planted on Orchard Road, Nassim Hill, Dunearn Road, Holland Road and several others. Magnificent full-grown trees can be seen near the entrance to Hindhede's Quarry at Bukit Timah.

Formerly there were many avenues of the Sea Apple (*Eugenia grandis*) but they have suffered from the widening of roads. That on Dalvey Road is the best that remains.

The Tree-Gardenias (*Gardenia carinata*, *G. tubifera*) have been planted recently on the new roads.

The Pink Cassia (*Cassia nodosa*) has been planted on Holland Road.

A fine specimen of the great strangling-fig (*Ficus caulocarpa*) occurs on Government Hill and another in the grounds of the General Hospital.

TREES OF LOCAL INTEREST

A tall specimen of the *Pulai* (*Alstonia spathulata*) stands by the entrance to Keppel Harbour Golf-Course and there are a few by Grange Road at the junction with Paterson Road: (it was dying in 1942).

Chekring-trees (*Erythrina fusca*) occur near the market at the 4th mile on Bukit Timah Road; there is a large specimen by the Chinese temple off Moulmein Road and there are a few on Paya Lebar Road.

In front of the Belle Vue Hotel (Keppel Harbour) is a magnificent *Kerayong* (*Parkia javanica*) which is, perhaps, the largest in the country.

The following places are particularly interesting for the study of less common trees:—

FORT CANNING.—*Merbatu* (*Parinarium corymbosum*), Tamalan (*Dalbergia*), *Terap* (*Artocarpus elasticus*), *Putat Laut* (*Barringtonia asiatica*), the Collared Fig (*Ficus procera*), Black Kelat (*Eugenia cymosa*), Jambolan (*Eugenia cumini*).

CATHEDRAL CLOSE.—Indian Banyan-tree (*Ficus bengalensis*), Sea Fig (*Ficus superba*), Bodh-trees (*Ficus religiosa*), *Waringin* (*Ficus benjamina*), Stinking Mahogany (*Cedrela Glaziovii*).

BOTANICAL GARDENS.—Many named trees, both exotic and native.

LABRADOR.—Such coastal trees as *Setada* (*Podocarpus polystachyus*), Sea Lettuce tree (*Scævola*), the Oil Fruit *Elæocarpus pedunculatus*, *Cerbera manghas*, *Teruntum* (*Lumnitzera coccinea*).

BUKIT TIMAH FOREST RESERVE.—Many named forest-trees: also a plantation of Gutta-Percha trees (*Palaquium gutta*).

KRANJI FOREST RESERVE.—The *Buta Buta* (*Excoecaria*) is exceedingly abundant. When it winters, the whole area of forest takes on the red autumn tints and is a striking feature by the main road.

CHANGI.—The big tree, conspicuous for miles round, is a species of *Sepetir* (*Sindora*). Many big forest trees occur near the coast in the military area, e.g. *Puah Kijang* (*Iringia*) with big buttresses.

Kelantan¹

Besides the trees characteristic of the Burmese monsoon-forest which occur in Kelantan as in Kedah and Perlis (p. 40), the following are noteworthy:—

The Kelantan Laurel (*Litsea* sp.) abundant in villages, rice-fields and secondary jungle.

Hantar Duri (*Zanthoxylum rhetsa*), not recorded from the west side of the peninsula.

The three thorny plants called *Duri Timun Tahil* (*Randia tomentosa*, *R. spinosa*, *Vangueria*), common in secondary jungle.

Lonnek or Custard Apple (*Annona reticulata*), frequent in coastal villages.

The red-flowered *Durian* (*Durio zibethinus* var. *roseiflorus*).

Kechupu (*Garcinia Prainiana*), abundant in villages and rice-fields in the environs of Kota Bahru.

Krian (*Eugenia pseudosubtilis*), common in the rice-fields.

Kenapeh (*Glycosmis pentaphylla*), common in villages and orchards.

The four plants *Melima* (*Gelonium*), *Batu* (*Chaetocarpus*), *Tejur* (*Neolitsea*) and the Pink-Eyed *Cerbera* (*C. manghas*) are common in the sandy, coastal villages.

(1) The Malay names of plants in Kelantan and Trengganu are often different from those in general use through the rest of the country, cf. the Tamarind, Mangosteen, Cashew Nut and *Mertajam*. The word for a plant is *pohun* not *pokok* (= a mass of cumulus-cloud).

Kelupang (*Sterculia foetida*), saplings are common in villages in the north, especially round Kota Bahru.

Common trees on the flood-damaged banks of the Kelantan river are the Red River Fig (*Ficus glomerata*), Apple Fig (*Ficus pomifera*), *Melochia umbellata* and *Homalanthus*.

TUMPAT.—There is a fine *Dalur*-tree (*Cratæva lophosperma*) near the station. By the residence the Sultan is the largest *Kelupang*-tree (*Sterculia foetida*) in the country and at Kampong Terbak is an enormous specimen of the Sea Apple (*Eugenia grandis*). The other big trees in this village are an undetermined species of Anisoptera, locally called *Terbak*.

KOTA BAHRU.—Round the padang are Tamarind and *Tanjong* (*Mimusops*). The little fruit-tree (*Erioglossum*) is exceedingly abundant in the kampongs where it is called *Terajah*, not *Mertajam* or *Kelat Layu* as is usual. Another common, but unidentified fruit-tree is the *Sekriah* (*Aglaia* sp.). The Apple Fig (*Ficus pomifera*) is common by the streams and ditches. The curious Annonaceous tree *Kenerak* (*Goniothalamus tapis*) is rather frequent.

KUBONG KRIANG.—In a neighbouring rice-field is the biggest tree of the Indian Mango (*Mangifera indica*) that we have seen in Malaya.

(The *Tiuþ Tiuþ*, *Adinandra dumosa*, common in the south of Malaya, appears to be absent from Kelantan and so does the *Mentalun*, *Terminalia pyrifolia*, which is common in Kedah).

Trengganu¹

Many trees of the Burmese monsoon-forest reach into this state, such as the Burma Simpoh (*Dillenia aurea*), the thorny Randias (*R. tomentosa*, *R. spinosa*) and the *Guchek* (*Antidesma ghæsembilla*); the general flora resembles that of Kelantan. Noteworthy are the following:—

The *Rengas* (*Gluta renghas*), on the river banks in the fresh water tidal reaches and, in parts of the country, extending in double rows through the rice-fields and secondary jungle.

Gelam-forests (*Melaleuca*) with scattered trees of the Burma *Simpoh* (*Dillenia aurea*) are common north of the Trengganu River.

KUALA TRENGGANU.—Many curious plants grow in this town which is most fascinating to the botanist. The narrow-crowned *Meninjau* (*Gnetum gnemon*) is very abundant and offers much variety in the size and shape of the fruit. Then there are the Banana-trees or *Pisang* (*Alphonsea*), the dipterocarp *Chengal Pasir* (*Hopea odorata*) and the Lettuce Trees (*Pisonia excelsa*). The *Melima* (*Gelonium*) is abundant. There are several beautiful specimens of the *Tangisong Burong* (*Heynea*). The big *Rengas*-trees (*Gluta renghas*) are very striking. The Black *Kelat* (*Eugenia cymosa*), the *Jambu Arang* (*Eugenia claviflora*) and the *Chawan* (*Melanolepis*) are common. An odd fruit that comes into the market occasionally is the *Buah Sakor* or *Nasi Dingi* (*Xerospermum* sp.), allied with the *Rambutan*. The Sea Olive (*Olea brachiata*) and the *Sugi* (*Mischocarpus sundaicus*) are common in the outlying coastal villages.

PULAU KAPAS.—The sea-shore trees can be studied readily on this island.

Railway-Line Trees

The following jungle trees can be recognised easily from the railway-carriage by their shape or by their leaves:—

Terap (*Artocarpus elasticus*), *Terentang* (*Camposperma auriculata*), *Kelempayong* (*Anthocephalus*), *Sungkai* (*Peronema*), *Mahang* (*Macaranga*),

(1) See the footnote on p. 50.

BOOKS

Bungor (*Lagerstroemia*), *Balek Angin* (*Mallotus*), *Kasai* (*Pometia pinnata*), *Membulan* (*Endospermum*), *Bayur* (*Pterospermum*), Oak-trees (*Quercus*) when in flower, *Petai* (*Parkia*), and the numerous strangling figs (*Ficus* spp.).

On the line from Gemas through Kuala Lipis to Kuala Krai, the following may be added :—

Tualang (*Koompassia excelsa*), Pink Cassia (*Cassia nodosa*), *Pelong* (*Pentaspadon velutinum*), *Neram* (*Dipterocarpus oblongifolius*), Burmese *Simpoh* (*Dillenia aurea*), the big leafed Hibiscus-trees (*H. floccosus*, *H. macrophyllus*), the *Beremban Bukit* (*Duabanga*), the wild *Kenanga* (*Canarium*) and the *Beka Grian* (*Pajanelia*).

Books

1. BACKER, C. A. ... Verklarend Woordenboek van Wetenschappelijke Plantennamen (publ. by Visser & Co., Batavia, 1936).
(*explaining the botanical names of all Malayan plants*).
2. BLATTER, E., AND MILLARD, W. S. ... Some Beautiful Indian Trees. (1937) publ. by John Bale, Sons and Curnow, Ltd., London).
(*many coloured plates of Malayan trees; very useful for ornamental trees*).
3. BRUGGEMAN, L. ... Indisch Tuinboek (1939) (publ. by De Spieghel, Amsterdam).
(*horticultural; many coloured plates of ornamental herbs and shrubs*).
4. BRUGGEMAN, M.L.A. ... Sierboomen (1938) (publ. by G. Kolff & Co., Batavia).
(*many photographs of Malayan trees*).
5. BURKILL, I. H. ... Dictionary of the Economic Products of the Malay Peninsula, 2 vols. (1935).
(*indispensable for a knowledge of the history and uses of plants grown in Malaya*).
6. COLTHURST, I. ... Familiar Flowering Trees in India (1942) publ. by Thacker, Spink & Co., Calcutta).
(*many photographs of Malayan trees*).
7. FOXWORTHY, F. W. ... Malayan Forest Records No. 3. Commercial Timber Trees of the Malay Peninsula (1927).
(*indispensable for the beginner*).
8. — ... Malayan Forest Records No. 10. Dipterocarpaceæ of the Malay Peninsula (1932).
(*technical: for the advanced botanist*).
9. GOUGH, K. ... A Garden Book for Malaya (1928, London).
(*horticultural*).
10. GRIST, D. H. ... Outline of Malayan Agriculture (1936) (publ. by Department of Agriculture, S.S. & F.M.S.).
(*describes the orchard trees*).
11. HERKLOTS, G. A. C. ... Hongkong Nature series: Flowering Shrubs and Trees (publ. by The University, Hongkong).
(*many drawings and photographs of Malayan plants*).

12. KING, G. AND GAMBLE, J. S. ... Materials for a Flora of the Malay Peninsula, 5 vols. (1898-1914).
(*technical: for the advanced botanist*).
13. KOORDERS, S. H. AND VALETON, T. ... Boomsorten op Java, Bijdrage 1-13 (1894-1914) publ. by G. Kolff & Co., Batavia).
(*technical: for the advanced botanist*).
14. — .. Atlas der Baumarten von Java, 4 vols. (1913-1918) Leiden).
(*technical, with many illustrations of Malayan trees: for the advanced botanist*).
15. KOORDERS, S. H. ... Excursionsflora von Java, 4 vols. (1911-1937) (publ. by Gustav Fischer, Jena).
(*technical: for the advanced botanist*).
16. MACMILLAN, H. F. ... Tropical Planting and Gardening (1935) (publ. by Macmillan & Co., Ltd., London).
(*horticultural*).
17. MILSUM, J. N. ... Fruit-culture in Malaya (1919) (Dept. of Agriculture, S.S. & F.M.S., Bulletin No. 29).
(*photographs of most common fruit trees*).
18. OCHSE, J. J. ... Vegetables of the Dutch East Indies (1931) (publ. by Archipel Drukkerij, Buitenzorg, Java).
(*many line-drawings of Malayan trees*).
19. OCHSE, J. J. ... Fruits and Fruitculture in the Dutch East Indies (1931) (publ. by G. Kolff & Co., Batavia).
(*many coloured plates of Malayan fruits*).
20. ROCK, J. F. ... Ornamental Trees of Hawaii (1917).
(*many photographs of Malayan trees*).
21. — . Leguminous Plants of Hawaii (1920) (publ. by Hawaiian Sugar Planters' Association, Honolulu).
(*many photographs of Malayan trees*).
22. SYMINGTON, C. F. .. Malayan Forest Records No. 16, Foresters' Manual of Dipterocarps (1944).
(*indispensable for the botanist*).
23. WATSON, J. G. ... Malayan Forest Records No. 6. Mangrove Forests of the Malay Peninsula (1928).
(*indispensable for the beginner*).
24. — ... Malayan Forest Records No. 5. Malayan Plant Names (1928).
(*This is a compilation and not all of the records are certain*).

Periodicals

1. Gardens Bulletin, S.S.
(*technical: for the advanced botanist*).
2. Journal of the Malayan Branch of the Royal Asiatic Society.
3. M. A. H. A. Magazine.
(*horticultural*).
4. Malayan Agricultural Journal.
(*agricultural*).
5. Flora Malesiana (and Bulletin): (Batavia and Leiden).

PART II

KEY TO THE IDENTIFICATION OF THE FAMILIES AND GENERA

Key to the General Groups of Trees

- Trees with needle-leaves or minute scale-leaves, without leaves Group A, p. 56
- Broad-leaved trees, the leaves at least $\frac{1}{4}$ " wide
- Thorny trees, with thorns on the trunk, twigs or leaves, or the leaves with prickly edges Group B, p. 56
- Thornless trees
- Trees with white, yellow, orange, red, brown or black sap, gum or latex in the bark, twigs, leaves or fruits Group C, p. 58
- Without such latex, or with watery, transparent, colourless or grey gum or sap
- Flowers and fruits borne on the trunk or main branches Group D, p. 60
- Flowers and fruits borne on the twigs, from the leafy parts or just behind the leaves
- Leaves pinnate or palmately lobed Group E, p. 60
- Leaves peltate Group F, p. 61
- Leaves trifoliolate (with 3 leaflets) Group G, p. 61
- Leaves pinnate or pinnately lobed
- Leaves opposite or whorled Group H, p. 62
- Leaves, spirally arranged or alternate Group I, p. 62
- Leaves simple, not peltate
- Leaves spirally arranged Group J, p. 65
- Leaves alternate Group K, p. 69
- Leaves opposite Group L, p. 73
- Leaves whorled Group M, p. 77

Key to the Special Groups of Trees

- Trees with the old leaves withering pink, red or reddish orange Group N, p. 77
- Trees with variegated or yellow foliage Group O, p. 80
- Trees with the leaves white or silvery underneath (not merely glaucous or bluish) Group P, p. 80
- Trees with the leaves brown, brownish olive or coppery beneath Group Q, p. 83
- Trees with the young leaves deep blue (not purple, violet or pink) Group R, p. 85
- Trees with orange or orange-brown bark (not merely brown) Group S, p. 85
- Trees with stilt-roots Group T, p. 86
- Seashore and mangrove trees Group U, p. 86
- Riverside and streamside trees Group V, p. 91

REDUCED LEAVES

GROUP A

Trees with needle-leaves or minute scale-leaves, or
without leaves

-
- With fleshy green branches containing latex *Euphorbia* p. 252
 With minute white flowers *Bæckia* p. 484
 Without flowers or latex, but with cones
 Twigs green, switchy, with long internodes: the leaves
 as minute teeth in circles at the nodes *Casuarina* p. 186
 Twigs without internodes, covered closely with scale-
 leaves or needle-leaves (or the old twigs covered thus
 closely with their scars) *Coniferæ* p. 713
 (See also *Emblica*, Plate 57)

GROUP B

Broad-leafed, thorny trees

Key to the Subdivisions

- With white latex *a*
 With palmate leaves *b*
 With pinnate leaves *c*
 With trifoliolate leaves *d*
 With simple leaves
 Spirally arranged *e*
 Alternate *f*
 Opposite (occasionally in whorls of 3) *g*

a

With white latex

- Cactus-like plants with fleshy green branches or twigs ... *Euphorbia* p. 252
 With normal, slender, leafy twigs: forest *Phyllochlamys* p. 690

b

With palmate leaves

- Tall trees with stout trunks: leaves with separate leaflets:
 pods with fluffy seeds *Malvaceæ* p. 434
 Bushes or small trees with lobed leaves or indistinctly
 separate leaflets: with small flowers and berries ... *Araliaceæ* p. 152

c

With pinnate leaves

- Weak, sprawling tree: the branches stout, sappy, often
 climbing, densely studded with thorns: leaves 2-3 times
 pinnate, with toothed leaflets *Leea* p. 97
 Not so
 Leaves twice pinnate: with pods and white, yellow or
 red flowers *Leguminosæ* p. 358

Leaves once pinnate

- Leaves alternate : flowers pink : pods long, black ... *Cassia* p. 386
 Not so : leaves spirally arranged
 Leaflets with prickly edges, toothed *Paranephelium*
 Not so p. 593
 Cultivated tree with oblong, yellow fruits 1½"
 long : twigs not thorny *Spondias* p. 114
 Fruits much larger; or wild trees with much smaller
 fruits and thorny twigs *Rutaceæ* p. 565

d

With trifoliate leaves

- Large trees : leaflets entire flowers red or purple, large,
 bean-like : with pods *Erythrina* p. 367
 Shrubs or small trees, the tissues with a resinous, lime-like
 smell when crushed : leaflets toothed *Rutaceæ* . 565

e

With simple leaves, spirally arranged

- Coniferous. without flowers : leaves small, stiff, spiky,
 densely set on the twigs : cult. *Araucaria* p. 717
 Flowers large, mauve, potato-like : cult. *Solanum* p. 606
 Flowers large, yellow, Hibiscus-like : hairs prickly : wild *Hibiscus* p. 440
 Flowers small
 Leaves with resinous, lime-like smell when crushed :
 fruits as limes, oranges, etc. *Rutaceæ* p. 565
 Leaves simple, not smelling : sea-shore *Ximenia* p. 728

f

With simple, alternate leaves

- Leaves with 3 longitudinal veins, small, toothed, hairy ... *Zizyphus* p. 519
 Leaves with one longitudinal vein (the midrib), glabrous or,
 if hairy, then not toothed
 Leaves toothed : flowers tiny
 Leaves with spiny teeth *Taxotrophis* p. 692
 Leaves not spiny *Flacourtiaceæ* p. 305
 Leaves entire
 Flowers 1" wide, feathery, with long white stamens :
 fruit large *Capparis* p. 179
 Not so : leaves small : old branches slightly thorny :
 berries small
 Riverside bush with small white berries ... *Flueggea* p. 255
 Not so : inland : flowers in small brownish axillary
 cushions : leaves often glaucous beneath ... *Bridelia* p. 242

g

With simple, opposite leaves

- Large tree with big, cabbage-like leaves *Fagraea* p. 422
 Small trees or saplings with rather small leaves
 With interpetiolar stipules : ovary inferior : corolla-tube
 with 5-10 petals : leaves occasionally in threes ... *Rubiaceæ* p. 530
 Not so : ovary superior : no stipules
 Leaves often whitish beneath, blunt or toothed : flowers
 as yellow trumpets : berries yellow *Gmelina* p. 702

WITH LATEX

Not so

- Trunk spiny: saplings: generally wild ... *Cratoxylon* p. 325
 Twigs often spiky at the ends: leaves small, 1/2"
 wide or less: flowers small, in panicles: cult.
 shub or treelet *Lawsonia* p. 428

GROUP C

Trees with coloured sap or latex in some or all tissues

Key to the Subdivisions

- Poisonous forest trees with blackening sap: leaves spirally
 arranged like those of the Mango or Cashew-Nut ... *Anacardiaceæ* p. 98
 With yellow gum or latex
 Leaves opposite: latex or gum in all parts *Guttifera* p. 310
 Leaves spirally arranged: latex only in the fruit:
 flowers Hibiscus-like *Thespesia* p. 444
 With pink, red, orange or brown sap or gum *a*
 With white gummy sap or latex
 Leaves compound or lobed *b*
 Leaves simple
 Spirally arranged *c*
 Alternate *d*
 Opposite *e*
 Whorled *Apocynaceæ* p. 137

a

With pink, red, orange or brown gum or sap

- Leaves pinnate: trees
 Bark orange brown: young leaves red: leaflets toothed:
 generally riverside trees *Pometia* p. 594
 Not so: *Keranji* (*Dialium*), *Angsana* (*Pterocarpus*) ... *Leguminosæ* p. 358
 Leaves simple or palmately lobed
 Leaves opposite
 Flowers pink or red: no stipules ... *Cratoxylon* p. 325
 Flowers greenish white: with interpetiolar stipules ... *Canthium* p. 534
 Leaves alternate (*see* below)
 Conical forest-trees with nutmeg-like fruits: leaves
 often large or coppery beneath *Myristicaceæ* p. 472
 A straggling mangrove tree: East coast *Inocarpus* p. 395
 Leaves spirally arranged
 Flowers large, with 5 white or pink petals: fruits
 densely fuzzy hairy: cultivated *Bixa* p. 173
 Not so: leaves with spider-web veining: wild
 With red gum in the pith: leaf often 3-lobed or
 peltate *Macaranga* p. 261
 With brown sap from the cut twigs *Endospermum* p. 250

b

With white sap or latex: leaves compound or lobed

- Leaves palmate
 Leaves large, toothed, with stout long stalks:
 cultivated papaya *Carica* p. 184

- Leaves with slender stalks, entire *Manihot* p. 273
 Leaves toothed : small trees with figs *Ficus* p. 658
 Leaves trifoliate (*see* below)
 Small tree : trunk soft, sappy : leaflets joined at the base *Manihot* p. 273
 With stout woody trunks : leaflets separately stalked, not
 joined at the base
 Rubber-tree : latex in all parts : leaflets obovate : fruit
 3-shouldered, green *Hevea* p. 256
 Village tree : latex mainly in the yellow fruit : leaflets
 ovate *Sandoricum* p. 466
 Leaves pinnate or pinnately lobed
 Leaves pinnately lobed or with pairs of small and large
 leaflets : twigs very massive *Artocarpus* p. 649
 Leaves simply pinnate
 Fruits rather large, with thick rind and 1-5 seeds
 surrounded with pulp : flowers with a staminal
 tube *Meliaceæ* p. 453
 Fruits with 4 pink wings like shuttlecocks, or small,
 oblong, pulpy with a stone : inflorescence often
 feathery : no staminal tube *Anacardiaceæ* p. 98

c

- With white sap or latex : leaves simple, spirally arranged
 Flowers large, 1-3" wide, white, red or yellow, with a long
 or conspicuous corolla-tube *Apocynaceæ* p. 137
 Flowers small or minute
 Latex only in the unripe, mango-like fruit *Mangifera* p. 106
 Latex in the twigs and leaves
 Fruits fig-like, clustered on the trunk or branches or
 in pairs in the leaf-axils : or the fruits large, round
 or oblong like the Bread Fruit *Urticaceæ* p. 646
 Not so
 Flowers with separate stalks, clustered in the leaf-
 axils or on the twigs behind the leaves, with
 5-many petals : corolla-tube short : leaves often
 white or brown beneath : buds often brown
 silky *Sapotaceæ* p. 597
 Not so : flowers small or minute, in spikes or panicles *Euphorbiaceæ* p. 222

d

- With white sap or latex : leaves simple, alternate
 Tree with dark green foliage coppery beneath, (but not a
 strangling fig) : cultivated *Chrysophyllum*
 p. 599
 A small tree of tidal creeks, in villages and rice-fields :
 leaves rather narrow, smooth, finely toothed : fruits
 about 1" wide *Sapium* p. 275
 Not so *Urticaceæ* p. 646
 (See also *Mimusops*, Plates 180, 181)

e

- With white sap or latex : leaves simple, opposite
 Flowers with a long corolla-tube, white or pink *Apocynaceæ* p. 137

CAULIFLOROUS, RAMIFLOROUS

- Flowers pale lilac blue, waxy : leaves white felted beneath *Calotropis* p. 159
 Small trees with figs on the branches or trunk ... *Ficus* p. 658
 Not so *Guttiferæ* p. 310

GROUP D

Flowers and fruits borne on the trunk or main branches

Leaves pinnate

Leaves spirally arranged

Cultivated tree with pink flowers and fruits like small green cucumbers : leaflets 6-17 pairs ... *Averrhoa* p. 516

Cultivated tree : flowers pink, bean-like : with pods : leaflets 6-8 pairs ... *Gliricidia* p. 371

Cultivated tree with rather large buff-coloured fruits, with pulpy seeds ... *Lansium* p. 463

Forest tree : glabrous : flowers white : fruit red ... *Dysoxylon* p. 460

Leaves alternate

With one pair of leaflets : cultivated ... *Cynometra* p. 391

With 3 or more pairs of leaflets, no terminal one : flowers massed, red yellow or orange-pink : pods purple ... *Saraca* p. 399

Leaves simple

Leaves in whorls, large, glaucous beneath ... *Actinodaphne* p. 345

Leaves opposite ... *Prismatomeris* p. 553

Leaves spirally arranged (*see* below)

Flowers 3" or more wide, very showy : cult. ... *Lecythidaceæ* p. 349

Flowers greenish, small, in racemes : fruit edible, with pulpy seeds, in strings or in clusters : fruit-trees or wild ... *Baccaurea* p. 238

Leaves alternate

Leaves brown or silvery beneath : *Durian*, wild or cultivated ... *Durio* p. 437

Fruits like black woody durians : buttressed, forest trees ... *Cælostegia* p. 436

Fruits as purple, ribbed pods ... *Theobroma* p. 607

Not so

Small trees or shrubs with minute flowers : berries orange to red, clustered on the rather slender branches : berry with 1 seed ... *Opiliaceæ* p. 514

Moderate sized trees with the flowers and fruits on burs on the trunk and branches

With 6 white or yellow petals : fruits in stalked bunches ... *Annonaceæ* p. 125

With a 4-5 lobed corolla-tube : fruits with a 4-5 lobed calyx at the base, clustered but separately stalked, with few to many seeds ... *Diospyros* p. 213

GROUP E

With palmate leaves : (without thorns or latex, not cauliflorous)

Leaves with separate leaflets

Leaves opposite : flowers blue or purple, small ... *Vitex* p. 706

- Leaves spirally arranged
 Flowers large, white, hanging on long stalks: rare,
 cultivated *Adansonia* p. 435
 Flowers 1" wide, red, in panicles: pods very large,
 red, in star-like clusters of 3-5: saplings with
 sticky young shoots *Sterculia* p. 618
 Not so
 Shrubs or small trees: crushed leaves with a resinous
 smell *Araliaceæ* p. 152
 Big, buttressed timber-trees: not resinous ... *Tarrietia* p. 621
 Leaves merely lobed, not divided into leaflets
 Leaves alternate, toothed: flowers 1-2" long, red or
 white: fruits long, twisted or woolly ... *Helicteres* p. 610
 Leaves opposite: flowers as yellow trumpets ... *Gmelina* p. 702
 Leaves spirally arranged
 Flowers yellow, large: cultivated *Cochlospermum*
 p. 174
 Flowers pink, 1" wide: garden shrub *Dombeya* p. 609
 Flowers pink, 3" wide, often double *Hibiscus* p. 440
 Mountain tree with 3-pointed leaves and flat stipules
 covering the buds *Bucklandia* p. 321
 Not so
 Leaves very large, deeply palmately divided and
 toothed: fruits large: flowers cream-white,
 nocturnal: Papaya *Carica* p. 184
 Forest saplings, 6-30 ft. high: leaves and stalks
 very large *Scaphium* p. 616
 Not so *Euphorbiaceæ* p. 222
 (See also *Pangium*, p. 308, with very large, 3-5
 lobed sapling-leaves)

GROUP F

Leaves peltate: (without thorns or latex, not cauliflorous)

- Sea-shore tree: fruits with a white cup loosely surrounding
 a black wrinkled stone *Hernandia* p. 323
 Not so
 Mature trees with peltate leaves *Euphorbiaceæ* p. 222
 Saplings with peltate, toothed leaves brown or orange
 beneath: mature trees with ordinary leaves *Pterospermum* p. 614

GROUP G

With trifoliate leaves: (without thorns or latex, not
 cauliflorous)

- Leaves opposite
 Petals joined in a yellow or blue corolla-tube: fruits as
 berries seated in the calyx-tube: crushed leaves often
 with a resinous smell *Vitex* p. 706
 Flowers small, white, with free petals: fruits as 2-4
 lobed capsules with dark or black seeds: crushed
 leaves often with a faint lime-like smell ... *Evodia* p. 517

TRIFOLIATE

Leaves spirally arranged

- Flowers large with 4 yellow petals : many long feathery
stamens projecting 1-3" *Cratæva* p. 180
- Flowers red, bean-like : trees with pods, pale grey bark
and ovate, joined leaflets : often thorny ... *Erythrina* p. 367
- Not so
- Medium-sized to big trees with rather large leaflets :
fruits 2-4" wide, round, yellow *Sandoricum* p. 466
- Shrubs or treelets
- Garden shrub with large, round, blunt leaflets ... *Nothopanax* p. 156
- Village or garden treelet : leaflets $\frac{1}{2}$ -1 $\frac{1}{4}$ " wide,
small, blunt, obovate : flowers orange yellow,
minute, very fragrant of citronella ... *Aglaia* p. 455
- Wild, generally near the sea : flowers white
- Flowers bean-like, clustered : pods jointed ... *Desmodium* p. 367
- Flowers minute, in slender spikes : petals 4 :
berries dull orange red, in slender spikes,
1-seeded ... *Allophylus* p. 584

GROUP H

With opposite or whorled pinnate leaves

- Mountain shrub or treelet with large, white, daisy-like
flowers : leaves pinnately lobed : cultivated ... *Montanoa* p. 196
- Flowers large, tubular or trumpet-shaped : fruits as cylindric
or flattened pods with papery, transparent or winged
seeds : leaves opposite or whorled *Bignoniaceæ* p. 160
- Flowers small, pink or white, not $\frac{1}{2}$ " wide
- Mountain tree : leaflets toothed, withering red : stipules
rather large, semicircular : flowers in small spikes ... *Weinmannia* p. 200
- Lowland trees, or cultivated
- Leaf-stalk winged : leaflets entire (toothed in saplings),
whitish beneath, purple when young : fruits pale,
dry : wild *Peronema* p. 704
- Leaf-stalk not winged : leaflets toothed : berries purple,
black or red : cultivated *Sambucus* p. 182

GROUP I

With alternate or spirally arranged pinnate leaves

Key to the Subdivisions

- Leaves pinnately lobed (not divided into separate leaflets) ... *a*
- Leaves 3-4 times pinnate *b*
- Leaves twice pinnate *c*
- Leaves once pinnate *d*

a

Leaves pinnately lobed

- Leaves divided into narrow lobes, silky beneath : cultivated,
often in the mountains *Grevillea* p. 518
- Leaves with broad lobes : wild *Aralidium* p. 153

b

Leaves 3-4 times pinnate

- Leaflets toothed: leaf-stalks sheathing the swollen nodes:
 shrubs or treelets with berries *Leea* p. 97
 Leaflets entire: small tree with 3-angled pods *Moringa* p. 470

c

Leaves twice pinnate

- Leaflets not toothed: trees with pods *Leguminosæ* p. 358
 Leaflets toothed
 Flowers purple, fragrant: berries yellow: cult. ... *Melia* p. 464
 Flowers white or red: leaf-stalks sheathing the swollen
 nodes: berries red, purple, or black
 Tissues resinous when crushed: flowers in panicles:
 leaflets often variegated or deeply cut ... *Nothopanax* p. 156
 Not so: flowers and fruits in flat-topped clusters ... *Leea* p. 97

d

Leaves once pinnate

- Big forest trees with the fruits attached to 3-fingered wings
 and set in hanging catkins *Engelhardtia* p. 331
 Big forest-trees with fruits like 4-winged shuttlecocks, not
 in catkins: (white latex in the bark) *Parishia* p. 112
 Shrubs or trees with *Pods* or more or less flattened, dry,
 1-seeded fruits: flowers generally showy or bean-like,
 mostly with a *standard* and 10 stamens *Leguminosæ* p. 358
 Not so: fruits round, oblong or angled, pulpy or with
 pulpy seeds, or as capsules splitting into 3-5 parts:
 flowers small
 Leaflets distinctly toothed (not merely notched or wavy
 on the edge)
 Moderate-sized or big trees
 Leaflets strongly curved, asymmetric, narrow:
 cultivated *Melia* p. 464
 Leaflets broad: young leaves reddish pink: bark
 orange: forest streamsides *Pometia* p. 594
 Not so: fruits with a resinous rind and, often, a
 hard, 3-angled stone: leaf-stalk jointed ... *Burseraceæ* p. 177
 Shrubs or treelets
 Leaf-stalks sheathing the swollen nodes
 Flowers in panicles: leaves often variegated or
 deeply cut: tissues resinous *Nothopanax* p. 156
 Flowers and berries in flat-tooped clusters ... *Leea* p. 97
 Leaf-stalks not sheathing
 Leaflets thin, hairy: with minute red flowers and
 small berries *Brucea* p. 603
 Leaflets glabrous, leathery, with rather spiny
 edge: fruits spiny *Paranephelium*
 p. 593

PINNATE

Leaflets entire or with the edge merely finely notched or wavy

Without a terminal leaflet

Leaflets 1-3 pairs

Sea-shore and mangrove trees: fruits not angled

Fruit 1" wide brown scurfy, wrinkled: flowers in small axillary clusters, with 10 stamens: bark brownish, entire *Cynometra* p. 391

Fruit 3-5" wide: flowers in lateral panicles, with a staminal tube: bark peeling or blackish and cracked *Carapa* p. 458

Inland trees or, if seashore trees, then with 3-angled fruits

Cultivated tree: pods woody, foetid, brown: flowers 1" wide, white *Hymenæa* p. 394

Not so: fruits often 3-angled: flowers ¼" wide *Sapindaceæ* p. 581

Leaflets 3-many pairs: flowers small, in panicles

Leaflets generally in opposite pairs on the leaf-stalk: flowers generally with a staminal tube, the anthers twice as many as the petals: fruit as a capsule splitting into 3-5 parts, or oblong, leathery and 1-seeded, or a round leathery ball 2" or more wide *Meliaceæ* p. 453

Leaflets generally alternate on the leaf-stalk: flowers with separate stamens (generally 8), often male: fruits 3-angled, 3-shouldered, or with 3 lobes (1" 2 lobes often not developed), in many cases warted or hairy *Sapindaceæ* p. 581

With a terminal leaflet

Village and garden tree with pink flowers: fruit with 5 strong angles *Averrhoa* p. 516

Forest trees or riverside shrubs with large fruits, 1" or more wide, splitting open: seeds large, red, or black with orange pulp *Dysoxylon* p. 460

Not so

Sparingly branched, wild trees, the few stout twigs bearing large rosettes of leaves

Slender, often unbranched forest treelet with dark bark: leaflets many, narrow: the pink flowers or orange-red berries in hanging panicles *Eurycoma* p. 604

Stout but small tree of secondary jungle or open country, with greyish white bark, forking branches, stout brown scurfy twigs, broad leaflets and huge, spreading, upright flat-topped green inflorescences *Arthrophyllum*

p. 154

Normal bushy plants with many twigs

Shrubs or small trees, the leaves often with resinous, foetid or lime-like smell: fruits lemon-like or as small pulpy berries (without a stone): seeds often green *Rutaceæ* p. 565

- Not so : moderate-sized or large trees
 Leaflets alternate : flowers bean-like : fruits 1"
 long, black velvety : buttressed ... *Dialium* p. 393
- Not so : leaflets more or less in pairs
 Flowers with 3 petals : fruits with leathery,
 resinous rind, oblong with a hard
 pointed 3-angled stone or roundish with
 a round stone : *leaves jointed, the stalk*
swollen at the attachment of the
leaflets *Burseraceæ* p. 177
- Flowers with 4-5 petals and a staminal tube,
 white, yellow or orange, fragrant :
 fruits with a thick rind and 1-several
 pulpy seeds *Meliaceæ* p. 453
- Not so : fruits pulpy, generally with a
 fibrous, hairy stone : stamens separate *Anacardiaceæ* p. 98.

GROUP J

With spirally arranged, simple leaves

Key to the Subdivisions

- Leaves smelling of eucalyptus-oil when crushed, generally
 slightly curved, pointing down, with one midrib :
 cultivated, mostly in the mountains *Eucalyptus* p. 485.
- Not so
 Leaves small or narrow, less than 1" wide : or the leaves
 without a midrib but with several longitudinal veins :
 flowers small (except *Archytæa* and *Michelia*) ... *a*
- Leaves more than 1" wide, with a midrib
 Flowers 1" or more wide *b*
 Flowers less than 1" wide *c*
- a*
- Flowerless trees, mostly without internodes on the twigs :
 leaves leathery : seeds solitary, stalked *Gymnospermæ*
 p. 711
- Flowering trees with internodes on the twigs
 Leaves without a midrib but with several longitudinal
 veins, strap-like
 Mountain or coastal shrub : leaves stiff, sessile,
 glaucous beneath : berries red *Leucopogon* p. 218.
- Lowland trees : leaves stalked : flowers fragrant, in
 spikes
 Flowers orange; pods coiled : cultivated *Acacia* p. 405
 Flowers white : fruits small, knob-like : bark shaggy
 flaky, fissured : leaves aromatic : wild or cult. *Melaleuca* p. 506
- Leaves with a midrib, not strap-shaped
 Leaves not ½" wide : flowers white, conspicuous :
 mountains *Leptospermum*
 p. 505
- Leaves asymmetric, with large and small leaves, each
 kind in 2 rows : wild *Anisophyllea* p. 122
- Leaves white beneath, lanceolate : riverside bush ... *Homonoia* p. 258

SIMPLE, SPIRAL

Leaves $\frac{1}{2}$ " wide or more, symmetric

Lowland plants

Leaves rather fleshy, sessile: waste and swampy
land *Archytæa* p. 627

Leaves stalked

Leaves entire: cultivated

Leaves glaucous beneath: smelling of camphor
when crushed: tree *Cinnamomum* p. 339

Not so

Flowers $\frac{3}{4}$ " long, very fragrant, fleshy:
cultivated bush *Michelia* p. 433

Flowers minute: small wild tree ... *Myrica* p. 471

Leaves more or less toothed

Cultivated or in rice-fields, the leaves withering
yellow: flowers minute, in catkins:
fruit not formed *Salix* p. 580

Wild trees, the leaves often withering red:
flowers in short sprays

Petals free, toothed: inflorescences lateral *Elæocarpus* p. 635

Petals joined: flowers bell-like, pinkish
white: berries $\frac{1}{4}$ " wide: sea-shores ... *Vaccinium* p. 219

Mountain plants

Leaves sessile, bluish white: cultivated ... *Acacia* p. 405

Leaves stalked

Leaves toothed: flowers pinkish: berries black
or purple

Flowers in small clusters: petals 4, free:
ovary superior: berry single ... *Ilex* p. 328

Flowers and berries in short sprays: corolla
bell-like: ovary inferior *Vaccinium* p. 219

Leaves entire

Leaves 3-veined (with a longitudinal vein on
either side of the midrib), glaucous
beneath: twigs brown-hairy ... *Lindera rufa* p. 346

Leaves with invisible veins: glabrous ... *Myrsine* p. 481

b

Leaves more than 1" wide: flowers 1" wide or more

Leaves 2-lobed at the apex: cultivated bushes or treelets
with pods *Bauhinia* p. 378

Leaves not 2-lobed

Ovary inferior: flowers white, pink, red or purple, either
very large with 6-12 petals, or 1-3" wide and with
the fluffy stamens much longer than the 4 petals
and set in hanging racemes *Lecythidaceæ* p. 349

Not so: ovary superior

Leaves heart-shaped or broadest near the base

Flowers green: fruit 6-12" long, massive: large
tree, wild or cult. *Pangium* p. 308

Flowers pink, 1" wide: leaves toothed: garden
shrub *Dombeya* p. 609

- Flowers white, yellow, orange, red or pink : stamens
 joined in a tube : stigmas 5 *Malvaceæ* p. 434
- Flowers white or pink : fruits coarsely hairy :
 cultivated *Bixa* p. 173
- Flowers orange : seashores *Cordia* p. 175
- Leaves narrowed to the base
- Petals 9-12, strap-like, white or orange : fragrant :
 twigs with ring-like scars at the nodes : cultiv-
 ated or wild in the mountains *Michelia* p. 433
- Petals 5 : twigs generally not ringed
- Petals fringed or toothed at the ends : flowers
 facing down, set in unbranched sprays : style
 1 : fruit with a large stone *Elæocarpus* p. 635
- Petals not fringed or toothed : fruits many seeded
 Flowers 1½-6" wide, white or yellow : styles 5
 or more : fruit enclosed by the persistent
 fleshy sepals *Dilleniaceæ* p. 201
- Flowers 1-3" wide, cream-coloured : petals and
 stamens often joined together at the base
 and falling off in one piece *Ternstræmiaceæ*
 p. 624
- c
- Leaves more than 1" wide : flowers less than 1" wide
- Leaves very large, oblong : fruits like grey, woody durians
 with yellow bristles on the partitions : forest trees ... *Neesia* p. 443
- Wild trees with acorns or spiny, or knobby, chestnuts :
 flowers minute, in spikes : leaves often silvery beneath *Fagaceæ* p. 290
- Fruits as limes, pumelo or oranges *Citrus* p. 568
- Leaves pale greenish yellow or yellowish white, often
 opposite *Pisonia* p. 510
- Not so
- Leaves heart-shaped or broadest near the base (ovate)
- Mangrove bush or small tree : leaves brownish olive
 beneath *Brownlowia* p. 634
- Not so
- Fruits as red pods set in star-like clusters of 2-5,
 splitting open and showing the black or dark
 brown seeds *Sterculia* p. 618
- Fruits like pointed tomatoes, 2" long, yellow or red :
 cultivated in the mountains *Cyphomandra* p. 605
- Fruits as pink slimy berries, clustered in bunches
 set on the twigs opposite to the leaves : flowers
 white *Cordia* p. 175
- Not so
- Flowers minute, lilac-tipped, clustered in small
 heads, the heads set in large panicles : seeds
 crowned with hairs, fluffy *Vernonia* p. 196
- Flowers small or minute, white, greenish or
 yellowish, often male or female : petals often
 none : styles 2-3 : fruits ¼-¾" wide, with
 2-6 shoulders : seeds often black, round, with
 thin red, orange or pink pulp *Euphorbiaceæ* p. 222

SIMPLE, SPIRAL

- Flowers with 5 pink petals or with a scurfy orange calyx-tube (1½" long) : or big forest-trees with brown fissured bark and winged fruits : fruits as capsules, open pods or winged nuts ... *Sterculiaceæ* p. 606
- Leaves narrowed to the base or broadest at or above the middle (elliptic to obovate)
- Trees with stiff outstanding limbs and large leaves in terminal rosettes
 - Leaves nearly sessile, 4-7" wide, withering scarlet : roadsides and sea-shores ... *Terminalia* p. 192
 - Leaves 10-24" long, withering yellow or red : forest and secondary jungle ... *Camphnosperma* p. 102
- Not so
 - Bark grey, yellow or orange, very smooth, peeling in scroll-like flakes : leaves withering red *Tristania* p. 508
 - Fruits like red pods set in star-like groups of 2-5, splitting open : seeds large, black or brown, velvety ... *Sterculia* p. 618
 - Flowers tiny, lilac-tipped, set in small heads, the heads in large panicles : seeds fluffy, crowned with a tuft of hairs ... *Vernonia* p. 196
 - Mountain tree, often epiphytic like a strangling fig : leaves coarsely toothed, wavy : flowers white, fragrant : ovary inferior ... *Pyrus* p. 529
- Not so
 - Petals joined, pink or white : fruits fleshy or pulpy
 - Leaves entire
 - Large tree : leaves with waved edges : flowers with a star-like corolla of 24 points, falling off in one piece : fruit 1" long, red, pointed : cultivated ... *Mimusops* p. 600
 - Seashore or mangrove shrub with white berries *Scævola* p. 310
 - Wild trees or shrubs : leaves rather leathery, often blunt : berries small, round ...
 - Flowers greenish, 2" wide, in axillary clusters : young leaves mottled ... *Ilex* p. 328
 - Flowers pink, larger : petals 5 ... *Myrsinaceæ* p. 478
 - Leaves toothed
 - Flowers pink ... *Ardisia* p. 479
 - Flowers white
 - Flowers falling off in the early morning, male or female : ovary inferior : stamens many ... *Symplocos* p. 622
 - Not so : ovary superior : stamens 5 : berries red or pink ... *Cordia* p. 175
 - Petals separate or none
 - Fruits pulpy, with one large seed, seated on the calyx-cup (composed of 6 sepals) like an acorn : flowers small, yellowish, clustered or in panicles : no petals, but 6 sepals : stamens opening with 2 or 4 flaps : twigs often brown-hairy or the leaves glaucous beneath : crushed tissues generally resinous or aromatic ... *Lauraceæ* p. 334

- Big, buttressed forest trees with brown fissured bark, fruits winged, large ... *Sterculiaceæ* p. 606
- Flowers in short unbranched sprays from the leaf-axils or from the twigs behind the leaves, green or white, facing down: petals 4-5, toothed or fringed at the end: fruits in short sprays, green or blue, round or oblong, with a hard stone ... *Elæocarpus* p. 635
- Leaves narrow, toothed, rather glaucous beneath: twigs and leaf-stalks reddish: flowers in catkins: rice-fields ... *Salix* p. 580
- Not so
- Flowers in rather flat clusters (not pink)
- Flowers-clusters lateral, long-stalked: fruits as sticky brown capsules ... *Ixonanthes* p. 221
(see, also *Ilex* on the opposite page)
- Flower clusters terminal: leaves narrow, very wavy: twigs and young shoots rusty scurfy: generally near the sea ... *Pittosporum* p. 517
- Flowers in racemes or panicles
- Leaves $\frac{1}{2}$ - $1\frac{1}{2}$ " wide, nearly sessile, in rosettes at the ends of the twigs: fruits red then black, $\frac{1}{3}$ " long, thinly pulpy, with one large seed ... *Myrica* p. 471
- Not so: with stalked leaves or different fruits
- Ovary inferior: flowers sessile, tiny, greenish, in unbranched spikes: fruit like a small mango or a *Ketapang*-fruit or flattened and born in catkins: big trees: wild ... *Terminalia* p. 192
- Ovary superior: with stalked flowers or different fruits
- Flowers in panicles: petals white, pink or violet: fruit mango-like or like a bean on a fleshy cushion or small and red with a black stone, not splitting open ... *Anacardiaceæ* p. 98
- Fruit red, splitting open, with 1-2 large seeds covered with bright reddish pink pulp: petals and stamens 4-5, tiny ... *Kurrimia* p. 189
- Not so ... *Euphorbiaceæ* p. 222

GROUP K

With alternate, simple leaves

Key to the Subdivisions

- Leaves 3-veined (having a long or short longitudinal vein from the base on either side of the midrib) ... a

SIMPLE, ALTERNATE

- Leaves 2-lobed at the apex, with 5-11 longitudinal veins ... *Bauhinia* p. 378
- Leaves with one longitudinal vein, namely the midrib
- Leaves toothed or notched, finely or coarsely ... *b*
 - Leaves entire *c*
- a*
- Leaves 3-veined
- Leaves toothed
- Flowers 1" wide, white: leaf-base asymmetric ... *Muntingia* p. 644
 - Flowers and berries not $\frac{1}{4}$ " wide: leaves often heart-shaped and rough-hairy, tapered to a long point ... *Trema* p. 693
 - Flowers (fragrant) and berries $\frac{1}{4}$ - $\frac{2}{3}$ " wide: stamens many: leaf-base narrowed, the longitudinal side-veins reaching $\frac{1}{3}$ - $\frac{3}{4}$ the length of the blade ... *Grewia* p. 642
- Leaves entire
- Lateral longitudinal veins reaching $\frac{1}{3}$ - $\frac{1}{2}$ the length of the blade: berries $\frac{3}{4}$ " long, orange *Grewia* p. 642
 - Lateral long. veins reaching the whole length of the blade (or nearly), or the leaves asymmetric and silvery beneath: fruits often large *Anisophyllea* p. 122
- b*
- Leaves with 1 longitudinal vein, toothed or notched
- Leaves $\frac{1}{2}$ -1 $\frac{1}{4}$ " wide on the flowering twigs: flowers small
- Leaves rather glaucous beneath: flowers minute, in catkins: twigs in some cases very drooping ... *Salix* p. 580
 - Leaves rough-hair: berries orange yellow *Trema* p. 693
 - Not so: berries blue: petals white
 - Ovary inferior: berries topped by the sepals: anthers white: flowers dropping off in the early morning *Symplocos* p. 622
 - Ovary superior: sepals at the base of the berry: anthers orange-brown *Eurya* p. 628
- Leaves wider or the flowers 1- wide
- Leaves sticky hairy, asymmetric at the base: flowers 1" wide, white, regular: berries pink then red ... *Muntingia* p. 644
 - Leaves with prickly edges: forests *Taxotrophis* p. 692
 - Leaves rough-hairy or the berries orange, $\frac{1}{4}$ " wide ... *Trema* p. 693
- Not so
- Leaves coarsely toothed or lobed
 - Flowers red, white or pink: capsules round and woolly or long, often twisted: hairy shrubs or trees *Sterculiaceæ* p. 606
 - Flowers minute, in slender spikes: capsules short: seeds pulpy *Aporosa* p. 235
 - Flowers small, clustered: berry red *Flacourtia inermis* p. 307
- Leaves slightly toothed, almost entire: with berries
- Flowers $\frac{1}{2}$ " wide or more, separately stalked, 1-3 in a leaf-axil: berries many-seeded, clasped by the sepals *Adinandra* p. 625
 - Flowers and berries minute, in panicles ... *Mæsa* p. 481

- Leaves with one longitudinal vein (the midrib), entire
- Fruits as acorns or chestnuts: flowers minute, in spikes:
leaves often whitish or silvery beneath: wild ... *Fagaceæ* p. 290
- Not so
- Leaves large 10-24" long
- Leaves with wavy edges, withering red: flowers
yellow: fruits very large, woody: cultivated ... *Bertholletia* p. 356
- Not so *Euphorbiaceæ* p. 222
- Leaves smaller
- Crushed leaves smelling of eucalyptus-oil: cultivated,
mostly in the mountains *Eucalyptus* p. 485
- Crushed leaves smelling of citronella-oil: blade rather
small, thin, glaucous beneath: bark greyish green,
smooth: flowers in small clusters in the leaf-axils:
mountains *Lindera* p. 346
- Leaves leathery, small, curved: mountains: ... *Dacrydium falci-*
forme p. 722
- Not so
- Big timber trees: fruits like shuttle-cocks with 2-5
long wings: forests mainly *Dipterocarpaceæ*
p. 208
- Big trees with fruits and flowers (white or red) like
durians: leaves often silvery or brown beneath:
wild and cultivated *Malvaceæ* p. 434
- Flowers large $\frac{3}{4}$ -3" long or wide, with 3 or 6 long
or thick petals, white, cream or yellow, often
very fragrant, facing down: fruits clustered on a
common stalk or very large and fleshy: crushed
leaves often resinous aromatic: mostly cultivated *Annonaceæ* p. 125
- Big tree, very strongly and sharply buttressed: bark
smooth, pale grey or brownish: fruits like small,
greenish grey mangos *Irvingia* p. 604
- Not so
- Leaves very small, not $\frac{1}{4}$ " wide, closely set, the
twigs suggesting pinnate leaves: fruits as sour
green berries *Emblica* p. 282
- Leaves larger
- Leaves asymmetric at the base, shortly stalked
- Leaves brown or brownish white scurfy or
woolly beneath *Pterospermum* p. 614
- Buds long, pointed: twigs with a ring-like scar
at the nodes *Gironniera* p. 688
- Not so
- Main branches with only minute scale-
leaves, the side-twigs bearing the foliage
leaves and suggesting pinnate leaves:
flowers tiny: fruits either as capsules
with red or black seeds or pulpy and
sour see *Glochidion* p. 278

SIMPLE, ALTERNATE

Not so : the leaves all alike, or of two kinds
(large and small) on the same twig,
each being in two rows ... *Anisophyllea* p. 122

Leaves symmetric or nearly so

Leaves more or less glaucous beneath

Twigs hairy

Twigs brown-velvety ... *Lauraceæ* p. 334

Leaves 4-9" long, silky beneath ... *Diospyros* p. 213

Not so ... *Euphorbiaceæ* p. 222

Twigs glabrous

Mountain shrub : leaves pointed : flowers
white, fragrant, set in long-stalked,
hanging heads : berries black ... *Daphne* p. 633

Lowland tree, chiefly coastal : leaves
blunt, with a pale but faint broad
band along the middle : twigs
flattened : berries red, small ... *Erythroxylon* p. 220

Not so ... *Euphorbiaceæ* p. 222

Leaves not glaucous beneath

Flowers with a corolla-tube with 3-5 lobes,
 $\frac{1}{4}$ -1" wide, white, pinkish or yellow,
clustered in the leaf-axils or on the
twigs behind the leaves : fruits pulpy
or leathery, containing several flat seeds,
seated on the persistent and often
enlarged, 3-5 lobed calyx : flowers and
fruits often with sooty black hairs ... *Ebenaceæ* p. 213

Fruits pale yellow to orange with 2 long
styles like whiskers, set in short axillary
sprays 1-3" long, 1-3 sprays in each
leaf-axil : buds long, pointed : twigs
with a ring-like scar at the nodes ... *Gironniera* p. 688

Fruits as small red or purple, 1-seeded,
juicy berries set in spikes : flowers
minute, without petals, in slender
spikes, one to several inches long ... *Antidesma* p. 231

Leaves softly hairy, withering red ... *Elæocarpus* p. 635

Not so

Leaf-stalks on the flowering or fruiting
twigs more than $\frac{1}{4}$ " long

A conical, monopodial tree : leaves
ovate, with upcurled sides, rather
shiny and fleshy : flowers yellowish,
small, in stalked heads clustered in
the leaf-axils ... *Lindera* p. 346

Flowers and berries minute, white, in
slender, lateral panicles (often
mossy through galls) : leaves
ovate : shrub or small tree ... *Mæsa* p. 481

- Flowers in terminal and axillary panicles: berries orange ... *Grewia* p. 642
- Flowers minute, in short yellow spikes: fruits as capsules, with 1-3 seeds covered with orange-red pulp: leaves narrow, $\frac{3}{4}$ -2" wide ... *Aporosa* p. 235
- Flowers $\frac{1}{3}$ - $\frac{1}{2}$ " wide, in short racemes on the twigs behind the leaves or at the base of the new shoots, fluffy with stamens: leaves often with 2 large knobs at the base of the blade: fruits $\frac{1}{2}$ - $\frac{3}{4}$ " wide, red or green with 1 large seed ... *Pygeum* p. 528
- Flowers $\frac{1}{2}$ " wide, star-like with 24 points: fruit: 1" long, red ... *Mimusops* p. 600
- Leaf-stalks on the flowering twigs $\frac{1}{4}$ " long or less
- Flowers $\frac{1}{2}$ -1 $\frac{1}{2}$ " wide, cream-white, 1 or a few in the leaf-axils ... *Adinandra* p. 625
- Flowers $\frac{1}{2}$ " wide, greenish white, fluffy with many stamens: fruits 1 $\frac{1}{2}$ " long, brownish, with 2 stones: big tree with grey bark ... *Parinarium* p. 527
- Flowers and fruits smaller
- Forest tree: bark grey, smooth, stripping: leaves small, 1-2" wide, with fine, crowded veins at right angles to the midrib ... *Aquilaria* p. 632
- Not so
- Flowers and fruits clustered in the leaf-axils
- Berries blue: leaf $\frac{1}{2}$ -1 $\frac{1}{2}$ " wide *Symplocos* p. 622
- With small red or purple berries *Ilex* p. 328
- With smooth or bristly capsules, or white or black berries ... *Euphorbiaceae* p. 222
- Flowers and fruits in spikes or racemes
- Shrubs or treelets to 15 ft. high, with yellowish, slender, trunks ... *Opiliaceae* p. 514
- Small to moderate-sized bushy trees up to 50 ft. high, with stout greyish brown trunks *Rosaceae* p. 524

GROUP L

Leaves simple, opposite

Key to the Subdivisions

- Leaves small, $\frac{1}{4}$ - $\frac{1}{2}$ " wide *Lythraceae* p. 426
- Leaves very large, 12-24" long
- Leaves stalked: flowers $\frac{1}{3}$ " wide: cultivated ... *Tectona* p. 705

SIMPLE OPPOSITE

- Leaves sessile, clasping the twig: flowers 1" wide:
 wild *Fagraea* p. 422
- Leaves neither so large nor so small
- Leaves without a midrib but with several faint longitudinal veins, leathery: mountain conifer, occasionally cultivated in the plains ... *Agathis* p. 715
- Leaves sessile, very glaucous, smelling of Eucalyptus when crushed: mountains, cult. ... *Eucalyptus* p. 485
- Leaves smelling of turpentine when crushed: buds rather large and pointed: fruits 1-2" wide, orange yellow, pulpy, smelling of turpentine, containing 1 large purple seed: young leaves violet: village fruit-trees, very bushy ... *Bouea* p. 100
- Leaves yellowish, even yellowish white, often spirally arranged: cultivated ... *Pisonia* p. 510
- Leaves fringed with hair-like teeth all round ... *Carallia* p. 521
- Not so
- Twigs with interpetiolar stipules: the stipules leaving linear scars on the twigs between the pairs of leaves or leaf-scars: leaves not 3-veined ... a
- Without such stipules
- Leaves 3-veined (a longitudinal vein lying on either side of the midrib) ... b
- Leaves with one longitudinal vein, namely the midrib ... c
- a
- With interpetiolar stipules
- Ovary inferior: fruits capped by the sepals
- With a corolla-tube and 4-8 petal-lobes: sepals often minute: flowers mostly bright or showy, often in heads ... *Rubiaceae* p. 530
- With separate, minute petals: buds conical, projecting from the ends of the twigs, twisted: twigs often hollow: stipules soon dropping off: often mangrove trees ... *Rhizophoraceae* p. 520
- Ovary superior: fruits with the sepals at the base: flowers $\frac{1}{4}$ " wide or less
- Buds conical, projecting from the ends of the twigs, long: twigs hollow: berries red then black: young leaves pinkish ... *Gynotroches* p. 522
- Not so: flowers and fruits minute, in panicles: young leaves blue or violet, or the leaves large and leathery (8-12" long) ... *Crypteronia* p. 197
- b
- Leaves 3-veined, without interpetiolar stipules
- Flowers 1-3" wide, pink or purple: ovary inferior: shrubs
- Flowers 1½" wide, pink, with many stamens bearing tiny anthers: leaves thinly white woolly beneath, blunt, withering yellow ... *Rhodomyrtus* p. 508
- Flowers often larger, pink to purple: stamens 10, 5 or all of them jointed (as if in two parts), with long anthers: leaves withering red ... *Melastomaceae* p. 445

Flowers smaller : trees

Leaves often silvery beneath : flowers with 4 petals, white, very fragrant : berries red then black, clustered in the leaf-axils, topped with sepals ... *Rhodamnia* p. 507

Not so

Flowers white or blue with 4 petals, singly or in small clusters : ovary inferior : leaves mostly pointed : *young leaves blue* ... *Pternandra* p. 451

Flowers cream-white, with 6 sepals (no petals), $\frac{1}{4}$ " wide, in panicles : ovary superior : berries oblong, seated on the persistent calyx : leaves often blunt, smelling sour or of cinnamon when crushed : *young leaves pink or green* ... *Cinnamomum* p. 339

c

Leaves with one longitudinal vein, without stipules

Flowers 1" or more long or wide, conspicuous

Flowers trumpet-shaped, the petals joined

Trumpets bright yellow or orange, swollen on the underside : stamens 4 : fruits yellow, pulpy : shrubs or small trees, with rather small leaves : cultivated ... *Gmelina* p. 702

Trumpets cream or dull yellow-ochre, regular : stamens 5 : wild trees ... *Fagraea* p. 422

Flowers reddish purple, or white speckled red : leaves variegated ... *Acanthaceae* p. 95

Flowers with separate petals

Petals 4, red : fruits large, ribbed, orange-yellow, with 4 sepals at the base : leaves rather narrow ... *Garcinia* p. 312

Petals 6, white, pink or mauve-purple : fruits as capsules with 6 sepals ... *Lythraceae* p. 426

Petals 4 or 5, white or pink

Flowers 3-4" wide, the stamens shorter than the petals : leaves whitish beneath : ovary superior : fruit as a capsule embraced by the sepals ... *Mesua* p. 320

Flowers fluffy, with many projecting stamens longer than the petals : ovary inferior : fruit pulpy or green, crowned by the sepals ... *Eugenia* p. 486

Flowers smaller or absent

A small, narrowly conical tree without flowers, but with spikes bearing whorls of seeds or whorls of minute stamens : twigs swollen at the nodes ... *Gnetum* p. 726

Flowering plants

Plants of gardens, roadsides and orchards, cultivated

A big tree with *rudded fissured, brown bark*, dangling twigs, small leaves, cream-white trumpet flowers in clusters and small orange-red berries ... *Fagraea* p. 422

Not so : mostly shrubs

Flowers blue, purple or greenish lilac : shrubs or treelets

Flowers and orange berries in hanging strings *Duranta* p. 702

Flowers greenish lilac with 4 long, outcurved stamens ... *Clerodendron* p. 699

SIMPLE, OPPOSITE

- Flowers tiny, lilac or purple, in flat clusters:
 - berries small, red, purple or black ... *Callicarpa* p. 697
- Flowers white, pink or orange
 - Flowers white speckled red ... *Pseuderanthemum* p. 96
- Corolla-tube deep orange: night-flowering shrub *Nyctanthes* p. 513
- Flowers tiny, white, very fragrant, in panicles:
 - stamens 2: berries black: leaves small, $\frac{1}{2}$ - $1\frac{1}{2}$ " wide: shrub ... *Ligustrum* p. 512
- Flowers small, white, in hanging spikes
- Trees: flowers very fragrant: leaves often orange-brown ... *Citharexylum* p. 699
- Shrub: with strings of orange berries ... *Duranta* p. 702
- Flowers fluffy with many stamens: ovary inferior: trees
 - Twigs and leaves hairy: fruit large, many-seeded ... *Psidium* p. 507
 - Glabrous: flowers white or pink: fruits with 1-2 large seeds ... *Eugenia* p. 486
- Wild plants
 - Petals joined in a corolla-tube: stamens 2-5
 - Corolla-tube $\frac{1}{2}$ " long, or $\frac{1}{2}$ " wide across the petals, rather large: or the stamens projecting far beyond the tube
 - Stamens 4, projecting far: flowers white, yellow or greenish lilac: corolla-tube narrow: berries generally seated on a star-like calyx *Clerodendron* p. 699
 - Flowers with 5 stamens: small or large trees ... *Fagraea* p. 422
 - Flowers small, $\frac{1}{4}$ " wide or less, with short corolla-tube
 - Flowers pink, lilac or purple, in flat clusters ... *Callicarpa* p. 697
 - Flowers white
 - Leaves foetid when crushed ... *Premna* p. 704
 - Not so
 - Flowers in lateral panicles: stamens 2: ovary superior: lowlands ... *Oleaceae* p. 511
 - Flowers in flat terminal clusters, very fragrant: stamens 5: ovary inferior: berries flattened: chiefly in the mountains ... *Viburnum* p. 183
- Petals free (not joined in a corolla-tube) or absent:
 - stamens few or many
 - Flowers white, pink or red, stamens shorter than the petals: ovary superior: fruits as capsules *Cratoxylon* p. 325
 - Not so
 - Flowers with petals, or fluffy from the many stamens: ovary inferior: sepals often minute or apparently absent
 - Twigs hairy: slender ... *Decaspermum* p. 484
 - Twigs glabrous
 - Flowers white, pink, blue or purple: stamens 8, short, clumsy: the rind or pulp of the berry surrounding a thin

- shell containing the much crumpled or folded seed-leaves (green or purple): leaves often very leathery with invisible veins *Memecylon* p. 448
- Flowers white, pink or greenish: stamens many, fluffy, slender, projecting: no shell in the fruit: seed-leaves very thick, fleshy, not folded *Eugenia* p. 486
- Flowers minute, inconspicuous
- Leaves in 2 rows: flowers in panicles (like branched spikes): fruits minute: young leaves deep blue, or the leaves large and leathery: with a linear scar on the twigs joining the leaves of a pair *Crypteronia* p. 197
- Leaves in 4 rows, 1-2½" wide, narrowed to the base, often withering red: fruit ½" wide, red, 2-3 shouldered and seeded *Longetia* p. 260

GROUP M

With simple, whorled leaves

- Leaves narrow, not 1" wide: flowers 1½-3" wide, pink or white, often double: cultivated *Nerium* p. 146
- Leaves over 1" wide
- Flowers as yellow trumpets set in dense umbrella-like inflorescences: tree *Deplanchea* p. 163
- Flowers greenish lilac, with 4 stamens arching out over the top: leaves toothed: shrub *Clerodendron* p. 699
- Flowers white, fragrant, in hanging spikes: leaves often orange-brown: small tree, cult. *Citharexylum* p. 699
- Flowers small and inconspicuous: fruits red or black, seated on the cup-like calyx: leaves large, smelling resinous or aromatic when crushed: *wild* trees or shrubs *Actinodaphne* p. 345
- (See also *Randia exaltata*, p. 556)

GROUP N

Old leaves withering pink, orange-red or red

Key to the Subdivisions

- Twigs switchy, green, without leaves: mountains *Casuarina* p. 186
- Leaves pinnate *a*
- Leaves trifoliolate *b*
- Leaves with 3 points, withering pink: mountains .. *Bucklandia* p. 321
- Leaves simple
- Crushed leaf smelling of eucalyptus-oil: mountains *Eucalyptus* p. 485
- Leaves narrow or small, up to 1" wide *c*
- Leaves larger
- Leaves in whorls of three: with latex *Alstonia angustifolia*
p. 141

WITHERING RED

Leaves opposite	...	...	...	...	<i>d</i>
Leaves spirally arranged	...	...	...	...	<i>e</i>
Leaves alternate	...	...	...	...	<i>f</i>

a

Leaves pinnate

Mountain tree : leaves opposite : leaflets toothed	...	...	...	...	<i>Weinmannia</i> p. 200
Mangrove or sea-shore tree with 1-3 pairs of leaflets	...	...	...	...	<i>Carapa</i> p. 458
Roadside tree with gloomy crown : 3-5 pairs of leaflets	...	...	...	...	<i>Swietenia</i> <i>macrophylla</i> p. 496

b

Leaves trifoliate

Rubber-tree : with latex : leaves glabrous	...	...	...	...	<i>Hevea</i> p. 256
Fruit-tree : leaves hairy	...	...	...	...	<i>Sandoricum</i> p. 466

c

Leaves simple, small, 1" wide or less

Leaves without a midrib but with several longitudinal veins, sessile : mountain or sea-shore	...	...	...	...	<i>Leucopogon</i> p. 218
Leaves with a midrib					
Lowland tree with rather long, fleshy, apparently vein- less, sessile leaves	...	...	...	...	<i>Archytæa</i> p. 627
Mountain tree with small, thin leaves not ½" wide	...	...	...	...	<i>Leptospermum</i> p. 505
Sea-shore or mountain : with toothed leaves ½-1" wide	...	...	...	...	<i>Vaccinium</i> p. 219
Lowland tree with white latex	...	...	...	...	<i>Sapium discolor</i> p. 276

d

Leaves simple, over 1" wide, opposite

Leaves 3-veined (with a longitudinal vein on either side of the midrib) : flowers large, purple or pink : shrubs	...	...	...	...	<i>Melastoma</i> p. 445
With latex	...	...	...	...	<i>Kopsia</i> p. 145
With large pink or purple flowers with 6 petals	...	...	...	...	<i>Lagerstræmia</i> p. 428
Not so					
Mangrove or sea-shore shrub : flowers pinkish : leaves withering pink	...	...	...	...	<i>Scyphiphora</i> p. 559
Small mountain tree with easily broken twigs	...	...	...	...	<i>Wendlandia</i> p. 565
Lowland forest tree with orange papery-flaky bark and small red berries	...	...	...	...	<i>Eugenia</i> <i>penangiana</i> p. 501

Not so

Without interpetiolar stipules : flowers and fruits on
the twigs behind the leaves or in the axils of the
old leaves

Leaves rather large, oblong, in 2 rows, their stalks ¼" long or less : flowers trumpet-shaped, with many stamens : fruit pulpy : sea-shores or near habitation	<i>Eugenia claviflora</i> p. 495
---	-----	-----	-----	-----	-------------------------------------

Not so : leaves in 4 rows, their stalks ¼-½" long : wild	<i>Longetia</i> p. 260
---	-----	-----	-----	-----	------------------------

- With interpetiolar stipules: flowers and fruits in terminal panicles or heads
- Tree of Saraca-streams: flowers in heads: leaves with 6-10 pairs of side-veins ... *Neonauclea* p. 551
- Shrub or treelet of secondary jungle: flowers in large panicles: leaves with many pairs of side-veins ... *Greenea* p. 541
- Swamp tree: leaves large: stipule sheath fringed ... *Jackia* p. 547
- e*
- Leaves simple, over 1" wide, spirally arranged
- With latex in the twigs
- Leaves brownish beneath: sea-shores and sandy health ... *Planchonella* p. 601
- Not so
- Mangrove or sea-shore tree: leaves often slightly notched round the edge ... *Excæcaria* p. 254
- Inland trees: leaves bluish green above, rather glaucous beneath, entire
- Leaves ovate or heart-shaped, widest near the base: fruit with 2 styles ... *Homalanthus* p. 257
- Leaves elliptic with 2 purple knobs at the top of the stalk: fruit 3-lobed ... *Sapium discolor* p. 276
- Without latex
- Sea-shore, roadside or garden tree with large, obovate, nearly sessile leaves ... *Terminalia* p. 192
- Crushed leaves smelling strongly of camphor or resin or lime-like ... *Cinnamomum* p. 339
- Riverside, mountain or sea-shore trees with smooth, peeling, often orange bark: leaves obovate ... *Tristania* p. 508
- Not so: leaves generally more or less notched or toothed
- Inflorescences axillary or lateral on the twigs
- Leaves large, blunt, entire, with winged stalk: in swamps, rare ... *Campnosperma* p. 102
- Not so
- Flowers and fruits born on unbranched sprays in the leaf-axils or on the twigs behind the leaves: leaf-stalk often with a knee at the top: buds often resinous ... *Elæocarpus* p. 635
- Flowers solitary or 2-3 together, 1" or more wide: leaf-stalk without a knee ... *Gordonia* p. 629
- Inflorescences terminal
- Flowers and fruits large, in hanging strings: by streams and rivers ... *Barringtonia* p. 350
- Flowers and fruits small, generally in upright spikes: leaves turning orange-red ... *Croton* p. 246
- Mountain tree: fruits 2-6 in a cluster ... *Pyrus granulosa* p. 529
- f*
- Leaves simple, over 1" wide, alternate
- Leaves very large, with wavy edges: cultivated tree ... *Bertholletia* p. 356
- Big riverside tree: Pahang, Trengganu, Kelantan ... *Dipterocarpus* p. 211
- Not so
- Flowers ½" or more wide, with petals and sepals, facing down: sepals persistent round the fruit: leaves generally finely notched ... *Adinandra* p. 625

VARIEGATED

Flowers $\frac{1}{4}$ " wide or less

Leaves withering red, generally asymmetric at the base: no leaves on the main branches ... *Glochidion* p. 283

Leaves withering pinkish yellow, to pale reddish ochre: leaves on all the twigs ... *Bridelia* p. 242

(See also *Elaeocarpus stipularis*, Plate 180, and *Flacourtia inermis* p. 307).

GROUP O

With variegated or yellow foliage

Leaves pinnate: garden shrub ... *Nothopanax* p. 156

Leaves trifoliolate

Garden shrub with toothed leaflets ... *Nothopanax* p. 156

Tree with entire leaflets: flowers red ... *Erythrina Parcellii* p. 370

Leaves palmately lobed: shrub ... *Manihot* p. 273

Leaves simple

Leaves merely yellow-green, not variegated, as often opposite as spirally arranged: small tree ... *Pisonia* p. 510

Leaves truly variegated

Leaves opposite ... *Acanthaceæ* p. 95

Leaves spirally arranged

Variegated yellow along the midrib only: leaves thin: flowers and fruits in hanging strings ... *Barringtonia racemosa* p. 355

Not so: Garden Crotons ... *Codiaeum* p. 245

GROUP P

Leaves white or silvery beneath, not merely glaucous

Key to the Subdivisions

- Thorny plants: shrubs or small trees ... *a*
- Not thorny
 - With white latex ... *b*
 - Without latex
 - Leaves palmate, trifoliolate or peltate ... *c*
 - Leaves pinnate or pinnately lobed ... *d*
 - Leaves simple
 - Leaves alternate ... *e*
 - Leaves spirally arranged ... *f*
 - Leaves opposite ... *g*

a

Thorny plants

Leaves 3-veined (with a longitudinal vein on either side of the midrib), toothed, alternate: flowers tiny, greenish: fruits yellowing, with a large stone ... *Zizyphus* p. 519

Not so: leaves opposite or clustered, even in whorls of three, entire: flowers 1" wide or more

Flowers as yellow trumpets with compressed mouth: ovary superior: berries yellow ... *Gmelina* p. 702

Flowers with 7-10 white or yellow petals set regularly
 round the corolla-tube: fruits velvety, olive brown,
 many seeded *Randia tomentosa*
 p. 557

b

With white latex

Leaves opposite, clasping the twigs: flowers pale bluish ... *Calotropis* p. 159
 Leaves whorled: large pagoda-trees *Alstonia* p. 140
 Leaves spirally arranged
 Leaves stiff, leathery, entire: cultivated, rather rare ... *Manilkara* p. 599
 Leaves thin, toothed, often 3-5 lobed: very common
 shrub or small tree with yellow or red figs: ... *Ficus alba* p. 681

c

Leaves palmate, trifoliolate or peltate

Leaves opposite with 3-5 leaflets: flowers pale blue ... *Vitex* p. 706
 Leaves alternate, with 3 points *Helicteres* p. 610
 Leaves spirally arranged
 Big tree, the lower branches and those of saplings bearing
 3-lobed leaves (not peltate): the upper branches with
 simple leaves: fruits large, very hard, flattened ... *Aleurites* p. 230
 Small sappy trees: leaves mostly peltate, with spider-web
 veining: fruits different, small
 Leaves 3-pointed: fruit woolly: inflorescence terminal *Mallotus barbatus*
 p. 270
 Leaves 3-lobed, 3-pointed or merely peltate: inflores-
 cences in the leaf axils or on the twigs behind the
 leaves: twigs often ant-inhabited: stipules often
 large *Macaranga* p. 261

d

Leaves pinnate or pinnately lobed

Cultivated tree, mostly in the mountains: leaves divided
 into narrow segments *Grevillea* p. 518
 Cultivated, lowlands: leaves alternate, pinnate ... *Amherstia* p. 377
 Wild, lowland: leaves opposite, pinnate, the stalk winged,
 the leaflets rather large *Peronema* p. 704

e

Leaves simple, alternate

Leaves 3-veined (a longitudinal vein from the base on either
 side of the midrib)
 Leaves toothed, scurfy or woolly beneath *Grewia tomentosa*
 p. 643
 Leaves entire, very asymmetric at the base, merely silvery
 beneath *Anisophyllea* p. 122
 Leaves with one longitudinal vein (the midrib)
 Leaves toothed *Sterculiaceæ* p. 606
 Leaves entire
 Big forest tree with pale greyish blue crown and narrow
 leaves: *Seraya* *Shorea Curtisii*
 p. 213
 Fruits as acorns or chestnuts: flowers minute in spikes *Fagaceæ* p. 290

WHITE BENEATH

Not so

Leaves scurfy or woolly beneath, heart-shaped and more or less asymmetric at the base ... *Pterospermum* p. 614

Leaves merely silvery beneath

Tree of Saraca-streams : leaves broad, thin, papery, tough ... *Schoutenia* p. 645

Spindly tree : leaves long, narrow, leathery, silky hairy beneath ... *Diospyros argentea* p. 215

f

Leaves simple, spirally arranged

Flowers large, yellow, with maroon eye, fading pink ... *Hibiscus tiliaceus* p. 442

Mountain shrub with sessile pointed leaves : cultivated ... *Acacia podalyriæfolia* p. 406

Riverside shrubs with very narrow leaves ... *Homonoia* p. 258

Mangrove or sea-shore tree with stiff leathery leaves ... *Heritiera* p. 612

Not so

Leaves withering orange, silvery beneath, narrowly heart-shaped at the base ... *Croton argyratum* p. 247

Not so : leaves withering yellow or brown

Leaves with rather short stalks, merely silvery beneath, not ovate : large trees with fruits as acorns or braided chestnuts ... *Fagaceæ* p. 290

Leaves with rather long stalks, generally ovate

Big tree with large, hard, flattened fruits ... *Aleurites* p. 230

Small or sappy trees : leaves with spider-web veining *Mallotus* p. 269

g

Leaves simple, opposite

Leaves sessile, blue-white, smelling strongly of eucalyptus-oil when crushed : mountains ... *Eucalyptus globulus* p. 485

Leaves stalked

Leaves 3-veined (with a longitudinal vein from the base on either side of the midrib)

Leaves silvery beneath, pointed : flowers white : tree ... *Rhodamnia* p. 507

Leaves scurfy or woolly beneath, blunt : flowers pink : shrub ... *Rhodomyrtus* p. 508

Leaves with 1 longitudinal vein (the midrib)

Leaves with a smooth waxy-white layer on the underneath, pointed, narrow : flowers large, with 5 petals, white ... *Mesua* p. 320

Leaves hairy, scurfy or woolly beneath : flowers yellow, pink or purple-lilac ... *Verbenaceæ* p. 695

GROUP Q

Leaves brown, brownish or coppery beneath

Key to the Subdivisions

- Small tree with thorny twigs: leaves with 3 longitudinal veins, small, toothed *Zizyphus* p. 519
- Leaves appearing whorled, long, drooping: wild mountain tree *Actinodaphne*
... *Maingayi* p. 345
- With red sap in the bark and twigs: leaves alternate, often large: wild nutmeg-trees with conical, monopodial crowns *Myristicaceæ* p. 472
- Not so
- With white latex in the twigs and leaves *a*
- Without latex
- Leaves palmately lobed or divided, or peltate *b*
- Leaves pinnate *c*
- Leaves simple
- Leaves alternate *d*
- Leaves spirally arranged *e*
- Leaves opposite *f*

a

With white latex

- Leaves pinnate: wild tree of lowland swampy forest *Amoora rubiginosa*
p. 453
- Leaves simple
- Shrub with blunt leaves: generally with a brown or black mark on the underside of the blade: with stalked figs in the leaf-axils *Ficus diversifolia*
p. 687
- Strangling fig-tree: buds conical, stout *Ficus consociata*
p. 676
Ficus pilosa p. 678
- Not so: normal trees *Sapotaceæ* p. 597

b

Leaves palmately divided or lobed, or peltate

- Leaves with 6-10 separate leaflets on one leaf-stalk: mountains *Schefflera* p. 156
- Leaves merely lobed or 3-pointed, often peltate, with spider-web veining
- Inflorescences mostly terminal: fruits 3-shouldered, often woolly *Mallotus* p. 269
- Inflorescences in the axils of the old leaves or on the twigs behind the leaves *Macaranga* p. 261
- Saplings of forest trees, the twigs and leaves very brown woolly *Pterospermum* p. 614

BROWN BENEATH

c

Leaves pinnate

- Mountain tree, rarely lowland, with gloomy dense crown :
 leaflets small, $\frac{3}{4}$ -2" wide : fruits with a 3-lobed wing *Engelhardtia nudiflora* p. 333
- Lowland trees with rather large, drooping leaflets 1 $\frac{1}{4}$ -4 $\frac{1}{2}$ " wide : crowns open
- Without a terminal leaflet : leaflets alternate, not coppery beneath but brown hairy on the stalks and veins :
 fruits like *Rambutan* *Nephelium* p. 591
- With a terminal leaflets brown scurfy or coppery beneath, often opposite on the leaf-stalk : fruit brown scurfy, hard : twigs with white latex *Amoora rubiginosa* p. 453

d

Leaves simple, alternate

- Twigs and undersides of the leaves silvery brownish scaly, not hairy *Durio* p. 437
- Hairy, not scaly
- Leaves 3-veined (with a longitudinal vein from the base on either side of the midrib)
- Leaves small, $\frac{1}{4}$ -1 $\frac{1}{4}$ " wide, entire *Schoutenia accrescens* p. 645
- Leaves large, generally with a few jagged teeth at the end *Grewia tomentosa* p. 643
- Leaves with one longitudinal vein (the midrib)
- Leaf-base heart-shaped, often asymmetric *Pterospermum* p. 614
- Not heart-shaped
- Spindly small tree or shrub with the leaves densely silky beneath *Diospyros argentea* p. 215
- Fruits as spiny chestnuts : leaves coppery scurfy or woolly beneath : large trees *Castanopsis* p. 291
- Not so : bushy shrubs or medium-sized trees *Lauraceae* p. 334

a

Leaves simple, spirally arranged

- Maugrove shrubs or small trees, by tidal brackish waters :
 leaves leathery *Brownlowia* p. 634
- Inland or dry land plants
- Leaves more or less heart-shaped or ovate with spider-web veining *Mallotus* p. 269
- Leaves not so, narrowed to the base
- Leaf-stalk 1-4" long, with a knee-joint next the blade
- Berries bluish : flowers greenish white *Elæocarpus ferrugineus* p. 638
- Pods red : flowers yellowish pink *Sterculia* p. 618
- Leaf-stalk $\frac{1}{4}$ -1" long (on the mature twigs)
- Leaves very glaucous beneath, entire *Cryptocarya* p. 342
- Not glaucous
- Leaves toothed : fruits as small berries *Symplocos javanica* p. 623

Leaves entire, coppery scurfy or woolly beneath :
 fruits as spiny chestnuts *Castanopsis* p. 291

f

Leaves simple, opposite

Mangrove or sea-shore trees : leaves leathery *Avicennia* p. 696
 Inland trees : leaves thin
 Flowers pink or lilac-purple, in flat-topped clusters : with
 small berries *Callicarpa* p. 697
 Not so : ovary inferior : twigs hollow *Pellacalyx* p. 523

GROUP R

Young leaves deep blue

Leaves 3-veined (with a longitudinal vein from the base on
 either side of the midrib) *Pternandra* p. 451
 Leaves with 1 longitudinal vein (the midrib)
 Flowers and fruits minute, in panicles : leaves and twigs
 often hairy : with interpetiolar stipules or their scars :
 common in Penang *Crypteronia* p. 197
 Not so : ovary inferior : fruits as berries
 Flowers pinkish or blue, with 8 clumsy stamens : leaves
 often fleshy with invisible veins *Memecylon* p. 448
 Flowers green, with fine stamens : fruit green : veins
 of leaf conspicuous *Eugenia Ridleyi*
 p. 503

GROUP S

With orange or orange-brown bark

Bark papery flaky, with orange flakes like tissue-paper :
 leaves opposite
 Leaves generally glabrous : wild trees *Eugenia* p. 486
 Leaves and twigs hairy : cultivated *Psidium* p. 507
 Bark very smooth, often greyish when old, peeling
 Flakes scroll-like, collecting at the base of the tree
 Leaves spirally arranged, simple, withering red *Tristania* p. 508
 Leaves pinnate : mangrove tree *Carapa* p. 458
 Flakes few, small, flat, irregular : leaves opposite
 Glabrous : wild *Cratoxylon*
ligustrinum p. 327
 Hairy shoots : cultivated *Psidium* p. 507
 Bark dipped from many small scales : big, buttressed trees
 Leaves pinnate *Pometia* p. 594
 Leaves simple, mango-like : with blackening sap *Melanorrhœa*
malayana p. 120
 Bark somewhat fissured and irregularly flaky with rather
 large or coarse flakes : leaves spirally arranged
 With white latex : leaves entire *Artocarpus* sp.
 p. 658
 Without latex : leaves often toothed *Dilleniaceæ* p. 201

GROUP T

With stilt-roots

- Mangrove trees with opposite, leathery leaves ... *Rhizophoraceæ*
p. 520
- Large cultivated tree: leaves pinnate ... *Canarium* p. 177
- Not growing in salt-water: often in swamps
- Strangling figs with white latex and large, latticed 'trunks' *Ficus* p. 658
- With watery red or pink sap in the bark and twigs:
leaves alternate: in swamps ... *Myristicaceæ* p. 472
- Not so
- Orange-barked trees with large leaves
- Leaves entire, nearly sessile, opposite: in swamps ... *Eugenia papillosa*
p. 501
- Leaves toothed, stalked spirally arranged: bark
rather fissured and coarsely flaky: on hillsides
and in dry forest as well as in swamps ... *Dillenia* p. 203
- Not so
- Leaves peltate or palmate: swamps ... *Macaranga* p. 261
- Leaves pinnate with toothed leaflets ... *Leea* p. 97
- Not so: leaves simple
- Leaves opposite ... *Eugenia longiflora*
p. 499
- Leaves alternate, glaucous beneath: bark smooth,
warm brown: on hillsides or in dry forest:
soft-wooded ... *Xylopia ferruginea*
p. 136
- Leaves spirally arranged
- Small tree with finely rugged bark: leaves
narrow, fleshy, almost sessile ... *Archytæa* p. 627
- Medium sized to large tree with smooth bark:
leaves stalked with medium-sized thin
blades: always in freshwater tidal swamps:
surrounded with aerial peg-roots ... *Elæocarpus littoralis*
p. 639

GROUP U

Sea-shore and Mangrove trees

Key to the Subdivisions

- With needle-leaves or scale-leaves or switchy twigs ... *a*
- With flat normal leaves, in some cases only $\frac{1}{4}$ " wide
- Thorny, with spines on the twigs or trunk ... *b*
- Not thorny
- Trees with white, yellow or red sap or latex ... *c*
- Without latex or with only watery or greyish trans-
parent gum
- Leaves palmate, trifoliolate or peltate ... *d*
- Leaves pinnate ... *e*
- Leaves simple (not peltate)
- Leaves alternate ... *f*
- Leaves spirally arranged ... *g*
- Leaves opposite ... *h*

SEA-SHORE, MANGROVE

Flowers minute, in slender spikes: berries dull orange-red, 1-seeded, in slender spikes ... *Allophylus* p. 584

e

Leaves pinnate

Leaves doubly pinnate

With large yellow flowers and brown, flat pods ... *Peltophorum* p. 398

With spikes of tiny yellow flowers and curled pods with scarlet seeds leaflets alternate. *Adenanthera* p. 407

Flowers tiny, fluffy, pinkish white in small heads: pods straight: rare ... *Albizzia* p. 408

Leaves simply pinnate

Shrub with grey silky twigs and leaves: flowers yellow: pods swollen at the seeds, constricted between them *Sophora* p. 377

Not so

With a terminal leaflet: leaflets large, 2 pairs ... *Pongamia* p. 374

Without a terminal leaflet

Leaflets many, small ... *Tamarindus* p. 404

Leaflets 1-3 pairs, rather large

Fruit as a flat pod: bark light grey ... *Intsia* p. 396

Fruit small, 3-angled, red: flowers small, white in panicles: (leaf-stalk winged in *Guioa*) ... *Sapindaceæ* p. 581
(*Guioa*,
Mischocarpus)

Fruit 1" wide, thick, brown scurfy, wrinkled: flowers in small axillary clusters, with 10 stamens: bark brown, entire ... *Cynometra* p. 391

Fruit 3-5" wide, round: flowers in lateral panicles, with a staminal tube: bark peeling, or blackish and cracked ... *Carapa* p. 458

f

Leaves simple, alternate

Leaves coppery hairy beneath *Myristica guattariifolia* p. 478

Leaves glaucous beneath (*see* below)

Leaves blunt, light green with a broad, pale, faint, central band: twigs green, flattened: berries red, small ... *Erythroxylon* p. 220

Leaves pointed, narrow, 3-8" long: fruit brown scurfy, containing a large pulpy red seed ... *Knema missionis* p. 477

Not so

Leaves rounded or heart-shaped at the base: East coast mangrove ... *Inocarpus* p. 395

Leaves tapered to the base

Leaves blunt, more or less obovate

Leaves small, 1/4-1" wide: gloomy little tree ... *Disopyros ferrea* p. 216

Leaves commonly 1-2" wide

Shrub: fruit pink, 1/2-3/4" wide: seeds with thin red pulp ... *Glochidion littorale* p. 287

- Small tree: fruits yellow to orange, $\frac{1}{2}$ " wide:
 seeds with thin white pulp *Gelonium* p. 255
- Leaves pointed, elliptic
 Fruits as densely bristly capsules in the leaf-axils ... *Chætocarpus* p. 244
- Not so
 Leaf-stalk $\frac{1}{4}$ - $\frac{1}{2}$ " long: flowers ochre-yellow,
 clustered in the leaf-axils: fruits green, seated
 on a small 4-pointed calyx *Diospyros lanceifolia*
 p. 216
- Not so: leaf-stalks $\frac{1}{4}$ " long or less: fruits brownish
 or pink *Rosaceæ* p. 524
 (*Parastemon*,
Parinarium)
- g*
- Leaves simple, spirally arranged
- Flowers large, over 1" wide
 Flowers white or pinkish, very large, fluffy, with a heavy
 scent: leaves large, leathery, sessile *Barringtonia*
asiatica p. 353
- Flowers yellow or orange
 Flowers with a maroon eye, Hibiscus-like
 Leaves glabrous, green beneath *Thespesia* p. 444
 Leaves whitish downy beneath, heart-shaped *Hibiscus tiliaceus*
 p. 442
- Flowers as orange trumpets *Cordia subcordata*
 p. 176
- Flowers smaller or absent
 Coniferous tree: flowers absent: twigs bearing narrow
 leathery leaves *Podocarpus* p. 723
- Flowering trees
 Leaves narrow, not 1" wide, stiff, sessile, without a
 midrib but with several longitudinal veins: East
 coast bush *Leucopogon* p. 218
- Leaves broader, with a midrib
 Undersides of leaves brownish or brownish olive:
 flowers pink: mangrove bushes *Brownlowia* p. 634
- Undersides of leaves silvery: blade rather blunt:
 fruit large *Heritiera* p. 612
- Undersides of leaves glaucous: blade with a long
 point: berries small, black *Neolitsea* p. 349
- Not so
 Big sea-shore tree with large, blunt, nearly sessile
 leaves 4-7" wide, withering red *Terminalia catappa*
 p. 193
- Sea-shore bush with white berries: leaves fleshy,
 light green, with recurved sides: flowers with
 the corolla-tube open along the upperside ... *Scævola* p. 310
- Small tree with brown hairy twigs and young
 shoots: leaves narrow, pointed, with very
 wavy edges *Pittosporum* p. 517
- Not so
 Inflorescences (and bunches of fruits) at the ends
 of the twigs
 Shrub: flowers pink: berries red or purple-
 back *Ardisia* p. 479

SEA-SHORE, MANGROVE.

- Shrub or small tree : leaves toothed, withering
orange-red : inflorescences as long spikes *Croton* p. 246
- Shrub : leaves toothed : flowers tiny, lilac-
tipped, in narrow heads, paniced ... *Pluchea* p. 196
- Mangrove shrub : flowers white, fragrant :
fruits like curved pods, in bunches ... *Aegiceras* p. 479
- Mangrove and sea-shore tree or shrub : flowers
red and clustered or white and in short
racemes : leaves entire : (ovary inferior) ... *Lumnitzera* p. 191
- Inflorescences (and bunches of fruit) in the leaf-
axils or on the twigs behind the leaves
- Leaf-stalks very short, $\frac{1}{4}$ " long or less
- Leaves toothed : flowers as small pink bells
in sprays *Vaccinium* p. 219
- Leaves entire
- With small berries, mostly on the twigs
below the leaves *Myrsine* p. 481
- With winged, 2-lobed capsules with black
seeds *Dodonaea* p. 586
- Leaf-stalks $\frac{1}{4}$ -2" long
- Flowers and fruits in unbranched sprays,
mostly from the twigs below the leaves :
flowers facing down : berries blue-grey
with a large stone *Elaeocarpus*
pedunculatus
p. 640
- Flowers in branched inflorescences from the
leaf-axils
- Bark peeling, smooth : panicles 1-2"
long : small capsules : S'pore, Johore *Tristania obovata*
p. 509
- Bark entire : panicles 6-12" long : fruits
purplish with a black stone ... *Buchanania* p. 101
- h
- Leaves simple, opposite
- Leaves small, about $\frac{1}{4}$ " wide : flowers white, small ... *Pemphis* p. 431
- Leaves larger
- Leaves with spider-web veining : twigs and undersides of
the leaves yellowish-white scurfy *Mallotus tiliifolius*
p. 273
- Leaves with very many, very fine, crowded veins at right
angles to the midrib, blunt, leathery *Calophyllum* p. 311
- Not so
- Mangrove trees with glabrous leaves and green or
reddish finger or cigar-like fruits 3-40" long : buds
conical : often with stilt- roots or breathing roots ... *Rhizophoraceæ*
p. 520
- Not so
- Without flowers or fruits but with the red seeds set
in circles on spikes from the leaf-axils : twigs
swollen at the nodes : trunks faintly ringed like
coconut-palms *Gnetum gnemon*
p. 726

Flowering trees

Mangrove trees with peg-like breathing roots from the mud

Flowers white or red, large : fruits large, with 6 sepals : leaves glabrous *Sonneratia* p. 431

Flowers small, yellow : fruits like short, pointed pods : leaves generally brownish, grey or white felted beneath *Avicennia* p. 696

Not so

Flowers with a corolla-tube : stamens 4-5, rarely more : ovary inferior : twigs with interpetiolar stipules of their scars *Rubiaceæ* p. 530

Not so

Flowers tiny, white, in small lateral panicles : stamens 2 : ovary superior : leaf-blade often toothed near the end *Olea* p. 513

Flowers small, greenish : leaves pale yellowish green *Pisonia* p. 510

Not so : flowers $\frac{1}{4}$ " wide or more : ovary inferior

Flowers white : stamens many, fluffy : no shell in the fruit : seed-leaves thick, fleshy, not folded *Eugenia* p. 486

Flowers pink, blue or purple : stamens 8, short, clumsy : the rind or pulp of the berry surrounding a thin shell containing the much crumpled or folded seed-leaves : leaves mostly leathery with invisible veins *Memecylon* p. 448.

GROUP V

Riverside and Streamside Trees

Key to the Subdivisions

- Big buttressed tree of the Pahang, Perak, Trengganu and Kelantan rivers, on the steep or rocky banks : leaves 6-12" long, withering red : *Neram* *Dipterocarpus oblongifolius* p. 211
- Big thorny tree with palmate leaves *Salmalia* p. 443
- Thorny sprawling plant with pinnate leaves *Leea angulata* p. 97
- Small trees of forest streams with red, yellow or pink flowers massed on the trunk or branches (or at the end of the branches), or with flat purple pods : young leaves in pink or purple tassels *Saraca* p. 399
- Bushes or small trees of tidal rivers, standing in the water with the stems more or less immersed at high tide : leaves spirally arranged, sessile or nearly so
- Flowers 3" wide, fluffy with stamens : fruit with 8 strong flanges at one end : in very dense thickets *Barringtonia conoidea* p. 354
- Flowers $\frac{1}{2}$ " wide, pink, in panicles : fruit pale brown, bun-like, puckered at the base : with blackening sap *Gluta velutina* p. 118

RIVERSIDE

Not so

- With white or yellow latex, or red or blackening sap ... a
- Without latex or coloured sap
 - Leaves pinnate b
 - Leaves simple
 - Leaves alternate c
 - Leaves spirally arranged d
 - Leaves opposite e

a

With latex or coloured sap

- With yellow gum : leaves opposite, often very large ... *Garcinia* p. 312
(*cf. G. nervosa*)
- With red or pink sap : leaves alternate
 - A straggling mangrove shrub or treelet of the East coast :
leaves more or less heart-shaped at the base ... *Inocarpus* p. 395
 - Conical trees of considerable size : fruits like nutmegs ... *Myristicaceae* p. 472
(*Horsfieldia irya*,
Myristica elliptica)
- With white latex or blackening sap
 - Leaves alternate, narrow, toothed : small tree of tidal
rivers and creeks : fruits round *Sapium indicum*
p. 277
 - Leaves spirally arranged, mostly entire
 - Flowers white, large, with a corolla-tube and yellow
eye : fruits large, flushed pink or purple, apple-
like : tidal rivers *Cerbera odollam*
p. 144
 - Big mango-like tree with rather orange bark : flowers
white, in panicles : fruits brown, puckered at the
base : sap blackening, poisonous : tidal rivers of
Pahang, Trengganu and Kelantan *Gluta renghas* p. 118
 - Fruits as figs *Ficus* p. 658
 - Figs on the twigs : by Saraca-streams (*see* p. 42)
Bush on the rocks in the stream : leaves narrow :
figs pink, red or purple, ribbed *F. pyriformis* p. 687
 - Small tree : figs yellow : leaves broad *F. lepicarpa* p. 683
 - Figs on the trunk and branches
 - Figs yellowish or brownish : small tree *F. obpyramidata*
p. 685
 - Figs pink or red
 - Leaves broad, toothed *F. pomifera* p. 686
 - Leaves rather narrow, entire *F. glomerata* p. 684

b

Leaves pinnate

- Leaves opposite
 - Flowers white, large, frilled : pods curved : tidal rivers ... *Dolichandrone* p. 163
 - Flowers pink or purplish : pods straight : forest streams ... *Radermachera* p. 168
- Leaves spirally arranged
 - Leaflets toothed : big buttressed tree : bark orange : forest
streams *Pometia* p. 594

Leaflets entire

Leaflets very narrow: shrubs or treelets of *Neram-rivers* (see p. 42)

Flowers white: fruits white flushed pink: seeds red,
several in a fruit *Dysoxylon*
angustifolium
p. 461

Flowers yellow, minute: fruits pinkish orange, with
2 seeds set in transparent yellowish pulp ... *Aglaia salicifolia*
p. 457

Leaflets 1" or more wide

Flowers red or pink: pods flat, purple: young leaves
in pink or purple tassels *Saraca* p. 399

Leaflets 1-2 pairs: leaf-stalk winged: flowers white,
minute: fruits 3-lobed *Guioa* p. 587

Not so: leaflets: 2-5 pairs: with pods

With a terminal leaflet: large trees

Flowers white: pod long, flat, with several seeds *Millettia* p. 372

Flowers pink: pod short, thick, 1-seeded ... *Pongamia* p. 374

Without a terminal leaflet *Cynometra* p. 391

c

Leaves simple, alternate

Trees of *Saraca*-streams (see p. 42), with thin, papery tough,
leaves silvery white beneath *Schoutenia* p. 645

Leaves toothed, narrow: tree of rice-field streams and rivers *Salix* p. 580

Not so: leaves entire

Leaves very narrow, $\frac{1}{4}$ -1" wide, long: bushes or tree-
lets of *Neram-rivers* (see p. 42) *Antidesma*
salicinum p. 234

Leaves broad or, if as narrow, then short in proportion

Bush with small obovate leaves: berries white ... *Flueggia* p. 255

Straggling shrub or treelet, East Coast mangrove: leaf-
base heart-shaped *Inocarpus* p. 395

Trees

Trunk greyish white, smooth: berries small, purple *Ilex cymosa* p. 328

Trunk brownish, with red sap in the bark: fruit $\frac{3}{4}$ "
wide or more, like nutmegs *Myristicaceæ* p. 472
(*Horsfieldia irya*,
Myristica elliptica)

d

Leaves simple, spirally arranged

Coniferous tree: twigs bearing narrow, leathery leaves *Podocarpus*
neriifolius p. 723

Flowering plants

Leaves $\frac{1}{4}$ -1 $\frac{1}{2}$ " wide, narrow, lanceolate: flowers in
spikes

Leaves toothed: rice-field tree *Salix* p. 580

Leaves entire, whitish beneath: bush of *Neram-rivers* *Homonoia* p. 258

Leaves larger

Bark smooth, peeling, pearl-grey or orange: leaves
withering red *Tristania sumatrana*
p. 510

RIVERSIDE

- Flowers pink in hanging strings, large, fluffy, with many stamens: fruits in hanging strings: ovary inferior ... *Barringtonia* p. 350
- Flowers large, yellow or orange, Hibiscus-like: leaves heart-shaped ... *Hibiscus* p. 440
- Not so
- Leaves heart-shaped: flowers pink, in panicles ... *Sterculiaceæ* p. 606
(*Klenhovia*,
Melochia)
- Leaves not heartshaped
- Leaves toothed or notched
- Flowers and fruits large, over 2" wide: petals white or yellow, entire: sepals persistent: leaves coarsely toothed
- Flowers and fruits very large over 5" wide ... *Dillenia indica* p. 204
- Flowers yellow: fruits pink ... *Wormia*
suffruticosa p. 207
- Flowers and fruits mostly less than 1" wide, in unbranched sprays: flowers facing down, with toothed white petals: fruits berry-like with a hard stone: leaves often faintly toothed or notched ... *Elæocarpus* p. 635
- Leaves entire
- Bark greyish white: leaves almost alternate: berries small, purple ... *Ilex cymosa* p. 328
- Bark brown or orange: leaves mango-like in form and arrangement
- Big tree of tidal rivers in Pahang, Trengganu and Kelantan: fruits brown, puckered at the base, 1-2" wide: sap blackening ... *Gluta renghas* p. 118
- Not so: fruits purplish, small, with a black stone ... *Buchanania lucida*
p. 102
- e
- Leaves simple, opposite
- Shrub with 3-veined leaves (a longitudinal vein on either side of the midrib): flowers large, pinkish purple ... *Melastoma* p. 445
- Tree with large pinkish purple flowers: leaves withering red ... *Lagerstræmia* p. 428
- Tree with very stiff horizontal limbs: on flood-damaged riverbanks ... *Anthocephalus*
p. 533
- Not so
- Twigs with interpetiolar stipules: flowers with a corolla-tube, often *Ixora*-like or set in heads: ovary inferior *Rubiaceæ* p. 530
- Not so
- Flowers fluffy with many stamens: ovary inferior: fruit 1-2 seeded, with a green or pulpy rind ... *Eugenia* p. 486
- Flowers red: fruit seated on a 6-pointed, star-like calyx: ovary superior: in tidal rivers: with peg-like breathing roots ... *Sonneratia* p. 431
- Not so: leaves very large or leathery and strongly ribbed (with yellow latex) ... *Garcinia nervosa*
p. 318

PART III

ACANTHUS FAMILY

Acanthaceæ

(from the genus Acanthus)

Leaves simple, opposite: stems often swollen at or below the nodes.

Flowers bilaterally, symmetrical, set in spikes or clusters: calyx with 5 sepals often joined in a cup: *corolla with a long tube and 4-5 lobes, generally 2-lipped:* stamens 4 or 2: *ovary superior,* with 1 style and 2 cavities.

Fruit as a capsule, generally rather long; *seeds few to many, borne on long stalks.*

About 200 genera and 2000 species throughout the warmer regions of the earth: about 36 genera and 200 spp. in Malaya.

Such garden plants as *Thunbergia*, *Ruellia*, *Barleria*, *Eranthemum*, and *Jacobinia* belong to this family which consists mostly of herbs, shrubs and climbers. The *Morado*, described below, can be regarded, however, as a small tree when it is full-grown. The family is nearly allied on the one hand with the *Verbena-* and *Labiata-*families and, on the other hand, with the *Scrophulariaceæ* (e.g. *Petunia*, *Torenia*). It is one of the principal families of forest-herbs in the tropics. The holly-leaved *Acanthus* (*A. ilicifolius*) of our mangrove swamps is described by WATSON (20, p. 53).

The leaves of the three species, which we describe, are used by Malays for poultices like those of the variegated garden *Crotons* and *Coleus*. It seems that all plants with such poultice-leaves bear the curious name *Puding*.

Key to the Genera

Flowers reddish purple, in terminal rosettes ... *Graptophyllum*
Flowers white spotted crimson, in terminal panicles ... *Pseuderanthemum*



Text-Fig. 16. *Morado* (*Graptophyllum pictum*), $\times \frac{1}{2}$.

AMPELIDACEÆ

GRAPTOPHYLLUM

(Gr., graptos—painted, phullon—a leaf)

Corolla strongly compressed and 2-lipped.
3 species, 2 in Australia, 1 in the Old World.

G. pictum Text-Fig. 16
(Lat., painted)

Morado, Caricature Plant
Puding

An evergreen shrub or small tree up to 15 ft. high: *bark* pale grey, finely fissured: *twigs* knobby, brittle, pale: glabrous.

Leaf-blade 3–8 × 1½–4", elliptic, simply pointed, *mottled or striped and splashed with pale yellow, in some cases mottled with purple*: stalks 1–3" long, short.

Flowers 1½" long, *mauve-pink to reddish purple*, in terminal clusters 2–4" wide: corolla with 4 recurved arms and an oblique mouth: stamens 2.

Capsule oblong, stalked, hard.

Of doubtful origin, widely cultivated from India to Polynesia: frequent in Malayan gardens and villages, never wild.

PSEUDERANTHEMUM

(Gr., pseudos—false: Eranthemum—an allied genus)

Corolla not compressed, with 5 petals, the upper two smaller than the lower three and the middle one of these the largest.

About 100 spp., throughout the tropics: 11 spp. wild in Malaya, several introduced.

P. acuminatissimum
(Lat., most pointed)

Variegated Eranthemum
Puding

Like the following species but the *leaves* rather fleshy, *blotched or variegated with pale green or pale cream patches or pale cream round the edge, tapered to each end, the blade* 2–6 × 1½–2½".

Possibly native of India or W. Malaysia: frequently cultivated in Malaya.

P. reticulatum Text-Fig. 17
(Lat., marked as a network)

Speckled Eranthemum
Puding



Text-Fig. 17.
nat. size.

A shrub up to 10 ft. high, woody, glabrous.

Leaf-blade 1½–4" wide, rather broad, *rounded at the base*, entire, thin, *generally with paler green or yellow net-like veining, often entirely yellow or dotted green*: stalk ½–1" long.

Flowers ¾–1" wide, clustered at the ends of the branches of upright terminal spike-like panicles 4–6" long, scentless, *white suffused and speckled light crimson about the throat*: stamens 2.

Possibly native of Australia but of doubtful origin, widely distributed throughout the tropics: commonly cultivated in Malaya.

GRAPE-VINE FAMILY

Ampelidaceæ

(Ampelopsis, the genus of the Virginia Creeper)

Most members of this family, which comprises some 500 species, are climbers with tendrils and pinnate or palmate leaves, such as the Grape-Vine (*Vitis*) of the Mediterranean region and the Virginia Creeper (*Ampelopsis*) of North America. In Malaya we have about 40 such climbers in the two genera *Vitis* and *Pterisanthes*. In the tropics of the Old World there occur also many shrubs or small trees, placed in the genus *Leea*, which have flowers and fruits similar to

these vines but which, on account of their habit, are lacking in tendrils. About 12 species of *Leea*, or Tree-Vines, have been found in Malaya, several being common, and to Malays they are universally known as *Mali*, *Mali Mali* or *Memali*. The majority are shrubs but a few must be classed as small trees; and the extraordinary *Leea angulata* develops first as a thorny scrambler, like a wild rose or bramble and subsequently becomes an ungainly tree.

The flowers of the family resemble in structure those of the Jujube-family (Rhamnaceæ) because the stamens are opposite the petals, but the compound leaves are distinctive. The toothed and pinnate leaves of *Leea* are unmistakable.

LEEAE

(J. Lee, 1715-1795, a Scottish botanist)

Shrubs or small sappy trees with ribbed branches and swollen nodes.

Leaves spirally arranged, pinnate (once to three times), with a terminal leaflet, large: *leaflets toothed, thin*, stalked: *leafstalk* generally swollen and often sheathing at the base, *swollen also at the junction of the side-stalks or leaflets.*

Flowers small, $\frac{1}{8}$ " wide, in large or small flat-topped clusters (cymes): calyx with 5 lobes: petals 5: *anthers 5, attached to a staminal tube*: ovary superior.

Berries flattened-round, 3-6 seeded, in flat-topped clusters.

About 70 species, tropical Asia and Africa, few in Australia; 12 species in Malaya.

Key to the Species

Thorny; scrambling bush or small tree	...	...	...	<i>L. angulata</i>
Not thorny				
Flowers red; shrub 2-12 ft.; leaflets rather small	...	...	...	<i>L. rubra</i>
Flowers green, white or yellowish; leaflets large				
Leaves, twigs and inflorescences glabrous; common			...	<i>L. indica</i>
Twigs, inflorescence-stalks and underside of leaflets finely hairy; not common	...	...	...	<i>L. aequata</i>

L. aequata

Hairy Tree-Vine

(Lat., equal)

Flower-clusters small, 2-4" wide, shortly stalked.

W. Malaysia; chiefly in the forest in the central parts of Malaya.

L. angulata

Thorny Tree-Vine

Branches, twigs and even the leaf-stalks set with thorns.

Leaves 6-24" long, 2-3 times pinnate, the stalks sheathing at the base: leaflets 2-4 × 1-1½"

Flowers greenish with pale cream staminal tube, in small clusters 2-4" wide.

W. Malaysia; especially on sandy heaths and riversides in the middle and North of Malaya, several compact coppiced trees near Keppel Harbour, Singapore.

This thorny plant begins its life as an unpleasant scrambling shrub with weak flopping stems and long thorny sprays. Eventually the old stem thickens to four, and even six, inches in width and forms a stout thorny trunk 6-12 feet tall, from which the curving branches straggle. Such grotesque trees may reach thirty or forty feet in height. The species forms a larger plant than any other of our Tree-Vines. There is a Malay legend that the trees ward off the attacks of tigers, but beasts are generally averse from thorns.

L. indica

Plate I

Common Tree-Vine

(from India)

A large glabrous bush or small tree up to 30 feet high, though flowering at 5 feet: often with stilt-roots from the base in swampy ground.

Leaves 1-4 feet long, simply pinnate, or twice pinnate in the lower part: leaflets: 4-12 × 2-4".

ANACARDIACE

Flowers greenish with white or yellowish staminal tube, in big clusters 6-24" across.

Berries .3-.5" wide, purple then black.

India to Polynesia: the commonest species in Malaya, in villages, secondary and primary forest, mostly in wet or swampy places.

L. rubra

Red Tree-Vine

(Lat., red)

A glabrous bush of swampy ground generally gregarious.

Leaves 6-24" long, with sheathing stalks, 2-3 times pinnate: leaflets $1\frac{1}{2}$ -5 × $\frac{1}{2}$ -1 $\frac{1}{2}$ ", narrow.

Flowers blood-red with white staminal tube, in small clusters 2-3" wide.

Berries $\frac{1}{2}$ " wide, dull red then purplish.

Indo-China to Java; common in the rice-fields and villages in the north of Malaya.

MANGO FAMILY

Anacardiaceæ

(from the genus Anacardium)

Crushed tissues generally with a resinous sap smelling of turpentine, occasionally with white latex.

Leaves opposite or spirally arranged, simple or pinnate: young leaves often violet, purple or purple-brown.

Flowers small, in panicles, mostly honey-sweet: petals 4-5, often recurved, free: stamens 4-5 or 8-10, free: ovary superior with 1-5 styles and as many cavities containing each one ovule, with a ring-like nectary round the base of the ovary or with as many knob-like nectaries as petals.

Fruits very various, generally with one large seed or stone and a leathery or pulpy rind, commonly mango-like.

About 55 genera, 500 spp., mostly tropical: 15 genera, 80 spp. in Malaya, abundant as big trees in the lowland forest, less common in the mountains.

It is impossible to define this family without recourse to the detailed structure of the flower. It is a difficult one, therefore, for the beginner whose acquaintance with it will come most easily through studying the Malay names of its common members and from examining our photographs. The family consists mainly of trees: it has no herbaceous representatives, but very few climbers, and a comparatively small number of shrubs. The resinous sap is often distinctive but caution must be used with this character because in several common species the sap is poisonous and irritant, notably in some of the Mango-trees and in the wild Rengas-trees in which it turns black (see p.116). The leaves and fruits show great diversity but an acquaintance with the village Mango-trees (*Mangifera*) and the Cashew-Nut (*Anacardium*) should enable one to recognise their wild allies. Fortunately most of the vernacular names are accurately applied by Malays and are in general use. Other trees with mango-like fruits which may be mistaken for those of this family are the *Pauh Kijang* (*Irvingia*), which has alternate leaves, and some species of *Terminalia* which have simple flower-spikes. The pinnate-leaved species resemble the trees of the *Sentol*-family (*Meliaceæ*) which differ in having the staminal tube in the flower and, often, several or many seeds in the fruits which may be capsules.

The family is important because it includes many fruit-trees. The timber is often excellent but it is seldom used because it is difficult to free from the irritant sap. Yet this poisonous sap, strangely enough, is put to commercial use as lacquer. Chinese and Japanese lacquer are obtained from the blackened sap of *Rhus vernicifera*: Burmese lacquer is obtained from *Melanorrhœa*: the poison is volatile and gradually disappears from the sap after it has been drawn

(see the account in BURKILL'S Dictionary). The Poison Ixies of North America, which are pests in some of the southern States, are also species of *Rhus*: one occurs in Malaya but it is a rare climbing shrub found in Perak and Pahang.

Key to the Genera

LEAVES SIMPLE

- Leaves opposite *Bouea* p. 100
- Leaves spirally arranged, generally in rosettes
- Forest trees with poisonous, blackening sap: fruit in some cases with 5 red star-like wings, or brown and wrinkled *Rengas-trees* p. 116
- Not so
- Fruit mango-like, 1" or more long: village trees with white, yellow, pink, red or violet flowers: bark generally rugged and grey-brown *Mangifera* p. 106
- Fruit as a kidney-shaped bean on a fleshy cushion: flowers pink *Anacardium* p. 100
- Not so
- Flowers white, $\frac{1}{4}$ " wide or less: fruit not $\frac{1}{2}$ " long, with a black stone: *Otak Udang* *Buchanania* p. 101
- Not so: leaves always blunt, often large
- Bark pale grey-buff or whitish, smooth: leaves medium to very large: flowers yellowish green, very small: fruits $\frac{1}{4}$ - $\frac{1}{2}$ " wide, smooth, green or purple, pulpy: common trees of waste places: *Terentang* *Campnosperma* p. 102
- Bark rather scaly, light fawn brown: flowers white, $\frac{1}{2}$ " wide: fruits brown, wrinkled, dry, $1\frac{1}{2}$ -3" wide: East coast rivers of Pahang, Trengganu and Kelantan *Gluta* p. 117

LEAVES PINNATE

- Village trees
- Flowers yellowish white, 3-4" wide, in large hanging panicles: fruit 1" wide, round, hanging: leaflets large: *Senkuang* *Dracontomelum* p. 104
- Flowers greenish, 1-2" wide, in stiff upright panicles
- Inflorescences much branched: fruits 1" or more long: leaflets 3-12 pairs: *Kedondong* *Spondias* p. 114
- Inflorescences not or slightly branched: fruits rarely formed, $\frac{1}{2}$ " long: leaflets 3-6 pairs... .. *Lannea* p. 105
- Forest trees
- Fruits with 4 red wings: *Surian* *Parishia* p. 112
- Fruits without wings
- Fruits round: leaflets large, 5-10 pairs: flowers 3-4" wide, in hanging panicles: *Senkuang* *Dracontomelum* p. 104
- Fruits oblong: leaflets rather small, 4 pairs: flowers 1" wide, in feathery white or pink upright panicles: *Pelong, Pelajau* *Pentaspadon* p. 113

ANACARDIUM

(Gr., ana—up, kardia—heart)

Like *Mangifera* but :—

Stamens 8–10, one much longer than the others.

Fruit a bean- or kidney-shaped nut enclosing one seed and seated at the end of the *pear-shaped, fleshy, swollen flower-stalk*.

A few species in trop. America : 1 species introduced to Malaya.

A. occidentale Plate 2
(Lat., western)Cashew-Nut Tree
Gajus, Jambu Golok, Keterek (Tr., Kel.)

A low sprawling evergreen tree, up to 40 feet high, with a heavy crown of dull green, upright, blunt leaves : bark smooth, brown, then rugged, with exuding gum.

Leaf-blade 3–7 × 1½–4½" *obovate*, entire, thinly leathery, blunt, often widely notched at the apex; *side-veins* 10–18 pairs : *stalk* ½–¾", long, flattened on the upper side.Flowers ½" wide, in terminal panicles up to 9" long, with a heavy sickly-sweet smell : *petals* 5, *greenish white becoming rose-pink* with red stripes.Nut 1½" long, greyish brown with a hard shell : *fleshy cushion* (stalk) about 2½" long and wide, *yellow*, often flushed pink, or red, pulpy, shaped like a *jambu-fruit* (*Eugenia*), fragrant.

Tropical America : common in villages, especially near the sea, often spontaneously wild on the sandy coast or hillocks near the sea.

The Cashew-Nut tree was one of the first West Indian fruit-trees to be distributed throughout the tropical world by the early Portuguese and Spanish adventurers. It is now so thoroughly established in Malaya, especially on the East Coast, as to appear indigenous : for it seeds itself as readily as any tree in the secondary jungle which develops on the sandy soil.

All parts of the tree contain an irritant skin-poison, like the *Rengas*-trees (p. 116), but particularly the seed, or kernel of the nut. On heating, this substance is destroyed, hence Cashew-nuts must be roasted before being eaten : the raw nut would sear the lips and could not be swallowed. The fleshy, pear-like cushion, on which the nut is so characteristically placed, can be eaten raw : it has a delightful fragrance but, in the Malayan varieties, the taste is poor and the juice sets up a slight irritation in the throat, obliging one to cough : much better varieties occur in Tropical America, where the pulpy part of Cashew-apple is extensively eaten. Various parts of the tree are used in native medicine, as described in BURKILL'S Dictionary.

Flower and fruit can be found side by side on the Cashew-Nut tree at nearly all times of the year, but the flowering occurs chiefly after dry weather.

BOUEA

(A. Boué, 1794–1881, a German naturalist)

Buds conical, projecting, covered by few scale-leaves : young leaves deep violet, hanging in limp tassels.*Leaves opposite, simple*, entire, smelling of turpentine or resin when crushed.*Flowers very small*. -1" wide, *greenish yellow*, in short axillary panicles : sepals and petals 3–4 : stamens 3–5.*Fruit like a plum or small mango*, yellow, pulpy, with a fibrous leathery stone showing, when cut across, *the bright purple seed-leaves* of the big seed.

About 5 species, NE. India to the Moluccas : 2 species in Malaya.

Both our Malayan species are grown as village fruit-trees, the broad-leaved *Kundangan* being the commoner, and both are wild in the lowland forest. Most trees have acid fruits with a slight, but rather pleasant, resinous taste; sweet

varieties exist, however, which could be improved by selection. In habit, both species are similar, the *Rumenia* appearing like a form of the *Kundangan* with small leaves, fruits and inflorescences. The *Rumenia* is deciduous but the *Kundangan* is evergreen: flowering is seasonal and occurs about the same time as the village Mango-trees.

Because of the opposite leaves, this genus may be mistaken for *Garcinia*, *Eugenia*, *Olea* or *Memecylon*, but the resinous smell of the broken twigs or crushed leaves and the pointed buds at once distinguish it.

Key to the Species

Leaves 2-4" wide *B. macrophylla*
 Leaves ½-2" wide *B. microphylla*

B. macrophylla Plate II *Kundangan, Kundang, Star*
 (Gr., makros—long, phullon—leaf)

An evergreen tree up to 60 feet high: crown very dense, bushy, conical or round: bark light greyish brown, finely fissured, giving out dark grey, gummy drops when cut: twigs thick.

Leaf-blade 4-10" long, oblong, tapered to a blunt tip, leathery: side-veins 15-24 pairs: stalk ¼-¾" long.

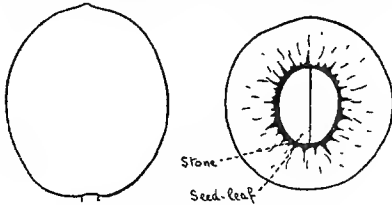
Panicles 2-5" long, often on the twigs behind the leaves.

Fruit 1½-2" long, oblong, yellow.

Malaya, Sumatra: common in villages.

The *Kundangan* suggests a Mangosteen-tree (*Garcinia mangostana*) but the leaves are lighter green, distinctly ribbed and down-turned. The name *Star* (cf. Alor Star) is used in the north of the country.

B. microphylla Text-Fig. 18 *Rumenia, Rumia, Gemia* (Kel.)
 (Gr., mikros—small, phullon—leaf)



Text-Fig. 18. nat. size.

Like *B. macrophylla* but:—bark dark grey to purple brown: twigs slender: leaves 2-7" long, smaller, lanceolate, the stalk ¼-½" long: panicles 1-3" long, at the ends of the leafy twigs: fruit smaller, 1" long, orange or light yellow.

Malaya frequent in the lowland forest not common in villages: common on Bukit Timah.

The *Rumenia* gives, perhaps, the densest shade of any tree in Malaya. It is excellent for parks, but its growth is slow. Many of the young violet leaves habitually fall off, when only half-grown.

(*Rumuyu* is *Eugenia claviflora* p. 495).

BUCHANANIA

(F. Buchanan-Hamilton, 1762-1829, Scottish botanist in the East India Company)

Like *Mangifera* but the fruit small, ½" long, thinly fleshy, with a black stone: stamens 8-10: ovary with 4-5 parts, only one being fertile and green, the others aborting: (sepals and petals 4-5).

About 20 species, Indo-Malaysia, tropical Australia: 2 species in Malaya.

ANACARDIACEÆ

An Indian species, *B. lanzan*, has larger fruits, the seeds of which supply the Calumpang-nuts of commerce and are used in place of almonds in confectionery. The Malayan species are not edible, but the first, *B. lucida*, is well-known to Malays. Its vernacular name, *Otak Udang* or Prawn's Brains, is of dubious significance.

Key to the Species

- Leaves blunt, rather leathery : flowers cream-white, in glabrous panicles : sea-coasts, sandy ground, river-banks *B. lucida*
 Leaves thin, with a pronounced tip : flowers greenish white, the panicles often hairy : inland forest, secondary jungle and streams *B. sessilifolia*

B. lucida Plate 3, Text-Fig. 19 Sparrows' Mango
 (Lat., shining) *Katak Udang, Ketak Udang, Otak Udang, Pauh Pipit, Puan (Kel.), Terentang Tikus*

An evergreen, glabrous tree up to 90 ft. high, not or scarcely buttressed, the crown compact with rather upright leaves : bark pinkish brown, smooth, red internally, oozing drops of harmless greyish gum when cut : twigs thick ; buds covered with numerous scales : young leaves pink.



Text-Fig. 19.
 Stamen, × 10.

Leaf-blade 3-9 × 1-3¼", oblong, narrowly obovate, tapered to the base, the sides rather upturned and wavy, shiny : side-veins 13-20 pairs : stalk ½-2" long, slightly winged.
 Flowers ¼" wide or less, fragrant, in axillary panicles 6-12" long, often pink or reddish.
 Fruits green, flushed purple-red, with green flesh, like small mangoes, the stone often empty.
 Malaya Peninsula, Sumatra, Borneo : common on river banks, sandy or rocky coasts and sandy heaths.

This tree is very conspicuous in flower, the crown becoming cream-white. April to June appears to be the main flowering season.

B. sessilifolia
 (Lat., with sessile leaves)
 Malay Peninsula, Sumatra, Borneo : common in inland forest.

CAMPNOSPERMA

(Gr., kamptein—to bend, sperma—a seed)

Twigs with pronounced Terminalia-branching.
 Leaves spirally arranged like *Mangifera*.
 Flowers very small, greenish yellow, male and female on different trees, the female panicles less branched than the male : sepals and petals 4 : stamens 8, the female flowers with sterile stamens : ovary with a sessile stigma.
 Fruit small, fleshy, round or oblong, with a hard stone containing a curved seed.
 10 species, mostly in tropical Asia, a few in tropical Africa, one in tropical America : 4 species in Malaya.

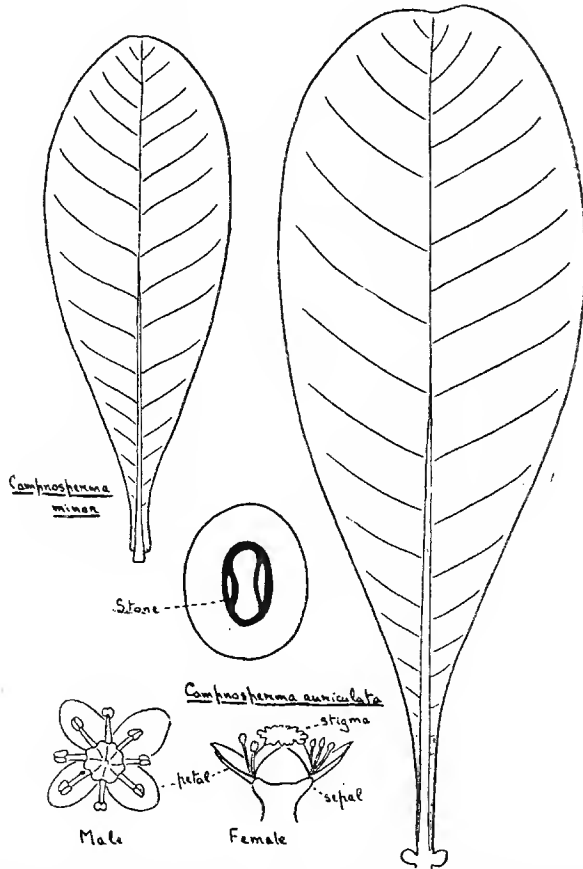
The Malayan species, two of which are common, are much alike in general appearance and, to Malays, they are well-known as *Terentang* or *Serentang*. Though they have pronounced *Terminalia-branching*, they do not present the

appearance of pagoda-trees on account of the upward direction of their main limbs. But this character, together with the very large leaves and pale grey bark gives the commonest species, *C. auriculata*, a striking shape, easy to recognize from afar.

The trees contain a slightly resinous sap which is harmful to some persons, especially that which oozes from the wood. The flowering is seasonal, about the time of the Mango-trees. The new leaves develop, however, and the old leaves fall off, throughout the year. The fruits are eaten by birds, especially by pigeons.

Key to the Species

- Leaves hairy beneath : stalk hairy : rather rare *C. macrophylla*
- Leaves glabrous
 - Leaves 6-20" long, with two small 'ears' at the base of the stalk : very common *C. auriculata*
 - Leaves 4-12" long, without ears at the base : in swampy places *C. minor*



Text-Fig. 20. Campnosperma : leaves $\times \frac{1}{2}$: flowers and fruit $\times 5$.

C. auriculata Plate 4, Text-Fig. 20
(Lat., set with little ears)

Terentang, Serentang

An evergreen tree up to 100 feet high, the crown becoming rather flat-topped, rather open with big leaves, without buttresses or with a few low ones: *bark light grey to yellowish (white from a distance)* with persistent leaf-scars, thinly flaky with small papery pieces, slightly fissured, the inner bark reddish brown in contrast with the white sap-wood: *twigs stout: young leaves pinkish brown: leaves withering yellow to brownish ochre.*

Leaf-blade $2\frac{1}{2}$ –8" wide, obovate, blunt, often notched at the apex, leathery, dark glossy green: *side-veins* 14–26 pairs: *stalk* $1\frac{1}{4}$ – $3\frac{1}{4}$ " long, flattened, narrowly winged almost to the base with a distinct small lobe on each side of the base.

Sapling leaves 2–4 feet \times 6–10", the stalk winged throughout its length and ending at each side of the base in a broad lobe clasping the stem.

Panicles 10–20" long, brownish scurfy.

Fruit .2–.3" wide, oblong, green with white spots, becoming dull reddish purple.

W. Malaysia: very common in Malaya, lowland and mountain (to 4000 ft.), especially in secondary jungle and swampy ground.

C. macrophylla
(G., macros—long, phullon—leaf)

Terentan, Serentang

Young leaves, inflorescences and twigs velvety: *leaves withering red.*

Leaves large as in *C. auriculata*: *side-veins* 16–36 pairs: *stalk* not or very narrowly winged, without lobes.

Fruit .3–.4" long.

W. Malaysia: rather rare in swampy forest in Malaya, perhaps only on the West Coast.

Superficially this suggests a *Dillenia*, but the leaves are entire. It has larger reddening leaves than any Malayan tree.

C. minor Text-Fig. 20
(Lat., less)

Terentang Jantan (Johore)

Like *C. auriculata* but a smaller tree with smaller leaves and larger fruits.

Leaf-blade $1\frac{1}{2}$ –4" wide, shortly and bluntly tipped: *side-veins* 10–22 pairs: *stalk* $\frac{1}{2}$ –2" long, winged nearly to the base, without basal lobes.

Inflorescences 4–10" long, the female only 2–5" long and unbranched.

Fruits .5–.8" wide, round, green speckled white (? never red).

Malaya: common in lowland swampy forest, occasional by streams on hillsides.

DRACONTOMELUM

(Gr., drakon—dragon, melon—a tree fruit)

Without latex, but with slight gummy drops in the bark and twigs.

Leaves spirally arranged, pinnate with a terminal leaflet.

Flowers in lateral panicles, the parts of the flower in fives: stamens 10: ovary with 5 styles joined at the tip.

Fruit nearly round, with soft fibrous pulp and a flattened, angular stone containing 5 cavities but only 1–2 seeds.

5 species, Indo-Malaysia, Pacific Is.: 1 species in Malaya.

D. mangiferum Plate 5, Text-Fig. 21
(Lat., mango-bearing)Argus Pheasant Tree
Sekuan, Senkuang

A tall deciduous tree up to 100 ft. high, with dense rounded crown (conical when young), rather strongly buttressed when old: *bark light greyish brown, slightly dippled-scaly with irregular flakes or almost smooth: twigs, buds and bases of the leaf-stalks light fawn-brown and finely hairy*, the twigs massive: *buds* covered by a few stout, long scales: *young leaves* pinkish, soon pale green.

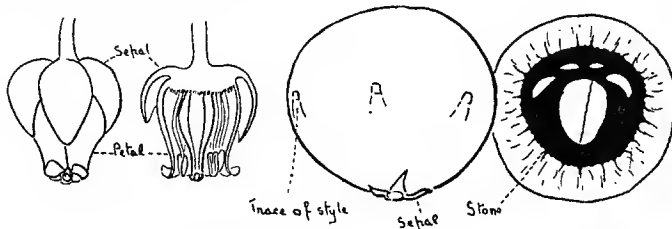
Leaves large, 12–22" long, more or less hairy, at least on the stalk and on the underside of the veins, weathering smooth: *leaflets* 3–10 \times $1\frac{1}{2}$ – $3\frac{1}{2}$ ", 5–11 pairs, opposite or alternate, oblong, tipped, rounded or asymmetric at the base, entire, thinly leathery,

dark shiny green and slightly drooping, shortly stalked, with 9-16 pairs of side-veins: *main stalk of leaf* stout, flattened on the upper side, especially toward the base, with a fine ridge between the leaflets on the upper side.

Flowers $\frac{1}{2}$ " wide, white (sepals pale yellow), slightly fragrant, in *hanging panicles* with spreading branches, 1-2 ft. long.

Fruit 1-1 $\frac{1}{2}$ " wide, hanging several on a stem, *green turning pale dull ochre and finally dingy brown*, glabrous, *set with 5 small scale-like flecks around the middle* (the remains of the 5 styles projecting round the young fruit), with the 5-lobed calyx at the base; *pulp* dirty yellowish, with a peculiar but not unpleasant sweet and sour taste: *stone* softly fibrous, flattened at the ends, very hard.

Indo-Malaysia: frequent in Malaya, by rivers and streams in the forest or planted in villages, commoner in the north.



Text-Fig. 21. *Dracontomelum*; flowers $\times 2$: fruit, nat size.

The *Senkuang* is a village fruit-tree, though the fruit is inferior and sought mostly by children: the flowers and leaves may also be eaten as a vegetable. In some exotic species the fruits are bigger and, evidently, more palatable. The five equatorial flecks on the fruit are characteristic and, because of their resemblance to the markings on the feathers of the Argus Pheasant, they give the tree its vernacular names.

In habit, the *Senkuang* resembles the Purple *Millettia* (*Millettia atropurpurea*) so closely that from a distance one may be unable to distinguish them. The leaves are shed after dry weather, the trees evidently having two seasons, one about July-August, the other about December-January. The buds open before all the old leaves have fallen and the inflorescences are produced at the base of the new shoots (in the axils of scale-leaves) before the foliage, in the same manner as in *Kurrimia* and *Pygeum*.

The *Senkuang* is a handsome and ornamental tree which could be used effectively for an avenue.

LANNEA

(from the African plant-name *Lanne*)

Leaves spirally arranged, pinnate with a terminal leaflet.

Flowers very small, unisexual, in slender racemes, male and female on different trees: sepals and petals 4: stamens 8: ovary with 4 short thick styles.

Fruit like a small mango, crowned by the styles, with a hard stone.

About 12 spp., Trop. Africa and 1 spp. in India.

L. grandis Plates 7, 8 (Lat., great)

Wodier Tree

Kayu Kuda, Kedondong

A medium-sized deciduous tree up to 50 ft. high, with rounded crown and rather upright and spreading branches: *twigs very thick*, dark brown or greyish with large dark leaf-scars: *young shoots* finely grey or brownish hairy, or powdered with fine scurfy hairs.

Leaves 12-20" long: *leaflets* 3-6 \times 1 $\frac{1}{2}$ -2 $\frac{1}{2}$, 3-6 pairs, elliptic, distinctly tipped, slightly oblique at the base, shortly stalked.

Male inflorescence 8-12" long, often with a few branches: *female inflorescence* 5" long or less, occasionally branched near the base, slender, clustered in the axils of

ANACARDIACEÆ

the fallen leaves towards the ends of the branches or in the axils of the newly developed leaves: *flowers* .15" wide, greenish yellow, the female with a vivid red ovary.

Fruit $\frac{1}{2}$ " long, red, ellipsoid, rather flattened, *very seldom formed in Malaya*.

India: introduced to Malaya and frequently planted in some towns as Singapore and Malacca.

This uninteresting looking tree is planted in gardens and on road-sides especially in the Straits Settlements, for it is useful where taller kinds are undesirable: it is abundant in the neighbourhood of Keppel Harbour. Except for some male trees at Ipoh, the others appear to be female, so that no fruit is set, but they are propagated readily by cuttings or loppings. (The Indian Willow-trees, which have also been introduced to Malaya and are propagated by the same means, are by contrast male). The Wodier-trees shed their leaves after dry weather and then flower on the bare twigs or as the new leaves develop: the inflorescences are very inconspicuous.

Wodier is the Tamil name of the tree. The gum, which oozes from the injured bark, finds several uses in India (*vide* BURKILL'S Dictionary). The leaves can be eaten like those of the *Sentang* (*Melia excelsa*) in Malaya.

Trees which may be mistaken for the Wodier are the Hong-Plums (*Spondias*), which have large panicles and commonly set fruit, and the *Sentang* which also has large panicles and more numerous leaflets and generally lacks the terminal leaflet.

MANGO-TREES

MANGIFERA

Large, unbuttressed trees with white latex in the unripe fruits: *bark* light brown to dark-greyish brown, shallowly fissured with broad flat ridges, *typically with a soft dull yellow layer* (like a smear of custard) *beneath the dead outer bark: twigs* often stout: *terminal buds stout*, covered with many small scales.

Leaves spirally arranged, simple, generally with upcurled sides and downcurved point, more or less leathery: stalk stout, often swollen in the basal part, or flattened on the upper side: young leaves violet.

Flowers small, in large terminal panicles, many being male (with rudimentary ovary or none): sepals and petals 4-5: *stamens* 1-5, either 5 fertile or 1 long and fertile and the others short, more or less sterile or even absent.

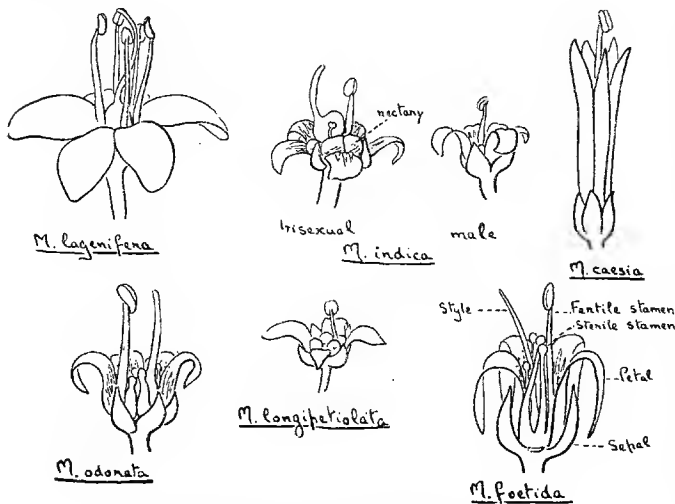
Fruit large, fleshy, oblong, with a large, often flattened stone generally set with coarse fibres and enclosing one large seed.

About 40 species, S.E. Asia, Malaysia: about 20 species in Malaya, mostly lowland, few in the mountains.

This is a genus of large and, for the most part, inaccessible trees of which we have very meagre knowledge in the Malay Peninsula. At least nine species are grown in the village orchards and five of these are common. Of the nine, all but the Indian Mango (*M. indica*), the *Kwini* (*M. odorata*) and the *Binjai* (*M. cæsia*) have been found in the forest so that they may be regarded as truly native. The Indian Mango has been cultivated from time immemorial so that its exact origin is uncertain, though it must have been in the monsoon belt of India or Indo-China. The origin of the *Kwini* and *Binjai* is more problematical, but they may yet be found in the virgin forests of Western Malaysia. Our account of the genus is far from perfect for the reason that the species cannot be identified in the first place without flowers and most of our records are from fruits and leaves. There is a wild mango in the mountains, for instance, rather common at Cameron Highlands, the fruits of which are like those of the *Bachang*, but the flowers have not been collected. We would welcome others who are interested in truly Malayan plants to join us in the pursuit of the wild mangoes: it seems that there is considerable unrecorded variety even among the cultivated kinds.

With a little practice one can soon learn to identify the ordinary cultivated species of Mango, namely the Indian Mango, the *Kwini*, the *Bachang*, the *Binjai* and the *Lanjut*. The Indian Mango has a short massive trunk which soon breaks up into several limbs supporting a dense, but comparatively low, spreading, hemispherical crown, up to 80 ft. high: the leaves curve out and down: and, in orchards and parks, the bottom of the crown is usually trimmed level by cattle browsing on the leaves, just like the Horse-Chestnut tree (*Aesculus*) of Europe. The other kinds tend to have a tall columnar trunk on which the relatively narrow and often conical crown is raised far out of reach; and the leaves point upward or are curved outward. The *Kwini* and *Bachang* seldom exceed 60 or 80 feet high, while the *Binjai* and *Lanjut* commonly reach 100 feet and more, rivalling the *Durian* for loftiness in the villages. The *Bachang* has a very dense, dark green crown of stiff leaves. The *Kwini* has a rather open crown of leaves like those of the Indian Mango, but hardly curved. The *Lanjut* has a dense, often almost hemispherical crown, of small, blunt, dark green, glittering leaves and numerous gnarled branches, much divided and almost horizontally directed. The *Binjai* resembles the *Lanjut* but it has much larger leaves which can be seen distinctly, pointing upward and arranged in rosettes at the ends of the massive twigs: its crown, also, is not so dense and the branches are fewer, more massive and obliquely ascending. The unwary may mistake the *Chempaka* (*Michelia*) for a Mango tree but its pale-grey bark is distinctive.

It is advisable to know how to recognise a Mango-tree because some, like the *Rengas*-trees (p. 116), contain an irritant sap which turns brown or black on exposure to the air; especially, must one guard against the white latex of the immature fruits. The *Lanjut* and *Binjai* are the most poisonous: even the vapour of freshly bruised tissues, the smoke from a bonfire of their leaves or raindrops from the crown may affect the skin. In the case of the *Bachang* and *Kwini*, it is chiefly the sap of the unripe fruit which should be avoided. The Indian Mango and the *Rawa*, on the other hand, are harmless, though the sap of the Indian Mango's leaves is said to act as a slow poison when taken internally. Our advice is always to treat respectfully Mango-like trees which smell of turpentine.



Text-Fig. 22. *Mangifera*, $\times 3$.

Concerning their flowering and leafing we know very little. Most species are ever-green but the *Binjai* and, perhaps, the *Lanjut* are deciduous. Generally the new shoots develop and flower between April and June after the first dry spell of the year, but there is often a second flowering toward the end of the year, or small irregular flowerings after any short but pronounced spell of cloudless weather. A few species, such as

ANACARDIACEÆ

the *Lanjut* and *Rawa*, flower only at very long intervals, as much even as twelve years it is said, but we have no accurate information.

The Barking Deer's Mango or *Pauh Kijang* (*Irvingia*) and the Pig's Mango or *Mempelam Babi* (*Terminalia phellocarpa*) have only a superficial resemblance to Mango-trees in their fruits.

Key to the Species

FLOWERING TREES

- Flowers deep violet: petals 5: stamens 5 fertile ... *M. lagenifera*
- Flowers pink or reddish: petals 5: stamens 1 fertile, 4 sterile
 - Flowers pale lilac in pink panicles: leaf-stalk short, broad, flattened ... *M. cæsia*
 - Flowers pink in reddish brown panicles: leaf-stalk not flattened, relatively slender
 - Flowers fragrant: leaves pointed, thinly leathery ... *M. odorata*
 - Flowers scentless: leaves often blunt, stiffly leathery ... *M. fœtida*
- Flowers white, yellowish, yellowish pink or greenish
 - Petals 5
 - Fertile stamens 3-5: panicles distinctly hairy ... *M. pentandra*
 - Fertile stamen 1: panicles minutely hairy or glabrous ... *M. indica*
 - Petals 4: stamen 1
 - Panicles hairy: leaves rather small ... *M. microphylla*
 - Panicles glabrous: leaves long, with long stalks ... *M. longipetiolata*
M. quadrifida

FRUITING TREES

- Ripe fruit 1" long, small, red then purple-black ... *M. microphylla*
- Ripe fruit 2" long, plump, purple ... *M. quadrifida*
- Ripe fruit pale yellowish or brownish with whitish flesh, rather bomb-shaped, 4-6" long
 - Fruit smooth: leaf small ... *M. lagenifera*
 - Fruit rough: leaf large ... *M. cæsia*
- Ripe fruit yellow, orange or pinkish ... *M. indica*
M. pentandra
- Ripe fruit green or yellowish green, plump
 - Flesh white, soft: stone without fibres, not flattened ... *M. ? Maingayi*
(see p. 109)
 - Flesh yellow: stone more or less fibrous, flattened
 - Fruit sour or slightly sweet: stone very fibrous
 - Leaves rather small and narrow with slender stalk: fruit not strong smelling ... *M. longipetiolata*
 - Leaves medium to large, very leathery, with a stout stalk: fruit very strong smelling ... *M. fœtida*
 - Fruit sweet: stone slightly fibrous
 - Leaves stiffly leathery: fruit aromatic ... *M. odorata*
 - Leaves thinly leathery ... *M. indica*
M. pentandra

(See also *Topah*, under *M. longipetiolata*)

M. cæsia Plate 9, Text-Fig. 22
(Lat., glaucous)

Binjai

Leaf-blade 5-12 × 2-4½", oblong, more or less obovate, blunt or bluntly tipped, very leathery, with many pairs (19-26) of side-veins: stalk ¼-¾" long, flattened.

Flowers pale lilac or pinkish, in misty pink, finely hairy panicles up to 15" long : flower buds up to 4" long.

Fruit 4-6 × 2-3", rather bomb-shaped, *pale brown to potato-brown with rough, scaly or scurfy skin*: flesh white or pale yellowish, generally sour but in a few kinds sweet and suggesting burnt sugar to the taste, the smell rather fetid and rank : seed pink.

W. Malaysia : common in orchards, especially in Malacca.

The sweet-fruited variety, which is uncommon, is called *Binjai manis*, but the strong smell detracts from the enjoyment of it. The sour fruits are used in place of tamarind. Allied with the *Binjai* are three other, rare and little known species. There is the *Kemang* (*M. kemanga*) which is said to have almost sessile, larger leaves and bigger panicles. There is *M. superba* with flowers twice as long as those of the *Binjai* and with large bracts on the inflorescence : its fruits are unknown. And there is a wild species with much longer leaves and larger, green fruits than the *Binjai* : it occurs in the middle and north of Johore, but its flowers are unknown.

The *Binjai* flowers about April to June simultaneously, it seems, with the *Mata Kuching* (*Nephelium malaiense*).

M. foetida Plate 10, Text-Fig. 22
(from the strong-smelling fruit)

Horse-Mango
Bachang, Machang, Machai,
Membachang

Leaf-blade 6-15 × 2½-6", narrowly or broadly elliptic, *generally rather blunt or notched at the apex*, dark green, *very stiff and leathery*: stalk 1-2" long, not flattened.

Flowers pinkish red, inodorous, on copper-red inflorescences 10-16" long, flower buds ½" long : *petals pink with pale edges*, with 2-3 yellowish ridges at the base, *fading yellowish*.

Fruit 3-4" long, plump, oblong, smooth, *ripening green, in some varieties with very sour fibrous orange flesh and a strong smell of turpentine, in other varieties with sweet pale yellow flesh and less smell*: stone very fibrous.

W. Malaysia : common in orchards, occasional in the forest.

The *Bachang* can be told by its stiff dark leaves, like pieces of cardboard, and by its copper-red panicles with pink inodorous flowers, or by its stinking fruits. The leaf-stalks are not flattened like those of the *Lanjut* and *Binjai*. The leaf-blades are generally wider in the wild trees, *Machang Utan*, than in the cultivated. The fruits are used in curries or for pickles : the sweet variety is palatable raw and could be improved by selection. In flower, the *Bachang* is our most beautiful *Mangifera* : it reminds one of the Horse-Chestnut (*Aesculus*) with its upright panicles. Though the trees flower generally about March or April and again about October in Singapore, individuals may flower only once a year.

Another *Mangifera*, variously called *Kemang Pulas*, *K. Putar*, *Machang Pulasan* (Perak) and *Lekub* (Johore), is rather like the *Bachang* in leaf but it appears to be the little-known species *M. Maingayi*, which has only 4 petals in the flower : the flesh of its fruit is white and the stone, which is not flattened, is fibreless : the leaves are broader and stiffer than those of the *Bachang*.

M. indica Plate 11, Text-Fig. 22

Indian Mango
Pauh, Mempelam, Mangga

Leaf-blade 6-13 × 2-3¾", narrowly elliptic or lanceolate, *pointed, thinly leathery*, with wavy edges : stalk 1-2" long.

Flowers greenish yellow, white, pale cream or even pinkish, 3" wide, *fragrant*, in finely hairy or glabrous panicles 6-20" long : flower buds 2" long : petals with 3-6 yellow stripes at the base.

Fruit very variable in size and shape, almost round to oblong, green, yellow or orange when ripe.

This is the commonest and most variable mango of our villages. The name *Pauh* is given generally to varieties with plump, round fruits and *Mempelam* to those with long fruits, but the names are often used indiscriminately. It is frequently stated that the best mangoes of the market are imported from India, Siam, Java and the Philippines and that the Malayan kinds are inferior in flavour. While this is true for towns, there are rural districts, particularly in the north of the country, where excellent mangoes are grown. In Krian, for instance, the varieties called *Chetti* or *Hempedal Ayam*, *Pisang*, *Acheh*, *Seri Kaya* (or *Siku*) and *Sourabaya* can be recommended. *Timun* is a long-fruited variety and *Mempelam Telor* a small-fruited variety with pleasant, though rather mawkish, taste. Near Kota Bahru the *Pauh Rengan* with small orange fruits 2" long is to be commended. *Pauh Siam* is the common green mango with a glaucous bloom. *Guri* and *Damar* are other varieties, but *Ayer* may be the different species *M. Pentandra*. We have, however, no classification or detailed study of our local Indian mangoes.

Concerning the introduction of the Indian Mango to Malaya, there is a full account in BURKILL'S Dictionary. The following are extracts:—"The Mango does best where the climate has strongly marked seasons and the rain is scarce at fruiting time. In wetter climates, the fruit sets badly and insects, which attack it, become more troublesome. Thus the climate of Malaya is by no means well suited". "It is well known in India that a shower at the time of flowering is most inimical to the crop: it leads to attacks on the flower of the anthracnose fungus, by which the whole crop of a tree may be destroyed". "The number of races of the Mango is legion, mostly unfixed: that is to say, they do not reproduce themselves truly by seed: which is why mango growers rely on grafting for retaining valuable trees."

Mango-trees fruit in the fourth year from seed. The biggest Mango-tree that we have seen in Malaya is at Kubang Kriang near Kota Bahru: it is about 80 feet high, with the crown 130 feet in diameter: under it grow rambutan-trees and a tuft of nibong-palms (*Oncosperma*).

There is another, but unidentified, species of *Mangifera* in Malaya like the Indian Mango but with much longer flower-stalks ($\frac{1}{3}$ - $\frac{1}{2}$ " long) and looser flower-clusters. Of its fruit we know nothing.

M. lagenifera Plates 12, 13, Text-Fig 22

Lanjut

(Lat., lagena-flask, ferre-to carry)

Leaf-blade 2-6 × $\frac{3}{4}$ -2", narrowly obovate, more or less obovate, blunt, very stiff and leathery, with 15-18 pairs of faint side-veins: *stalk* $\frac{1}{2}$ -1" long, flattened on the upper side and narrowly winged.

Flowers .4-.5" wide, deep violet or purple in erect violet-brown panicles 6-12" long: petals olive colour on the inner face: stamens with violet filaments and yellow anthers: ovary and style pinkish.

Fruit like that of the *Binjai* but smooth, pale dull green or greyish turning brownish, the flesh dirty white to dirty pinkish, sour and stringy.

Malaya: frequent in orchards especially in Malacca, occasional in the forest.

The coarse fruit of the *Lanjut* has little to commend it but the poisonousness of the sap will preserve, we hope, the magnificent trees which are scattered throughout the country. A grander being than an old *Lanjut* is hard to imagine. The trees flower only at long intervals of many years.

M. longipetiolata Text-Fig. 22

Topah (Ked.), *Sepam* (Pk., Joh.),
Kolah (Joh.)

(with long leaf-stalks)

Leaf-blade $3\frac{1}{2}$ -8 × 1-3", rather small and narrow, slightly obovate, more or less pointed, very stiff and leathery, dark green: *stalk* 1-2 $\frac{1}{2}$ " long, slender.

Flowers .2" wide, fragrant as lime-flowers, cream white, in pale green panicles 3-9" long.

Fruit $1\frac{1}{2}$ -3 × $1\frac{1}{2}$ -2 $\frac{1}{2}$ " rounded, plump, ripening green with yellow, very fibrous pulp like the Bachang (*M. foetida*) but sweet.
Malaya, occasional in villages and in the forest.

In flower and leaf this species is difficult to distinguish from *M. quadrifida*. Whether *Topah*, of Kedah, is really this species is uncertain: the stone of its fruit is scarcely fibrous at all.

M. microphylla

Rawa

(Gr., mikros--small, phullon--leaf)

Leaf-blade $2\frac{1}{2}$ -4 $\frac{1}{2}$ × 1-2 $\frac{1}{2}$ ", small, elliptic, blunt or tapered to a blunt tip or even suddenly tipped, rather thinly leathery, with 9-12 pairs of side-veins: stalk $\frac{1}{2}$ -1" long, slender.

Flowers cream white, in hairy panicles.

Fruit 1-1 $\frac{1}{2}$ × $\frac{3}{4}$ -1", small, slightly flattened, smooth, in clusters, green then pale yellow turning rose-red and finally blackish, smelling pleasantly like the *Kwini* (*M. odorata*), rather thick-skinned, with pale orange-yellow, rather watery, fibrous, sour-sweet flesh quite pleasant to taste.

Malaya, scattered throughout the country in villages and in the forest, but nowhere common.

The *Rawa*, from a distance, resembles the *Durian* but its leaves are not brownish underneath and the crown is darker and glossy green. The trees seem to fruit almost as infrequently as the *Lanjut*. According to Malays, the fruits ripen during the night, beginning to become sweet towards sunset. It is likely that the trees called *Tengek* (Trengganu) and *Serba Jaman* (Kedah) are the same species or the closely allied *M. Griffithii*. The fruits of *Tengek* are identical but its leaves are rather longer: we have not seen the flowers. The fruits of *Serba Jaman* are slightly larger ($1\frac{1}{2}$ -1 $\frac{3}{4}$ +1 $\frac{1}{4}$ ") and in ripening turn from greenish yellow to black without a red stage: they are pleasantly sweet.

M. odorata Text-Fig. 22

Kwini, *Kwining*

Leaves like those of the Indian Mango (*M. indica*) but more leathery, not wavy on the edge, and the apex rather blunt.

Flowers $\frac{1}{4}$ " wide, the buds $\frac{1}{4}$ " long, pink, fragrant as lilies, in yellowish or reddish brown panicles 6-12" long: petals white, with 3-5 short yellow stripes, becoming deep pink.

Fruit 3-5" long, rather plump, oblong, fragrant, green to yellowish green with brown dots, the flesh light yellow, sweet.

W. Malaysia (? where wild): common in Malayan orchards.

The leaves of the *Kwini* come between those of the Indian Mango and the *Bachang* in size, shape and texture. The tree resembles a *Bachang* but its crown is never so dense so that the light can always be seen through it. Nevertheless it is often difficult to distinguish *Bachang* and *Kwini* when sterile.

M. pentandra

Pauh, *Pauh Damar*, *Mempelam Bemban*

(with 5 stamens)

Very like *M. indica* but the leaf-blade often not wavy on the edge, rather more leathery, not or slightly curved: flowers .15" wide, yellowish white with 3-5 fertile stamens, the panicles much hairier: fruit 3-4 × 2-2 $\frac{1}{2}$ ", oblong, ripening green, rather fragrant, with pale orange, rather sweet, watery flesh with few fibres.

Malaya: occasional in villages throughout the country but generally mistaken for *M. indica*.

M. quadrifida

Asam Kumbang

(split into 4 parts)

Leaf-blade 3-12 × 1 $\frac{1}{2}$ -3 $\frac{1}{2}$ ", narrowly elliptic, pointed, very stiff and leathery: stalks $\frac{1}{2}$ -3", long (up to 5" in saplings).

This is the commonest and most variable mango of our villages. The name *Pauh* is given generally to varieties with plump, round fruits and *Mempelam* to those with long fruits, but the names are often used indiscriminately. It is frequently stated that the best mangoes of the market are imported from India, Siam, Java and the Philippines and that the Malayan kinds are inferior in flavour. While this is true for towns, there are rural districts, particularly in the north of the country, where excellent mangoes are grown. In Krian, for instance, the varieties called *Chetti* or *Hempedal Ayam*, *Pisang*, *Acheh*, *Seri Kaya* (or *Siku*) and *Sourabaya* can be recommended. *Timun* is a long-fruited variety and *Mempelam Telor* a small-fruited variety with pleasant, though rather mawkish, taste. Near Kota Bahru the *Pauh Rengan* with small orange fruits 2" long is to be commended. *Pauh Siam* is the common green mango with a glaucous bloom. *Guri* and *Damar* are other varieties, but *Ayer* may be the different species *M. Pentandra*. We have, however, no classification or detailed study of our local Indian mangoes.

Concerning the introduction of the Indian Mango to Malaya, there is a full account in BURKILL'S Dictionary. The following are extracts:—"The Mango does best where the climate has strongly marked seasons and the rain is scarce at fruiting time. In wetter climates, the fruit sets badly and insects, which attack it, become more troublesome. Thus the climate of Malaya is by no means well suited". "It is well known in India that a shower at the time of flowering is most inimical to the crop: it leads to attacks on the flower of the anthracnose fungus, by which the whole crop of a tree may be destroyed". "The number of races of the Mango is legion, mostly unfixed: that is to say, they do not reproduce themselves truly by seed: which is why mango growers rely on grafting for retaining valuable trees."

Mango-trees fruit in the fourth year from seed. The biggest Mango-tree that we have seen in Malaya is at Kubang Kriang near Kota Bahru: it is about 80 feet high, with the crown 130 feet in diameter: under it grow rambutan-trees and a tuft of nibong-palms (*Oncosperma*).

There is another, but unidentified, species of *Mangifera* in Malaya like the Indian Mango but with much longer flower-stalks ($\frac{1}{3}$ - $\frac{1}{2}$ " long) and looser flower-clusters. Of its fruit we know nothing.

M. lagenifera Plates 12, 13, Text-Fig 22

Lanjut

(Lat., lagena-flask, ferre-to carry)

Leaf-blade 2-6 × $\frac{3}{4}$ -2", narrowly obovate, more or less obovate, blunt, very stiff and leathery, with 15-18 pairs of faint side-veins: *stalk* $\frac{1}{2}$ -1" long, flattened on the upper side and narrowly winged.

Flowers .4-.5" wide, deep violet or purple in erect violet-brown panicles 6-12" long: petals olive colour on the inner face: stamens with violet filaments and yellow anthers: ovary and style pinkish.

Fruit like that of the *Binjai* but smooth, pale dull green or greyish turning brownish, the flesh dirty white to dirty pinkish, sour and stringy.

Malaya: frequent in orchards especially in Malacca, occasional in the forest.

The coarse fruit of the *Lanjut* has little to commend it but the poisonousness of the sap will preserve, we hope, the magnificent trees which are scattered throughout the country. A grander being than an old *Lanjut* is hard to imagine. The trees flower only at long intervals of many years.

M. longipetiolata Text-Fig. 22

Topah (Ked.), *Sepam* (Pk., Joh.),
Kolah (Joh.)

(with long leaf-stalks)

Leaf-blade $3\frac{1}{2}$ -8 × 1-3", rather small and narrow, slightly obovate, more or less pointed, very stiff and leathery, dark green: *stalk* 1-2 $\frac{1}{2}$ " long, slender.

Flowers .2" wide, fragrant as lime-flowers, cream white, in pale green panicles 3-9" long.

Fruit $1\frac{1}{2}$ -3 × $1\frac{1}{2}$ -2 $\frac{1}{2}$ " rounded, plump, ripening green with yellow, very fibrous pulp like the Bachang (*M. foetida*) but sweet.
Malaya, occasional in villages and in the forest.

In flower and leaf this species is difficult to distinguish from *M. quadrifida*. Whether *Topah*, of Kedah, is really this species is uncertain: the stone of its fruit is scarcely fibrous at all.

M. microphylla

Rawa

(Gr., mikros—small, phullon—leaf)

Leaf-blade $2\frac{1}{2}$ -4 $\frac{1}{2}$ × 1-2 $\frac{1}{4}$ ", small, elliptic, blunt or tapered to a blunt tip or even suddenly tipped, rather thinly leathery, with 9-12 pairs of side-veins: stalk $\frac{1}{2}$ -1" long, slender.

Flowers cream white, in hairy panicles.

Fruit 1 -1 $\frac{1}{2}$ × $\frac{3}{4}$ -1", small, slightly flattened, smooth, in clusters, green then pale yellow turning rose-red and finally blackish, smelling pleasantly like the *Kwini* (*M. odorata*), rather thick-skinned, with pale orange-yellow, rather watery, fibrous, sour-sweet flesh quite pleasant to taste.

Malaya, scattered throughout the country in villages and in the forest, but nowhere common.

The *Rawa*, from a distance, resembles the *Durian* but its leaves are not brownish underneath and the crown is darker and glossy green. The trees seem to fruit almost as infrequently as the *Lanjut*. According to Malays, the fruits ripen during the night, beginning to become sweet towards sunset. It is likely that the trees called *Tengek* (Trengganu) and *Serba Jaman* (Kedah) are the same species or the closely allied *M. Griffithii*. The fruits of *Tengek* are identical but its leaves are rather longer: we have not seen the flowers. The fruits of *Serba Jaman* are slightly larger ($1\frac{1}{2}$ -1 $\frac{3}{4}$ +1 $\frac{1}{4}$ ") and in ripening turn from greenish yellow to black without a red stage: they are pleasantly sweet.

M. odorata Text-Fig. 22

Kwini, Kwining

Leaves like those of the Indian Mango (*M. indica*) but more leathery, not wavy on the edge, and the apex rather blunt.

Flowers $\frac{1}{4}$ " wide, the buds $\frac{1}{4}$ " long, pink, fragrant as lilies, in yellowish or reddish brown panicles 6-12" long: petals white, with 3-5 short yellow stripes, becoming deep pink.

Fruit 3-5" long, rather plump, oblong, fragrant, green to yellowish green with brown dots, the flesh light yellow, sweet.

W. Malaysia (? where wild): common in Malayan orchards.

The leaves of the *Kwini* come between those of the Indian Mango and the *Bachang* in size, shape and texture. The tree resembles a *Bachang* but its crown is never so dense so that the light can always be seen through it. Nevertheless it is often difficult to distinguish *Bachang* and *Kwini* when sterile.

M. pentandra

Pauh, Pauh Damar, Mempelam Bemban

(with 5 stamens)

Very like *M. indica* but the leaf-blade often not wavy on the edge, rather more leathery, not or slightly curved: flowers .15" wide, yellowish white with 3-5 fertile stamens, the panicles much hairier: fruit 3-4 × 2-2 $\frac{1}{2}$ ", oblong, ripening green, rather fragrant, with pale orange, rather sweet, watery flesh with few fibres.

Malaya: occasional in villages throughout the country but generally mistaken for *M. indica*.

M. quadrifida

Asam Kumbang

(split into 4 parts)

Leaf-blade 3-12 × 1 $\frac{1}{2}$ -3 $\frac{1}{2}$ ", narrowly elliptic, pointed, very stiff and leathery: stalks $\frac{1}{2}$ -3", long (up to 5" in saplings).

ANACARDIACEÆ

Flowers .15" wide, white, fragrant, in greenish white panicles: petals with 1-3 yellow stripes.

Fruit $1\frac{1}{2}$ - $2\frac{1}{2}$ × $1\frac{1}{4}$ - $1\frac{1}{2}$ ", plump, ripening dark purple with pale brownish spots, with light yellow, very fibrous flesh, sour though not unpleasant.

Malaya: frequent in villages in the north.

The long-stalked, long and narrow, leathery leaves and the purple fruits distinguish this *Mangifera*.

PARISHIA

(C. S. P. Parish, 1822-1897, an English botanist in Burma)

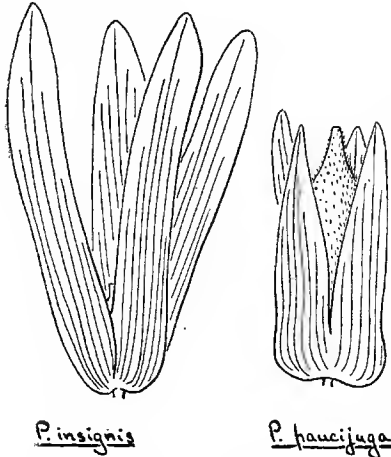
Latex white, harmless, scant, not blackening.

Leaves spirally arranged, pinnate, with a terminal leaflet and 4-10 pairs of opposite side-leaflets.

Flowers pale yellow, with the parts in fours.

Fruit a thin-walled, hairy nut surrounded by the 4 enlarged wing-like sepals like shuttlecocks.

10 spp., Burma, Andaman Isles, W. Malaysia to the Philippines: 5 species, at least, in Malaya.



This genus includes a few kinds of large, buttressed forest-trees difficult to identify in the absence of the characteristic fruits. The pinnate leaves distinguish the genus from the Dipterocarps and from the *Rengas*-trees (*Melanorrhœa*) which have rather similar fruits. *Surian* and *Sepal* are the usual Malay names for the species: they are given also to *Cedrela* (p. 459). In India, the timber of *P. insignis* is called Red Dhup.

It seems that all the Malayan species are deciduous and flower before or with the new leaves. *P. insignis*, however, (like *Firmiana* p. 610) matures even its fruits while the crown is bare of leaves.

The species are uncommon and little known.

Text-Fig. 23. *Parishia*, × $\frac{1}{2}$.

Key to the Species

- Wings of fruit no longer than the large nut *P. paucijuga*
- Wings of fruit much longer than the rather small nut
- Wings of fruit 3-3½" long: leaflets glabrous *P. insignis*
- Wings of fruit 4-5" long
- Leaflets 5-12 pairs *P. Maingayi*
- Leaflets 5-7 pairs, hairy beneath *P. pubescens*

P. insignis Text-Fig. 23 Red Dhup
 (Lat., distinguished)
 Leaflets 4-8 prs., abruptly rounded and asymmetric at the base.
 Nut finely velvety.
 Andaman Islands, Malaya: occasional throughout the country.

P. Maingayi

(A. C. Maingay, 1836-1860, the English botanist in the East)

Leaflets tapered at the base, scarcely asymmetric.
Malaya.**P. paucijuga** Text-Fig. 23

(Lat., paucus—few, jugum—a yoke)

Leaflets 4-5 pairs, tapered and symmetrical at the base.
Fruit-wings $1\frac{1}{2}$ -2" long, pointed: nut golden velvety.
Malaya.**P. pubescens**

(Lat., hairy)

Flowers $\frac{1}{4}$ " wide, pale green: deciduous March-May: Malaya.**PENTASPADON**

(Gr., pente—five, spadon—eunuch: from the five sterile stamens)

Big deciduous forest trees, up to 150 ft. high, generally with short spreading buttresses: bark light brown to dark grey brown, finely pimply, scaly with a few angular or oblong flakes, the inner bark pale yellowish with scant white latex in small drops on the cut surface: twigs rather thick.

Leaves spirally arranged with 4 (3-5) pairs of opposite leaflets: leaflets shortly stalked, narrowly elliptic, thin, not or barely asymmetric.

Flowers $\frac{1}{4}$ " wide, minute, white, in long-stalked, much branched, feathery or bushy panicles, 4-12" long, with the branches thinning to fine points and the main stalk often flattened: sepals, petals and stamens 5, and also 5 sterile stamens.

Fruit 1" long, oblong, leathery then pulpy, purplish then black, with one large seed.

A few species, Lower Siam, Malaya, Borneo: 3 spp. in Malaya.

Pelong or, less commonly, *Pelajau* is the Malay name for two very similar trees of this genus. They are easily recognised as pinnate-leaved trees from their graceful feathery crowns, but it would seem difficult to identify them further were it not for their very characteristic bushy inflorescences which decay slowly and thus, as they lie on the ground beneath the trees, render them easy of recognition. The small number of leaflets is also distinctive.

An oil, *Minyah Pelong* or *Minyah Pelajau*, which is used for curing skin-diseases, is obtained by hacking a basin-like cavity in one side of the trunk and allowing the oil to drain slowly into it, exactly as *damar* is collected from *Keruing-trees* (*Dipterocarpus*).

P. officinale

(Lat., sold in shops)

White *Pelong*-Tree*Pelong, Pelajau*Leaves glabrous: young leaves pink: leaflets up to $5 \times 2\frac{1}{4}$ ".

Inflorescences glabrous or sparsely hairy, not so bushy, shining white.

Generally in low-lying, often swampy forest or by low-lying streams and rivers.

The trees shed their leaves and flower with the new foliage twice a year, about March to May and again about October to November. The crown is whitened by the fragrant blossom

P. velutinum

(Lot., velvety)

Pink *Pelong*-Tree*Pelong, Pelajau*

Leaves and inflorescences densely velvety: young leaves reddish pink.

Leaves 5-12" long: leaflets $1-3\frac{1}{2} \times \frac{1}{2}-1\frac{1}{2}$ ".

Inflorescences very bushy, pinkish.

Common in the middle and north of Malaya on hillsides and by rocky streams.

Sometimes, when one is travelling over the passes of the main range on their eastern side or is travelling on the railway from Mentakab northward, tall trees with their crowns covered with pale flesh pink inflorescences are to be seen scattered among the *Tualang*-trees (*Koompassia excelsa*). Such are the Pink *Pelong*-trees. How often they flower we do not know but believe that it is once a year contemporaneous with the *Tualang* and Pink Cassia (*C. nodosa*).

HOG-PLUM TREES

SPONDIAS

(a Greek plant-name)

Twigs neither grooved nor pitted at the base of the leaves

Leaves spirally arranged, pinnate with a terminal leaflet.

Flowers small, greenish white, male, female and bisexual, generally in large, much branched panicles: sepals and petals 4-5: stamens 8-10: ovary with 3-5 short styles.

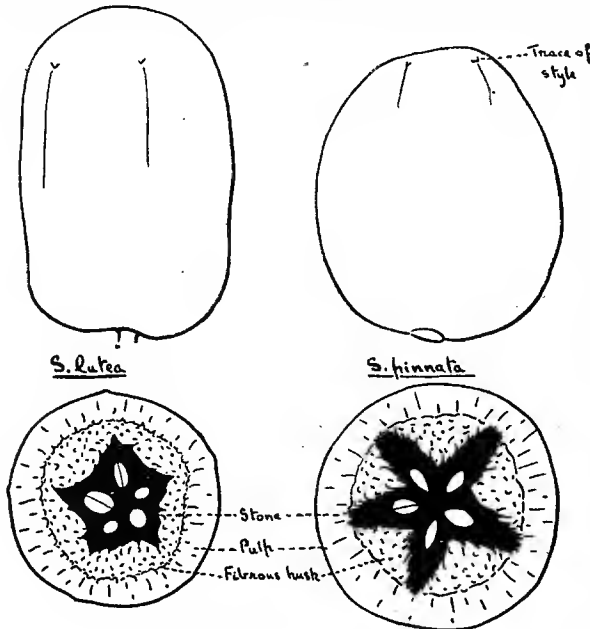
Fruit oblong, in some cases faintly angled or with five faint ridges reaching from the base more than half the length of the fruit, like a large green plum ripening yellow to orange (or purple) with pale fibrous flesh and a hard round or ridged stone generally prickly from woody fibres, the hard core star-like in cross-section and containing 3-5 cavities.

6 spp., trop. Asia and trop. America: 4 spp. introduced to Malaya.

Two Asiatic and two American species have been introduced to Malaya. The Asiatic species are commonly seen in gardens and villages and are known to Malays as *Kedondong* from the shape of the fruit. The American species are yet under trial in Singapore and Kuala Lumpur but they may become

familiar fruit-trees in course of time. All the species are very similar. The fruit is generally sour though some varieties are sweet or have a mawkish taste, and it is eaten, usually after cooking, as pickles or flavouring. All parts of the plants have a foetid smell of turpentine when broken or bruised: the smell differs in each species and is characteristic. The flowers are honey-sweet like those of Mango-trees.

The Hog-plum trees are wholly or partly deciduous in Malaya and they flower and fruit throughout the year, though chiefly after dry weather. The inflorescences develop at the ends of the bare twigs either before the new leaves or with them and



Text-Fig. 24. *Spondias*, nat. size.

the fruits dangle from the leafy twigs. Flower and fruit are generally to be seen together on the same tree.

A little care is needed to distinguish *Spondias* from *Canarium*, for both are called *Kedondong*. *Spondias* can be recognised from the shortly stalked leaflets and the absence of swellings on the main leaf-stalk where the leaflets are attached. But the leaflets of *Spondias* have also rather crowded veins which make a wide angle with the midrib and pass nearly straight to a distinct and characteristic marginal vein close to and parallel with the edge. The flowers of *Spondias* also have the parts mostly in fives and the fruits, which are not pointed as those of *Canarium*, have fibres passing from the stone through the pulp. From other plants with pinnate leaves, especially the *Wodier* (*Lansea*), *Spondias* can be distinguished by its strong turpentine smell.

Key to the Species

- Trunk rugged with corky spines or knobs : fruit $1\frac{1}{2}$ " long, orange
 yellow *S. lutea*
- Trunk nearly or quite smooth
- Leaflets 1-2" long : fruit 1" long, purple *S. monbin*
- Leaflets larger, 2-7" long
- Leaflets 2-8 pairs, entire : fruit $1-1\frac{3}{4}$ " long, often brownish
 and rather scabby : twigs rather tough : common... .. *S. pinnata*
- Leaflets 4-12 pairs, finely toothed : fruit 2-4" long, orange
 yellow : twigs very brittle : frequent *S. cytherea*

S. cytherea Plate 14
 (surname of Aphrodite)

Great Hog-Plum
Kedondong

Like *S. pinnata* but:—twigs, leaves and inflorescences succulent and brittle : leaflets generally more numerous and faintly toothed, thinner, dark shiny green : flowers distinctly stalked : fruits much larger, oblong.

Pacific Islands : frequent in Malayan gardens and villages.

This produces the best fruits in Malaya, but better species occur in Tropical America. There is a tree by the Crag Hotel in Penang. (It has been called *S. dulcis*).

S. lutea Text-Fig. 24
 (Lat., yellow)

Thorny Hog-Plum

Trunk and branches thickly set with blunt, light brown, corky spines and knobs, the trunk of old trees becoming widely and deeply fissured with irregular, hard, narrow, uneven ridges or toothed flanges.

Leaflets $2\frac{1}{2}$ -5" long, 5-9 pairs, very unequal-sided and oblique at the base, the stalks often pink, the main leaf-stalk often hairy and pink.

Panicles 7-10" long, finely hairy : flowers with slender stalks.

Trop. America : several old trees in the grounds of Raffles College, Singapore.

This species is little known in Malaya, yet it appears to be a good one to cultivate. The fruit is pleasantly fragrant, like plums in turpentine ! The taste is sweet, if mawkish.

S. monbin

Spanish Plum

Leaflets $1-1\frac{1}{2}$ " long, small, 5-12 pairs, very unequal-sided at the base.

Panicles 1-2" long, very short.

Fruits apparently ripening purple or yellow.

Trop. America : little known in Malaya.

S. pinnata Text-Fig. 24

Common Hog-Plum

Kedondong, Membrah, Embrah, Emrah.

Up to 60 ft. high with broken crown, straggling or wide spreading branches and smooth grey bark, occasionally with a few knobs but never spiny: *twigs* thick, rather tough, grey, with large leaf-scars: *young leaves* pinkish: glabrous.

Leaflets 2-7 × $\frac{1}{2}$ -3", 2-8 pairs, opposite or nearly so, narrowly elliptic, tipped, *slightly oblique at the base or nearly equal-sided*, thinly leathery, very shortly stalked, rather dull green, *with entire edge*.

Inflorescence up to 18" long: *flowers* .2" wide, *nearly sessile*.

Fruit green ripening yellow brown to orange brown or greyish brown, smelling of rotting apples.

India to the Moluccas: introduced to Malaya, the commonest species in cultivation but with the most inferior fruit. (The species has been called *S. mangifera*).

RENGAS TREES

(Gluta, Melanochyla, Melanorrhœa, Semecarpus, Swintonia)

The name *Rengas* is given by Malays to many forest trees which botanists classify into five genera. The trees contain a poisonous, resinous sap which has the property of blackening when exposed to the air and of becoming like lacquer, e.g. Burmese lacquer p. 98. In some species the sap is mild and causes only a slight itching of the skin, but in others it sets up an irritation so severe that painful blisters form resulting in open sores which heal very slowly, and if, as may happen in timber-felling, a large part of the body is affected, fever develops which is sometimes fatal. The more poisonous kinds, belonging to the genera *Melanorrhœa* and *Melanochyla*, are usually called *Kerbau Jalang* (the untamed buffalo) and it is unwise even to shelter beneath them because raindrops will carry down the poison from the leaves. Since *Rengas*-trees are common in the lowland forest, it is important that one should be able to recognise them.

Most *Rengas*-trees are large and not a few are among the tallest and finest in the forest. In habit and leaf they resemble the Mango-trees (*Mangifera*) and the Cashew-Nut tree (*Anacardium*), with which one should become well acquainted. The leaves are characteristically stiff, more or less upright and with the two sides of the blade upcurled: the young leaves are red, pink or violet. The outer bark differs widely in the various species and, though diagnostic of each, affords no criterion to the group as a whole: but the inner bark of all *Rengas*-trees is bright pinkish or reddish brown in contrast with the white sapwood; and on the surface of the trunk and limbs there are nearly always a few black stains where the sap has oozed out and darkened. These stains are the surest guide to the recognition of the trees. Black lines may also be seen in the freshly cut sapwood or just beneath the bark and, if the bark has been extensively injured some hours or days previously, the wound will be covered with a pitch-black smear. In a few species the sap darkens quickly but in most it takes at least half an hour.

The heart-wood of many *Rengas*-trees is dark red-brown, hard, durable and beautifully marked; but unless it has been thoroughly seasoned in the open until the sapwood has rotted away and the poison disappeared, it is dangerous to work. Some kinds, it is said, never lose their irritant properties, at least for sensitive skins. Were it not for this drawback, *Rengas*-timber would be one of the finest decorative woods.

The chemical nature of the sap-poison is not known beyond the fact that it is some volatile aromatic substance. Its effect on the skin is not due to any protein-sensitization but to a chemical and physical action, and neither immunity nor anaphylaxis is obtainable. The remedy is to apply weak solutions of mild alkali or active reducing agents, such as formalin, sulphites, "hypo", or potash: wood-cutters sometimes take the precaution of smearing the body with coconut-oil. It is doubtful whether animals suffer from the poison: monkeys and squirrels appear to be immune, for they will eat the *Rengas*-fruits; and certain kinds of insects feed on sap, their bodies becoming lacquered.

The flowers of *Rengas*-trees are white or pink and set in panicles like the Mango-trees. The fruits are varied and characteristic.

For further information about *Rengas*-Trees, see the account by FOXWORTHY (7, p. 52) and BURKILL (5, p. 52). *Rengas*-trees must not be confused with the poisonous Ipoh-Tree (*Antiaris*, p. 637).

Key to the Common Rengas-Trees

- A bush or treelet standing in the water of tidal rivers :
 flowers pink: fruits 2-3" wide, round: leaves
 blunt *Gluta velutina*
- Not so: large trees with white flowers and smaller
 fruits
 Leaves rather narrow, blunt: : fruits 1-2" wide,
 round, wrinkled and puckered, brown: East
 coast rivers of Pahang, Trengganu and Kelantan *Gluta renghas*
- Not so
 Leaf 1-2 ft. long, narrow, sessile, pointed, very
 stiff *Melanochyla auriculata*
- Not so
 Bark very shaggy scaly, brown: leaves blunt ... *Melanorrhæa sp.*
- Not so
 Leaves nearly or quite sessile, hairy, obovate,
 blunt: buttressed tree of swampy forest *Melanorrhæa malayana*
- Not so
 Fruits with 5 red star-like wings
 Nut of fruit stalked: leaves rather small
 pointed *Melanorrhæa Curtisii*
- Nut sessile
 Leaf blunt *Melanorrhæa Wallichii*
 Leaf pointed, rather large ... *Melanorrhæa Woodsiana*
- Fruit without wings, mango-shaped:
 leaves narrow, pointed: north of
 Malaya *Gluta elegans*

GLUTA

(Lat., gluten-glue)

Fruit rather large, round or oblong, smooth or uneven with ridges, knobs or wrinkles, greyish brown, with one large seed.

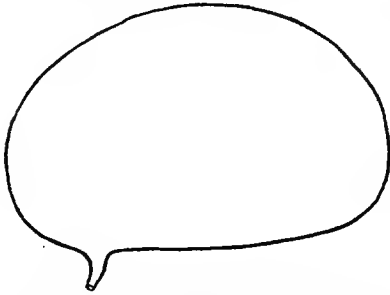
About 6 species, S.E. Asia, W. Malaysia: 6 species in Malaya.

ANACARDIACEÆ

G. elegans Text-Fig. 25

Penang Rengas

A medium-sized tree, flowering at 12 ft. : young foliage intensely violet.



Text-Fig. 25. *Gluta elegans*: fruit, nat. size.

Leaf-blade 3-7 × 1¼-3", narrowly elliptic, tapered to apex and base, with 7-12 prs. of side-veins : stalk ½-1" long.

Flower white : calyx orange-red.

Fruit 1-2" long, shaped like a small mango, rather flattened, smooth, blackish, with a stalk on one side of the base.

Tenasserim to Perak : said to be very abundant on Penang Hill.

G. renghas Plate 6, Text-Fig. 26
(from the Malay name)

East Coast Rengas
Rengas, Jintun (Kel.)

A large evergreen riverside tree, up to 100 ft. high, with dense crown like *Mangifera indica*: old trees becoming buttressed and often developing many stems from a common base so as to appear tufted : bark light fawn brown. or greyish when old, dimpled scaly with small flakes.

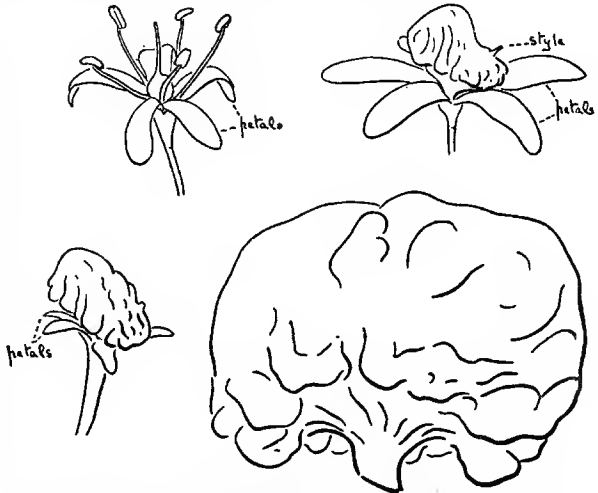
Leaf-blade 2½-6 × 1½-3", narrowly elliptic-obovate, blunt, leathery : stalk ½" long or less, very short, the blade often tapered to the twig.

Flowers ½" wide, white, fragrant of aniseed.

Fruit 1½-2" wide, scurfy brown, much warted, lobed and puckered round the base.

Malaya to Celebes : Kelantan, Trengganu, Pahang, leaning from the river-banks in the fresh-water tidal reaches, common at Pekan and Kuala Trengganu.

This fine tree is limited to the lower reaches of the Neram-rivers on the East Coast : whether it occurs South of the Pahang River we do not know. In parts of Trengganu the Rengas-trees are clustered along the banks of streams and small rivers so that they look like a double row of mango-trees winding across the open country. The bark at once distinguishes them from a Mango-tree. The heart-wood is not red-brown as it is in most other species of Rengas-but pale pinkish.



Text-Fig. 26. *Gluta renghas*: upper figures × 2 : lower figures, nat. size.

G. velutina
(Lat., velvety)

Water Rengas
Rengas Ayer

A large woody shrub or small tree, up to 20 ft. high, evergreen, with smooth pinkish brown trunk and branches and white opalescent sap (reddening then blackening on exposure to the air) : crown uneven, rather open : young leaves reddish pink.

Leaf-blade 5-10 × 2-3½", elliptic, tapered gradually to the blunt tip, curved out and down, with upcurled sides, round at the base, often nearly sessile: *stalk* ¼" long or less.

Flowers ½" wide, with pink petals: stamens white.

Fruit 2-3" wide, round, puckered at the base, with one or two irregular ridges extending over the fruit, pale brown, scurfy.

Malaya, Sumatra, Java, Borneo: common along the edges of tidal rivers on submerged mud-banks in the fresh-water or slightly brackish zone: *standing in the water, with submerged trunk except at low tide.*

This is a most characteristic bush in the tidal stretches of river above the region of *Nipa*-palms. It grows with *Putat Ayer* (*Barringtonia conoidea*) and *Rassau* (*Pandanus helicopus*). The sap is slightly irritant.

MELANOCHYLA

(Gr., melas—black, chulos—sap)

Fruits round, rather fleshy, often grooved, surrounded at the base by the persistent fleshy calyx, containing a hard stone.

About 15 spp., W. Malaysia: 10 spp. in Malaya.

Several species are common in the forest but are difficult to recognise. Among *Rengas*-trees they can be distinguished by the smooth bark (which varies light brown to dark brown), the frequent presence of stilt-roots in low-lying or swampy forest, the pointed leathery leaves and the fact that the buds, twigs, inflorescences and fruits are often rusty scurfy. The following species has unmistakable big leaves.

M. auriculata

(Lat., set with little ears)

Swamp *Rengas*

Kerbau Jalang

An evergreen tree up to 80 ft. high, generally much smaller, with a few upright branches bearing the long upturned leaves at the ends: *bark* light grey, smooth, with persistent leaf-scars.

Leaf-blade 1-2 ft. long, 3-5" wide, very long, lanceolate, pointed, tapered to the rounded base, the sides upturned and wavy, stiff, leathery, sessile.

Endemic in Malaya: frequent in lowland forest, especially where swampy, very abundant by the roads to Mersing.

MELANORRHŒA and SWINTONIA

(Gr., melas—black, rhoia—flow)

(G. Swinton, Government official in Bengal, ca. 1840)

Fruit a small, sessile or stalked, thin-walled, smooth, round or oblong nut, ripening greenish black, set in the centre of a 5-rayed star formed by the much enlarged, rose-red petals.

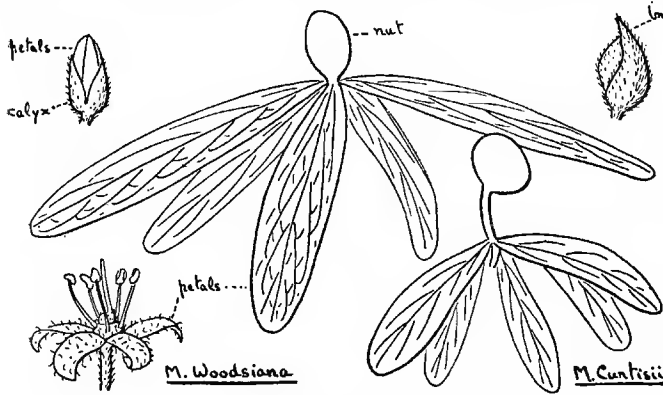
Melanorrhœa:—12 species, Indo-China, Malay Peninsula, Sunda Shelf: 10 species in Malaya.

Swintonia:—9 species, of like distribution but reaching the Philippines: 7 species in Malaya.

The fruit of these genera must not be mistaken for that of *Dipterocarps*. The 5-rayed star is formed by the persistent petals, which enlarge as the fruit develops, and they do not cover the nut. In the *Dipterocarps*, the 5 sepals enlarge, the petals falling off, and they more or less enclose the nut. The similar fruit of *Parishia* has four enlarged sepals.

ANACARDIACEÆ

Melanorrhœa and Swintonia differ, primarily, in the structure of the flower, but they can be distinguished in most cases, also, from their leaves. The calyx of Swintonia has 5-lobes and it remains round the open flower: that of Melanorrhœa is shaped like a cone or candle-snuffer and it is pushed off when the flower opens. The leaves in Swintonia are typically small, lanceolate-elliptic, pointed at each end and have slender stalks: those of Melanorrhœa are medium-sized to large, more or less obovate and blunt, often leathery, and have rather short, thick stalks.



The species of Swintonia are rare or local but several of Melanorrhœa are common and at certain seasons their fallen fruits are strewn throughout the forest.

Melanorrhœa yields the best Rengas-timber. *M. usitata*, of Burma, and *M. lacifera*, of Indo-China, give lacquer (BURKILL'S Dictionary).

Text-Fig. 27. Melanorrhœa: flowers and buds $\times 2$: fruit $\times \frac{1}{4}$.

M. Curtisii Text-Fig 27

Curtis' Rengas

(Ch. Curtis, 1853-1928, curator of the Waterfall Garden, Penang)

A tree up to 80 ft. high, the sap very irritant.

Leaf-blade $3-6 \times 1\frac{1}{2}-2\frac{1}{2}$ " , lanceolate elliptic, pointed, glabrous: stalk $\frac{1}{2}-1$ " long.

Fruit with a stalked nut.

Malaya: frequent in Penang, Kedah, Perak.

M. malayana

(from Malaya)

Malayan Rengas

Kerbau Jalang, Rengas

A big deciduous tree, up to 150 ft. high, with heavy dome-like crown, and steep and rather narrow buttresses: bark pinkish grey to light greyish fawn, with fine, close transverse furrows, becoming slightly dippled scaly.

Leaf-blade $6-12 \times 2\frac{1}{2}-6$ " , obovate, blunt or slightly pointed, often notched at the apex, tapered to the base, nearly or quite sessile, rather thin, hairy on both sides of the midrib and main veins, glabrous when old: side-veins many.

Fruit with a round nut, $\frac{3}{4}$ " wide, on a long stalk, with 5 small rose-red petals $\frac{1}{2}-\frac{3}{4}$ " long.

Malaya: frequent in E. Johore and Pahang, flowering early in the year, before or with the young leaves.

This species is illustrated by FOXWORTHY as *M. aptera* (ref. 7, p. 52). The bark is characteristic, like that of *Kasai* (Pometia).

M. Wallichiana

Wallich's Rengas

(N. Wallich, 1786-1854, the Danish botanist at Calcutta)

A large evergreen tree, up to 150 ft. high, with shabby green, rather narrow crown (like *Eugenia grandis*) and gnarled or twisted branches, slightly buttressed or not at all: bark greyish brown, shallowly fissured, slightly flaky.

Leaf-blade $3-6 \times 1\frac{1}{2}-3$ " , slightly obovate, blunt or slightly pointed: side-veins 12-17 pairs: stalk $\frac{3}{4}-1\frac{1}{4}$ " long, flattened on the upper side, very narrowly winged.

Flowers $\frac{1}{2}$ " wide, white, in hairy panicles 8-12" long.
Fruits with wings 2-3" long, *the nut sessile*.
 Malaya, Sumatra: common in low-lying swampy forest.

In the south of the peninsula, the trees flower early in the year, about a month after the Christmas rains have ceased. The crowns are then whitened with blossom and are rendered prominent throughout the forest; they can be seen to advantage from the roads to Mersing. The trees may be deciduous, perhaps, in the northern half of the country.

M. Woodsiana Text-Fig 27 Common Rengas
 (Rev. J. E. Tenison-Woods, a naturalist who visited Malaya from Australia in 1883-84)

Like *M. Wallichii* but:—the bark distinctly ridged and fissured: young twigs and leaf-stalks light brown hairy: leaves larger, the blade 6-12 × 2-5", pointed, with 17-25 pairs of side-veins, the stalk 1-2" long: petals yellow at the base.

Malaya: common in hillside forest, perhaps our commonest species.

Melanorrhœa sp.

Scaly Rengas
 Kerbau Jalang, Rengas

A big deciduous tree, up to 150 ft. high, with heavy, rounded crown and slight buttresses up to 7 ft. high: *bark dark rich brown, very flaky and shaggy with large elongate jagged pieces separating from below upwards and overlapping*.

Leaf-blade 4-5½ × 2-3", rather small, obovate, blunt, tapered to the base, leathery, glabrous, with numerous veins: *stalk ½-¾" long*.

Flowers 1" wide; petals white: stamens pink, attached to a thickened green disc.
 Fruit?

Malaya: East Coast from Johore to Trengganu, in the dryer part of the forest and on hillsides, rather common.

This handsome tree with striking bark, reminiscent of the *Kapur* (*Dryobalanops*) but much shaggier, is reputed to be highly poisonous. It is often seen at the edge of the forest by the roads to Mersing. We have observed that in Trengganu the trees shed their leaves in October and November, at the beginning of the wet season, and then flower on the bare twigs before the new leaves unfold. We have been unable to identify the species.

SEMECARPUS

(Gr. sema—token, karpos—fruit)

Leaves generally with prominent reticulate veins on the underside, *characteristically glaucous beneath*.

Fruit fleshy, ohlong or round, oblique, *seated on a fleshy body made from the base of the flower and the calyx*.

About 40 spp., trop. Asia, Australia and Polynesia: about 10 spp. in Malaya.

All the species seem to be highly poisonous, but the Malayan ones are uncommon or rare. The fruit-wall, particularly, is filled with irritant black resin, but the fleshy base of the fruit of certain species can be eaten after roasting, for instance that of the Indian Marking Nut Tree (*S. anacardium*). The black sap of this species, when mixed with lime-water or alum, is used by natives for a marking ink: it is insoluble in water.

LEECHWOOD FAMILY

Anisophylleaceæ

Leaves alternate, simple, often asymmetric, jointed to the twig, without stipules: generally with a short row of tiny buds on the twigs just above the leaf-axil.

Flowers minute, unisexual, in tiny clusters or on spikes from the leaf-axils: sepals 3-4: petals 3-4 or none: stamens 6-8: ovary inferior with 3-4 styles.

Fruit oblong or round, with a pulpy or leathery rind and a hard woody stone enclosing one large seed, not splitting open: with the 3-4 sepals persistent at the top of the fruit.

One gen., 15 spp. trop. Asia and Africa: 7 spp. in Malaya, in lowland and mountain woods.

To this small and little known family, the affinity of which appears to lie with those of Terminalia and the Mangroves (Combretaceæ and Rhizophoraceæ), there belongs a common, yet most elegant, forest-plant called the Leechwood, the curious foliage of which conjures up the picture of a giant Selaginella. The other species are not so easy to recognise though the botanist will have little difficulty in identifying those with alternate, 3, veined leaves and fruits like Barringtonias, one of which, *A. grandis*, is common on Penang Hill. An African species, *A. laurina*, has edible fruits but none of the Asiatic species is edible except to wild animals. Noteworthy and distinctive are the supernumerary axillary buds, for in most plants there is only one bud in a leaf-axil. The fruits differ from those of Barringtonia in having a stone.

ANISOPHYLLEA

(Gr., with unequal leaves)

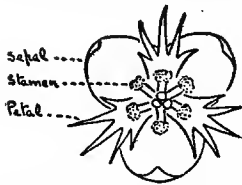
Key to the Species

- Leaves $\frac{1}{2}$ - $1\frac{1}{4}$ " long, of two kinds: 2 rows of spreading, very asymmetric leaves, and 2 rows of small stipule-like leaves flattened to the twig: shrub or treelet *A. disticha*
- Leaves larger, of one kind
- Leaves with a single midrib *A. Griffithii*
- Leaves with 3 prominent longitudinal ribs
- Leaves very asymmetric, silvery beneath: fruits $\frac{3}{4}$ " long: shrub or treelet *A. Scortechinii*
- Not so: fruits larger: trees
- Leaves 5-12" long: fruits 4-5" long, brown scurfy *A. grandis*
- Leaves 3-5" long: fruits 3-4" long, yellowish green with dull red stripes, glabrous *Anisophyllea sp.*

A. disticha Plate 15, Text-Fig. 28
(in two rows)

Leechwood
Kayu Pachat, K. Ribu Ribu, Pokok Kanchil, Raja Berangkat (Johore)

An evergreen shrub or small tree to 25 ft. high, with a slender, strong, main stem and graceful, drooping branches generally arranged in distant whorls and leafy for a considerable stretch: twigs and undersides of the leaves hairy.



Text-Fig. 28. *Anisophyllea disticha*, $\times 10$.

Leaves sessile, of two kinds arranged in 4 rows: large leaves $\frac{1}{2}$ - $1\frac{1}{4}$ \times $\frac{1}{4}$ - $\frac{1}{2}$ ", rhombic in outline, with a fine point, unequal-sided at the base, glossy green, in some cases glaucous beneath, spreading on each side of the twig, with 4 longitudinal veins: small leaves $\frac{1}{2}$ " long or less, lanceolate, flattened against the twig, in two rows on the upper side, appearing as stipules.

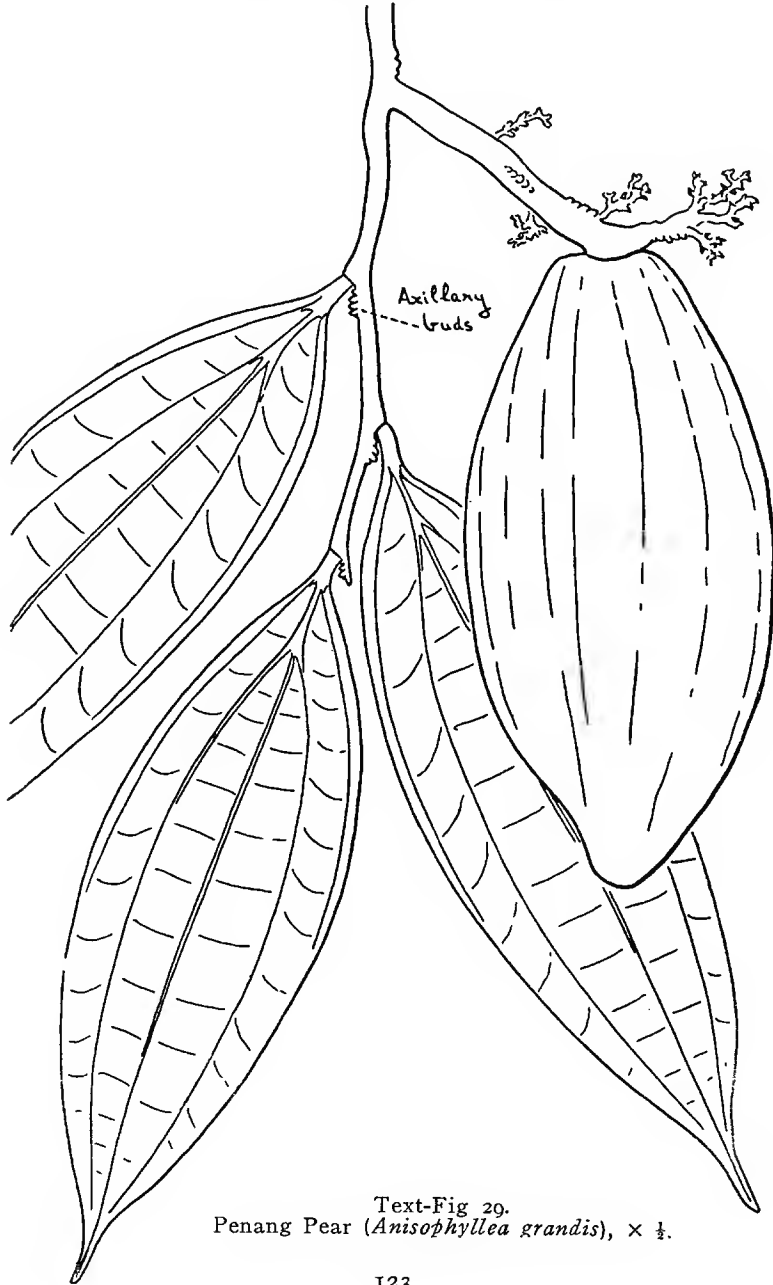
Flowers .05" wide, pinkish white, with slender stalks, in tiny clusters in the axils of the large leaves and turned to the underside of the twigs.

Fruit $\frac{3}{4}$ -1" long, oblong, pulpy, red, hanging singly or in pairs from the underside of the twigs, sessile, yellow white stone with 6-8 grooves.

W. Malaysia: common in the lowland forest in Malaya.

The hard wood of the main stem can be made into walking-sticks. The arrangement of the leaves is extraordinary and occurs only in a few other species of the genus: on the main upright stems, only the small kind of leaf occurs. The Leechwood is a perfect miniature tree: specimens with trunks 4" thick are rare.

Compare *Phyllanthus*, p. 290, and *Glochidion*, p. 278, both of which have only one kind of leaf: they often simulate the Leechwood.



Text-Fig 29.
Penang Pear (*Anisophyllea grandis*), $\times \frac{1}{2}$.

A. grandis Text-Fig. 29

Penang Pear

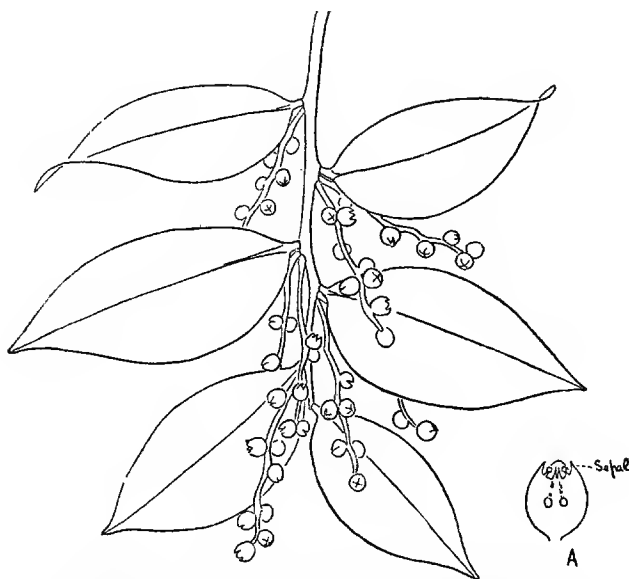
An evergreen tree up to 60 ft. high with rather narrow conical crown, drooping branches and leaves: twigs and leaves glabrous.

Leaf-blade 5-12 × 2-3½", large, narrowly oblong, tipped, leathery, pointing vertically down, with 3 conspicuous longitudinal veins and 2 fainter ones along the edges: stalk ¼" thick, stout.

Flowers in uneven spikes up to 6" long and sparingly branched, often in tufts from the leaf-axils.

Fruits 4-5 × 2-½", pear-shaped, finely rusty brown scurfy, with leathery rind and massive stone: hanging on the tree like oblong pears.

Penang, Perak: very abundant in the forest and secondary growth on Penang Hill.



Text-Fig. 30. Griffith's Leechwood (*Anisophyllea Griffithii*), × ½: A, section of flower × 2.

A. Griffithii Text-Fig 30

Griffith's Leechwood

(W. Griffith, 1810-1845, doctor and botanist of the East India Co.)

A small to medium-sized evergreen tree with dense, even crown: bark light brown, becoming shallowly ridged, cracked and rugged: *young leaves bronze*.

Leaf-blade 2-4 × ¾-2", elliptic, pointed, slightly but distinctly asymmetric, drooping with upcurled sides, dark shiny green above, yellowish green beneath, with 6-8 pairs of indistinct side-veins: stalk ½-2" long.

Flowers ½" long, green, cup-shaped with a brownish cross-shaped mouth, set in zig-zag unbranched sprays 1-2" long, 1-2 from a leaf-axil.

Fruit 1½-2" long, large, broadly ellipsoid or subglobose, like a green apple.

Malaya: frequent in lowland forest and secondary jungle.

The small asymmetric leaves in 2 rows, with a row of 2-4 small buds in each leaf-axil, will always distinguish this tree which, however, one can soon learn to recognise from the colour of the leaves.

A. Scortechinii

Scortechinii's Leechwood

(B. Scortechini, 1845-1886, the Italian missionary and botanist)

A shrub or small tree like *A. disticha* but without the small stipule-like leaves (or with only a few) and with larger, asymmetric leaves and larger inflorescences.

Leaf-blade $1\frac{1}{2}$ -6 × $\frac{1}{2}$ -2 $\frac{1}{4}$ " , *very asymmetric*, rhombic, pointed, *silvery beneath*, with 3 longitudinal veins.

Flowers in slender spikes 1-3" long.

Fruit $\frac{3}{4}$ " long, broadly ellipsoid, ? red.

Malaya: frequent in the lowland forest.

Anisophyllea sp.

Perak Leechwood

(unidentified)

Like *A. grandis* but:—

Leaf-blade smaller, 3 - $5\frac{1}{2}$ × 1 - $2\frac{1}{4}$ " .

Flowering spikes very slender, 1-3" long.

Fruits smaller, 3 - $3\frac{1}{2}$ × $1\frac{1}{2}$ - 2 " , rather pointed at each end, glabrous, *greenish to yellow then brownish with dull red stripes*.

Malaya: common throughout the lowland forest, abundant in Perak: generally recognised from the fallen fruits.

KENANGA FAMILY**Annonaceæ**(from the genus *Annona*)

Monopodial trees *with resinous or sourly aromatic tissues* (bark, pith, etc.): *bark generally smooth* and entire, pale grey or buff to warm brown, the inner bark with conspicuous radiating and V-shaped lines on the cut surface: the twigs generally with 'septate pith' (*i.e.* the pith marked with fine, close transverse lines).

Leaves simple, commonly oblong, pointed, and drooping, *with short stalks*, no stipules: alternate on the branches: withering yellow or brown.

Flowers solitary or in clusters, often opposite the leaves (not in their axils), *hanging or facing down, sweetly and often intensely fragrant, rather large*, commonly opening while still as young buds, (not wrapped in a bract as in the Magnoliaceæ): *sepals* 3, generally small: *petals* 6 in two rows, the inner often smaller or differently shaped, or 3 only (the inner ones being absent), *rather thick and fleshy*, green, white, yellow, orange, pink, red or purple: *stamens numerous, very short, dumpy, minute, crowded round the ovary in a rosette*: ovary composed of few to many, tiny separate parts (carpels) each with a very short style: *the stamens and ovary forming a button-like rosette commonly hidden by the petals*.

Fruit typically a bunch of round, oblong or pod-like, stalked fruits (ripe carpels) *radiating from a short woody stalk* (the flower-stalk): each fruit 1-many seeded, with a fleshy or pulpy rind and generally not splitting open: in a few cases forming a large, compact fleshy head (the fruiting-carpels fused, *e.g.* *Annona*): *seeds* medium-size the hard endosperm broken up with brownish plates, strands or lines of tissue (ruminant).

45 genera, 800 spp., throughout the tropics but chiefly in the Old World: 29 genera, 180 spp. in Malaya, one-third being climbers.

So many oddities distinguish this family that its description cannot be condensed into a few words. It is, so to speak, a tropical idea with which we

can gain no acquaintance in temperate countries. It is a family of woody, resinous plants, comprising only trees, shrubs and climbers, whose flowers are fragrant beetle-traps and whose fruits are bunches of big-seeded berries for the delectation of such animals as squirrels, monkeys, civet-cats and bats. It is well-represented in Malayan lowlands where the tree-species form one of the main elements of the lower layers of the forest and its woody climbers abound, but at a greater altitude than 3,000 ft. it becomes, in contrast with the allied Magnoliaceæ, distinctly scarce. Whether it be from the shape of the tree, from the leafy twig, the flower, the fruit or the seed, we can very quickly learn to recognise a member of the family.

Few of our species are big trees. Most are about fifty feet high or less. They have the conical crown, with the trunk tapering to the vertex, of the monopodial type (p. 27) and the branches are set with the short-stalked drooping leaves for some distance from the ends: in habit they can be mistaken only for the Wild Nutmegs (p. 472) which have red sap. If a twig is slit lengthwise, the narrow pith with its transverse lines will be seen. Crush the leaf or break the bark: in most cases, a characteristic resinous odour will be given out.

The flowers are unusual in several ways. While still in the bud, the sepals and petals may spread so that the flowers seem to open when they are still small. Actually they do not mature until several days later when they have grown larger. The petals then colour up and the fragrance is given out. Commonly the petals and stamens fall off on the day that the flower ripens, and the ovary is then left on the stalk to develop into the fruit. When they become scented, the flowers attract crowds of small beetles. If the flower is an open kind, like that of the *Kenanga*, the beetles crawl about as they wish. But in a large number of species such as the *Antoi* (*Drepananthes*, *Xylopi*), the *Kenarah* (*Goniothalamus*) and the *Twin-seed* (*Anaxagorea*), the inner petals form a trap by being pressed tightly over the compact stamens. In such cases the scent begins to escape a few days before the flowers are ripe. The beetles force their way into the trap but cannot escape until the petals fall off, by which time the stamens have opened and shed their pollen. The beetles fly off to another flower where they are detained a few more days: they pollinate it on arrival and carry away its pollen when they leave. On pressing open these flowers, many beetles crawl out.

The fruits look like bunches of small bananas, particularly in the fruit-tree *Alphonsea*, and hence their common Malay-name *Pisang-Pisang* or *Mempisang*. Each bunch of fruits is the product of *one* flower. The flower-stalk thickens into the woody stalk of the bunch (the scars of the sepals and petals can generally be seen below its swollen head) and each part of the ovary (or each carpel) becomes a stalked fruit. Such a head of fruits is, therefore, quite different from a bunch of *Petai*-fruits (*Parkia*) each pod of which comes from one flower and the common stalk of which is that of the inflorescence. Animals, particularly bats, eat the rind of the fruits which becomes more or less fleshy or oily and is generally brightly coloured. The fruit-trees, *Annona*, are exceptional in having the carpels joined into fleshy heads, and the fruits of the *Twin-seed* are capsules that split open.

On account of their fragrance the flowers of many species such as the *Kenanga*, the *Kenarah* and the wild trees called *Antoi* (*Drepananthes*, *Xylopi*) are made into garlands for decoration and are commonly sold in markets or Mohammedan shops.

Excepting the Custard Apple (*Annona reticulata*), it seems that all our species are evergreen. They flower seasonally after dry weather. We have, however, very little information concerning their habits.

Key to the Genera

TREES OF VILLAGES AND CULTIVATION

- Leaves long, narrow, with wavy edges, $\frac{1}{2}$ - $1\frac{1}{2}$ " wide: *flowers* greenish white, star-like, on the twigs behind the leaves *Polyalthia longifolia* p. 135
- Not so: leaves wider
- Fruits very large, round or oblong, 3-6" wide: small trees up to 20 ft. high *Annona* p. 130
- Fruits consisting of bunches of stalked pods: often taller trees
- Flowers 2-3" long, with 6 wavy, strap-like, thin, yellow petals: *leaves* thin, easily wilting, often heart-shaped at the base: tall tree *Canangium* p. 131
- Not so, petals fleshy or tightly pressed over the flower
- Flowers $\frac{3}{4}$ -1" long, with recurved petals, greenish white: *fruits* $1\frac{1}{2}$ -3" long, large, yellow to orange, pulpy: East Coast towns from Pekan northward *Alphonsea*
- Flowers $1\frac{1}{2}$ -2" long, with 3 large outer petals and 3 small inner ones, cream-white or pinkish: *fruits* $\frac{1}{2}$ " long, round *Goniothalamus* p. 134
- Flowers $\frac{3}{4}$ -1" long, greenish then cream: *fruits* $1-1\frac{3}{4}$ " long, oblong, splitting open at the top, with 2 black seeds: shrub or treelet *Anaxagorea* p. 129

WILD TREES OF FOREST AND SECONDARY JUNGLE

- With stilt-roots, and warm reddish brown, smooth bark: leaves glaucous beneath *Xylopia* p. 136
- Not so
- Petals incurved or inarched near the base: *Antoi* *Drepananthus* p. 132
- Not so
- Shrub or treelet with oblong fruits $1-1\frac{3}{4}$ " long, splitting at the top, with 2 black seeds *Anaxagorea* p. 129
- Tall tree: wild *Kenanga* *Canangium* p. 131

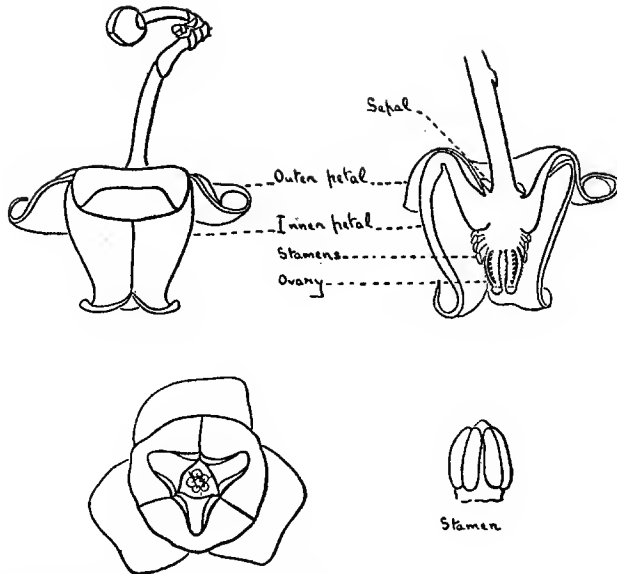
ALPHONSEA

(Alphonse de Candolle, 1806-1893, the Swiss botanist)

Flowers singly or in small clusters on the leafy twigs opposite the leaves or on the bare twigs behind the leaves, not in the leaf-axils: sepals 3, very small: *petals* 6, bag-like at the base, in two rows, those of the outer row recurved, those of the inner row almost as large, covering the stamens and recurved at their tips only.

Fruits fleshy, stalked, not splitting open, containing many large seeds inseparable from the pulp or separable with difficulty.

About 10 or 12 spp., India, S. China, Malay Archipelago: 5 or 6 species in Malaya in the lowlands, (very little known).

Text-Fig. 31. *Alphonsea elliptica*; flowers $\times 2$; stamen $\times 10$.

A. elliptica Plate 221, Text-Fig. 31
(from the shape of the leaf)

Banana-Tree
Pisang

An evergreen or partly deciduous monopodial tree up to 70 ft. high: *the crown dense, bushy, gloomy, rather conical*: the trunk becoming fluted to a height of 10 or 20 ft.: bark dark grey, slightly fissured: young leaves pale green: old leaves withering yellow then brown.

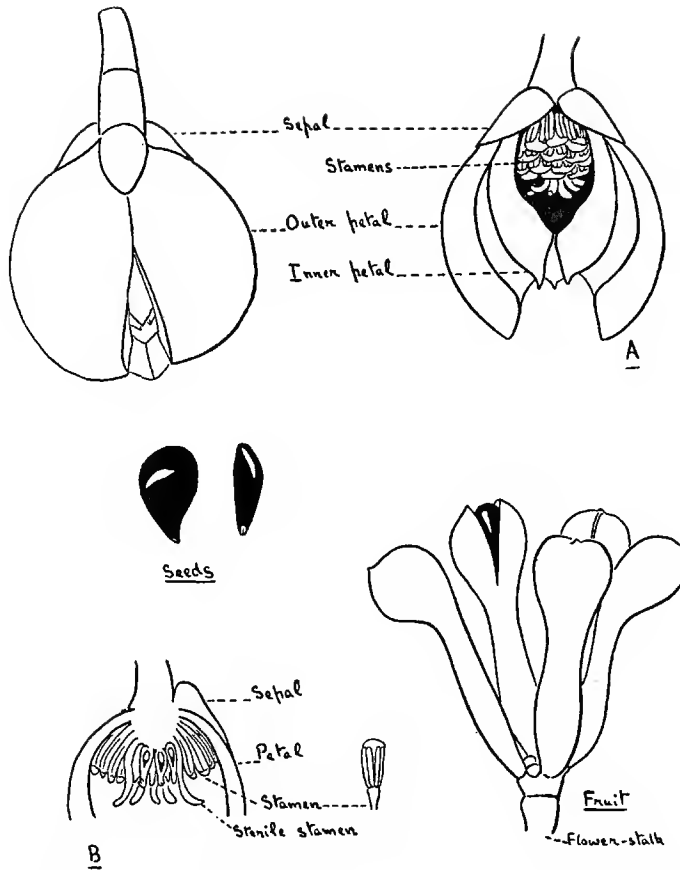
Leaf-blade 3-7 \times 1-2½", elliptic, rather narrow and even oblong, shortly tipped, narrowed to the base, *dull dark green, leathery*, with 7-11 pairs of side-veins: stalk 1-2" long.

Flowers 7-8" wide, *entirely pale greenish cream*, facing down, smelling faintly of *Kenanga*-flowers (though sweeter), on slender stalks ¼-½" long: solitary or in small clusters mostly on the twigs behind the leaves.

Fruits 1½-3 \times 1-2", *large, green then yellow, velvety, rather flattened and like dumpy bananas*, often waisted, on stalks ¼-1" long and arranged 2-6 on a stout common stalk (the original flower-stalk) ¼-½" long: the skin of the fruit easily separable from the light yellow or orange-yellow pulp but the numerous pale brown large seeds inseparable from the pulp and attached to it by fibres.

Siam, Malaya: occasional in the coastal towns of Pahang and Trengganu, very abundant at Kuala Trengganu; rare in the forest from Malacca northward.

This curious tree is certainly a rarity. Indeed, all the members of its genus are rare and imperfectly known to botanists. It was with great delight, therefore, that we discovered it to be one of the commonest fruit-trees at Kuala Trengganu. In shape it suggests a mixture of the Mangosteen (*Garcinia*) and the *Chempaka* (*Michelia*), for it has the long crown and smooth grey trunk of the latter and the dense gloomy foliage of the former. Like all the members of the family, the trunk tapers to the vertex of the crown but the branches arise steeply from the trunk, then arch out and turn down like those of the Mangosteen. In the sterile state, the alternate leaves and absence of yellow gum distinguish it from a Mangosteen, and the absence of ring-scars on the twigs distinguish it from the *Chempaka*. The pulp of the fruit is edible. It has the consistency of Mango-flesh, not unpleasantly sour-sweet, but, like so many of our unselected village fruits, the pulp adheres firmly to the large seeds and is thus difficult to enjoy.



Text-Fig. 32. *Anaxagorea javanica*; flowers $\times 2$: fruit and seed nat. size: A, with an outer petal removed: B, in section.

ANAXAGOREA

(Anaxagoras, 500–428 B.C., Greek philosopher)

Flowers in small clusters on the leafy twigs, (opposite to the leaves): *petals* 6, the inner three often smaller than the outer or even absent, (occasionally only 2 petals and 2 sepals), *thick, fleshy*, slightly spreading: inner circle of stamens sterile, overtopping the carpels.

Fruits with thick stalks, the rather small head splitting open and, on drying, shooting out the two shiny black pear-shaped seeds pressed flat together.

About 8 spp., a few in tropical Asia, the rest in tropical America: 2 spp., in Malaya.

A. *javanica* Text-Fig. 32

Twin-seed
Bunga Pompon (Perak), *Kekapur* (Kuantan)

An evergreen shrub or small spreading tree to 20 ft. high: bark pale greyish brownish or rather silvery: twigs dark green, drooping.

Leaf-blade 4–10 \times 1½–4", *elliptic or oblong* often widest near the apex, with a short, blunt or rather long, pointed tip, *thin, bulging between the side-veins* (8–10 pairs), *light shiny green, yellowish green beneath*, drooping: stalk 2–4" long.

ANNONACEÆ

Flowers $\frac{3}{4}$ -1" long, round or oblong, singly or in small groups, on short stalks .2-4" long, *fragrant: petals greenish white then cream white, fleshy*, often with only 3 petals, occasionally only 2.

Fruits 1-1 $\frac{3}{4}$ " long, *dark green*, 4-8 in a bunch, *upright*: seeds .5-.7" long, hard, slippery, with a tiny white hilum at the pointed end.

Lower Siam, Borneo, Malaya, Sumatra: common in lowland forest in Malaya, occasionally common in villages, especially round Kuala Kangsar.

The intensely fragrant flowers are used like *Kenanga*-flowers. In having fruits that split open, the genus is very exceptional in the family: the seeds, which are shot out for 2-3 yards, are most distinctive. In the East of Johore we have found commonly a variety with only 2 sepals and 2 petals.

(The species is called *A. Scortechinii* in BURKILL'S Dictionary).

ANNONA

(a South American plant name)

Flowers with minute sepals: petals 6 or 3: the parts of the ovary (carpels) more or less joined.

Fruit a large, fleshy structure with the many seeds embedded in the soft pulp: (the carpels fused together but recognisable on the surface of the fruit as small spines i.e. the styles, or as knobs or bulges).

60 spp., tropical America, a few in tropical Asia and Africa: 3 introduced species in Malaya.

Three well-known tropical American fruit-trees, the Soursop, the Custard Apple and the Sweet Sop, belong to this genus. They were among the first fruits of the New World to be disseminated by the early voyagers. Now they grow with the Guava, the Cashew and the Rubber-Tree like native plants in our villages.

Key to the Species

- Fruit very large, oblong, dull green, set with prickles: petals 6 *A. muricata*
- Fruit round, not prickly: petals 3
 - Fruit nearly smooth, reddish brownish: leaves long-pointed, strongly ribbed (mostly on E. Coast) *A. reticulata*
 - Fruit set with knobby, separable bulges, light green: leaves small, rather blunt *A. squamosa*

A. muricata

(Lat., armed with points like the Tyrian shell-fish, Murex) Soursop
Durian Belanda,
 ... *D. Europa*, *D. Makkah*

A small evergreen tree with steeply ascending limbs: leaf-blade 2 $\frac{1}{2}$ -7" long, shortly tipped, with a sour aromatic smell when crushed: flowers 1" wide, rounded, with thick yellow petals, the inner ones slightly shorter than the outer: fruit 6-12" long.

Common in all villages.

A. reticulata

Custard Apple, Bullock's Heart
 (Lat., having the appearance of net-work) *Nona*, *Lonang* (Pah.), *Lonnek* (Kel.)

A small deciduous tree to 25 ft. high, the stout pale grey and rather fissured trunk of old trees breaking up into several arching branches: leaf-blade 5-10 x 2-4", large strongly ribbed, with a long down-turned point and upcurled sides, the stalk stout: petals yellow, red-brown at the base: fruit 3-4 $\frac{1}{2}$ wide, round or heart shaped, reddish brownish, only slightly bumpy (the bumps not separable) marked with a faint net-work.

Common in East Coast villages from Rompin to Tumpat, little known on the West side of the Peninsula.

Generally about April, or May, soon after the beginning of the dry weather, the old leaves are shed and the new shoots develop. From the ends of the twigs the main foliage-shoots grow out, but the flowering shoots with smaller leaves develop from the axils of the freshly fallen leaves, *i.e.* on the wood of the preceding season. After flowering and fruiting, the short reproductive twigs drop off.

A. squamosa

(Lat., covered with scales)

Sweet Sop, Sugar Apple

Nona, S'eri Kaya

Like *A. reticulata* but with smaller, blunt or scarcely pointed leaves, 2-6" long, glaucous beneath, not so strongly ribbed: the twigs and leaf-stalks slender: *fruit* light greyish green or glaucous, very bumpy, the tops of the bumps easily separable. ? evergreen.

Common in Malayan villages.

CANANGIUM

(from the Malay name, *Kenanga*)

Petals not pressed together to form a cup over the stamens, limp, strap-shaped, green then yellow.

Fruits stalked, many from each flower, each with many seeds arranged in two rows: not splitting open.

2 spp., Burma throughout the Malay Archipelago to New Guinea and N. Queensland.

C. odoratum

Plates 16, 17, 87

Kenanga, Chenanga, K. Utan, Nyai (Pahang), *N'rian* (Grik)

An evergreen, soft-wooded tree reaching 100 ft. high, commonly only 40-50 ft. in cultivation: trunk smooth, pale grey or silvery, without buttresses, tapering to the vertex of the crown: *branches awkward, stiffly spreading from the trunk*, some ascending steeply but *most with very drooping ends and long dangling leafy twigs*: leaves hairy or nearly glabrous.

Leaf-blade 3-9 × 1½-3¼", elliptic, gradually tapered to the tip, the base often slightly heart-shaped, *soft, soon wilting, drooping*, with 7-12 pairs of side-veins: stalks ½-¾" long.

Flowers large, dangling in clusters from the older parts of the leafy twigs or from the branches behind the leaves, green turning light dull yellow, very fragrant when mature and full-grown: sepals 3, short: *petals* 6 narrow, *strap-like*, pointed, often curled or wavy, *with a purple brown spot at the base*, 2½-3" long.

Fruits about 1 × ¾", oblong, stalked, 4-12 in a bunch (from each flower) though as many as 20 in the wild trees, *dark green ripening blackish* with 2-12 seeds embedded in yellow oily pulp and arranged in 2 rows: seeds pale brown, flattened, the surface pitted, hard.

Burma throughout the Malay Archipelago to New Guinea and N. Queensland, cultivated and wild throughout this range: abundant in Malayan villages and common, as a wild tree, in belukar and at the edge of the forest from Negri Sembilan northward.

The *Kenanga* is one of the best known village-trees in Malayan countries. Its fragrant flowers are used for personal adornment and for decoration at feasts and other celebrations, for which purpose they are sold, like those of the *Chem-paka* (*Michelia*), the *Bunga Tanjong* (*Mimusops*) and the *Bunga China* (*Gardenia*), in the market or in the front of Mohammedan shops. In Malaya the propagation of the tree is left to chance but in Java, the Philippines and Réunion it is grown commercially for the oil which is distilled from the flowers and made into scent: the oil consists of Ylang-Ylang oil (the Philippine name for the *Kenanga*) and

Cananga-oil, the addition of which to coconut-oil together with a few other ingredients makes Macassar-oil. The qualities of the oil are discussed in BURKILL'S Dictionary.

The *Kenanga* has two forms, the wild and the cultivated, but the differences between them are slight and pertain, it seems, mainly to the smell of the flowers, which is less pleasing in the wild kind to Malays, and to the quality of the oil. The wild tree in Malaya is particularly noticeable by the railway-line from Kuala Lipis to Kota Bahru. It is loftier, lankier, and with a narrower crown and less drooping branches than the cultivated kind: the flowers are rather sour and rank and the fruits seem to be smaller, more numerous from each flower and with fewer seeds. It is generally called *Kenanga Utan* but in the neighbourhood of Benta and Jerantut it is called *Nyai* and, at Grik, *Nĕrian*. It appears to be as widely distributed as any wild tree in the Eastern Tropics.

In shape, the *Kenanga* presents the opposite to the soldierly Kapok (*Ceiba*) for its appearance is 'broken-backed'. Branches droop, leaves droop, flowers hang in loose bunches, and the petals are flaccid: though the trunk passes to the top of the tree, it is commonly bent so as to heighten the dilapidated aspect; and long leafy sprays may dangle for a length of 10, or even 20 feet. The flowering of both cultivated and wild trees is seasonal and, roughly, simultaneous after periods of dry weather: there is a regular flowering of several weeks at the beginning of the year at some time between February and May, the month depending on the part of the country, and often a second flowering between August and October. Saplings of cultivated trees flower when 1½ to 2 years old at a height of 7 feet, but it seems that the wild trees do not begin until thirty or forty feet high. Exactly how the flowers are pollinated we do not know but the oily fruits are taken by squirrels, bats, monkeys and, perhaps, pigeons by which means the seeds are distributed.

A dwarf-variety of *Kenanga* is often seen in Chinese gardens. It is a bush, 3-5 feet high, with very curly petals which are frequently supernumerary. It flowers throughout the year but never sets fruits. It has, apparently, been introduced from Siam.

In Singapore there are old *Kenanga*-trees planted by Bukit Timah Road between Newton circus and Cluny Road.

DREPANANTHUS

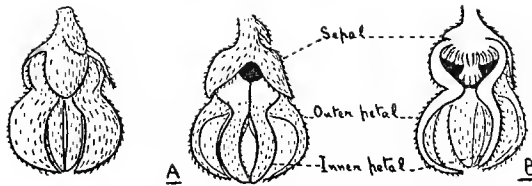
(Gr., drepane—a sickle, anthos—flower: *i.e.* the curved petals)

Like *Canangium* but the petals curved in near the base to form a cover over the stamens: flowers cream-yellow, sweetly fragrant.

About 8 spp., from Sumatra to New Guinea: 4 spp. in Malaya, in lowland forest.

Key to the Species

Tall trees with large, stiff leaves 8-17 × 4-9", the stalks ¼-1" long, stout: flowers in bunches mostly on the branches behind the leaves	
Outer petals not much longer than the sepals, if at all, ¾-1" long	... .. <i>D. pruniferus</i>
Outer petals much longer than the sepals, narrow and strap-like	... .. <i>D. ramuliflorus</i>
Small tree with thin leaves 5-10 × 2-4½", the stalks 2-3" long: flowers on the leafy twigs or just behind	... .. <i>D. phangensis</i>



Text-Fig. 33 *Drepananthus pahangensis*,
nat. size: A, with one outer petal removed:
B, in section.

D. pahangensis Text-Fig: 33

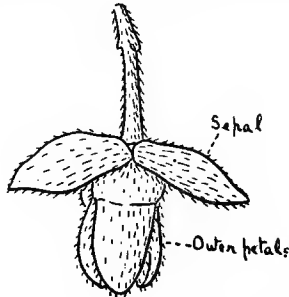
Antoi

A shrub or small tree to 30 ft. high, with pale grey bark: twigs slender, velvety: undersides of leaves more or less velvety, at least on the veins and the stalk.

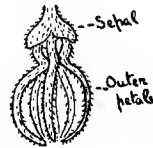
Leaves oblong-elliptic, broadest near the apex, tipped, not leathery, with 11-15 pairs of strong side-veins, more or less heart-shaped at the base.

Flowers singly or 2-3 together, $\frac{3}{4}$ " long and wide.

Malaya: only on the east side of the country from Kota Tinggi to Kemaman.



Text-Fig. 34. *Drepananthus pruniferus*,
nat. size.



Text-Fig. 35.
Drepananthus ramuliflorus, nat.
size.

D. pruniferus Text-Fig. 34
(from the plum-like fruits)

Antoi

A strictly monopodial tree to 70 ft. high with stiffly spreading branches drooping at the ends: twigs stout: twigs and undersides of leaves more or less velvety, at least when young.

Leaf-blade very large, stiff and leathery, often glaucous beneath, shaped as in *D. pahangensis*, strongly ribbed with 14-18 pairs of side-veins.

Fruit 1-1 $\frac{1}{4}$ " long, egg-shaped, 3-9 in a bunch.

Malaya: common in lowland forest.

This is a common forest tree easily recognised from the large leaves set alternately on stiff, sparingly branched limbs, and from the pole-like trunks. It seldom flowers. The tough bark was formerly used for string.

D. ramuliflorus Text-Fig. 35
(flowering on the small branches)

Antoi

Very like the preceding but with curiously narrow petals and small sepals.
Malaya, Sumatra: less common than the preceding.

GONIOTHALAMUS

(Gr. gonia—angle : thalamus—the base of the flower)

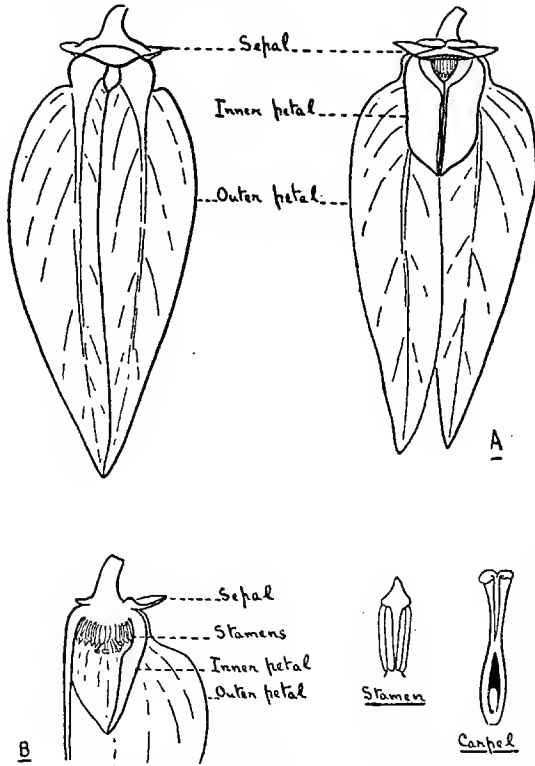
Like Canangium and Polyalthia but the inner three petals much shorter than the outer three and joined to form a 3-sided pyramid covering the stamens : the flowers scarcely opening : fruits with 1-3 seeds.

S. E. Asia to New Guinea : about 15 spp. in Malaya, lowlands and mountains.

This genus greatly resembles Polyalthia but the short inner petals and seemingly closed flowers distinguish it. The species are not so numerous nor so common as those of Polyalthia.

G. tapis Text-Fig. 36
(a Malay plant-name)

Kenerak, Kenarak (Kelantan)



A small tree, reaching 30 ft. high, with narrowly conical, uneven crown and ascending branches with short twigs : bark grey, smooth.

Leaf-blade 5-10 × 2½-4½", oblong, generally widest near the apex, shortly and often bluntly tipped, thinly or rather thickly leathery with very faint veins, dull yellowish green, drooping : stalk 1-4" long.

Flowers about 2" long (when full-grown), solitary on the leafy twigs, hanging from a short stalk ¼" long, fragrant : stalk and calyx green flushed crimson : outer petals large, leafy, cream white or pale pinkish.

Fruits about ½" long, ellipsoid or rounded, shortly stalked, ripening red then purple and finally black : generally 1-seeded : rather many in a tight bunch.

Sumatra, Borneo : rather common in Malaya forest, also grown in the villages of Upper Perak, Kedah, Kelantan and Trengganu.

Text-Fig. 36. *Goniotalamus tapis*: flowers nat. size : stamen and carpel × 10 : A, with an outer petal removed : B, in section.

This species is common in the neighbourhood of Kota Bahru. Its fragrant flowers are sold in the market like those of the *Kenanga*.

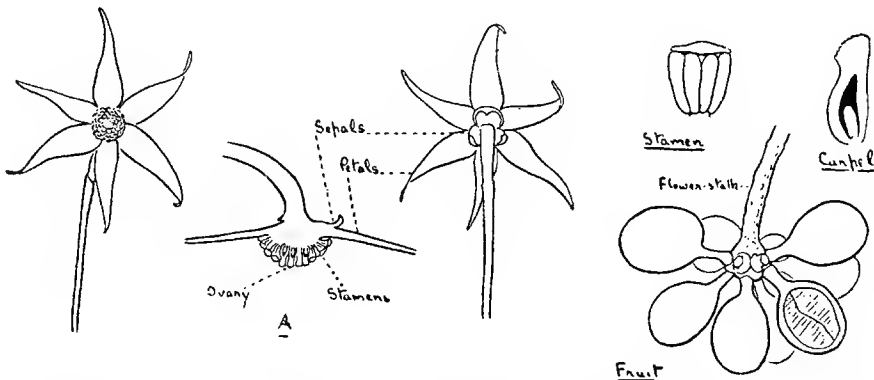
POLYALTHIA

(Gr., *polus*—much, *althein*—to heal : much used in native medicine)

Like *Canangium* but the fruits one-seeded : the flowers white, yellow, orange, pink, red or purple, generally in bunches on the trunk or branches.

About 60 spp., mostly tropical Asia, a few in tropical Africa and Australia : about 40 spp. in Malaya, lowlands and mountains.

This is the most abundant genus of Annonaceous trees in our Malayan forests. They are generally rather small, seldom exceeding 60 ft. in height, and a few are really shrubs. Several are so common that one cannot go far in the forest without meeting with them. They can be recognised from the tufts of brightly coloured *Kenanga*-like flowers on the trunks or branches, for very few have their flowers on the leafy twigs. The fruits, also are conspicuous, like bunches of *Kenanga*-fruits but turning yellow, pink, red, brown or purple, and often striped, before they ripen black : some kinds have as many as a hundred fruits in one bunch. One species, *P. hypogæa*, which grows in Perak, Pahang and Trengganu, is most remarkable because it flowers like the Earth-figs (p. 665) on underground runners which arise from the base of the trunk and may reach a length of eight feet : it is one of the largest trees of the genus. The only species in cultivation is the following.



Text-Fig. 37. *Polyalthia longifolia*: flowers nat. size, the section $\times 2$: fruit $\times \frac{1}{2}$: stamen and carpel $\times 10$: A, in section.

P. longifolia Plate 18, Text-Fig. 37
(from the long, narrow leaf)

Cemetery Tree
Mempisang

A rather small, stocky tree, up to 50 ft. high, *shaped like the Mangosteen* but with less dense crown : bark dark grey, becoming cracked : twigs very dark.

Leaf-blade 4-9 \times 7-15", long, very narrow, lanceolate, tapered gradually to the point, broadest near the base, thinly leathery, with many faint veins, dark glossy green, yellowish underneath, the sides upcurled, the edges crisped and wavy, pointing down the tip often curled round : the stalk 1-3" long.

Flowers 1½-1¾" wide, greenish white, without scent, like 6-rayed stars, arranged in bunches, 2-3" wide on the twigs behind the leaves: flower-stalks, ¾-1¼" long.

Fruits ¾" long, ¼-¾" wide, on short stalks, ellipsoid, smooth, shiny, ripening yellowish then reddish and finally black: 5-13 in a bunch from each flower.

Native of Peninsular India and Ceylon: planted in Penang, Kuala Lumpur and a few other towns in Malaya.

In Penang, this tree is found in many gardens and by the roadsides, but it is most conspicuous in the Christian Cemetery. The very narrow leaf with crisped edge will always distinguish it. Concerning its habits of flowering and leafing, we know nothing. It is a gloomy tree with white ghostly flowers and wavy long leaves like Death's fingers. Bats eat the fruits.

XYLOPIA

(Gr., xulon—wood, pikros—bitter)

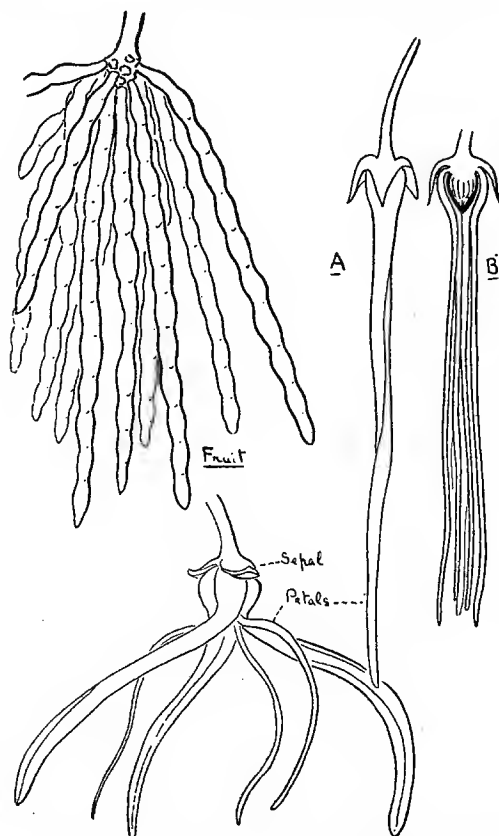
Like Canangium but the petals narrow, pressed tightly together, then spreading, the inner three narrow and strap-like: fruits commonly constricted between the seeds like a string of beads.

About 100 spp., throughout the tropics: about 16 spp. in Malaya, lowland forest.

X. ferruginea Text-Fig. 38

(Lat., ferrugo—iron-rust, from the rusty coloured hairs)

Stilted Antoi
Antoi Jangkang



Text-Fig. 38. *Xylopiá ferruginea*: flowers nat. size: fruit $\times \frac{1}{2}$: A, flower-bud: B, in section.

A medium sized tree, reaching 80 ft. in the forest, the trunk with few to many still-roots issuing at heights up to 3 ft. from the ground: the branches rather drooping: bark warm brown or orange-brown, not scaly: wood soft, white: twigs red-brown, having on the upperside a ridge from each leaf: the buds and young twigs rusty brown hairy.

Leaf-blade 3-9 \times 1-3 $\frac{1}{4}$ "", oblong elliptic rather narrow, tapered, blue-glaucous beneath: stalks 1-3" long.

Flowers 2-3" long, narrow, singly or in clusters of 2-4 hanging from the leafy twigs, very fragrant (of bananas and eau-de-cologne): petals yellow, slightly twisted: stamens reddish on the top.

Fruits 3-5" long, $\frac{1}{4}$ - $\frac{1}{3}$ " wide, as many as 18 in a bunch, bean-like but constricted between the 5-13 seeds, hanging, (red?).

Malaya Sumatra, Borneo: common in lowland forest and belukar in Malaya.

The name *Jangkang* indicates the stilt-roots. See also the Stilted *Simpoh* (*Dillenia*, p. 203).

The rich brown bark, the stilt-roots, the soft white wood and the glaucous undersides of the leaves will distinguish this from any other Malayan tree. The flowers open at dusk and last on the tree for two or more nights.

PERIWINKLE FAMILY

Apocynaceæ

(from the genus *Apocynum*)

With white latex, at least in the green parts.

Leaves simple, opposite, whorled or in close spirals, never alternate: stipules none.

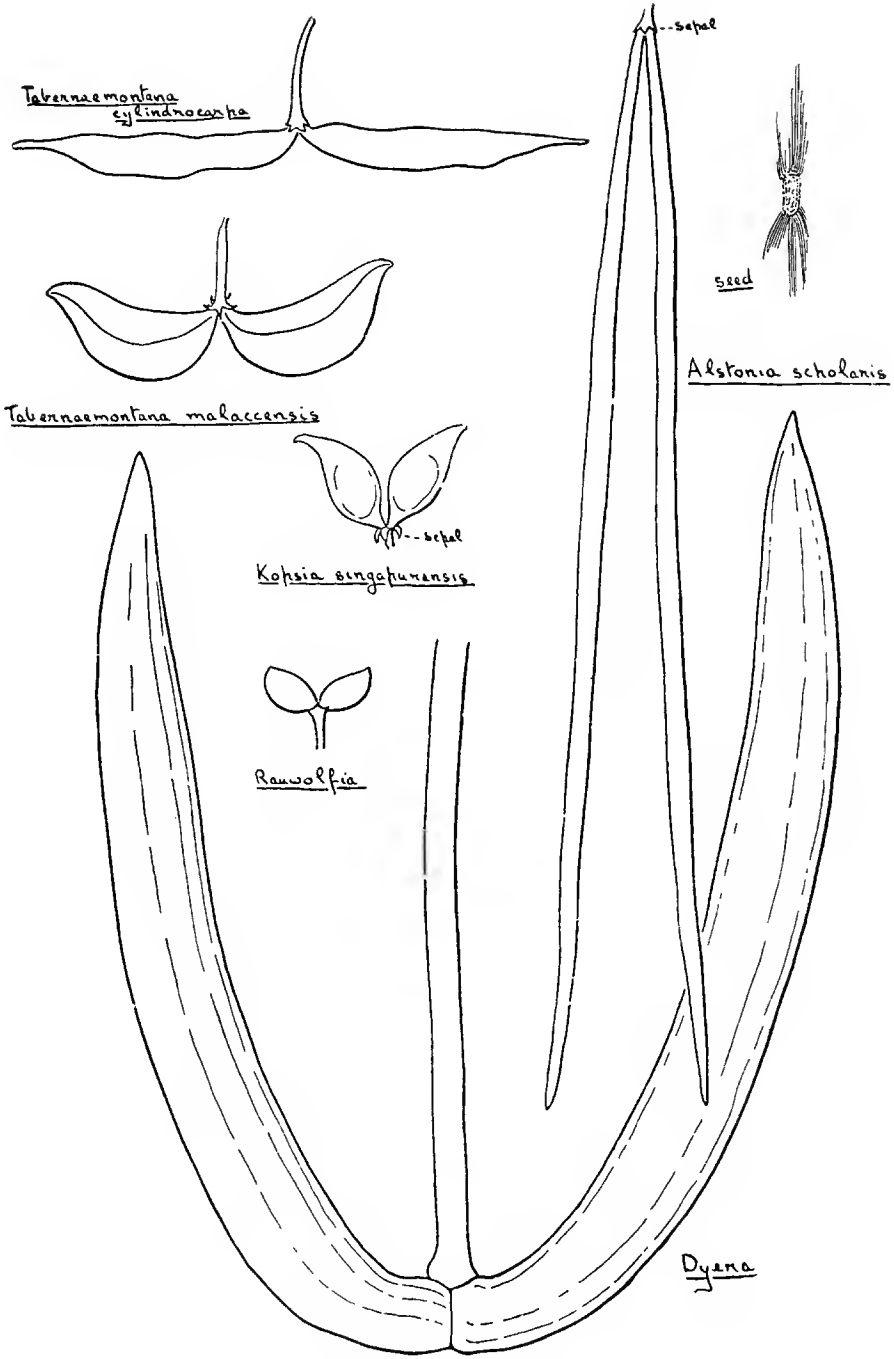
Flowers small to large, generally showy, radially symmetrical: sepals 5, rather small: corolla funnel-shaped with a short or long tube and 5 spreading petals twisted in the bud, more or less curved and overlapping in the same direction in the open flower: stamens 5, hidden in the corolla-tube: ovary superior, composed of two separate narrow parts (carpels) joined at the top by the single style: style slender, split near the base and with a knob-like stigma blocking the corolla-tube at the level of the anthers.

Fruit typically a pair of pods from each flower, the pods joined at the base, long and narrow or short and thick, dry or fleshy, often divergent: seeds various, plumed or pulpy.

120 genera, 1,500 spp., mainly tropical and subtropical, throughout the world: 32 genera, 120 spp., in Malaya, lowlands and mountains, and several introduced species.

The latex, the leaf-arrangement, the curved and overlapping petals of the trumpet- or funnel-shaped flower, which is like a five-bladed propellor, and the twinned pods distinguish the family. It contains many climbing plants but few trees or shrubs. The largest tree of the family is the forest *Jelutong* (*Dyera*), whose massive trunk and lofty crown few other Malayan trees can surpass. The commonest are the *Pulai*-trees (*Alstonia*), abundant by waysides and in secondary jungle throughout the country and rendered conspicuous by their formal shape. The family is better known, however, through such cultivated plants as the *Periwinkle* or *Kemunting China* (*Lochnera*), *Oleander* (*Nerium*), *Yellow Oleander* (*Thevetia*), *Kopsia*, *East Indian Rosebay* (*Tabernæmontana*), *Frangipanni* (*Plumeria*) *Allamanda*, *Strophanthus* and *Odontadenia* (= *Dipladenia*). Many of these, as *Nerium*, *Thevetia*, *Plumeria*, *Alstonia* and *Strophanthus*, contain in their latex virulent poisons, descriptions of which will be found in BURKILL'S Dictionary: the caution must be given that plants with latex should be handled carefully to avoid splashing the latex on the face or getting it into cuts on the hands. Latex, of course, is more often harmless than poisonous, as in the *Rubber-tree* and *Bread-fruit tree*, but poisonous trees like the *Buta Buta* (*Excoecaria*) and *Yellow Oleander* (*Thevetia*) are common.

The terminal buds on the twigs of many plants of this family are sunken or hidden, like those of the *Mangosteens* (*Garcinia*), between the bases of the leaf-stalks of the terminal set of leaves, e.g. in *Kopsia*, *Tabernæmontana* and *Alstonia*. To see the buds, therefore, while they are dormant, the terminal leaf-stalks must be pressed apart. In several cases it will be seen that the base of the leaf-stalk has a small flange or peg on the upperside which makes with its neighbours a canopy over the bud: and after the bud has extended, this flange gives the leaf-stalk the appearance of clasping the twig.



Text-Fig. 39. Fruits of the Periwinkle-family (Apocynaceæ), $\times \frac{1}{2}$: seed of *Alstonia*, nat. size.

Key to the Genera

- Leaves spirally arranged, clustered at the ends of the twigs
- Sea-shore, mangrove, and riverside trees: fruit large, round, seldom twinned *Cerbera* p. 143
- Small trees of cultivation
- Leaves very narrow: flowers yellow, faintly fragrant *Thevetia* p. 152
- Leaves broad: branches stout flowers very fragrant *Plumeria* p. 147
- Leaves in whorls of 3-8
- Sea-shore tree: leaves in whorls of 3: fruit short, massive *Ochrosia* p. 147
- Inland trees or shrubs
- Trees
- Vast tree: no buttresses: crown conical or round, spreading: leaves in whorls of 6-8: pods massive, upturned: *Jelutong* *Dyera* p. 144
- Crown narrow, generally pagoda-like: if big trees, then buttressed or fluted: if small, then without buttresses but the leaves in whorls of 3-4: pods hanging, slender: *pulai* *Alstonia* p. 140
- Shrubs
- Flowers $1\frac{1}{2}$ " wide or more: leaves narrow: gardens *Nerium* p. 146
- Flowers $\frac{1}{3}$ " wide: leaves broad: wild or in villages *Rauwolfia* p. 148
- Leaves in pairs, opposite
- Sea-shore tree: fruits short, massive *Ochrosia* p. 147
- Not so
- Pods orange, thick, fleshy: seeds coated with red pulp: flowers white with a yellow eye or wholly yellowish or double: base of leaf-stalk clasping the stem *Tabernæmontana* p. 148
- Not so
- Flowers white or pink with red eye: corolla-tube 1" or more long: leaves broad, tipped *Kopsia* p. 145
- Flowers white without an eye: leaves rather blunt
- Bush with narrow upward pointing leaves $\frac{1}{2}$ - $1\frac{3}{4}$ " wide: Kedah, Perlis *Holarrhena* p. 145
- Tree with broader leaves withering red: fruit as blue-black berries *Kopsia flavida* p. 145

PULAI TREES

ALSTONIA

(C. Alston, 1685-1760, the Scottish botanist)

Pagoda-trees with Terminalia-branching: buds concealed between the bases of the leaf-stalks, often coated with white or yellow resin.

Leaves in whorls of 3-8, generally narrowly elliptic-obovate, shortly tipped and with very numerous side-veins.

Flowers small, white, very fragrant, in small, stalked, terminal clusters: corolla-tube short.

Fruit as a pair of long hanging cylindric pods, splitting open, containing many small, narrowly oblong, flat seeds with a tuft of silky hairs at each end.

About 30 spp., trop. Africa, Asia, Australia and Polynesia: 6 spp. in Malaya.

To this genus belong three kinds of large tree known as *Pulai*, namely *A. angustiloba*, *A. scholaris* and *A. spathulata*, and also three kinds of small tree which are seldom recognised by Malays and which have no distinctive vernacular names. The whorled leaves and white latex distinguish them from all other Malayan trees except the *Jelutong* (*Dyera*), which is not a pagoda-tree, and the sea-shore *Ochrosia* which has different fruits and is very local in distribution. Often the long dangling pods are a sufficient mark of an *Alstonia*.

Pulai-trees are recognisable on the landscape from their pagoda-habit which we have described in the introduction (p. 32, Text-Fig. 15). The trunks are stiffly upright, the main branches strictly whorled and horizontal; the twigs are arranged by the mechanism of Terminalia-branching to form a close leafy layer along the upperside of the branches: and even the leaves have an upward pitch, adding to the formality of the tree. When in vigorous growth, as many as five tiers of foliage can be distinguished but, at length, with age or with impoverishment, the lower tiers die off and a comparatively small leafy head, indistinctly layered, tops the big trunk. Village trees are frequently coppiced and, as several stems may spring from the stump, such a coppiced tree may not give the normal appearance because the tiers of branches interfere with each other. The other three species of small tree have essentially the same construction but they have fewer branches in a tier and fewer leaves and twigs so that they do not look so typical.

Pulai-trees are quick-growing and deciduous. The leaves are shed from the whole crown or part of it at irregular intervals which have not been determined exactly or correlated with weather-conditions. They do not flower at every leaf-change, but only after markedly dry weather, once or twice a year.

The wood is remarkably soft, especially that of *Pulai Paya* or *Basong* (*A. spathulata*). The latex from the bark is used in native medicine: for its extraction the trunks are scored in herring-bone fashion like the *Jelutong*- and *Gutta Percha*-trees (*Dyera*, *Palaquium*).

Alstonia and *Terminalia* must not be confused, though they are similar in habit. *Terminalia* has spirally arranged leaves and no latex, and the crowns of *Terminalia*-trees are generally much fuller and more spreading than the rather narrow, almost cylindric crowns of *Alstonia*.

An introduced shrub, that is coming into cultivation, is *A. venenata*: its leaves wither red.

Key to the Species

- Big trees, fluted or steeply and narrowly buttressed: *latex* in the trunk: *buds* not conspicuously resin-coated: *leaves* 4-8 in a whorl, narrowly elliptic to narrowly obovate, pale greenish white beneath, *withering greenish yellow to pale yellow, with many crowded side-veins at right angles to the midrib*
- Leaves small, 2-5 × 1-2", round or blunt at the apex: stalk short, indistinct, up to 1/3" long ... *A. spathulata*
- Leaves distinctly, though often bluntly, pointed: stalk 1/3-1 1/2" long, distinct
- Leaf-blade 2 1/2-5 1/2 × 1-2 1/2": side veins about .1" apart or less, without visible reticulations between them in the dried fallen leaves ... *A. angustiloba*
- Leaf-blade 3-9 × 1-3": side-veins .1-.25" apart, with distinct reticulations between them in the fallen dried leaves *A. scholaris*
- Small or slender trees, the trunk cylindrical from the base: *latex* only in the leafy shoots and inflorescences: *buds* conspicuously or thinly coated with resin: *leaves* 3-4 in a whorl, with many well-spaced side-veins making an acute angle with the midrib, not greenish white beneath
- Leaves generally 4 in a whorl, large, 5-14 × 1 1/2-4", light shiny yellowish green, *withering pale clear yellow*: buds with pale cream resin: north Malaya ... *A. macrophylla*
- Leaves generally 3 in a whorl
- Leaves large and broad, 3 1/2- × 2-3 3/4", dark shiny green, *withering dull orange brown*: buds coated with bright yellow resin: Penang, mountains of the main range *A. latifolia*
- Leaves small, narrow, 2 1/2-6 × 3/4-2", *withering light reddish brown to dull scarlet*: buds thinly coated with transparent resin: south Malaya ... *A. angustifolia*

A. angustifoliaRed-leafed *Pulai*

(Lat., angustus-narrow, folium-leaf)

A slender tree 15-70 ft. high, with greyish yellow to greyish brown bark becoming shallowly fissured in old trees: crown rather conical.

Leaf-blade narrowly elliptic-obovate, rather long-tipped, with 11-16 pairs of side-veins.

Flowers .15" wide, very small, in hairy clusters 1 1/2-2 1/2" long: corolla-tube .15" long, hairy outside.

Pods 20-28 × 1/4": seeds finely hairy, pointed at one end.

Sumatra, Malaya, Borneo: common in the south of Malaya, not known north of Selangor.

This little tree bears a superficial resemblance to a sapling *Tembusu* (*Fagraea fragrans*) although it is easily distinguishable by the latex, leaf-arrangement, fruit and bark: yet the easiest way to distinguish them at a glance is from the colour of the withering leaves which turn red in this species and yellow in the *Tembusu*.

A. angustilobaCommon *Pulai*

(Lat., angustus—narrow, lobus—lobe)

A tall tree up to 120 ft. high: bark dark grey, smooth or becoming cracked.

Leaf-stalk $\frac{1}{2}$ –2" long.Flowers $\frac{1}{2}$ " wide, in stalked clusters, 2–4" long, in groups of 3–8 at the ends of the twigs, white: corolla-tube $\frac{1}{4}$ " long, glabrous outside.Pods 8–12 × $\frac{1}{4}$ ", finely hairy: seeds with the body $\frac{1}{4}$ " long, smooth.

W. Malaysia: common in open country in the lowlands of Malaya.

This is the commonest *Pulai*-tree in Malaya.**A. latifolia**Penang *Pulai*

(Lat., latus—broad, folium—leaf)

*Setinggi*Like *A. macrophylla* in appearance, but *A. angustifolia* in flower and fruit.

Leaf-blade with 14–18 pairs of side-veins, broadly elliptic-obovate, slightly tipped.

Flowers $\frac{1}{4}$ " wide.

Borneo, Malaya: common on Penang Hill and the mountains of the main range.

A. macrophyllaBroad-leafed *Pulai*

(Gr., makros—long, phyllon—leaf)

Itai Setapoh, Tujok Setapoh, Setinggi, Tinjau Belukar

A small, rather sparingly branched tree to 50 ft. high, with pale grey, smooth bark.

Leaf-blade narrowly elliptic-obovate, shortly tipped, glabrous or hairy, with 20–26 pairs of side-veins: stalks $\frac{1}{2}$ –1 $\frac{1}{2}$ " long.Flowers $\frac{3}{4}$ –4" wide in clusters 2–3 $\frac{1}{2}$ " long, faintly fragrant: corolla-tube $\frac{1}{2}$ " long, glabrous outside.

Pods 12–20" long.

Malaya, Borneo, Philippine IIs., New Guinea: known only in the north of Malaya in Penang, Kedah, Kelantan and Trengganu, and there common in secondary jungle.

This species often gives the appearance of a spindly pagoda-tree. Twigs that have flowered and fruited shed their leaves and wither off completely.

A. scholaris

Plates 142, 221, Text-Fig. 39

Indian *Pulai*

(Lat., belonging to a school)

As *A. angustiloba* but:—flowers greenish yellow, very fragrant (somewhat of burnt sugar), in clusters 3–5" wide: corolla-tube $\frac{1}{3}$ " long, finely hairy outside: pods 1–2 ft. long: seeds minutely pimply on one side.

Ceylon, India, Malaysia, trop, Australia: common in the northern half of Malaya, apparently not known south of Segamat.

The wood of this *Pulai* was used for making slates for schools: the writing was cleaned off by rubbing the wood with the harsh leaves of the climber *Mempelas* (Delima, of the *Simpoh*-family, Dilleniaceæ), or the wood was coated with pipe-clay on which the writing was made with a pen of Arenga-wood (the *Kabong* palm). Hence the specific name *scholaris*.**A. spathulata**

Plate 19

Marsh *Pulai*

(Lat., like a spathula)

*Pulai Paya, Basong*Like *A. angustiloba*, but:—

Trunk rather deeply fluted-buttressed: bark pale grey to greyish buff: leaves 4–6 in a whorl.

Leaf-blade often notched at the apex, dull dark green above, yellowish beneath, the side-veins $\frac{1}{2}$ –2" apart: stalk narrowly winged almost to the base.Flowers $\frac{1}{2}$ – $\frac{3}{4}$ " wide, rather large.

Pods 6–8" long, glabrous.

W. Malaysia: in lowland swampy forest, common, especially in old tin-mining districts.

This *Pulai* commonly grows on swampy, deserted mining land where it is generally a small tree reaching no more than 40 ft. high and flowering at 10–15 ft.

In the forest it will reach well over 100 ft. It has exceptionally light wood, particularly in the roots, and this has been put to various uses such as the making of pith-helmets, as setting-boards for insects and as floats for nets.

In Singapore there were two big trees near the junction of Paterson and Grange Roads and another at the junction of Bukit Berlayer and Keppel Harbour Roads.

CERBERA

(Gr., Cerberos—the hell-hound)

Leaves spirally arranged.

Flowers funnel-shaped, rather large, white, in long-stalked, sparingly branched clusters: sepals rather large.

Fruit large, round or oblong, solitary or occasionally paired, thinly pulpy, with a large thick, fibrous, woody stone.

5 spp., tropical shores and tidal rivers of the Indian and West Pacific Oceans: 2 spp. in Malaya.

The two Malayan species are well-known riverside and sea-shore plants to which the names *Pong Pong* and *Buta Buta* are given. Tales are told of their poisonous latex, blinding if it enters the eyes, but, as BURKILL explains, they are false or exaggerated and have arisen from a confusion with the truly poisonous Euphorbiaceous tree *Excoecaria*, to which the name *Buta Buta* should by right be restricted. Only the seeds of *Cerbera* are poisonous. The bark, leaves and oil extracted from the seeds are used in native medicine. The fruits are like rosy apples but they are not edible: they float in the sea or in rivers, being distributed by currents, and they are commonly washed up on the shore with only the fibrous husk left round the hard stone.

The two species are sometimes treated as one but this is incorrect for they are easily distinguished by the shape and colour of the flower, the structure of the seeds and the situations in which they grow. They are evergreen and appear to flower and fruit throughout the year. The flowers of the Yellow-Eyed species (*C. odollam*) open between 9.30 and 10 A.M. (summer-time) and last for a little more than 24 hours: the eye of the flower turns grey as it ages. It is rather unexpected to find white flowers with such sweet fragrance opening in broad daylight for they are generally nocturnal and pollinated by moths.

Key to the Species

Flowers with yellow eye: corolla-tube $\frac{1}{2}$ – $\frac{3}{4}$ " long: fruit round: tidal river-banks	<i>C. odollam</i>
Flowers with red eye: corolla-tube 1–1 $\frac{1}{2}$ " long: fruit oblong: sandy and rocky sea-shores	<i>C. manghas</i>

C. manghas

(Portuguese name for the mango)

Pink-Eyed Cerbera
Pong Pong, Buta Buta, Nyan (Kel.)

Like the following species but:—

Leaves generally smaller, very glossy.

Flowers 1–2" wide, the tube 1–1 $\frac{1}{2}$ " long, slightly swollen at the top by the stamens: the eye at first orange-pink then reddish pink.

Fruit often paired, 2–2 $\frac{3}{4}$ × 1 $\frac{3}{4}$ ".

Malaysia generally: common on all rocky and sandy sea-coasts and on the sandy heaths of coastal villages.

APOCYNACEÆ

C. odollam Plate 20
(an Indian plant-name)

Yellow-Eyed Cerbera
Pong Pong, Buta Buta

A rather bushy tree up to 40 ft. high, with greyish white pustular bark and rather narrow crown.

Leaf-blade 4-12 × 1½-3", narrowly obovate-elliptic, more or less tipped, *dark glossy green*, with many veins, *withering orange brown*: stalk ½-2" long.

Flowers 2-3" wide, fragrant, the corolla-tube ½-¾" long and swollen in the middle by the stamens: sepals ½" long.

Fruit 2-4" thick, round, green then pink, rosy purple and, finally, blackish, *solitary*.

India, Malay Peninsula, Sumatra: common in mangrove swamps and on the muddy banks of tidal rivers far inland.

JELUTONG TREES

DYERA

(Sir W. T. Thiselton-Dyer, 1843-1928, the English botanist)

Like *Alstonia* with the rather broad leaves in whorls of 5-8, and with tiny white flowers, but the pods woody, massive, curved almost vertically upward like a pair of horns, and the seeds rather large, flat and winged.

2-3 spp., Malaya, Sumatra, Borneo: 1 sp. in Malaya.

D. costulata Text-Fig. 39
(Lat., full of small ribs)

Jelutong

The *Jelutong* is described and illustrated by FOXWORTHY and there is an excellent account of the sylviculture and tapping of the trees and of the uses of the latex in BURKILL'S Dictionary. Although it is common in the lowland forest it is seldom found in the open or by roadsides. Big trees occur in Singapore in the Botanical Gardens and in the neighbourhood of MacRitchie Reservoir. Where one can look down on the forest, the *Jelutong*-trees may often be recognised from their huge, lofty crowns, commonly raised above the rest of the canopy. The crown is very unlike that of the *Pulai*-trees (*Alstonia*) being dense, dome-like and composed of many strong ascending limbs each of which ends in a conical head of foliage like a minaret, and the individual leaves can generally be seen because of their size. At close quarters, the vast trunk, without any buttresses, with dark grey bark, black on rainy days, irregularly dippled with small flakes, and frequently scored herring-bone fashion for the extraction of the latex, serve to distinguish it.

The *Jelutong* is deciduous partly or wholly. After a short spell of dry weather only a few branches may change their leaves but after a longer spell the whole crown is affected at once and remains bare for a day or two before the new leaves begin to develop all over it at once. Such a general leaf-change often occurs about June, July, or August in Singapore, and it always excites our wonder that so vast a tree can work in unison in all its parts. The flowers are nocturnal, opening between 5 and 7 p.m., and the white corollas fall off about the same hour in the morning. The flowering lasts about 10 days, during which time the ground beneath the trees is whitened with fallen blossom for a brief while every day, but the blossom soon turns brown. The fruits ripen in 2-3 months. Generally all the trees of a district change their leaves and flower simultaneously.

HOLARRHENA

(Gr., holos—whole, arrhenos—manly)

Leaves opposite, not clasping the stem.*Flower white, without a darker eye*: stamens attached near the base of the corolla-tube: style very short.

Fruit as a pair of long erect pods with many flattened seeds each with a tuft of long silky hairs at the top.

About 8 spp., trop. Africa and Asia: 2 spp. in the extreme north of Malaya.

H. Curtisii

Kedah Bush

(C. Curtis, 1853–1928, first curator of the Waterfall Gardens, Penang)

A *shrub* to 10 ft. high, the twigs and undersides of the leaves glabrous or, more usually, finely hairy.*Leaf-blade* $2\frac{1}{2}$ –5 × $\frac{1}{2}$ – $\frac{3}{4}$ " , elliptic-obovate, narrowed to a blunt or shortly pointed apex, tapered to the base, *pointing upward*, with 8–16 pairs of side-veins: *stalk* 1–2" long, *very short*.Flowers $\frac{3}{4}$ –1 $\frac{1}{2}$ " wide, not fragrant, in stalked terminal loose or dense clusters 3–4" long and 2–3" wide, finely hairy: corolla-tube $\frac{1}{2}$ – $\frac{3}{4}$ " long, finely hairy.Pods 8–10" long, $\frac{1}{2}$ " wide, glabrous: hair-tuft on the seeds 1 $\frac{1}{2}$ –2" long.

Siam, Kedah, Perlis; common in open country.

The flowers vary much in size: they seem to enlarge after opening. It is possible that there are fragrant varieties.

KOPSIA

(J. Kops, 1765–1849, a Dutch botanist)

Leaves opposite: terminal buds hidden by the bases of the leaf-stalks.*Flowers rather large, white or pink*, in terminal clusters: corolla-tube long, with the stamens attached near the top.

Fruit as a pair of short flattened pods each with one seed, occasionally two, and opening by a slit along the inner edge, or the pods like one-seeded berries and not opening.

About 12 spp., S.E. Asia: 7 spp. in Malaya, in lowland forest.

Key to the Species

Corolla white with crimson eye: bush or small tree:	
wild	... .. <i>K. singapurensis</i>
Corolla pink with crimson eye, fading white: garden	
bush	... .. <i>K. fruticosa</i>
Corolla white without an eye: fruit as a berry: tree of	
cultivation	... .. <i>K. flavida</i>

K. flavida

Penang Sloe

(Lat., yellow)

An *evergreen tree* to 40 ft. high with an irregularly *conical or rounded crown densely bushy from the ground*: the lower branches drooping: *bark* pale greyish buff, not scaly or fissured: *old leaves blood-red*: *latex copious in all the green parts*, absent from the branches and trunk.*Leaf-blade* 4–8 × 1 $\frac{1}{2}$ –2 $\frac{1}{2}$ " , elliptic, tapered to the blunt apex, the sides upcurled and rather wavy, thinly leathery, with 11–17 pairs of side-veins: *stalk* $\frac{1}{2}$ " long.Flowers 1 $\frac{1}{2}$ –2" wide, in short, dense clusters on stalks $\frac{1}{2}$ –1" long: corolla-tube 1–1 $\frac{1}{4}$ " long.*Fruit* 1 × $\frac{3}{8}$ " , *oblong with round end, pulpy, black with a blue-grey bloom*, generally solitary, occasionally paired and then the two berries widely divergent.

Java: introduced to Malaya.

At present this species is represented in Malaya by a single tree in the Waterfall Gardens in Penang and by a few saplings which have been raised

from it, but it grows so well and flowers so freely, the crown being whitened with blossom, that it will certainly become a popular tree in course of time. The name "Penang Sloe" is suggested because the fruit, so unlike the flat pods of the White Kopsia, resembles the sloe or wild plum, *Prunus spinosa*, of Europe. The botanical name *flavida* refers to the yellow colour of the leaves in dried specimens. The tree grows near mangrove-swamps in Java.

K. fruticosa Plate 21

Pink Kopsia

(Lat., shrubby)

A very twiggy, rounded, evergreen, garden bush, 3-10 ft. high.

Leaf-blade 4-9 × 1½-3½", elliptic, thin, with a distinct blunt tip up to ¼" long, rather yellowish green: stalk ¼-½" long.

Flowers 1½-2" wide, in sessile or shortly stalked, dense clusters: corolla-tube 1¼-1½" long.

Fruits 1-1¼" long, flattened, rather triangular in outline, finely hairy.

Burma: much cultivated in gardens and villages in Malaya.

The Pink Kopsia flowers throughout the year but seems never to fruit.

K. singaporensis Plate 21, Text-Fig. 39

White Kopsia

(from Singapore)

A small evergreen tree with conical crown, up to 25 ft. high: bark greyish buff to pale silvery brownish, becoming slightly flaky.

Leaves as in *K. fruticosa*, up to 4" wide, rather dark green.

Flowers 1-1½" or 2-3" wide, in rather loose clusters on stalks 1½-3" long.

Fruit 1½" long, ¾" wide, as in *K. fruticosa* but glabrous.

Malaya, from Negri Sembilan southward to Singapore, common in lowland swampy forest.

This tree is scarcely known in cultivation though it is a vigorous plant very attractive when covered with the white blossom. In the Johore forests there occurs a form with large flowers, 2-3" wide, which are as fine a wild blossom as can be expected. In the flowering season, which occurs at least twice a year, generally about February and October, many little trees may be seen by the road to Mersing, shining like white patches in the forest.

Several related species occur in our forests. They are mostly shrubs with a yellow eye to the flower. None has been brought into cultivation.

NERIUM

(an old name for the Oleander, from the Greek nerion—moist)

Evergreen shrubs with watery, colourless latex.

Leaves in whorls of 3, rarely 4, narrow, linear or lanceolate.

Flowers medium-size, in terminal stalked clusters: corolla with several hair-like processes or toothed crests at the mouth of the tube.

Fruit as a pair of cylindrical pods.

A few spp., Mediterranean region, northern and subtropical Asia.

N. indicum Plate 22

Scented Oleander

(from India)

Leaf-blade 3-6 × ½-¾", long, narrow, pointed, with many fine crowded side-veins: stalk very short and thick.

Flowers 1½" wide, rose-pink, very fragrant.

Persia to Japan: commonly cultivated in Malaya, not wild.

Varieties with white, pale pink or yellow flowers or with larger double flowers, 2-3" wide, occur. It is doubtful if the species is really different from the Mediterranean Oleander which has scentless flowers and which is said also to be grown in Malaya. Both species are poisonous.

OCHROSIA

(Gr., ochros—ochre-yellow)

*Leaves opposite or in whorls of 3.**Flowers small, white, in small but rather long-stalked clusters, 2-3 at the end of a twig: sepals minute.**Fruit like that of Cerbera but nearly always in divergent pairs.*

About 12 spp., Mascarene IIs., trop. Asia and Polynesia: 1 sp. in Malaya.

O. oppositifolia

Twin-Apple

(from the paired leaves)

An evergreen tree up to 50 ft. high, with pinkish grey, slightly fissured bark.

Leaf-blade 3-8 × 1¼-4", broadly elliptic-obovate, slightly tipped, leathery, *light green, withering yellow: stalk ½-1"*.*Flowers ½" wide, in clusters 2-3" wide: corolla-tube ¼" long.**Fruit 3 × 2", oblong, ripening yellow, with slightly upturned ends, several hanging in a bunch, mostly twinned.*

Mascarene IIs., trop. Asia: locally common on sandy and rocky sea-shores on the whole of the East coast and from Lumut northward on the West.

At first sight this tree may be mistaken for a *Cerbera* but the arrangement and shape of the leaves, the colour which they wither, the small flowers and the oblong twinned fruits easily distinguish it. The oblong fibrous husks are thrown up on the sea-shore but less commonly than those of the *Cerberas*.

PLUMERIA

(Charles Plumier, 1646-1706, a French botanist)

Buds thinly varnished with resin: *twigs very thick and fragile.**Leaves spirally arranged, in dense terminal rosettes, rather large, stalked.**Flowers large, very fragrant, in terminal or lateral stalked clusters: sepals minute: corolla funnel-shaped, waxy, with broad petals.**Fruit as a pair of cylindrical, recurved pods with many flat seeds shortly winged at one end.*

About 10 spp., trop. America: 3 spp. commonly planted in Malaya.

Key to the Species

Flowers pink to rose-red	...	...	...	<i>P. rubra</i>
Flowers white with yellow centre				
Flowers 1-2½" wide: leaves light dull green, pointed	...			<i>P. acuminata</i>
Flowers 3½-4" wide: leaves dark glossy green, blunt	...			<i>P. obtusa</i>

P. acuminata Plate 23 Common Frangipanni, Temple Tree,
(Lat., pointed) Temple Flower*Chempaka, C. Biru, Pokok Kubor, Bunga Kubor, Kamboja*

A small, much branched, evergreen or partly deciduous tree up to 20 ft. high, with greyish white bark.

Leaves elliptic, tapered gradually to the apex, glabrous: stalks often pinkish.

Inflorescence stalks 2-6" long: corolla with a broad yellow centre and a pinkish streak on the inside of each petal.

Pods 6-7 × ¾", green then black.

Native of Mexico, now planted throughout the tropics.

This is the common Frangipanni of gardens, villages, temples and grave yards. It flowers throughout the year but seldom fruits. It is so much branched that the branches are generally more obvious than the leaves. The origin of the Malay custom of planting a Frangipanni by a grave is uncertain but it may be derived from Hindu influence for the tree is sacred in India. Of all ornamental plants with large fragrant flowers the Frangipanni is the easiest to grow: a

branch stuck in the ground generally needs no further attention. The history and uses of the plant are described in BURKILL'S Dictionary (where it is called *P. acutifolia*). The latex is poisonous but not deadly except when taken in large quantity.

The Malay name *Chempaka* is also given to other plants with large fragrant flowers such as *Michelia* and *Gardenia*: botanically they are not related.

P. obtusa Plate 23
(Lat., blunt)

Great Frangipanni
Chempaka

Like the preceding but more robust and with knobby branches caused by small corky excrescences.

Leaves narrowly obovate, blunt at the end or with a small tip.

Inflorescence stalks 7-12" long: corolla wholly pure white except for the yellow centre.

Frequent in gardens, the leaves often blackened and disfigured by a sooty, harmless mould on the surface.

P. rubra
(Lat., red)

Red Frangipanni
Chempaka

This is a convenient name for the pink and red flowered varieties of which there are many differing in the size and shape of the leaves and the flower and in the intensity of its colour. It has yet to be discovered whether these varieties represent a species or a group of hybrids between other species.

RAUWOLFIA

(L. Rauwolf, 1540-1596, the Austrian botanist)

Leaves in whorls of 3.

Flowers small, slender, in long-stalked terminal and Ixora-like clusters.

Fruit a pair of short, oblong, pointed, thinly pulpy pods each with one seed, not splitting open.

About 50 spp., throughout the tropics, mostly American: 2 spp. in Malaya.

R. perakensis Text-Fig. 39
(from Perak)

Rice-weed
Beras, Beras Beras, Sepuleh, Chenam Bulan

A shrub 3-10 ft. high.

Leaf-blade 5-11 × 1½-3", elliptic, tipped, thin, tapered to the base: stalk ¼-½" long.

Flowers ¼" wide, ¾" long, *white with pink tube*, scentless, in long-stalked inflorescences 3-5" long, set 1-4 together at the ends of the twigs.

Pods ¾" long, ripening pink then reddish and finally purple-black with a grey bloom.

Malaya from Pahang northward: frequent in open places by villages, ricefields, rivers, sea-shores and in the mountains.

The very bitter root of this plant is variously used in native medicine. That of the closely allied Indian species, *R. serpentina*, is valued as a remedy for snake-bites, scorpion-stings and so on. The Malayan species may be only a variety of the Indian.

ROSEBAYS

TABERNÆMONTANA

(J. T. Mueller, or Tabernæmontanus, d. 1590, the German botanist)

Leaves opposite, those on the upperside of the inclined twigs smaller than those on the underside: the base of the stalk clasping the twig.

Flowers small to medium-size, white, often yellowish in the centre, faintly fragrant or not at all, arranged in terminal and axillary stalked clusters: *petals* occasionally 6, *rather blunt, more or less crisped on the edge.*

Pods short, thick, fleshy, twinned, yellow to orange-red, strongly divergent, often upcurved, generally hanging, splitting along the lower edge, opening out and disclosing the rows of seeds clad in scarlet pulp.

About 170 spp., throughout the tropics: 10 spp. in Malaya, mostly in the lowlands.

The extraordinary fruits, like the gaping red mouth of the *betel-eater*, distinguish this genus. They may suggest, at first, those of *Sterculia* but there can be little likelihood of confusion: *Sterculias* have black or brown seeds and no latex.

The species are poisonous, because they contain alkaloids like those of *Strophanthus*, and several are used in native medicine. The East Indian Rosebay (*T. divaricata*) is a common village plant found in every Malay garden and resembling in its double variety the White Gardenia, which has no latex. Two other species are cultivated, namely *T. capsicoides* and *T. pallida* (? *T. pandacaqui*). Some of the wild species have larger flowers in more beautiful clusters: and the genus should be recommended to the Malayan horticulturist.

Malay names for the species are *Jelutong Badak*, which is given to the large shrubs and trees in reference to the latex, and *Susun Kelapa*, *Susoh Ayam*, *Lada Lada* (*Melada* or *Lelada*) for the small shrubs. Sometimes these are called *Pokok Restong* or *Sakit Restong* because of the use of their leaves, roots or bark for the treatment of ulcers in village medicine.

(In BURKILL'S Dictionary the genus is called *Ervatamia*.)

Key to the Species

Small trees with a trunk		
Cultivated: leaves less than 2" wide	... ..	<i>T. capsicoides</i>
Wild: leaves mostly more than 2" wide		
Lowland: leaves tipped, thin, up to 6" wide	... ..	<i>T. corymbosa</i>
Mountain: leaves blunt, very stiff and leathery, up to 3½" wide	... ..	<i>T. polyneura</i>
Bushes without a trunk		
Flowers ½" wide or less, in long-stalked, loose clusters		
4-9" long: fruit ½-¾" long, twisted	... ..	<i>T. peduncularis</i>
Flowers and fruit larger: fruit not twisted		
Cultivated: gardens or villages		
Flowers 1-2¼" wide, often double	... ..	<i>T. divaricata</i>
Flowers ¾-1½" wide: leaves small	... ..	<i>T. capsicoides</i>
Wild: flowers ¾-1" wide		
Pods 1-2" long, thick, with 3 ridges: sepals tiny, very narrow	... ..	<i>T. malaccensis</i>
Pods 2-5" long, rather slender: sepals ¼-⅓" long, oblong, conspicuous	... ..	<i>T. cylindrocarpa</i>

T. capsicoides

Chilli Rosebay

(Gr., like *Capsicum* or chilli)

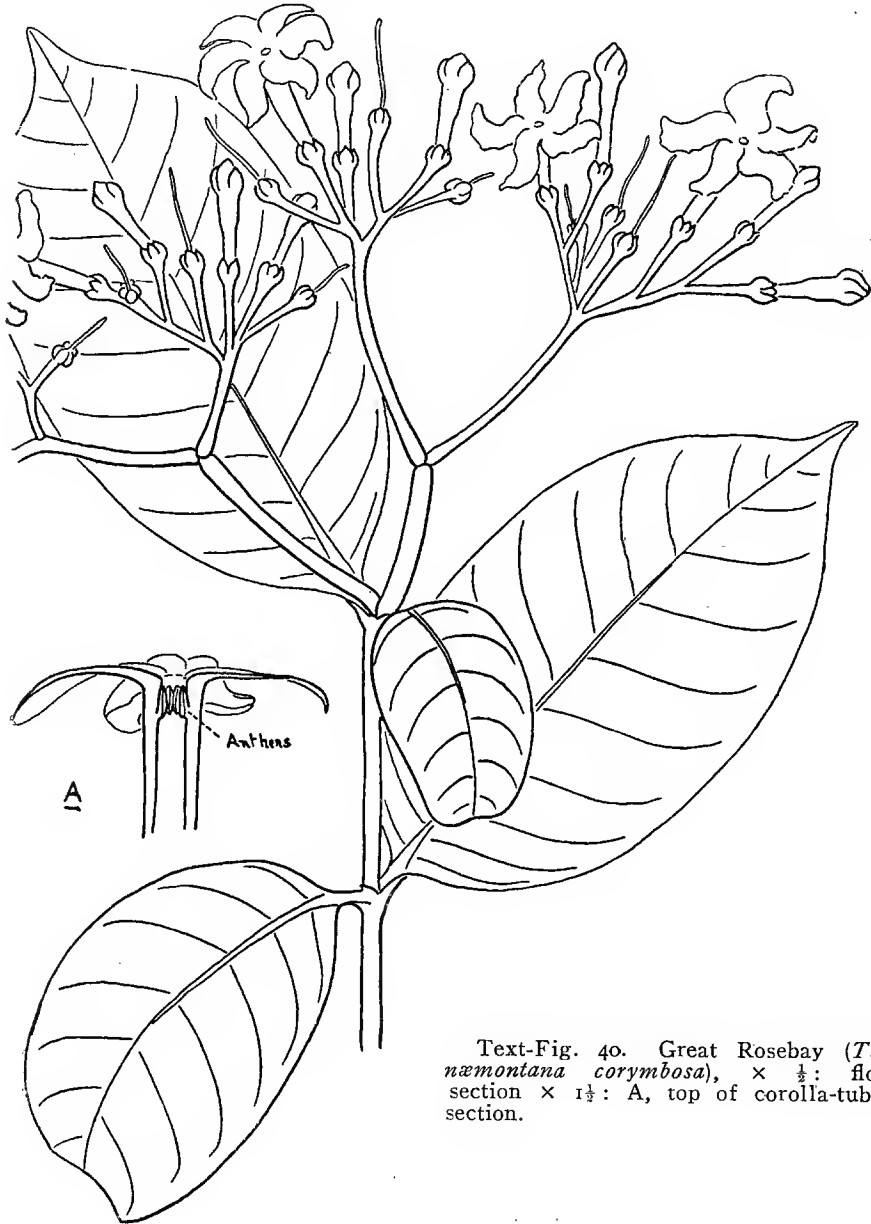
A shrub or small tree to 20 ft. high, very bushy and free-flowering.

Leaf-blade 1½-4 × ¾-1¼", small, with 9-14 pairs of side-veins.

Flowers 1-1½" wide, in rather dense clusters 3-5" wide, elongating 4" long with age: sepals minute: calyx turning ochre-yellow after flowering.

Molucca IIs.: in gardens and villages from Ipoh northward.

Rather similar to this species is another more tree-like one of cultivation which may be *T. pallida* or *T. pandacaqui*, which is grown in Manila. It has larger, lanceolate leaves (up to 7 × 2"), rather smaller flowers ($\frac{3}{4}$ -1" wide), arranged in the *flat* clusters normal in the genus, and its calyx does not turn yellow after flowering (though that of *T. pandacaqui* of Manila does turn yellow). Both species are pretty plants which deserve to become well-known in gardens.



Text-Fig. 40. Great Rosebay (*Tabernaemontana corymbosa*), $\times \frac{1}{2}$: flower-section $\times 1\frac{1}{2}$: A, top of corolla-tube in section.

T. corymbosa Text-Fig. 40 Great Rosebay
Jelutong Badak
(the flowers in corymbs)

An evergreen shrub or small tree to 40 ft. high, with grey, finely and closely ridged bark.

Leaf-blade 3-16 × 1¼-6", elliptic, thinly leathery, glabrous or hairy beneath, rather dark glossy green, with 10-18 pairs of side-veins: stalk ½-1" long.

Flowers ¾-1¼" wide, cream-white, waxy, in lax, long-stalked clusters 4-6" wide. at the end of the twigs: corolla-tube ¾" long.

Fruit 1½-2 × 1-1¼", thick, curved, shortly beaked at the end.

Malaya: frequent in lowland forest throughout the country.

The corollas fall off in the early morning so that this may be a night-flowering tree.

T. cylindrocarpa Text-Fig. 39 Pointed Rosebay
(with cylindrical fruit)

A slender shrub up to 8 ft. high, like *T. malaccensis* but:—

Corolla-tube ½" long.

Fruit much longer, straight or slightly curved, with a long pointed end, 2-several seeded.

Malaya: frequent in lowland and mountain forest and open country from Malacca northward.

T. divaricata Text-Fig. 39 East Indian Rosebay
(Lat., spread out) *Susun Kelapa, Susoh Ayam*

A shrub up to 8 ft. tall, like a Gardenia.

Leaf-blade 3-7 × 1½-3", elliptic, often rather broad, rather fleshy, with 6-10 pairs of side-veins.

Flowers in flat-topped clusters or solitary, often double: sepals small, rather broad.

Pods with 1-3 ridges.

Possibly native of India: common in Malayan gardens and villages.

T. malaccensis Text-Fig. 39 Malayan Rosebay
(from Malacca) *Lada Lada, Lelada, Susun Kelapa*

A small straggling shrub or treelet, 3-15 ft. high.

Leaf-blade 1½-6 × ½-2", elliptic or lanceolate, tipped, thin, with 6-10 pairs of side-veins: stalk ¼" long or less.

Flowers white with a yellow eye: corolla-tube ½-¾" long: sepals 1-2" long, pointed, very narrow.

Fruits 1-1½ × ¼-¾", curved, pointed, with 3 ridges, generally only one pair to each inflorescence, many-seeded.

Malaya: frequent in lowland forest throughout the country.

T. peduncularis Lesser Rosebay
(Lat., with a small stalk) *Lada Lada, Lelada, Susun Kelapa*

A shrub or treelet 4-15 ft. high.

Leaf-blade 3-9 × 1-3½", elliptic, thin, long-tipped, with 9-19 pairs of side-veins: stalk ¼-¾" long.

Flowers white, slender: corolla-tube ½" long.

Fruits small, strongly curved or twisted, several to an inflorescence, with 1-2 seeds each.

Malaya: from Malacca northward, frequent in lowland forest and open country.

ARALIACEÆ

T. polyneura

Mountain Rosebay

(Gr., with many nerves)

A mountain tree up to 20 ft. high, *the buds covered with waxy brown resin.*

Leaf-blade with very numerous (14-30) pairs of side-veins spreading from the midrib at right angles.

Flowers scented? Fruits?

Malaya: frequent in the mountains above 3,000 ft., common in the forest at Fraser's Hill.

Very little is known of this species which may be our most beautiful.

THEVETIA

(André Thevet, a French monk, 1502-1590)

Leaves spirally arranged, linear or lanceolate, crowded.

Flowers large, stalked, in few-flowered terminal clusters: corolla trumpet-shaped, with a long tube and large bell of 5 blunt petals.

Fruit solitary, rounded, bluntly angled, thinly pulpy, with a large stone broader than long.

About 10 spp., trop America.

T. peruviana

Trumpet Flower, Yellow Oleander

(from Peru)

Bunga Jepon, Jepon, Jitong, Zetun

An evergreen shrub or small tree to 25 ft. high, rather sparingly branched.

Leaves 2-6 × 1½-5", long and narrow, with indistinct stalks, light green.

Flowers 2½" long, 1½" wide, on stalks 1" long, yellow, hanging.

Fruit 1" long and thick, green then yellow.

Trop. America: common in gardens in Malaya, planted by roads in Kedah.

var. alba

Flowers larger, 2½-3" long, white.

var. aurantiaca

Flowers smaller, 2" long, pinkish orange.

In the dryer climate of the north of Malaya the Trumpet Flower will grow into a small tree. It blossoms throughout the year.

"All parts of the plant are poisonous owing to the presence in the latex of a glucoside, closely allied to that of *Strophanthus*" (BURKILL).

IVY FAMILY

Araliaceæ

(from the genus *Aralia*—a word of unknown origin)

Twigs and leaves resinous-aromatic when crushed.

Leaves more or less compound, palmately lobed or divided into leaflets, pinnate or pinnately lobed, set spirally in dense rosettes at the ends of the massive twigs.

Flowers small, regular, arranged in umbels or heads and these grouped in larger inflorescences (compound umbels or panicles): *calyx* with very small teeth-like sepals, or absent: *petals* 5-11, small, green or white: *stamens* as many as the petals: *ovary inferior*, crowned by a nectary, the style very short or absent.

Fruit a small berry with leathery or pulpy rind.

55 gen., 700 species, mostly tropical: 11 genera and 55 species in Malaya, mostly in the mountains, and 2 introduced genera.

The European Ivy is the best known member of the family but, as one so frequently has to learn, it is only an outlying representative of a large tropical family of trees, shrubs and epiphytes. The trees have a similar habit. Generally they are small, not exceeding 40 feet in height, sparingly branched or even unbranched, and they have pale bark, soft wood and, often, thorny trunks: the limbs are upright, and the massive, easily broken twigs bear rosettes of big, long-stalked leaves giving large scars when they fall. The Common Ivy Palm (*Arthrophyllum*) is the only one that can be said to form a crown: the others look like elongated and grotesque shrubs. The characteristic resinous smell of the crushed tissues is caused by the presence of oil-glands, as in the Lime- and Myrtle-families (*Rutaceæ*, *Myrtaceæ*). The seeds of the wild plants are generally distributed by birds which eat the fruit.

Of the genus *Aralia* we have three species in our mountain forests. *A. quinquefolia*, of China and Japan, supplies the famous ginseng-roots of Eastern medicine (see BURKILL'S Dictionary).

The Ivy-family is closely connected with the Umbelliferae which is a big, and mainly temperate, group of aromatic herbs including the carrot, parsnip, celery, caraway, hemlock, fennel and coriander. It seems likely that the ancestors of the Ivy-family were the arboreal and tropical stock from which the herbaceous Umbellifers evolved under the rigours of a temperate climate.

Key to the Genera

Trunks spiny			
Leaves with separate leaflets ...	...	...	<i>Trevesia</i> p. 157
Leaves palmately lobed ...	...	...	<i>Brassaiopsis</i> p. 155
Not spiny			
Garden plants			
Tree with palmate leaves and red flower-heads ...	...	...	<i>Brassia</i> p. 155
Shrubs or treelets with pinnate, trifoliate or even simple leaves ...	...	...	<i>Nothopanax</i> p. 156
Wild trees			
Leaves pinnate with separate leaflets ...	...	...	<i>Arthrophyllum</i> p. 154
Leaves pinnately lobed ...	...	...	<i>Aralidium</i>
Leaves palmate ...	...	...	<i>Schefflera</i> p. 156

ARALIDIUM

(like *Aralia*: Gr., *eidōs*—outward appearance)

Leaves pinnatifid, or pinnately lobed, in some cases entire.

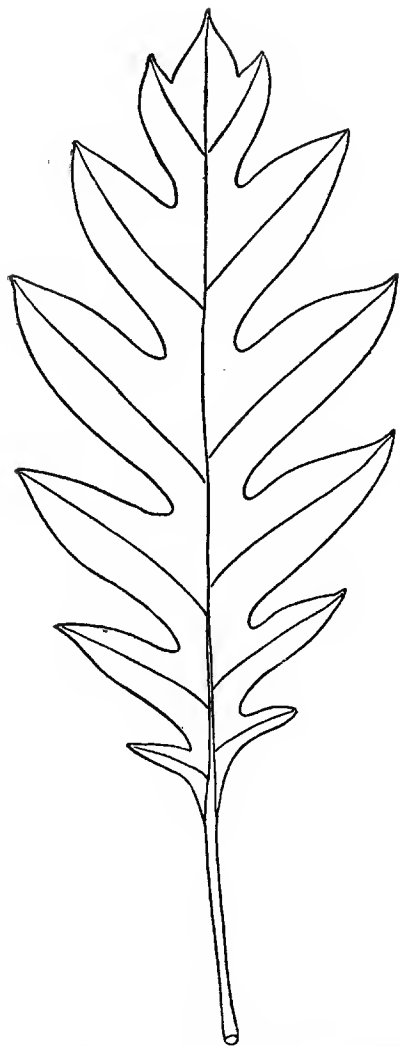
Flowers minute, in large, limp, finely branched terminal panicles: petals 5: stamens 5.

Fruit oblong, pointed, with a thin rind and large hard seed, not opening.

2 species, W. Malaysia: 1 species in Malaya.

A. pinnatifidum Text-Fig. 41

False Ivy Palm
Balai, Sebalai, Balai Balai
Puah Pungah (Pk.)



Text-Fig. 41. *Aralidium pinnatifidum*, $\times \frac{1}{2}$.

A small tree to 50 ft., flowering at 12 ft.

Leaf-blade 13-22 \times 5-11", generally deeply divided into 3-5 pairs of lobes and a terminal lobe, the lowest lobes smallest, rather thick and fleshy, leathery, glabrous, rather yellowish green; stalk 1.5-6" long.

Flowers .1" wide, pale yellowish: panicles a foot or more long, and 10" wide, finely hairy, drooping.

Fruit 1½ long, with white rind (? becoming purple when ripe).

Siam, Malaya, Sumatra: very common in lowland forest and in thickets.

The very striking leaves, resembling in shape small Bread-fruit leaves though not in texture, distinguish this plant. There are trees to be found in which the leaves are entire, oblong or obovate, and shortly pointed, 6-19 \times 1½-6", yet in other respects they appear identical and it is doubtful if they are more than a variety: such kinds are known as *Chengpok* in Johore.

The position of the genus is doubtful, because of its peculiar large seed. It is often placed in the Dog-Wood family (Cornaceæ) but fits neither that nor this.

ARTHROPHYLLUM

(Gr., arthron—a joint, phyllon—a leaf)

Leaves pinnate with stalked, opposite leaflets and a terminal leaflet.

Flowers with 5 petals and stamens.

Fruit oblong, small.

About 10 spp., Andaman Is., Malaysia, New Guinea: 8 spp. in Malaya.

A. diversifoliumCommon Ivy Palm
Tumboh Kelapa, T. Nyior

A small sparingly branched evergreen tree up to 40 ft. high: *branches upright, appearing forked*, crowned by the massive rosettes of long leaves: *bark pale whitish buff*, generally pimply with small conical lenticels, not spiny: *buds and leaf-bases thickly brown scurfy*: twigs massive with large, leaf-scars.

Leaves 1½–3 ft. long, with 9–11 pairs of leaflets: *leaflets* rather large, 3–7 × 1½–3", *mostly with distinctly asymmetric base*, oblong, slightly tipped, scarcely resinous, glabrous, leathery: stalks ½–¾" long.

Flowers ½" wide, *greenish yellow*, strongly scented, *arranged in umbels* 1" wide *themselves grouped in enormous terminal compound umbels* 2–4 ft. wide and subtended by reduced leaves, *crowning the end of each branch*.

Fruit ½" wide, green then black.

W. Malaysia: very common throughout Malaya in open country and secondary jungle.

This singularly unattractive tree can soon be recognised from its few upright forking branches which bear the large leaves only at the ends, the enormous inflorescences, the pale trunk and the massive twigs with brown scurfy ends. It is perhaps as common as any tree can be and it often forms pure thickets in secondary jungle. From the trunks of old trees dormant buds may break forth and develop rudimentary twigs with small leaves, thus giving the false impression that the tree will become bushy.

BRASSAIA

(S. von Brassai, 1797–1897, an Austrian botanist)

Leaves palmate with 7–16, mostly 12–14, stalked leaflets.

Flowers sessile in small, shortly stalked heads set on the 4–5 long, unbranched, stiff rays of a large terminal inflorescence: *petals* 11, thick, triangular, falling off on opening: stamens 11, short.

1 species, tropical Australia.

B. actinophylla Plate 24

Australian Ivy Palm

(Gr., *aktis*—ray, *phullon*—leaf)

A sparingly branched tree with massive, easily broken twigs like *Arthrophyllum*: leaves in big rosettes at the ends of the branches.

Leaflets 4–12 × 1½–4", oblong, shortly tipped, leathery, on stalks 1–3" long: *leaf-stalk* 7–18" long, expanded into a small disc at the end.

Inflorescence-branches up to 2 ft. long, *thick, stiff, horizontal, purplish black*: *flower heads* ½" wide, all pointing upward: *flowers* ¼" wide, *red*: stamens pinkish.

Not uncommon in gardens; very striking in flower.

Seedlings of this Ivy Palm often begin life as epiphytes on the trunks of trees or of true palms. Their roots clasp round the supporting tree, in the basketing manner of a strangling fig, and spread to the ground, but they are not strong enough to strangle their support, from which the trunk of the Ivy Palm grows obliquely upright. (See the genus *Schefflera* p. 156.)

BRASSAIOPSIS(like *Brassaia*; Gr., *opsis*—outward appearance)

Leaves palmate, deeply 3–5 lobed.

Flowers in stalked umbels arranged in a large loose terminal panicle: petals 5, separate: stamens 5: style as a short column.

11 species, India, S.W. China, Malaya, Java: 3 species in Malaya in the lowlands and mountains.

B. palmata

Perak Ivy Palm

An unbranched shrub or small tree to 15 ft. trunk very thorny.

Leaf-blade 10-16" wide, divided about $\frac{2}{3}$ to the base, toothed: stalks 10-20" long.-15" wide on stalks $\frac{1}{2}$ - $\frac{3}{4}$ " long.
Inflorescences up to 2 ft. long and wide, brown scurfy: umbels 1" wide: flowers

Endemic to Malaya: common in Perak in lowland and mountain forest.

NOTHOPANAX(like the genus *Panax*; Gr., *nothos*-spurious)

Cultivated, evergreen shrubs or small tree, with resinous-aromatic tissues.

Leaves spirally arranged, simple, trifoliate or 1-3 times pinnate, with sheathing base: on stout sappy twigs.

Flowers greenish or yellowish, small, shortly stalked, clustered in small heads, the heads arranged in lax panicles: petals and stamens 5: ovary with 2-8 styles and cavities.

About 70 species, mostly in tropical Asia and Polynesia: 3 species and many varieties introduced to Malaya.

The foliage shrubs or shrubby treelets called *Panax* in gardens, but *Puding* in the villages, belong to this genus. They seem almost to be as variable as the Garden Crotons so that it is difficult to classify them. They often produce different kinds of foliage from different branches. Thus both *N. fruticosum* and *N. pinnatum* may have leaves with narrow fern-like leaflets and leaves with broad leaflets on the same bush: generally, the lower leaves are the more finely divided. The flowers and fruits are insignificant.

Puding, as a Malay plant-name, is given to any plant the leaves of which are used in poulticing, e.g. *Coleus*, *Codiaeum*, *Graptophyllum*.

Key to the Species

- Leaves simple or with 2-5 blunt, round or heart-shaped leaflets, often white- or yellow-variegated, the edges notched, waved or crisped* *N. scutellarium*
- Leaves simply pinnate with 4-7 pairs of leaflets and a terminal one: leaflets broad and finely toothed or narrow and deeply toothed, both kinds generally on the same bush, often rather yellow: panicle often down-turned* *N. pinnatum*
- Leaves 2-3 times pinnate; the leaflets generally narrow and wavy, finely or deeply toothed: panicle upright, the flowers and joints bronze-green in some varieties, pale yellow in others: some varieties with blunt crisp, parsley-like leaflets* *N. fruticosum*

SCHEFFLERA

(J. C. Scheffler, a seventeenth-century German botanist)

Leaves palmately divided.

Flowers in stalked umbels set along the spike-like inflorescences: sepals none: petals 5-6: stamens as many.

Fruit small, round or oblong, pulpy, with a 5-8 angled stone.

About 80 species, Old World Tropics: 30 species in Malaya.

Most species of *Schefflera* are epiphytic shrubs or climbers, in which capacity they form one of the typical features of the Malayan forests. Some of the climbers develop strong roots which twine round the trunk of the supporting tree and descend to the ground, like those of the strangling figs, but they seem never to be powerful enough to crush their host. A few species are terrestrial shrubs and that, which for lack of a botanical name we describe below as the Mountain Ivy Palm, develops into a fair-sized tree: yet all of these may also be epiphytes. It would be an interesting study to collect the wild *Scheffleras* and to grow them as epiphytes or on the ground in order to compare, and perhaps to find out the reasons for, their different behaviour. The large, compound leaves and large inflorescences of fragrant flowers which give place to the attractive yellow, red or black berries, set so gracefully on the curved, hanging stems reinforced with all manner of architectural devices, make the genus a most attractive one for study.

Key to the Species

Shrub with the leaves several times divided	...	<i>S. heterophylla</i>
Mountain shrub or tree with simply palmate leaves and brown scurfy twigs and leaf-stalks	... ..	<i>Schefflera</i> sp.

S. heterophylla

Great-leafed Ivy Palm

(Gr., heteros—different, phullon—leaf)

A shrub or treelet to 12 ft. high, not or sparingly branched.

Leaves 2-4 feet long, 3-4 times palmately divided, glabrous: leaflets 2-7 × ½-5", elliptic, pointed, very variable in shape and size, 3-5 on each end-stalk of the compound leaf.

(Inflorescences as in the next species).

Fruits ¼-½" long, oblong, yellow then dark red, with a 5-angled stone.

Sumatra, Malaya: frequent in the forest of the middle and north of the country.

The extraordinary compound leaves unlike those of any other tree or shrub in Malaya will at once distinguish this species. The leaves of the Midnight Horror (*Oroxylum*) are also compound to the third or fourth degree, but they are pinnately divided.

Schefflera sp. Plate 218

Mountain Ivy Palm

A terrestrial tree with a few very upright branches reaching 40 feet high, or an epiphytic shrub: sapling with the stems covered with the leaves: *twigs, buds, leaf-stalks, and undersides of the leaves light brown scurfy.*

Leaves with upright blackish stalks, 3-16" long, bearing 6-10 upright, stalked leaflets at the top: leaflets 3-7 × 1¼-3", elliptic, pointed, leathery, entire.

Flowers ½" wide on stalks ¼" long, set about 10 together in stalked bunches (umbels) and the bunches arranged on racemes 1-2 ft. long, *the whole inflorescence forming a huge terminal panicle with black stalks and branches.*

Fruits ½" wide, black, with 5-8 dot-like stigmas at the top: the stone with 5-8, generally 6, angles.

Malaya: common at Fraser's Hill, by the roads and in the forest.

TREVESIA

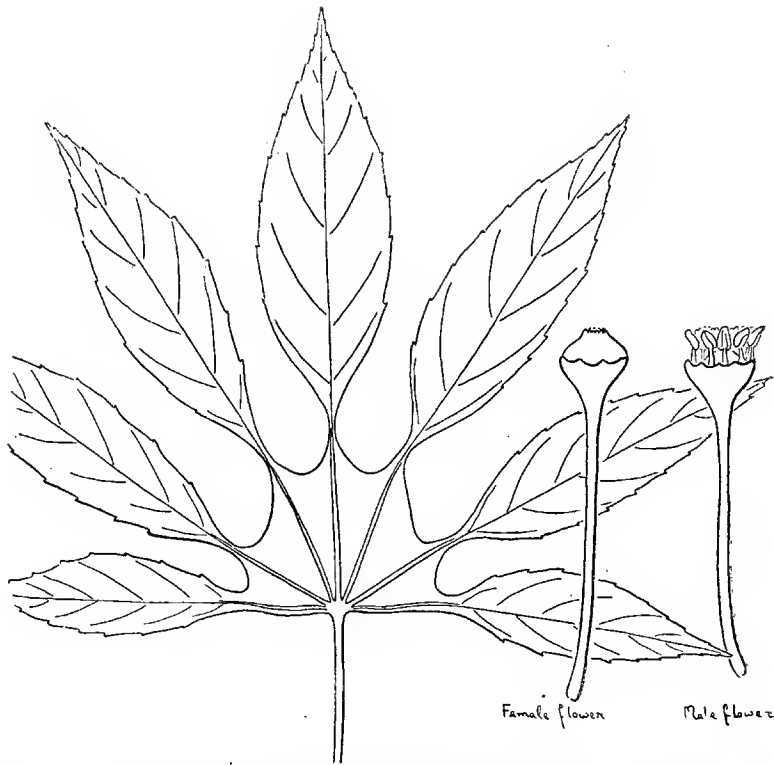
(E. Treves de Bonfilii, a nineteenth-century Italian naturalist)

Unbranched, or sparingly branched, tree *with very thorny trunk.*

Leaves palmate with a central entire part and 7-9 more or less distinctly stalked leaflets from its edge.

Flowers unisexual, on long stalks in umbels arranged in long, down-turned inflorescences: petals joined together and falling off in a cap: stamens 10: stigmas 5-6 sessile.

About 12 species, S.E. Asia and Malaysia: 2 species in Malaya.



Text-Fig. 42. Ghost's Foot (*Trevesia cheirantha*): leaf $\times \frac{1}{2}$; flowers nat. size.

T. cheirantha Text-Fig. 42
(Gr., cheir—hand, anthos—flower)

Ghost's Foot
Dauu Tapah Badak, D. T. Rimau,
D. T. Hantu, Mati Sedangor

Up to 30 ft. high, flowering at 10 ft.: bark greyish buff, with big leaf-scars and numerous sharp thorns.

Leaf-blade with the central part up to 8" wide: *leaflets* up to 13 \times 6", with toothed edges: *leaf-stalks* up to 3 ft. long, generally prickly.

Inflorescences up to 2 ft. long, with numerous umbels 3-4" wide on long stalks (4-9" long): *flowers* on stalks 1-2" long, faintly sourly fragrant: *male flowers* $\frac{3}{4}$ " wide across the cream-white stamens set on an orange disc: *female flowers* $\frac{1}{2}$ " wide, yellow with several green, sessile stigmas: *corolla* dingy greenish, brown scurfy, like a candle-snuffer.

Fruit $\frac{3}{4}$ " wide, rounded.

Apparently endemic to Malaya: common in the middle and north of the country from the lowlands to the mountains, generally in swampy places by streams: not definitely recorded south of Malacca.

The leaves of the Ghost's Foot are as extraordinary as any could well be and the Malay names are various attempts to indicate the shape which baffles also botanical description. It sometimes happens that the segments are incompletely separated from the central part of the blade and the leaf can then be described as deeply palmately lobed but this is not the typical form. The habit of the plant is like that of *Arthrophyllum*. The flowers are unusually large for the family: they open both in the morning and the evening.

The Ghost's Foot is evidently bound up with some village tales. The name *Mati Sedangor* is used in Upper Perak because, it is said, the *Orang Sedangor* on suffering a great defeat took refuge in the forest where they ate in desperation the leaves of this plant and vanished.

ASCLEPIAD FAMILY

Asclepiadaceæ

(from the genus *Asclepias*)

With white latex.

Leaves opposite, simple.

Flowers very waxy, radially symmetrical, generally fleshy and compact, not funnel-shaped or tubular, without obvious stamens or style: sepals small, 5: *corolla tube* short, with 5 lobes: *the stamens* (5) *and style joined to form an angular or star-like mass in the centre of the flower*: ovary superior.

Fruits typically a pair of pods, in some cases only one: seeds numerous, generally with a tuft of silky hairs.

Over 2,000 spp., through the tropics and subtropics, few in temperate regions: 32 genera and 155 spp. in Malaya, lowlands and mountains.

Nearly all the Malayan members of this family are climbers. A few are herbs or erect shrubs but none is really a tree, though the plant described below almost deserves the name. The structure of the flower is exceedingly complicated, more so even than that of orchids, and the family is one of the most highly evolved among flowering plants. It is closely allied with the Periwinkle-family (*Apocynaceæ*) and is, in fact, to be regarded as the outcome of the tendency already present in that family in which the stamens adhere to the swollen top of the style.

Among the commoner members there are the climbing *Hoya*, the epiphytic *Dischidia* and the poisonous village herb known as *Bunga Mas* or *Rumput Ekor M'rah* (*Asclepias curassavica*).

CALOTROPIS

(Gr., kalos—beautiful, tropis—ship's keel)

4 spp., Tropical Africa and Asia: 1 sp. introduced to Malaya.

C. gigantea Plate 25

Asclepiad Tree
Remiga, Remiga, Merigu

An evergreen shrub or bushy treelet to 15', with copious thick white latex: *buds and young parts densely white woolly (as if clad with cobwebs), the underside of the leaves persistently cobwebby*: twigs thick, pale green: leaves opposite.

Leaf-blade 3½–10 × 1½–5", broadly elliptic to obovate, pointed, not tipped, *deeply heart-shaped and rather puckered at the base, pale green, fleshy*, the midrib pale yellowish with short thick brown hairs at the base on the upperside: stalk short 2–4" long, inconspicuous from above.

Flowers 1¾" wide, *pale lilac-blue* with deeper tips, on long stalks *in axillary clusters*, 3–5" wide, themselves *on pale green thick stalk* 2–4½" long: sepals pale yellowish: petals reflexed at the tips.

Fruits a pair of large, green and pale yellow, inflated pods 3–5" long, sometimes only one, thick fleshy or pithy: seeds many, flattened, rather broad, with a tuft of hair 1–1¼" long.

India: frequent in villages in Malaya, especially near the sea.

BIGNONIA FAMILY

Bignoniaceæ

(the genus *Bignonia*—J. P. Bignon, 1662–1743, courtier of Louis XIV)

Leaves generally opposite and pinnate, simply or 2–4 times: in a few cases simple and whorled, or simple and spirally arranged: often with glands on the leaflets.

Flowers showy, trumpet- or funnel-shaped, generally in terminal inflorescences: *calyx tubular*, with or without 5 lobes or teeth, *often closed in the bud and filled with water* (water-calyx): *corolla bilaterally symmetrical, tubular, more or less flattened from above downwards*, with 5 lobes, 2 on the upperside, 3 on the lower, the upper lobes often smaller than the lower: *stamens 4 or 5 attached to the corolla*: *ovary superior*, generally surrounded at the base by a ring-like nectary: *style long with 2-lobed stigma*.

Fruit as a pod divided by a longitudinal partition into 2 compartments, splitting open: seeds many, flat, with a small disc containing the embryo and surrounded by a very thin and transparent, or thickened and opaque, wing.

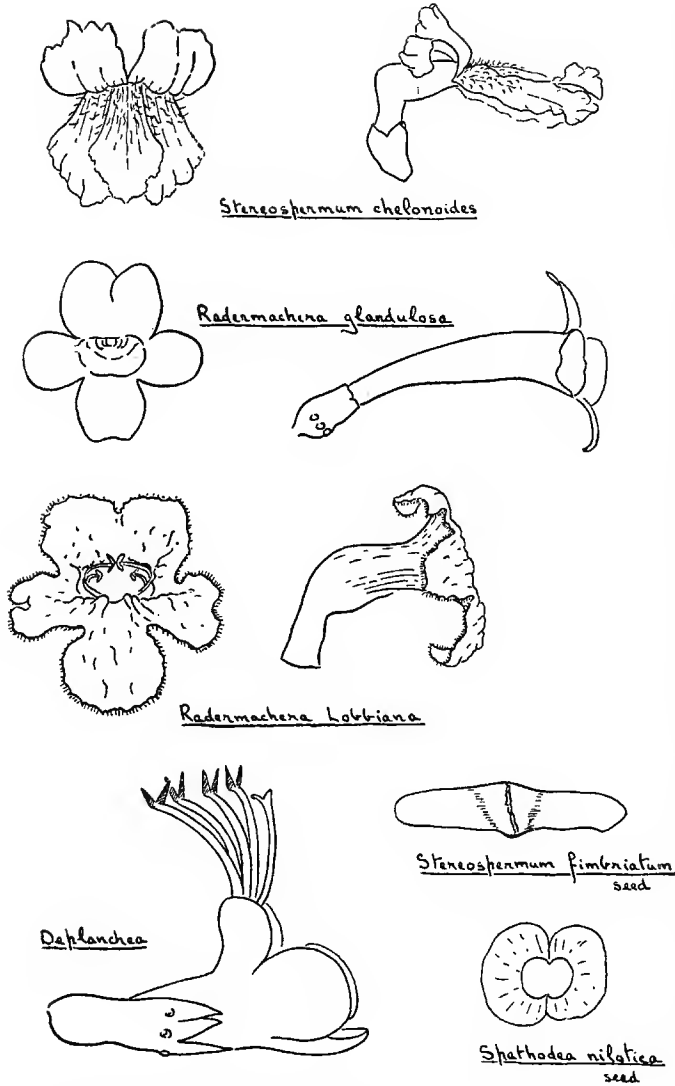
About 100 genera, 600 spp., tropics and subtropics, mostly American: 8 genera, 10 spp., wild in Malaya, in the lowlands.

The *Bignonia*-family consists of shrubs, trees and woody climbers, easily recognised from their opposite, pinnate leaves, large trumpet-flowers and pods with flat winged seeds. The flowers resemble in shape those of *Gloxinias* or the European Fox-Gloves because the corolla is somewhat flattened and has an oblique mouth with 5 lobes. The pods differ from those of the *Leguminosæ* by having a partition down the centre and by the countless flat seeds which they contain and which, in most cases, are like slips of tissue-paper with a dark centre. "Opposite pinnate leaves" are a feature also of the cultivated Elder (*Sambucus*), the wild *Sungkai* (*Peronema*) and the mountain *Weinmannia* but they have tiny, regular white flowers. The best introduction to the family is through the garden shrub called Yellow Bells (*Stenolobium*), the Tulip Tree (*Spathodea*), the *Jacaranda* and the cultivated climber *Bignonia magnifica*.

In shape, *Bignoniaceous* trees are distinguished by their open or uneven crowns with the pairs of leaves bunched at the ends of the branches. They are constructed sympodially, that is by a succession of side-branches. The saplings flower at an early stage, often before they have branched, and as the terminal bud develops in most cases into the inflorescence, so the growth of the sapling is continued by branching from below and the crown is gradually built up from a succession of side-branches. This manner of growth is displayed by the sapling Tulip Trees (*Spathodea*) and, particularly well, by both the Midnight Horror (*Oroxylum*) and the *Beka Grian* (*Pajanelia*).

Many *Bignoniaceæ* are night-flowering. Some, like the *Tui* (*Dolichandrone*) and the Indian Cork-Tree (*Millingtonia*) have fragrant white flowers with long tubes which must certainly be pollinated by long-tongued moths. But others, such as the Midnight Horror, the African Sausage Tree (*Kigelia*) and the Calabash (*Crescentia*) have lurid, fleshy, funnel-shaped flowers with a most unpleasant, pungent smell and they, it seems, are pollinated by bats. Actually, there is little information on the flowering, or the leafing, of our species: and many strange facts concerning them await discovery. The family excites curiosity both for the extraordinary fruits, flowers and leaves that it has evolved as well as for its horticultural value.

DESCRIPTION



Text-Fig. 43. Flowers and seeds of the Bignonia-family (Bignoniaceæ), nat. size.

The delicate, winged seeds blow out of the pods while they hang on the trees so that Bignoniaceæ, generally, are distributed by the wind. But the seeds of the *Tui* have corky wings and are water-borne.

Besides the trees which are described below, two others are occasionally planted and they are noteworthy as freaks rather than objects of any beauty. Both belong to an aberrant section of the family which is distinguished by having fleshy fruits which do not open and seeds which have no wings: it is not represented by any wild species in Asia.

The African Sausage Tree (*Kigelia æthiopica*) is grown in the Singapore Botanic Gardens and on Penang Hill. It is a small bushy tree with simply pinnate leaves, in whorls of 3, rarely 4, and with hanging strings, 3-6 ft. long, of large, liver-red, nocturnal flowers, 4-5" wide, in the place of which develop a few greyish brown, scurfy, inedible fruits.

looking like 'German sausages' let down from the branches. It is deciduous once a year (January-February in Singapore), but the seeds do not ripen in our climate.

The Calabash (*Crescentia cujete*) of Tropical America is occasionally grown in gardens. It needs a dry climate in order to thrive and the best specimens in Malaya are several dense, bun-shaped bushes, 6-12 ft. high, in a garden near the mosque at Kangar, in Perlis. The leaves are simple and spirally arranged, or set in small tufts along the branches. The foetid, nocturnal flowers develop from the old branches near the trunk and have a pale greenish yellow funnel-shaped corolla finely veined with brown. The fruits are like green melons ripening yellow then blackish. They are not edible but their woody shells, when

BIGNONIACEÆ

cleaned and smoked, are used in the native home of the tree for bowls and water vessels, and they can be variously shaped like marrows or pumpkins by skilfully tying the fruit when immature.

The relatively large proportion of very distinct genera with only one or two species, *e.g.* *Millingtonia*, *Oroxylum*, *Pajanelia*, by which the family is represented in Asia suggest that it is now on the decline; that formerly these genera possessed more numerous species but that now they are reduced to relics, *c.f.* the *Coniferæ*.

Key to the Genera

WITH FLOWERS

- Flowers white or very pale pinkish
 Flowers 5-7" long, trumpet-shaped, frilled at the edge: wild *Dolichandrone* p. 163
 Flowers 3-4½" long, pipe-like, not frilled: cult. ... *Millingtonia* p. 165
 Flowers 2-3" long, funnel-shaped, frilled at the edge: wild and cultivated *Stereospermum* p. 172
 Flowers white inside, pinkish lilac or purplish outside ... *Radermachera* p. 168
 Flowers blue or bluish like, in dense clusters ... *Jacaranda* p. 164
 Flowers greenish red or greenish purple, fleshy, nocturnal, with wide mouth
 Leaves simply pinnate: pods 1-1½ ft. long, dagger-shaped *Pajanelia* p. 167
 Leaves 3-4 times pinnate: pods 2-4 ft. long, sabre-shaped *Oroxylum* p. 166
 Flowers red *Spathodea* p. 169
 Flowers yellow
 Flowers dull yellow buff, crisped round the edge, the mouth closed: wild *Stereospermum* p. 172
 Flowers clear bright yellow, not crisped or frilled
 Flowers 1-1½" long, the stamens projecting: leaves simple, in threes: wild *Deplanchea* p. 163
 Flowers 2" long, stamens not projecting: leaves pinnate, in pairs: cult shrub or treelet ... *Stenolobium* p. 170

WITH FRUITS

- Pods sabre-like, 2-4 ft. long *Oroxylum* p. 166
 Pods dagger-shaped, 1-1½ ft. long *Pajanelia* p. 167
 Pods coiled in a loose spiral, narrowly cylindrical, hanging Not so *Stereospermum* p. 172
 Pods more or less erect, stout, 6-9" long ... *Spathodea* p. 169
 Pods hanging
 Pods 8-20" long
 Pods curved, in close bunches *Dolichandrone* p. 163
 Pods straight, singly or in straggling clusters ... *Radermachera* p. 168
 Pods less than 8" long
 Pods cylindrical: leaves once pinnate ... *Stenolobium* p. 170
 Pods flattened, short: leaves twice pinnate ... *Jacaranda* p. 164
 Leaves simple, in threes *Deplanchea* p. 163

DEPLANCHEA

(E. F. Déplanche, 1824-1874, the French physician and naturalist)

*Leaves simple, in whorls of 3.**Flowers clear yellow, in long stalked, and dense, rather umbrella- or disc-shaped clusters: calyx tubular, with 5 teeth, filled with water when in bud, splitting along the top: corolla rather shortly funnel-shaped, with 5 lobes, the two upper lobes recurved, rather flattened sideways: stamens 4, projecting and curved back with the style over the top of the flower.*

Pod oblong, pointed, splitting into 2 boat-shaped parts: seeds with a broad, very thin, transparent wing.

8 spp., Malay Peninsula through Malaysia to Australia: 1 sp. in Malaya.

D. bancana Text-Fig. 43
(the island of Bangka)

Yellow Pagoda Flower Tree

A tree reaching 100 ft. high, flowering at 20 ft., with pale brownish or grey, rather rough trunk, becoming fluted-hutressed like *Spathodea*: crown rather open: *inflorescences, leaf-stalks, veins on the undersides of the leaves, and young twigs closely yellow hairy.**Leaf-blade 4-13 × 2½-8"*, elliptic-obovate, *with heart-shaped base, upright with wavy edge, with 1-4 small cup-shaped green glands on the upperside at the base: stalk 1-4" long.**Flowers 1½" long, 1" wide, in clusters up to 3" long × 7-8" wide, on stalks 4-7" long: flowers in groups of 3: calyx .6" long, with 3 green glands: corolla-tube a little longer than the calyx.*

Pods 3-6 × 1¼": seeds 1½ × ¾".

Malaya, Sumatra, Borneo: occasional in lowland forest throughout Malaya, especially by swampy streams.

This beautiful tree is included in our book for the same reason as *Jackia ornata*, because it offers in bloom such a wondrous sight, the light green crown being decked with pyramids and pagodas of yellow flowers. It has not been brought into cultivation in Malaya, though it would be a worthy addition to our ornamental trees, but it is occasionally found in the forest where it can be recognised from the fallen yellow trumpets with the stamens sticking out on one side. It occurs on Penang Hill, and about Port Dickson, Lumut, Kuantan, and Mersing, perhaps in most parts of the country: and there is one tree at Bukit Timah in Singapore.

DOLICHANDRONE

(Gr., *dolichos*—long, *andron*—man, or stamen)*Leaves once pinnate, with a terminal leaflet.**Flowers white, very fragrant, with very long, pipe-like, corolla-tube, arranged in short, squat, terminal clusters with one flower open at a time: calyx conical and closed in the bud, filled with water, and with the apex recurved, then splitting open along one side (as in *Spathodea*): corolla with 5 lobes frilled round the edge: stamens 4, not projecting.*

Pods long, generally curved, hanging in tufts from the ends of the twigs: seeds many, with thin corky wing and appearing like small, narrowly rectangular biscuits.

9 spp., from E. Africa through tropical Asia to Australia: 1 sp. in Malaya.

D. spathacea Plates 26, 27
(Gr., *spathe*—a broad blade)Mangrove Trumpet Tree
Tui, Tuai, Joran

An evergreen, tree up to 60 ft. high, with narrow dark green crown: bark grey, shallowly ridged and fissured, slightly scaly: young leaves slightly pinkish.

BIGNONIACEÆ

Leaves 6-14" long, distinctly stalked: leaflets 2-4 pairs, generally 3 pairs, 3-6 × 1-2½", elliptic, long tipped, asymmetric at the base, drooping, often slightly toothed along the margin, shortly stalked.

Flowers 5-7" long, the mouth of the trumpet 3-5" wide, pointing obliquely upward: calyx 1½-2" long.

Pods up to 18 × 1", green then brown: seeds ½-¾ × ¼", pale biscuit colour.

S. India, Bengal and Malaysia to New Caledonia: common in Malaya.

This, like the *Birah* (*Fagraea crenulata*), is a tree of the swampy lowlands adjoining the mangrove but it is much commoner than that species especially in the coastal rice-fields, and in Perlis it is indeed a feature of the country. In the south of Kedah, curiously enough, it is seldom met with but as soon as one reaches Koding it attracts attention because it stands like an upright poplar in the rice-fields and in many places flanks the roads which lead to Kangar and Singgora. The trunks of old trees are massive and fluted at the base. Generally they break up at a low height into a few large, steeply ascending, strongly sinuous branches or the main stem may continue to the top of the crown and have a few such limbs, but even the main stem has this sinuous growth. The side-branches are short, more or less horizontal, and set with tufts of leaves on their short twigs. Thus the crown is very narrow and steep, being widest at the base, about head-level, tapering upward and casting no over-head shade. Nevertheless there are trees, particularly in the south of the Peninsula, with much bushier crowns and it is by no means evident why the trees in Perlis should be so distinctive unless it is that there alone they have developed normally to their full height.

The flowers are nocturnal. They open at dusk and the white trumpets fall off about sunrise or rather earlier. They must be pollinated by very long-tongued moths. The old, opened, twisted pods remain for a long while on the tree and enable one to identify it in the absence of flowers, though these appear to be developed throughout the year.

The wood is light and finds several uses in the villages.

The seeds float readily. From their corky texture and from the limitation of the tree to tidal swampy land, especially by streams, it is evident that the seeds are distributed by water and not by wind as is usual in the Bignoniaceæ.

JACARANDA

(the Brazilian plant-name)

Leaves twice pinnate with many pairs of opposite side-stalks bearing many pairs of small opposite leaflets.

Flowers bluish lilac in short dense clusters on short side-twigs from the main branches or in terminal panicles, with several flowers open at a time, not terminal on the main branches: stamens 4, inside the corolla-tube but with a fifth sterile stamen projecting beyond the corolla-tube.

Pod short, rather wide, flat, oblong: seeds flat, winged.

30 spp., S. America.

J. filicifolia Plate 28
(Lat., fern-leafed)

Jacaranda
Jambul Měrak

A small, partly or wholly deciduous tree up to 40 ft. high, *with light green, irregular and rather open, feathery crown*: bark greyish buff, pale, fissured and flaky: wood and twigs brittle.

MILLINGTONIA

Leaves 8-20" long, with 8-20 pairs of side-stalks: leaflets $\frac{1}{2}$ - $\frac{3}{4}$ × .15-.25", 7-20 pairs on each side-stalk, *small, almost rhombic, pointed, asymmetric at the base, whitish beneath.*

Flowers stalked: calyx minute: corolla about 2" long, with a curved tube suddenly constricted near the base, pale lilac, purplish at the base with a broad white band along the upper side of the tube, and lilac hairs in the throat: fertile stamens white with lilac anthers, the sterile stamen densely lilac-hairy.

Pods $1\frac{1}{2}$ -2 $\frac{1}{2}$ × 1 $\frac{1}{4}$ ", rather woody, greyish brownish: seeds 1 × $\frac{1}{2}$ ", the wing very thin and transparent with brown veins.

S. America: commonly planted in gardens and by roadsides in Malaya.

The Jacaranda is known from its delicate, feathery foliage and its clusters of lilac-blue flowers borne on the bare branches. In monsoon climates, after pronounced dry weather, it is completely deciduous and flowers with or before the new leaves. When the dry season is short or not pronounced, as is generally the case in Malaya, only a few branches may shed their leaves and then flower, so that the crown does not become wholly bare: the individual trees vary much in their manner of flowering. The flowers open about 4 a.m., the buds having begun to swell visibly the previous afternoon, and the blue trumpets fall off about 4 p.m.: they are not fragrant. The flower of the *Jelutong* (*Dyera*) works at exactly opposite hours.

The other species with terminal inflorescences, as *J. mimosaeifolia*, are scarcely known as yet in Malaya.

MILLINGTONIA

(Sir Thomas Millington, 1628-1704, physician to William III and Mary)

Leaves twice to three times pinnate (in their lower parts).

Flowers white, fragrant, in lax terminal panicles, several flowers open at a time: calyx very short, with 5 slight lobes: corolla somewhat 2-lipped, with long pipe-like tube: stamens 4, slightly projecting.

Pod long, narrow.

One sp., native of Burma: widely cultivated in the East.

M. hortensis

(Lat., of gardens)

Indian Cork-Tree

A small evergreen tree up to 40 ft. high, flowering at 10 ft., producing suckers from the roots: bark grey-buff, irregularly ridged and fissured, very rough and corky: crown open, uneven, with few main branches: twigs greyish white.

Leaves 7-15" long, with 3-5 pairs of side-stalks, the lower 1-3 pairs generally pinnate themselves and the lowest often twice pinnate, glabrous: leaflets 1-2 $\frac{1}{2}$ × $\frac{1}{2}$ -1 $\frac{1}{4}$ ", rather small, ovate or elliptic, tipped, entire or coarsely toothed, dark green, thin.

Inflorescences 8-15" long, terminal, erect: calyx 1" long: corolla 3 $\frac{1}{2}$ -4 $\frac{1}{2}$ " long, the mouth 1 $\frac{1}{2}$ -2" wide, pure white with a waxy sheen, the upper two petals joined to the middle, the other three spreading, the tube pipe-like.

Pod 12-15" × $\frac{3}{4}$ " : seeds 1 × .5" with a broad transparent wing.

The Indian Cork-Tree, the bark of which supplies an inferior kind of cork, is occasionally planted in Malaya. It grows best in the drier climate of the north and may be wild in Perlis or Kedah: several moderate sized trees occur in Penang, for instance on Jelutong Road. The flowers are nocturnal, opening in the evening with delicate fragrance, and falling off next morning. Fruit is seldom formed in this country. In shape and leaf the tree much resembles the Persian Lilac (*Melia*, p. 464), but its rough bark is distinctive.

OROXYLUM

(Gr., oros—mountain, xulon—wood)

*Leaves 3-4 times pinnate, very large, with terminal leaflets.**Flowers large, in big terminal racemes: calyx large, tubular, without lobes, filled with water in the bud: corolla funnel-shaped with 5 lobes: stamens 5, big, clumsy, not projecting.**Pods very long, broad, hanging like a big flat sabre: seeds large, with a very thin, transparent wing like tissue paper.*

One species, India, South China and Malaysia to Timor, Celebes and the Philippines.

O. indicum Plate 29

The Midnight Horror

Beka, B. Kampong, Bonglai, B. Kayu, Bulai, B. Kayu, Merlai

An evergreen, or partly deciduous, tree up to 60 ft. high, sparingly branched, flowering at 15 ft.: bark buff-grey, somewhat fissured: glabrous throughout: twigs pale grey, massive, with big scars, pimply from lenticles.

Leaves 3-7 ft. long and wide, very large, spreading, the main stalk and side-stalks arched, swollen and jointed at the attachment of the side-stalks and leaflets: *leaflets* 2½-5 × 1½-3", elliptic, shortly tipped, stalked, thin, with wavy edge, light green and dark along the veins, the base narrowed or heart-shaped, generally asymmetric.*Flowers with a foxy stink, inflorescences up to 2-6 ft. long, flowering in the upper part, fruiting below: calyx 1-1½" long: corolla 4" long, 5" wide, fleshy, lurid reddish purple to liver brown outside, greenish white and yellow on the inside and wrinkled lobes.*

Pods 2-4 ft. × 3", curved at the base, with a fine ridge on each side: seeds 3 × 1½", very many.

Common in Malaya from Malacca northwards, chiefly in villages and by rice-fields.

This grotesque tree fills us with astonishment. Botanically it is the sole representative of its kind: æsthetically, it is monstrous.

The enormous leaves look like branches, so regularly are the leaflets displayed. But each leaf develops as a unit and when it withers it breaks up gradually in regular order from the tip to the base: the leaflets fall off singly and the main-stalk and its side-stalks break up at the joints: the bits accumulate round the base of the trunk like a collection of limb-bones, so that we may call it the 'Broken Bones Plant'. The leaves are crowded near the end of the stem or its branches, and saplings, which remain unbranched until after their first flowering at a height of some 15ft., look like gigantic umbrellas. When the saplings flower, the inflorescence develops from the apical bud and therefore further upward growth of the main stem is prevented. When the inflorescence has finished flowering, the leaves below it fall off and the leafless stem is left as a pole with a few sabre-like pods dangling from its extremity (*c.f.* Plate 29; and *Cochlospermum*): wherefore, we may call it the "Tree of Damocles". Then, after 3-4 weeks in a leafless state, one or more lateral buds on the stem break out and grow into side-branches which, in due course, flower, fruit, shed their leaves and branch in their turn: and, thus, the big trees are constructed sympodially with open irregular crown and a few lanky ascending limbs. Each branch seems to flower independently of the others so that flowers, fruits and growing twigs may be found on the same tree (contrast the gigantic *Jelutong* p. 144). After the sapling stage, the tree loses its most characteristic appearance, yet the umbrella-like groups of big leaves with the inflorescence in the centre are always distinctive.

The flowers are nocturnal. The corolla begins to open about 10 P.M., when the tumid, wrinkled lips part and the harsh odour escapes from them. By midnight, the lurid mouth gapes widely and is filled with stink. Before sunrise

the corolla is detached and slips off over the long style. The flowers are pollinated by bats which are attracted by the smell and, holding to the fleshy corolla with the claws on their wings, thrust their noses into its throat: scratches, as of bats, can be seen on the fallen flowers next morning.

The pods are longer than the fruits of any other Malayan tree, being equalled only by those of some climbers. They soon bend down under their weight. When they are ripe, the gauzy seeds slip out and flit away on the breeze with the jerky motion of a butterfly: so, in the noon-tide, we may call the tree the "Midday Marvel".

[It may be that the *Beka Grian*, Pajanelia, is another bat-pollinated plant like the *Durian*, the African Sausage-Tree (*Kigelia*) and the Calabash (*Crescentia*). There is a great deal to be learnt of the relation between bats and flowers. A torch and a certain wilfulness in the middle of the night are all that are needed].

The Midnight Horror has many uses in native medicine, as described by Burkill. The young shoots may be cooked and eaten like those of the *Sentan* (*Melia excelsa*).

PAJANELIA

(the Malabar name *pajaneli*)

Like *Stereospermum* but:—

Pod flattened and winged, without a central corky strand: seeds flat.

One species, India, Andaman Islands, Malay Peninsula and Natuna Islands.

P. longifolia Plate 30

Dagger-Tree
Beka, Beka Grian, B. Utan

A medium to large, sparingly branched, upright tree to 80 ft. high, without buttresses: bark grey, becoming shallowly fissured, not flaky, rather pustulate with lenticels: the leaves crowded at the ends of the upright branches, giving a narrow, open, incomplete crown: twigs pale grey, very massive, with very large leaf-scars: young leaves violet.

Leaves 1½–6 ft. long, held out stiffly, at first upright, then horizontal and finally drooping, glabrous: leaflets 8–16 pairs, 4–12 × 2½–5", large, opposite or alternate ovate-elliptic, tipped, the base abruptly rounded and very unequal, often yellowish green, on the underside with tiny purple spot-like glands in the axils of the lower veins.

Flowers 2–2½" wide, large, with a soapy odour, in very large terminal panicles 2–3 ft. long and becoming woody in fruit: calyx 1½" long, full of water in the bud: corolla-tube 2" long, dull greenish red, the lobes yellowish and crisped at the edge.

Pod 12–18 × 2–2½", massive, dagger-shaped with a longitudinal ridge on each side, hanging, many to an inflorescence, green then brown, leathery: seeds 1–1½ × ½–¾" with transparent, slightly curved wings, very many.

Malaya, from Tanjong Malim and Kuala Lipis northward, common in belukar and open country especially in the neighbourhood of the mountains, up to an altitude of 1,500 ft.: commonly planted, as stakes, for hedges in the rice-fields in Kelantan.

This remarkable tree is common in the neighbourhood of Kuala Kangsar, Taiping and Kota Bahru, and by the roads to Grik and Kroh. Its saplings are monopodial and unbranched until they reach a height of 15–30ft. and they suggest the *Tumbok Kelapa* (*Arthrophyllum*) but have much larger leaves and leaflets and their young twigs are not brown scurfy: they suggest also the sapling of the *Kelumpayan* (*Anthocephalus*), the pinnate leaves imitating the stiff-side-branches of that tree. Mature specimens are easily known from the shape and

big leaves and by the terminal inflorescences, the dead remains of which persist for a long time at the ends of the branches. The timber is said to be excellent and to resemble teak, although the tree appears to be one of rapid growth.

Like the Midnight Horror (*Oroxylum*), it appears to be night-flowering and bat-pollinated, but we have no information whatever concerning its habits: indeed, it appears that flowers have not been seen by any botanist this century.

RADERMACHERA

(J. C. M. Radermacher, 1741-1783, patron of science in N.I.)

Very like *Stereospermum* but:—

Leaves once or twice pinnate.

Pods straight or twisted, with the corky central strand scarcely notched: the body of the seed flat with the wings.

30 species, tropical Asia from India and South China to the Philippines, Celebes and Java: 2 spp. in Malaya.

Key to the Species

- Leaves once pinnate, flowers pinkish purple outside, white inside *R. glandulosa*
- Leaves twice pinnate in the lower part: flowers pale pinkish lilac outside with orange spots and streaks in the throat, the edges crisped *R. Lobbia*

R. glandulosa Text-Fig. 43
(from the glands on the leaflets)

Hill Fox-Glove Tree

A small crooked tree up to 40 ft. high with pale drab brown bark slightly pimply and peeling but not flaky or fissured: *young leaves deep purple: all parts glabrous.*

Leaves 12-36" long, once pinnate: leaflets 4-12 × 1½-5½", 2-5 pairs and a terminal one, large, elliptic, shortly tipped, with a conspicuous embossed purple-black gland on each side of the asymmetric base: leaflet-stalk ¼-½" long.

Flowers ¾-1" wide, day-flowering, nearly regular, set in small clusters on a lax gradually elongating inflorescence 6-38" long, often with the upper part flowering, the lower fruiting: calyx ½" long, purple spotted with 5-7 purple glands in a crescent: corolla 1½" long, pinkish purple outside, white inside: stamens white.

Pods 8-12" long × ¼", straight, hanging singly or in bunches: seeds ½" × ¼", with silvery, transparent, narrowly oblong wings.

Burma and W. Malaysia: frequent by streamsides, especially rocky Saraca streams, from Malacca northwards.

R. Lobbia Text-Fig. 43
(T. Lobb, ?-1894, plant-collector for Veitch and Sons)

Lowland Fox-Glove Tree

A tall tree up to 80 ft. high, in shape like a lofty, bushy *Spathodea*: bark grey to buff grey, rather deeply ridged and fissured, slightly flaky.

Leaves 8-24" long, twice pinnate, with 3-5 pairs of side-stalks, the lowest pair generally with 2-5 leaflets, the second pair simple or with 2-3 leaflets, the leaf-stalks jointed: leaflets 3-6 × 1½-2½" long, elliptic to obovate, not or shortly tipped, the base tapered and nearly symmetric, with a cluster of tiny dot-like brown glands on either side of the base and at the apex, leathery dark green upturned: leaflets-stalks ¼-½" long.

Flowers with the corolla $1\frac{1}{4}$ " long, 1" wide, cream white, on the outside suffused pinkish lilac, on the inside with 5 orange patches and many fine orange lines in the throat, the edge crisped and finely woolly: calyx $\frac{1}{2}$ " long.

Pods 12–20" long.

Malay Peninsula, Borneo, Sumatra: frequent in lowland forest, especially by streams.

The corolla suggests that of the Yellow Snake-Tree (*Stereospermum chelonoides*), but it has a wide open mouth and a different colour. In BURKILL'S Dictionary, this species is called *R. gigantea*.

SPATHODEA

(Gr., spathodes—bladeshaped)

Leaves once pinnate, with several pairs of leaflets and a terminal leaflet.

Flowers very large, red, crowded in terminal erect inflorescences (racemes), 2–5 flowers open at a time: calyx tubular, upcurved, splitting open along the lower side, full of water in the bud: corolla upturned, with a short tube and large sack-like orange-red, oblique bell having a 5-lobed edge with a golden wavy border, yellow veined red inside: stamens 4, projecting from the upperside.

Pod long, flattened, thick, obliquely erect, splitting into 2 boat-shaped parts.

2 spp., tropical Africa.

The well-known African Tulip Trees, so-called from the colour of their flowers, belong to this genus. Both species, which are very similar, have been introduced to Malaya but *S. nilotica* is not yet as common as the larger and more handsome *S. campanulata*. It must be remarked that the true Tulip Tree of China and North America—*Liriodendron*—is a totally different plant belonging to the Magnolia-family.

The African Tulip Trees are evergreen and flower throughout the year. They grow quickly and flower at an early age, but the two species differ somewhat in this respect as well as in the development of their fruit. Their roots are equally vigorous, growing for long distances from the trunk so that they may give trouble by obstructing drains or breaking up the floors of dwellings. Their wood is soft and pale.

The flowers open about 4 a.m., at the same hour as those of the Jacaranda. The corolla emerges from the calyx during the preceding afternoon and gradually swells, straightening its wrinkles and exhaling the unpleasant musang-smell during the night. The flowers remain on the tree about three days. How they are pollinated is not known. It may be through little sun-birds which perch on the top of the inflorescence and suck the nectar from the base of the corolla but, as they often peck a hole through the corolla and do not put their heads into the trumpets, it is not very likely that they will carry pollen. The harsh smell, on the other hand, and the wide bell of the flower suggest that, like the Midnight Horror (*Oroxylum*), it is bat-pollinated. Because it has a thin texture and is open for several days, the flower of the Tulip Tree may, as yet, be only imperfectly adapted, *c.f.* the flowers of *Cerbera* which appear moth-pollinated but open during the day.

S. campanulata Plates 31, 32
(Lat., bell-shaped)

Tulip Tree

Up to 70 ft. high with dense, dark shining green crown: trunk becoming strongly fluted or buttressed at the base: bark pale buff-white or greyish, smooth.

Leaves 1–2 ft. long, distinctly stalked, glabrous or nearly so: leaflets 5–8 pairs, $3\text{--}4\frac{1}{2} \times 1\frac{1}{2}\text{--}2\frac{3}{4}$ " elliptic, tipped, asymmetric at the base, dark glossy green, with several glands as small yellow bosses along the midrib near the base.

BIGNONIACEÆ

Flowers 4" long, 2" wide, *with a foxy smell*, stalked: calyx 2" long, fawn brown, finely velvety: ovary glabrous.

Pods 6-9 × 1½", thick, firm, dark brown, often splitting first on one side: seeds about 1" wide, with broad silvery white, transparent wing.

Native of tropical W. Africa: widely cultivated as a garden and roadside tree in Malaya.

This is the ordinary, large Tulip Tree planted throughout the country. It is often found in deserted clearings where the forest has re-established itself and in such places it appears to be wild because it can compete with forest-trees. It seldom fruits in Malaya.

S. nilotica Text-Fig. 43

Nile Tulip Tree

Very like the preceding but:—

A smaller tree up to 40 ft. high, flowering at 6-10 ft., *with paler, often yellow green, hairy foliage*: leaflets distinctly, and even densely, hairy on the underside: calyx woolly hairy: ovary hairy.

Native of tropical E. Africa.

This tree is now frequently seen in Singapore and it is generally mistaken for the other species of which it may well be only a variety. It is by no means so fine a tree, but it flowers earlier and fruits often. It seems to thrive only in the full open and to be unable to compete under forest conditions.

STENOLOBIUM

(Gr., *stenos*—narrow, *lobion*—a pod)

Leaves simply pinnate with 2-3 pairs of *toothed sessile leaflets* and a terminal one. *Flowers yellow*, in short dense terminal clusters: calyx shortly tubular with 5 teeth: *corolla* rather flattened tubular, with 5 spreading lobes and *fine orange lines in the throat*: stamens 4, not projecting.

Pod long, slender, cylindrical: seeds many, with transparent wing.

4 spp., Mexico to South America: 2 spp. introduced to Malaya.

S. stans Plate 159, Text-Fig. 44 (Lat., upright, standing)

Yellow Bells

A straggling bush to 10 ft. with glabrous, light yellow green foliage: leaves 4-8" long, with a long stalk and more or less deeply toothed, elliptic, pointed, thin leaflets 1½-4 × ¾-1½".

Flowers about 2" long, 1¼" wide, faintly scented: calyx ¼" long, green.

Pods 6-7" × ¼", hanging in bunches: seeds ¾ × ¼".

Native of South America.

This is the bush commonly grown in Malayan gardens as *Tecoma stans*. It flowers several times a year, apparently after dry spells, and it sets a great quantity of fruit. The inflorescences do not exhaust themselves at once but last for several flowerings like those of the *Angsana* (*Pterocarpus*): it may be a Temperature-tree (p. 38). A variety has the leaflets deeply toothed, almost pinnatifid.

S. Smithii

Very like the preceding but becoming a small tree up to 25 ft. high: flowers richer yellow, with two prominent ridges along the lower side of the tube.

This species is commonly cultivated in gardens and villages, especially in the north of the country. It is said to be a hybrid of garden origin.



Text-Fig. 44. Yellow Bells (*Stenolobium stans*): (by courtesy of G.A.C. Herklots, Hongkong University).

STEREOSPERMUM

(Gr., stereos—hard, sperma—seed)

Leaves once pinnate, with opposite leaflets and a terminal leaflet.*Flowers* in large loose terminal or lateral panicles: corolla rather thin and delicate: *stamens* 4.*Pod* long, narrow, twisted or coiled, with a corky-spongy, notched central stand with the seeds fitted into the notches: seeds rather small with narrow, oblong semi-transparent wings and keel-like central body.

About 20 spp., tropical Africa: 2 spp. in Malaya.

Both our species are interesting botanically because they find their most southerly distribution in Malaya, the first about Malacca, the second in Singapore.

Key to the Species

- Leaves hairy: flowers 2" wide, white or pale pink with fringed edge S. *fimbriatum*
 Leaves glabrous: flowers ¾" wide, the mouth closed, ochre-buff with crisped edge S. *chelonoides*

S. fimbriatum Plate 33, Text-Fig. 43

Snake Tree

A tall, very upright, deciduous tree to 90 ft., not buttressed: crown high, narrow, cylindrical, rather open and uneven, the main limbs few, steeply ascending with short hanging twigs: bark light grey, slightly fissured and flaky: young leaves purple or violaceous.

Leaves 12-20" long, the stalks yellowish, with rather sticky hairs: leaflets 2-4 pairs, mostly 3, 3-6 × 1½-2½", elliptic, long-tipped, rounded at the asymmetric base, light yellowish green especially when young: leaflet-stalks ¼" long.

Flowers 2-2½" wide, varying dull white to pale pink or pale pinkish lilac, in large spreading clusters, 3-12" long and wide, on the bare twigs or with the new leaves, calyx ½" long, with 5 very short lobes: corolla funnel-shaped, the tube 1½-2" long, the petals beautifully fringed.

Pods 15-24" long × ½", long, thin, hanging, twisted in a loose extended coil like a snake, the corky central strand pale ochraceous: seeds 1-1¼ × ¼", pale buff, with rather thick wings.

Burma and Malay Peninsula as far south as Malacca, in high forest and open country: frequent in villages and belukar from Malacca to Perlis and Kelantan: often on rocky coasts and headlands.

When in leaf only, this tree is not easy to recognise unless one is familiar with its upright, narrow appearance. But both the white or pale pink trumpet-flower with fringed edge, like a dainty night-cap, and the hanging snake-like pod are unmistakable. It seems that the trees throughout the country have only one flowering period in the year and that lies between February and June, after the first spell of dry weather, and about the time of flowering of the *Tualang* (*Koompassia excelsa*), the Pink Cassia (*C. nodosa*) and the *Pelong* (*Pentaspadon*). The leaves are then shed and the flowers appear on the bare boughs in delicate clusters lasting until the new foliage is mature. In the early morning the corollas spin down like snow-flakes and carpet the ground with pale lilac blossom. There are many trees in the Christian Cemetery at Malacca, and a fairer one for a graveyard would be hard to come by.

S. chelonoides Text-Fig. 43

Yellow Snake Tree

(Gr., chelone—tortoise, ides—like)

A deciduous tree very like the preceding, with pale pinkish grey bark becoming rather coarsely fissured and flaky but not ridged:—

Leaves glabrous: leaflets 3-6 pairs, gradually tapered to the base, held rather stiffly with upcurled sides: young leaves purplish or pinkish.

Flowers $\frac{3}{4}$ " wide, $1\frac{1}{4}$ " long, *dingy yellow* in slender, upright, lengthening inflorescences 5-16" long, on the bare twigs with the new leaves: calyx .3" long, purple, with 3-4 short lobes: *corolla-tube* $\frac{3}{4}$ " long, curved at the cylindrical base, the bell-shaped part compressed *with the mouth closed* and the underside grooved, the petals crisped, the upper two recurved, the lower bearded at the mouth, *ochre-buff with brownish or purplish lines, pinkish purplish on the outside.*

India, S. China, Malay Peninsula: known only from Singapore and Penang in Malaya, in lowland forest.

This tree is rather rare. A magnificent specimen, about 100 ft. high, occurs by the Glugor Road in Penang. A tree in the Singapore Botanic Gardens flowers between March and June every year. In India it is a timber-tree and the flowers are offered in the temples.

ANATTO FAMILY

Bixaceæ

(from the genus *Bixa*)

Leaves spirally arranged, entire or palmately lobed.

Flowers large, showy, white, pinkish or yellow: sepals 5, free: petals 5, free: *stamens many, free: ovary superior with a single style and single cavity,* the ovules attached in 2 or 5 rows to the wall of the ovary.

Fruit a capsule splitting in 2 or 5 parts with the seeds in 2 or 5 rows on the wall.

4 genera, 24 species, the tropics generally but mostly American: 2 species, introduced to Malaya.

This small family is near that of the *Rukum* (Flacourtiaceæ) from which it differs in the large showy flowers and the capsular fruit. Neither of the species grown in Malaya, however, is likely to be mistaken for members of that family.

Key to the Genera

Flowers white or pinkish: leaves entire: fruit hairy ... *Bixa*
Flowers yellow: leaves 3-5 lobed: fruit smooth ... *Cochlospermum*

BIXA

(biché—the Brazilian name)

Most parts of the plant containing a red or orange juice.

Fruit set with long coarse hairs and splitting into 2 parts: the seeds attached in 2 rows.

One sp., native of tropical America: cultivated throughout the tropics.

B. Orellana Plate 34

(Fr. de Orellana, 1505-1550, explorer of the Amazon)

Anatto
Kesumba, K. Kling

A laxly branched, evergreen shrub or small tree up to 30 ft. high: the young shoots rusty scurfy.

Leaf-blade 3-9 × 2-6", *heart-shaped, tapered to the tip,* glabrous, entire, the main veins 5-7 pairs and often pink or purple beneath: *stalk* $1\frac{1}{2}$ -3" long, *the top swollen and dull orange-red.*

BIXACEÆ

Flowers $2\frac{1}{2}$ " wide, scentless, in upright terminal panicles 3-4" long, 1-2 flowers open at a time: sepals soon falling off: *petals white or pale pink*, faintly dotted pink on the outside: stamens white: style pink.

Fruits $1\frac{1}{2}$ " wide, rather flattened, *bag-like, green or reddish-brown, softly prickly with green or reddish brown coarse hairs* ($\frac{1}{4}$ - $\frac{1}{2}$ " long), like those of the Rambutan: arranged in massive upright bunches: seeds $\cdot 2$ " wide, *with a thin pulp, vermilion skin*.

The Anatto is found commonly in villages and gardens in Malaya and it is often used for a hedge. It flowers and fruits throughout the year. It is the sole species of its kind, yet it is well-known from the orange-red dye which abounds in all parts of it but which is most readily extracted from the coating of the seed. The Anatto-dye was used originally as a war-paint by the Indians of Tropical America: it has the colour of arterial blood. The plant was brought to the Philippines by the Spaniards, from whence its cultivation has extended through the East. Formerly there was an export of Anatto to Europe for the dyeing of fabric but it has given place to the use of synthetic Congo-Red. Anatto is still used, however, for colouring food-stuffs as butter and cheese, the yellow of which it intensifies, as well as in pharmacy because it is both harmless and easily prepared.

COCHLOSPERMUM

(Gr., kochlos—snail, sperma—seed)

Leaves palmately divided with 3-5 lobes.

Fruit splitting into 5 parts, the outside smooth: *seed woolly*, arranged in 5 rows. 15 spp., throughout the tropics except E. Africa, Malaya and the Malay Archipelago: introduced to Malaya.

C. religiosum Plates, 35, 36

Yellow Cotton-Tree,

(from its use in temple-grounds in India) Yellow Silk Cotton-Tree, Buttercup tree

A small, more or less deciduous, quick-growing tree up 25 ft. high, laxly branched with open crown, the flowering branches without leaves: bark smooth, greyish white: without coloured sap, but the freshly bruised tissue fragrant.

Leaf-blade 3-8" wide, with the sides of the lobes bent up, *toothed*: stalk 2-6" long, often reddish on the upperside.

Flowers 3-3½" wide, scentless, in terminal branched inflorescences at first compact but eventually 1-2 ft. wide and with a few straggling branches, one flower open at a time on each branch and facing sideways: *petals rich golden yellow*, notched at the apex: *stamens orange-yellow*: ovary greenish white: style yellowish, down curved.

Fruit 3-4" long, pear-shaped, smooth: seeds $\frac{1}{4}$ " long, brown, coiled like a snail, covered with long hairs.

Native of India: cultivated in most parts of Malaya.

The English names of this tree refer to its large buttercup-like flowers and to the floss round its seeds. It is a shapeless, yet very ornamental, little tree which flowers throughout the year and is therefore more or less deciduous the whole time, the twigs losing their leaves when they begin to flower: well-grown specimens, indeed, have commonly more flowers than leaves. But our equable climate is not well-suited to it because in Malaya it seldom bears perfect fruit; either the flowers or the young fruits drop prematurely. It is propagated by cuttings or, rather, loppings for any branch stuck in the ground will strike in wet weather. Like those of the Midnight Horror (*Oroxylum*), the saplings become leafless poles terminating in an inflorescence: when they have flowered, several buds on the trunk break out into leafy shoots to flower and produce leafy

shoots in their turn, and thus the lax crown is built up. The flowers last for a day and a half. They begin to open at 3 a.m., are wide open at sunrise and begin to close the following morning between sunrise and noon: if the flower is setting fruit, the withered petals remain for a long time; if not, the whole flower drops off.

The big yellow, scentless flowers with five petals and many stamens suggest those of the *Simpoh*-trees (Dilleniaceæ) but the palmate leaves, the simple undivided ovary, with its single style, and the smooth grey bark forbid any such affinity. The flowers, moreover, have a slight bilateral symmetry. In BURKILL'S Dictionary, the plant is called *C. gossypium*.

HELIOTROPE FAMILY

Boraginaceæ

(from the genus of the Borage, Borago)

Leaves alternate or spirally arranged, simple, without stipules.

Flowers regular, small to medium-size: calyx as a cup or tube with 5 lobes: *corolla with a short or long tube and generally 5 petals*: stamens 5, with slender filaments, attached to the corolla-tube: *ovary superior*.

Fruit pulpy or dry, with a hard stone or divided into 2 or 4 nutlets each with one seed.

About 2,000 spp., throughout the world: 5 gen., 11 spp. in Malaya, in the lowlands.

Anchusa, Hounds-tongue (*Cynoglossum*), Borage and Heliotrope belong to this family. It is poorly represented in Malaya, principally by some trees with very little resemblance to any of these more familiar garden-plants, but several introduced species of *Cordia* are likely to become popular as small flowering trees. In the structure of the flowers and fruits, the family is like the *Buddleia*-family (*Loganiaceæ*) which, however, has opposite leaves and many-seeded berries.

CORDIA

(V. Cordus, 1515-1544, a German botanist)

Leaves often toothed, spirally arranged.

Flowers bisexual and male in some clusters, the male being slightly smaller and more numerous: *calyx* shortly tubular, with short lobes: *corolla with 4-8 lobes*: stamens as many as the petals: *ovary with 4 cavities, each with one ovule: style with two branches at the apex, each branch itself forked once, making 4 stigmas.*

Fruit pulpy or dry, with a hard stone, surrounded by or seated on the persistent calyx: stone with 1-4 cavities each with one seed.

About 300 spp., throughout the tropics: 4 spp. in Malaya.

Key to the Species

- | | | |
|---|--------|---------------------------|
| Seashore tree with orange trumpet-flowers | ... | <i>C. subcordata</i> |
| Inland trees or bushes with small white flowers | | |
| Rough-leaved bush: flowers in spikes: fruit red | | <i>C. cylindristachya</i> |
| Trees with smooth leaves: flowers in loose clusters | | |
| Fruit $\frac{3}{4}$ " long, pink | ... .. | <i>C. dichotoma</i> |
| Fruit $\frac{1}{2}$ " long or less | ... .. | <i>C. Griffithii</i> |

C. cylindristachya
(with cylindric spikes)

Plate 37

String Bush

An evergreen shrub to 10 ft. high: twigs and leaves hairy.

Leaf-blade 2-4 × $\frac{1}{2}$ -1 $\frac{1}{2}$ ", narrowly elliptic, pointed, *toothed, harsh on the upper side, greyish green*: stalk $\frac{1}{4}$ - $\frac{3}{4}$ " long.*Flowers* $\frac{1}{2}$ " wide, *small, white, sessile, crowded on the upper half of a drooping spike* 5-10" long, the spikes terminal or on the twigs *opposite* the leaves: corolla-tube very short, with 5 lobes.*Fruit* $\frac{1}{2}$ " wide, *red, pulpy*.

Trop. America: common in the Tanglin district of Singapore, especially near the old railway line.

This shrub was introduced to Singapore last century and it escaped from the old economic Gardens which were formerly on the site of Raffles College. Its inflorescence is remarkable. It is a spike which works *from apex to base*. The first flowers to open are at the top end of the spike and as they set fruit so the other flowers open progressively downward: ripe fruits can be found at the end of the spike and flower-buds at the base, half-ripe fruits and open flowers in the space between. It is an instructive plant for classes in natural history; and it is also useful for making a close hedge on good or poor soil.

C. dichotoma

(Gr., cut in two)

Cordia Tree

*Nona Burong, Petekat, Sekendal, Sekendai*A tree up to 60 ft. high, with conical to cylindric, then rounded crown, the branches drooping at the ends: *bark* light grey, shallowly fissured.*Leaf-blade* 3-6 × 2-3 $\frac{1}{2}$ ", elliptic or ovate, rounded or narrowed or almost reart-shaped at the base, shortly and bluntly tipped, *generally irregularly toothed towards the apex*, glabrous or hairy beneath: stalk $\frac{1}{2}$ -2" long.*Flowers* $\frac{1}{2}$ - $\frac{1}{2}$ " long, $\frac{1}{2}$ " wide, *small, white*, in loose terminal or lateral clusters 2-4" wide and long: *calyx-tube* finely hairy, with 5 lobes: *corolla* with a short, inconspicuous tube concealed in the calyx, with 5 petals.*Fruit* $\frac{3}{4}$ " long, *pulpy, ripening clear pink, seated on the enlarged but shallow calyx-cup*, 4" wide, with uneven edge, *with very slimy juice*.

S.E. Asia to tropical Australia and Polynesia: occasional in villages throughout Malaya, possibly wild in the north.

This and the following species are conspicuous only when they are hung with the clear pink fruits. The leaves of saplings are strongly toothed round the edge.

C. Griffithii

(W. Griffith, 1810-1845, doctor and botanist of the East India Co.)

Griffith's Cordia

Very like *C. dichotoma* and with the same Malay names but:—*Leaf-blade* smaller, 1 $\frac{1}{2}$ -4 × $\frac{3}{4}$ -2 $\frac{1}{2}$ ", distinctly narrowed to the base, with slender stalk.*Flower-clusters* slender 2-5" long: flowers smaller, with glabrous calyx-tube.*Fruit* smaller, $\frac{1}{2}$ " long or less.

Malaya: from Malacca northwards, occasional, but frequent in Kedah and Perlis.

C. subcordata Text-Fig. 45

(Lat., slightly heart-shaped)

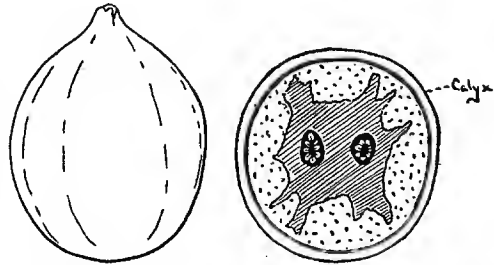
Sea Trumpet

A small evergreen bushy tree to 50 ft. high, with dense round crown: *bark* pale grey, irregularly fissured and flaky, the inner bark whitish.*Leaf-blade* 2 $\frac{1}{2}$ -7 × 2-5", *ovate* with a short pointed tip, the base abruptly and broadly rounded, not truly heart-shaped, thinly leathery, with 4-6 pairs of side-veins: *stalk* $\frac{1}{2}$ -3" long: *sapling leaves strongly toothed*.*Flowers* 1 $\frac{1}{2}$ -2" wide, *trumpet-shaped, a charming clear orange or pinkish orange*, scentless, in rather shortly stalked clusters attached to the twigs *opposite* the leaves: calyx with 2-3 lobes: *corolla with 6-7 recurved lobes*.

Fruit 1-1½" long, ¾-1" wide; almost round, dry, bony, enveloped in the much enlarged calyx, green then yellow: in bunches opposite the leaves.

On sandy coasts of the Indian and West Pacific oceans: common on sandy coasts from Lumut and Mersing northwards in Malaya.

This little tree greatly resembles the two seashore trees *Baru Laut* (*Thespesia*, p. 444) and the Sea Hearse (*Hernandia*) but it is at once distinguished by the flower and fruit. The orange trumpets are, indeed, unlike any other Malayan flower and they keep their vivid colour for several days after they have fallen to the ground. The fruit is remarkably like that of the seashore tree *Guettarda* (p. 541): both are sea-borne and they afford an instance of 'convergence', or the evolution of a similar construction in unrelated organisms.



Text-Fig. 45. *Cordia subcordata*: fruit, nat. size.

KEDONDONG FAMILY

Burseraceæ

(from the genus *Bursera*)

Large, resinous trees, often buttressed, with greyish, resinous, aromatic gum oozing in small drops from the cut twigs, bark or wood.

Leaves once pinnate, spirally arranged, large, with a stalked terminal leaflet and one to several opposite pairs of stalked leaflets: stipules present.

Flowers small, regular, often unisexual, greenish, yellowish or reddish, set in conspicuous panicles from the leaf-axils, the parts of the flower generally in threes: petals present: stamens short: ovary superior.

Fruit generally fleshy or leathery, with a hard stone, the small persistent calyx at the base, the rind of the fruit resinous; stone 3-celled.

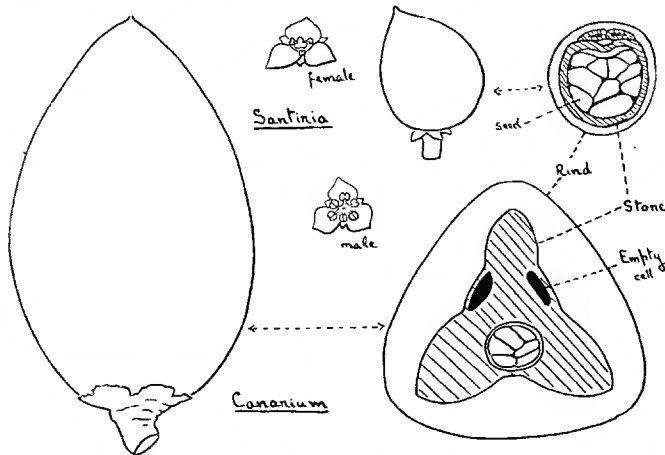
16 gen., 600 spp., throughout the tropics: 5 gen., 35 spp. in Malaya, in the lowland forest.

Many trees of this family occur in the lowland forest of Malaya but they are generally so large that identifiable specimens are difficult to obtain. It is therefore not an easy group for the beginner though he will often meet Burseraceous saplings in the forest. There are many named trees in the forest reserve on Bukit Timah in Singapore. From other large trees with pinnate leaves such as those of the Bean-, *Sentol*-, Soap Nut- and Mango-families (*Leguminosæ*, *Meliaceæ*, *Sapindaceæ* and *Anacardiaceæ*), the Burseraceous trees are distinguished by the resinous bark, twigs and fruit with aromatic or turpentine smell. Moreover their leaves are generally recognisable from the strictly opposite arrangement of the stalked leaflets, the terminal leaflet and from the fact that the leaf-stalk is swollen at the attachment of each pair of leaflets: the stalks of the leaflets are also swollen at each end so that the leaf has a jointed aspect. The bark of the trees is like that of the *Sentol*-family (*Meliaceæ*): it is light grey varying to yellowish, pinkish or brownish, entire or rather scaly with thin angular flakes, small or large, but it is not fissured. The largest and best-known genus is *Canarium* the fruits of which are very distinct. There are two cultivated species. One is *C. album* of Indo-China, the fruits of which are sold in the shops and markets as *Buah Ca-na* and are eaten like olives, but

it is not grown in Malaya. The other is *C. commune* which we describe and figure. The wild species are called by Malays *Kedondong*: this name is given also to trees of the *Sentol*-family (Meliaceæ) which have large fruits, and must therefore be accepted with caution. The kernels of the fruit of some of these

wild trees are edible and even the rind of the fruit which, if astringent at first, sweetens on being chewed. Concerning the extraction and uses of the resin or *damar* and the numerous other economic aspects of the family, there are full details in BURKILL'S Dictionary.

Most of our native species are evergreen but a few are deciduous: we have little information concerning their habits.



Text-Fig. 46. *Kedondong*-family (Burseraceæ): flowers $\times 2$: fruits nat. size.

CANARIUM

(from the Moluccan name *Kenari*)

Flowers unisexual, with 3 sepals, 3 petals and 6 stamens in the male flower, an ovary with 3 cavities in the female.

Fruits oblong, often pointed and 3-angled, rather large, with green or brown firm resinous flesh and a very hard pointed stone having 3 angles and 1-3 seeds each in its own cavity: the small, cup-like calyx persistent at the base.

150 spp., Africa, Indo-Malaysia, tropical Australia and Polynesia: 12 spp. in Malaya.

Closely allied with *Canarium* is another genus, *Santiria*, which is represented by many common trees in the forest. It differs mainly in its smaller, rounded or obliquely ellipsoid fruits which have a thin rind and round shell (Text-Fig. 46). The fruits of *Santiria* are also generally brightly coloured red, purple, pink, yellow or black and are set in large bunches, thus contrasting with the small clusters of sombre fruits which hang on the *Canarium*-trees (see Plate 39). The Malay names for *Santirias* are *Kerantai* and *Kedondong*.

C. commune Plate 38
(Lat., common)

Kenari-Nut Tree
Pokok Kenari

A large tree up to 90 ft. high, with medium-sized buttresses and grey bark.

Leaves up to 18" long, with 3-5 pairs of leaflets 3-8 \times 1 $\frac{3}{4}$ -3 $\frac{1}{2}$ ", and a terminal leaflet: leaflet-stalks $\frac{1}{2}$ -1" long, whitish like the main leaf-stalk: stipules $\frac{1}{2}$ -1" long, broad, the sides incurved, the edge uneven and notched.

Flowers .2" wide, sessile, pale yellowish white, fragrant, in rather open whitish panicles 6-12" long.

Fruits 1 $\frac{1}{2}$ -2 \times $\frac{3}{4}$ -1 $\frac{1}{4}$ ", oblong, faintly 3-angled, green then bluish black, sometimes waxy, the stone with 1 kernel.

Celebes, Molucca IIs., Flores, but widely cultivated in the Eastern tropics: occasionally planted in Malaya.

This tree is valued for the oily kernel of the fruits and these are traded under the Moluccan name of *Kenari*, or *Buah Kenari* of Malays. The species is

exceptional in producing one large kernel (or seed) in each stone instead of the three small ones usual in the genus. The oily kernel serves like that of almonds in confectionary. The oil is also used for cooking. The rind of the fruit is not eaten and the seed-coat must be removed from the kernel because it contains a substance causing diarrhoea. The tree grows fast and makes an excellent shade where the soil and climate are favourable, which seem not to be the case in Singapore. At Buitenzorg, in Java, there is a famous and magnificent avenue, which is now more than 100 years old. The trunk often gives off rather slender aerial roots, especially on the side to which it leans: these roots may arise from a height of 12 ft.

CAT'S WHISKER FAMILY

Capparidaceæ

(from the genus *Capparis*)

Leaves simple, trifoliate or with 5-7 finger-like lobes, alternate or spirally arranged. *Flowers rather showy, feathery with the numerous, long stamens*, generally white, pink or pale yellow, slightly bilaterally symmetrical: sepals 4: *petals 4, free*, generally stalked: stamens many (10-30 or more), long: *ovary small, at the end of a stalk about as long as or longer than the stamens*, the ovules attached in 2 or more rows to the wall of the ovary.

Fruit a capsule or a berry.

45 genera, 1000 spp. in all the warmer parts of the earth, but mainly tropical: 5 genera, 18 spp. in Malaya.

This family is closely allied with the Cruciferæ, which contains such plants as turnips, cabbages, cauliflower, mustard, watercress and radish. The same sharp, cress- or mustard-like taste occurs also in the tissues of many Capparidaceæ and is familiar in 'capers' which are the pickled flower-buds of the Mediterranean bush, *Capparis spinosa*, c.f. our Caper-Thorn (*C. micracantha*). But instead of the small regular and compact flower of the Cruciferae, that of the Capparidaceæ is open and bizarre, at times almost grotesque, from the outspread petals, long stamens and stalked ovary. The best known member of the family in Malaya is the Cat's Whiskers (Gynandropsis) of our gardens, but it is a native of Africa. Among our wild members are the Caper-Thorn, in the north of the country, easily recognised from its spiny twigs, and the beautiful trees of the genus *Cratæva*. The family is not well-represented in the rain-forest, its members preferring rather arid climates.

Key to the Genera

Leaves simple: twigs spiny	...	...	...	<i>Capparis</i>
Leaves trifoliate: twigs unarmed	...	...	...	<i>Cratæva</i>

CAPPARIS

(a Greek plant-name)

Twigs with a pair of sharp thorns at the base of each leaf: leaves simple, alternate.

Flowers singly or in small, sessile groups just above the leaf-axils, feathery with long stamens: the upper two petals often twisted and placed together to form a standard.

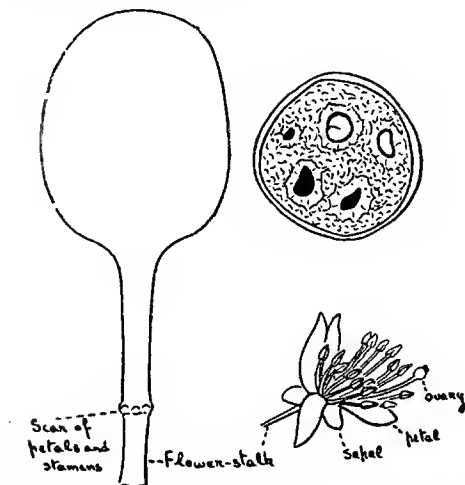
Fruit as in *Cratæva*: seeds smooth, more or less kidney-shaped.

About 350 spp. in all the warmer regions of the world: 10 spp. in Malaya.

C. micracantha Text-Fig. 47
(Gr., mikros—small, akantha—thorn)

Caper-Thorn
Melada

A shrub or treelet reaching 15 ft. high, with thorny twigs and trunk, tending to form thickets: the trunk reaching 6" thick, greyish, finely fissured and set with small knobs each surmounted by a thorn: the branches curving out, with drooping ends, the twigs hanging.



Text-Fig. 47. *Capparis micracantha*: flower and fruit, $\times \frac{1}{2}$.

Leaf-blade $2\frac{1}{2}$ -9 \times 1-3 $\frac{1}{2}$ ", oblong, occasionally almost lanceolate, the apex blunt or slightly pointed but not tapered, dull yellowish green, with 8-11 pairs of rather strong side-veins: stalk $\frac{1}{4}$ - $\frac{1}{2}$ " long.

Flowers about 1" long and wide, in rows of 2-6 just above the leaf-axils, white, feathery, the leaves at the ends of the flowering twigs often much reduced in size: upper petals yellow turning dull purple, with white tips, lateral petals white: stamens 15-20, white, curving out like whiskers, about 1" long: ovary green on a long white stalk.

Fruits about 2" wide and long, nearly round, green (? turning purple), with numerous shiny black seeds, $\frac{1}{4}$ " wide, embedded in the pulp: fruit-stalk 1- $\frac{1}{2}$ " long, woody, grey, jointed below the middle.

Burma and Indochina to Philippines, Borneo, Java: frequent in villages and on sea-coasts in the north of Malaya (Penang, Kedah, Perlis, Kelantan, Trengganu), also on the East Coast Islands as far south as P. Aor.

This is a well-known village plant, though one of little importance, in the north of Malaya. The Malay name refers to the spiciness of the seeds, like pepper. The fruits are edible.

CRATÆVA

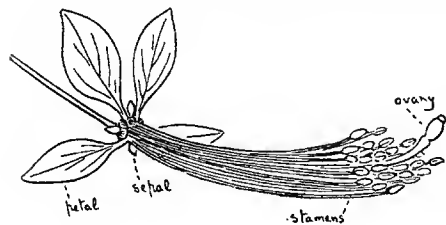
(Krateuas—an ancient Greek root-gatherer, or medicine-man, about B.C. 100)

Leaves trifoliate, spirally arranged.

Flowers showy, rather large with pale yellow petals and feathery with long pinkish violet stamens, on long stalks in upright racemes, the buds opening while green and still very young: the disc or the flower 4-angled: sepals small: stamens many, (10-24).

Fruit round or oblong, rather large, stalked, not opening, containing many hard, curiously horseshoe-shaped seeds embedded in pulp.

About 20 spp., throughout the tropics: 2 spp. wild in Malaya, 1 introduced.



Text-Fig. 48. *Cratæva lophosperma*, $\times \frac{1}{2}$.

The trees of this genus are comparatively little known, yet they offer a novelty in ornamental planting, being none the less attractive for their bizarre flowers. The pale yellow petals and long violet stamens recall in their shape the Peacock Flower (*Cæsalpinia*) but the structure of the fruit shows that there is only a superficial resemblance between them. The Burmese *Dalur* (*C. lophosperma*) is the only species that is at all frequent and it is restricted at

present to the East Coast towns between Pekan and Tumpat, though it seems to be not uncommon by the rivers in the forest, especially in Kelantan. It is the most vigorous species in Malaya and it would make an excellent roadside tree in the more seasonal parts of the country. It appears to be deciduous and to flower after the new foliage has developed.

The trifoliate leaves of *Cratæva* resemble those of the Rubber-tree but they do not wither red. The flowers are peculiar because, like those of the *Kenanga* (*Canangium*), they open while they are still green and young and thus they gradually grow larger and colour up.

Dalur is the name of *C. lophosperma* in Kelantan and Trengganu. For want of another, we have adopted it as the common name for the genus.

The shoots and flowers of the Burmese and Indian *Dalur* are eaten in curries.

Key to the Species

Leaflets stalked

Leaflets and inflorescences up to 4" long: petals less than 1" long: fruit round *C. Roxburghii*

Leaflets and inflorescences longer: petals more than 1" long: fruit oblong *C. lophosperma*

Leaflets sessile: wild, in swampy places *C. membranifolia*

C. lophosperma Text-Fig. 48

Burmese *Dalur*

(Gr., lophos—a crest, sperma—seed)

Dala, Dalur, Kepayang Ayer

A tree to 30 ft. high, developing a big, spreading crown and stout trunk, ? evergreen.

Leaflets 2-8 × 1-3", rather narrowly elliptic, tapered to a point, with distinct short stalks, *more or less glaucous beneath*, side-veins 12-19 pairs: stalk of the whole leaf 1½-4½" long.

Flowers 2" wide, the inflorescences 4-12" long, 10" wide, very showy: *petals* 1½" long: stamens (18-24) and ovary-stalk 2-3" long.

Fruits 1½-2 × 1¼-1¾", greyish white then brownish (? purple or red when ripe): seeds ½" wide, greyish brown or blackish, fringed or crested with irregular teeth on the outer side.

N. E. India, Siam, Indo-China, Malaya: by streams and rivers in the forest, occasionally in villages and towns in Perak, Pahang, Trengganu, Kelantan, especially on the East Coast.

There is a superb specimen of this species near the station at Tumpat.

C. membranifolia

(from the thin leaflets)

Marsh *Dalur*

Kepayang Ayer

Like the preceding but:—

Leaflets 2-5" wide, rather broad, thin, nearly or quite sessile, with only 7-10 pairs of side-veins: ? large flowers: stamens 10-16: fruit rather larger, 2½ × 2": seeds light brown, closely warted or roughened on the outer margin.

Sumatra, Malaya, Borneo: in swampy forest and swampy thickets in the open, from Johore to Perak, not common, little known.

C. Roxburghii

Indian *Dalur*

(W. Roxburgh, 1751-1815, Director of the Calcutta Botanical Gardens, 1793-1814)

Smaller in all its parts than the other two species, flowering before and with the new leaves.

Leaflets 2-4 × ¾-2", with 5-8 pairs of side-veins, often shaped like those of *Dadap* (*Erythrina*), distinctly stalked.

Flowers 1½" wide or less, round: seeds ¼" wide, black, smooth.

Ceylon, India, Indo-China, Siam: at Tg. Kling and in the Residency Garden at Malacca, perhaps in other gardens but, at present, little known: introduced.

HONEYSUCKLE FAMILY

Caprifoliaceæ

(from the European Honeysuckle, *Lonicera caprifolium*)*Leaves opposite*, without stipules, simple or compound.Flowers with the parts in fives: *petals joined in a corolla-tube with 5 lobes: ovary inferior*, with 1-2 cavities.*Fruit a berry.*

13 genera, 300 spp., chiefly North Temperate: 2 genera and 6 spp. wild in Malaya.

Honeysuckle, Elderberry, Snowberry and Guelder-Rose characterise this family in temperate climates. In Malaya we have but a few stray species of Guelder-Rose (*Viburnum*), a rare wild Honeysuckle in Pahang and a few introduced species of Honeysuckle and Elderberry in our gardens. The family is close to the Ixora-family (*Rubiaceæ*) but lacks the interpetiolar stipules.

Key to the Genera

Leaves simple: wild *Viburnum*
 Leaves pinnate: cultivated *Sambucus*

SAMBUCUS

(a Latin plant-name)

Like *Viburnum* but:—leaves pinnate; berries round.

12 spp., temperate regions and high mountains in Asia: 2 spp. introduced to Malaya.

One can mistake for an Elder-bush the Tree-Vines (*Leea*) with alternate leaves and the *Sungkai* (*Peronema*) with winged leaf-stalks and dry fruits.

Key to the Species

Leaves once pinnate: with yellow cup-shaped nectaries
 scattered among the flowers: berries red then black *S. javanica*
 Leaves twice pinnate: without cup-shaped nectaries:
 berries purple then black *S. mexicana*

S. javanica

(from Java)

Javanese Elder

A shrub or small tree, to 15 ft. high: crushed twigs and leaves rather fœtid.

Leaves 10-20" long, with 3-8 pairs of opposite leaflets and a terminal leaflet: leaflets 3-8 × ½-2", oblong-lanceolate, pointed, toothed, thin.

Flowers 2", wide, cream-white, fragrant, crowded in large, stalked terminal clusters (compound umbels) 6-12" wide.

Berries 2" wide.

India, Java, Philippine Islands, China, Japan: occasional in Malayan gardens.

S. mexicana

Plate 40

Garden Elder

(from Mexico)

Very like *S. javanica*.

Leaves 4-12" long: leaflets 2-4" long.

Mexico: frequent in Malayan gardens.

This may be *S. canadensis*, which is cultivated in Java.

VIBURNUM

(a Latin plant-name)

Flowers small, regular, in terminal clusters: sepals 5, small: corolla with a short tube and 5 lobes: ovary with a short style and 1 cavity.

Berry, small, flattened, or oblong, pulpy, with one ridged stone enclosing one seed.

About 100 spp., N. Temperate, mountains of trop. Asia and trop. America: 5 spp. in Malaya, mountain.

V. sambucinum

(like Sambucus)

Penang Guelder Rose

Buas-Buas Bukit, Bebuas Bukit

An evergreen shrub or small tree, up to 25 ft. high: bark greyish brown, entire: twigs and inflorescences hairy.

Leaf-blade 4-10 × 2-5", elliptic; tipped, thin, glabrous, with 5-7 pairs of side-veins: stalk $\frac{1}{2}$ -3" long.

Flowers .15" wide, .3" long, white, very fragrant, crowded in flat, stalked clusters 2-5" wide.

Fruit .4" long, .25" wide, oblong, pointed, ripening black: stone with 2 grooves on one side, 3 on the other.

W. Malaysia: common in the mountains, especially on Penang Hill, occasional in swampy places in the lowlands.

The Penang Guelder Rose can be mistaken readily for the Bastard Guelder Rose (*Premna corymbosa*, see p. 705).

V. lutescens

(Lat., yellowing)

Toothed Guelder Rose

Leaf-blade toothed: flower-clusters smaller: stone with 1 groove on one side, 2 on the other.

W. Malaysia: less common in the mountains.

PAPAYA FAMILY

Caricaceæ

Tissues with sticky, watery latex.

Leaves spirally arranged, palmately divided, (entire in some spp. of Carica).

Flowers male or female, generally on different plants: male flowers with a 5-lobed calyx, slender corolla-tube with 5 lobes and 10 stamens: female flowers with the petals not or scarcely joined; ovary superior, undivided, with the ovules arranged in 5 rows on the wall, the styles 5.

Fruit a small or large berry.

2 genera, few spp., trop. America.

This is an anomalous family allied with the gourds and cucumbers (Cucurbitaceæ) and, perhaps, with the Begonias! The structure of the ovary and fruit is like that of the passion-flowers (Passifloraceæ). It is such peculiar isolated kinds of plants, as the Papaya, which make us realize how little of the previous flora of the world remains.

CARICA

(Lat., a fig.: from the leaf-shape)

A few species in tropical America.

C. papaya

(? from a West Indian word)

Papaya, Papaw
Betek, Ketelah (Ked.)

A sappy, soft-wooded, evergreen tree up to 30 ft. high, generally unbranched or with a few massive, upcurved branches: *all parts containing a sticky, white sap.*
Leaves large, variously divided palmately into 7-11 toothed lobes, with very long stalks.

Flowers very fragrant, nocturnal, generally male and female on different trees: *male flowers* $\frac{3}{4}$ " wide, like cream-coloured trumpets, set in panicles 1-3 ft. long: *female flowers* $1\frac{1}{2}$ - $2\frac{1}{2}$ " wide, white, solitary or a few together in the leaf-axils: some trees with a few female flowers at the ends of the branches of the male panicle.

Fruit large, pulpy, green turning yellow or orange, with orange flesh and many black wrinkled seeds enclosed each in a gelatinous membrane: the seeds attached in 5 rows to the wall of the fruit.

For a general account of this well-known tree, which is more like an overgrown herb, we must refer to BURKILL'S Dictionary: The Papaya was introduced to the East from Tropical America by the Spaniards in the sixteenth century. The flowers are moth-pollinated, the male flowers lasting only one night. The inheritance of sexuality in the Papaya is described in *Chronica Botanica* vol. 6, 1941, p. 245.

CASUARINA FAMILY

Casuarinaceæ

Trees with most of the twigs modified into green switchy needles with pale joints, branched or unbranched, borne on stouter woody twigs: the internodes of the needle-twigs finely grooved or angled.

Leaves reduced to minute teeth in whorls of 4-18 at the twigs.

Flowers minute, male or female, in cone-like spikes on the same or different trees, wind-pollinated: *male-spikes* as slightly modified ends of the ordinary, long needle-twigs: *male flowers* in whorls, one flower in the axil of each leaf-tooth and consisting of two minute bracts, 1-2 minute sepals and one tiny yellowish stamen: *female-spikes* as the swollen ends of special, very short needle-twigs, the flowers in whorls and consisting each of two bracts enveloping a tiny ovary with two red styles.

Fruit-head a small, round or oblong, green then brown, cone-like structure composed mainly of the swollen, hardened leaf-teeth and bracts of the female-spike with whorls of fruit-cells between them: *fruit-cells* more or less projecting and pointing, 4-10 in a whorl, composed of the two swollen bracts of the female flower making a cavity containing the slip-like seed (1-seeded ovary of the female flower) and gaping when ripe: seeds wind-blown.

One genus, about 23 spp., mostly Australian, a few only in the Malay Archipelago and Pacific, one extending to the E. Coast of the Bay of Bengal.

A more deceptive family of plants is difficult to imagine. At first sight, a Casuarina suggests a Conifer rather than any other kind of living tree and yet, when we come to study it in detail by dissecting the minute flowers and examining the structure of the wood, we find this resemblance superficial. While it is certain that Casuarinas are Flowering Plants because their seeds are contained in an ovary and they have tiny stamens, their leaves and flowers are so reduced and simple, primitive or modified, that no one has discovered with what sort of Flowering Plant they are related. Like the Gnetum (p. 726), they suggest some ancient and extinct group, or *lusus naturæ*, of which we have no knowledge, and in support of this idea we find that they are members

of the Australian flora which is known to contain relics of former kinds of vegetation, such as the Araucarias and several other Conifers (p.715)—relics that have the same significance to botanists as the Marsupials and Monotremes to zoologists, only they are much more difficult to interpret. In spite, therefore, of their cone-like flower-spikes, their cone-like fruit-heads, their pine-like needles, their conical monopodial habit when young, like the closed umbrellas of Cypresses, and the fact that they are wind-pollinated and evergreen, we must accept the disagreeable conclusion that Casuarinas are not Conifers.

A Casuarina can be recognised without difficulty from its switchy green twigs, its lack of foliage and its formal shape. If these twigs are likened to the needles of a pine-tree, it must be remembered that they differ profoundly. Pine-needles are true leaves, but those of Casuarina are twigs; they end in buds: the joints are their nodes and the finely grooved intervening parts their internodes. The leaves of Casuarina are merely teeth set in circles at the nodes and so small that they can scarcely be discerned without magnification: they have no vestige of a blade and, in fact, have lost their power of photosynthesis which has been taken over by the green twigs; they are, to all intents, useless except for the protection of the buds and young flowers. These, too, are so insignificant that most people do not notice them, but the tiny stamens give to the ends of the needle-twigs a brownish or yellowish look and the young female heads are conspicuous from the red styles. When the stamens are ripe, the twigs give off clouds of pollen which is blown about by the wind and if any settles on the projecting styles of the female flowers, those flowers will be fertilised and set fruit; there is no evidence that insects visit them. Casuarinas are big trees, most minute in their construction.

To understand the growth of a Casuarina one must realise that it has two kinds of twigs. The most obvious are the green needle-twigs which have a limited life: they grow to a certain length, characteristic of each species, but they do not thicken nor do they become woody: and after a certain time they age, turn brown and are cast off the tree to collect round its base like a mat of pine-needles. These twigs serve in the office of leaves and they are borne on the stouter twigs of the second kind, which are green only at their tips and soon become woody and develop into the branches. The appearance of the crown, whether bushy as in the Sumatran *Ru* or rather skimpy as in the Common *Ru*, depends on the abundance of needle-twigs, the amount of branching in the stouter twigs which is more frequent in the bushy Sumatran *Ru*, and whether the needle-twigs themselves are branched or unbranched. Until they have reached their full height, Casuarinas are strictly monopodial and have a conspicuous main stem tapering to the vertex of the crown: after this period, a few main limbs develop strongly and the conical shape may disappear.

Another peculiarity of Casuarinas in the presence of small swellings on their roots. It has recently been shown that these contain bacteria which are able to fix atmospheric nitrogen exactly like those in the root-nodules of Leguminous plants. This property helps to explain why Casuarinas can grow so well in apparently infertile ground, as in sand, because they are not dependent like most plants on decaying organic matter for their supply of nitrates.

The Malay name for Casuarina is *Ru* or *Aru*. As the commonest and best known species is *C. equisetifolia*, we would restrict the name to it and distinguish the others as Sumatran *Ru*, Weeping *Ru*, and so on. The Malayan name is also given to other unrelated plants of similar aspects as the Mountain *Ru* and the False *Ru*, which are mentioned in the following paragraph. In Australia, Casuarinas are called oaks, e.g. Swamp Oak, She Oak, Forest Oak, from the

similarity of their hard, pale timber with big rays to that of true Oaks (*Quercus*) : but we consider these names ambiguous in Malaya and to be avoided, however familiar they may be in Australia where the true Oaks are not wild.

There are three Malayan plants mistakable for Casuarinas. One is the Mountain *Ru* (*Dacrydium elatum*) which greatly resembles the Sumatran *Ru* in habit but it is a Conifer with its twigs densely clothed with scale-leaves and without internodes. The others are the False *Ru* (*Bæckia*) and the *Mentigi* (*Pemphis*) both of which have true leaves in pairs, though needle-like in the False *Ru*, and small flowers with white petals.

As we have indicated, Casuarinas are members of the Australian flora. Those which occur wild in the Malay Archipelago are regarded as a westward extension of the Australian flora like the Malayan Conifers, the False *Ru* (*Bæckia*) and the *Merambong* (*Scævola*). Only the Common *Ru* is wild in Malaya but two others from the Malay Archipelago (*C. Rumphiana* and *C. sumatrana*) are planted in gardens; a fourth, *C. Junghuhniana*, is commonly planted in the mountains; and a fifth, Australian species (*C. glauca*) is likely to be found useful. It is probable that several Australian kinds will be introduced to the mountains where they will do better than in the plains.

Four of the species, which are described here, are illustrated in the M.A.H.A. Magazine 1933-35, p. 108.

CASUARINA

(from the likeness of the switchy twigs to the plumage of the Cassowary or "kasuari".)

Key to the Species

- Green switchy twigs* mostly branched, arranged
 1-2 at a node : *leaf-teeth* 4 at a node : *internodes*
 4-angled : *woody twigs* marked for a long time with
 4 green stripes on each internode, the stripes alternat-
 ing at successive internodes : *cones* as broad as long
 or broader, with very prominent fruit-cells.
- Switchy twigs all drooping in vertical tassels, very
 slender, not ½ mm. thick; the four angles scarcely
 visible to the naked eye *C. Rumphiana*
- Switchy twigs stiffly upright as well as drooping,
 densely tufted at the ends of the shoots, about
 1 mm. wide, conspicuously 4-angled *C. sumatrana*
- Green switchy twigs* mostly unbranched, long, often
 arranged 3-5 at a node as well as 1-2 : *leaf-teeth*
 more than four at a node : *woody twigs* with several
 fine brown ridges.
- Switchy twigs 1-1½ mm. wide, stout, 8-24" long, with
 9-18 (mostly 14-17) teeth at a node, mostly droop-
 ing vertically : seldom (? ever) fruiting in Malaya :
 commonly suckering *C. glauca*
- Switchy twigs ½ mm. wide, slender, 4-14" long :
 5-10 teeth at a node : not suckering
- Switchy twigs withering yellow : 5-8, mostly 7,
 teeth at a node : seashore and lowland *C. equisetifolia*
- Switchy twigs withering red : 8-10 teeth at a node :
 mountain, cultivated *C. Junghuhniana*

C. equisetifolia Plate 41
(with foliage like Horsetails, Equisetum)

Common *Ru*

Bark dark brown to greyish brown, ridged, fissured and flaky in oblong pieces.

Male-spikes $\frac{1}{2}$ -2" long.

Fruit-heads $\frac{1}{2}$ -1" long \times $\frac{1}{2}$ - $\frac{3}{4}$ " wide, distinctly longer than broad: fruit-cells scarcely projecting, arranged in whorls of 7-8.

Bay of Bengal to the Pacific Isles: E. Coast of Malaya, elsewhere cultivated.

This species is described and illustrated by FOXWORTHY. Its botanical name is derived from the resemblance of its switchy twigs to the stems of the fern-like plants called Equisetum (Horse-tails), which do not grow in Malaya.

Throughout its area of natural distribution the *Ru* is a pioneer tree on sandy coasts. Its seeds sprout on the hot, open sand above the high-water mark and form a thicket of conical, cypress-like saplings that develop into a Casuarina-forest provided that the sea makes no encroachment upon it. It is very strange to find the slender seedlings, like miniature Christmas-trees a few inches high, in the full glare of the beach at mid-day but that is their favourite situation where they grow vigorously and send strong roots down to the water-table beneath the surface. Moreover, the seedlings are unable to survive in forest or dense vegetation or, even, in the carpet of needles under the older Casuarina-trees. Unless the shore is advancing seaward, therefore, from the accumulation of sand driven by the wind and the waves, the Casuarina-forest that fringes the coast is unable to extend and, in course of time, it will be more or less completely supplanted by saplings of other coastal trees, that can survive in its shade, and it will be transformed ultimately into *Eugenia grandis*-forest (p. 488) with a narrow strip or single file of Casuarinas on the front. If the coast is now abraded many Casuarinas may fall into the sea and they may all disappear. Such a strip of trees fronting the shore is to be seen on most parts of the East Coast of Malaya, perhaps with a few saplings before them where the beach is locally extending and again with old trees fallen over where there is abrasion. In contrast, there are several places on the Pahang Coast, at Miang and Bebar for instance, where big sand-spits have been thrown across an estuary and have been extended down the coast for many hundreds of yards, even for several miles, and such broad sand-banks are crowned with a forest composed almost entirely of Casuarina, the seedlings and saplings on the advancing spit and the old trees affording favourite roosting-places for a certain kind of hornbill. Further there are a few bays, like Jason Bay (Telok Subong) on the East Coast of Johore, where the beach is advancing or has been advancing for a very long time so that one may find a succession from the sapling Casuarinas on the front through the mature Casuarina-forest, intermixed with other coastal trees, to the *Eugenia grandis*-forest behind: and in this virgin, inland forest there occur a few very old lofty Casuarinas, 120-150 ft. high, at distances up to 400 yards from the sea, which bespeak both the age that the Casuarina may attain and the rapidity with which the coast has advanced, for such trees, embedded now in forest, must once have been seedlings on the open shore. Unfortunately, the *Ru* is good firewood—the best, it is said, in the world: and these fine forests of the East Coast have been, for the most part, devastated.

In other parts of Malaya, the *Ru* is planted. It thrives best, of course, in sandy places near the sea but does well in ordinary soil far inland though it is said not to fruit much in these places, if at all. There is no evidence that it is wild on the West Coast, though it is much planted at Port Dickson, Morib and Penang: it is not to be found, for instance, in the wild bays at Lumut and Pangkor where the virgin forest rises from the shore and the deep sandy beaches offer ideal conditions.

In a suitable place the *Ru* grows rapidly: a rate of ten feet a year has been recorded for saplings. In 25 years it may reach 100 ft. The crown is at first conical, the leader projecting from the top and often curiously wavy, and the branches curving upward: some plants are much bushier and more shapely than others so that one imagines there may be varieties. Eventually, when the crown has reached its full height, a few of the larger limbs stand out and give the tree an awkward, straggling shape very different from its tidy sapling. The age of the tree is not known but from our observations on old forest trees at Jason Bay we are confident that it can extend to several hundred years.

Concerning the sex of *Ru*-trees there is some variability. Some are wholly male, others wholly female, but not a few bear both male and female cones.

The *Ru* casts little shade but it makes an excellent wind-break and such is its chief virtue on the coast. A single file of trees will appreciably modify the wind and a depth of three trees will break its force entirely so that when to seaward the wind is southing, trees are bending and hats blow off, a few yards inland the air may be still and heavy. The effect is caused by the abundance of switchy twigs.

C. glauca

Australian Swamp *Ru*

(Gr., glaukos—a pale, glancing blue)

(Cones .5–.7 × .5", oblong).

Native of Queensland.

As grown in Malaya, this species suggests a poorly developed *Ru* with narrow crown, but it has much stouter and longer, drooping needle-twigs, many more leaf-teeth at a node and the habit of throwing up suckers from the roots. It has been planted at Katong, in Singapore, and perhaps elsewhere. It is likely to be a useful tree where a thick hedge is needed in swampy or sandy ground because pruning will encourage the root-suckers.

C. Junghuhniana

Red-tipped *Ru*, Mountain *Ru*

(F. W. Junghuhn, 1809–1864, the Dutch botanist of Java)

A mountain tree very like *C. equisetifolia* but:—the green switchy twigs often longer, 6–14", with 8–10 teeth at each node, withering orange-red or scarlet: seed-cones smaller, .3–.4" long, .3" wide, (the stalk only .1–.15" long), with 5–6 whorls of fruit-cells (8–10 in a whorl).

W. Malaysia: commonly planted in the mountains of Malaya, especially at Fraser's Hill, not wild.

This species presents two forms, one in which all the green switchy twigs are long and drooping, the other in which they are short and more or less upright. By the vivid colour which these twigs turn in withering, the species is at once recognised: in the other four they become yellow. Botanically, the plants cultivated in Malaya are *C. Junghuhniana* var. *tenuior* with slender twigs. The species was called *C. montana* in the first edition of this work.

C. Rumphiana

Weeping *Ru*

(G. E. Rumpf, the Dutch botanist of Amboina, 1628–1702)

Unbranched green needle-twigs 1–3", rarely 4", long.

Fruit-heads $\frac{1}{2}$ " wide and long: fruit-cells arranged as in *C. sumatrana* and strongly projecting.

Moluccas, Celebes, Philippines, in mountain forests: introduced to Malaya.

The drooping ends of the twigs, with all the needle-twigs hanging in green tassels on the underside of their supporting branches, at once distinguishes this species from any other. It is slow growing like the Sumatran *Ru* and, in the

plains, less robust, reaching only 30-40 ft. high, but it is a most attractive tree and, doubtedless, one that would do better in the mountains. The drooping habit is uncommon in Malayan trees but, in this case, it is closely paralleled by the False *Ru* (*Bæckia*) which has, of course, proper needle-leaves and little flowers with white petals.

C. sumatrana Plate 42Sumatran *Ru*

Unbranched green needle-twigs 2-8" long, the longest drooping from the lower side of the main twigs.

Fruit-heads $\frac{3}{4}$ - $\frac{3}{4}$ " long, $\frac{3}{4}$ -1" wide: the fruit-cells in 4 whorls of 4 cells each (with sterile, undeveloped whorls at top and bottom), strongly projecting.

Burma, W. part of Malay Archipelago, but not wild in Malaya.

This beautiful species has a much bushier crown and more symmetrical shape than the Common *Ru*. Its branches curve up in the same way but, instead of tapering to a straggling point, they end in a big tuft of switchy needle-twigs as in the Mountain *Ru* (*Dacrydidum elatum*), and such branches, in consequence, look bearded. The compact effect is caused by the condensed growth of the buds of the main twigs and the branching of the needle-twigs. Saplings have the pyramidal appearance of a Thuja and, though in mature trees the branch-endings are better spaced, the crown always retains a peculiar and striking symmetry. It grows much more slowly than the Common *Ru* and never reaches such a height, perhaps not exceeding sixty feet. Nevertheless, it should be much more widely planted than at present because it is one of the best formal trees of the East Indies.

SPINDLE-TREE FAMILY

Celastraceæ

(from the genus *Celastrus* of Asia, Australia, and N. America)

Leaves simple, spirally arranged or opposite.

Flowers, small, regular: sepals, petals and stamens 4 or 5, free, alternating: ovary surrounded by or immersed in a fleshy ring or disc, the style short or none.

Fruit typically a capsule: seeds mostly with a pulpy coat (aril), not ruminant.

About 500 spp., throughout the world: 12 genera, 55 spp. in Malaya, mostly in the lowland forest.

KURRIMIA

(? an Indian plant-name)

Buds conical, projecting at the ends of the twigs.

Leaves spirally arranged, the stalk with a swollen joint or knee at the upper end.

Flowers in simple or branched spikes, small.

Capsule splitting into 2 parts: seeds large, with pulpy red coat (aril).

3 or 4 spp., Indo-Malaysia: 2 spp. in Malaya.

Key to the Species

- Leaves 1-3" wide: flowers red, in unbranched spikes:
 capsule conical, red, 1-seeded *K. robusta*
 Leaves 3-6" wide: flowers yellowish cream, in branched
 spikes: capsules 2-shouldered, 2-4-seeded *K. paniculata*

K. paniculata Plate 43, Text-Fig. 49 Malayan Spindle Tree

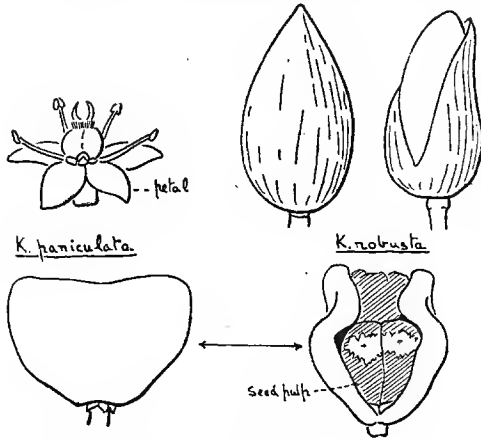
An evergreen tree, up to 80 ft. high, with dark green, heavy crown supported by wide-spreading limbs, scarcely buttressed: bark light brownish grey, entire or somewhat cracked and fissured: buds $\frac{1}{2}$ -1" long, covered by long green scale leaves: young leaves pale green.

Leaf-blade 5-13 × 2½-6", oblong-elliptic, not tipped, thinly leathery, rounded at the base, pointing down, with 14-19 pairs of side-veins and very fine crowded parallel veinlets between them: stalk $1\frac{1}{2}$ -3½" long.

Flowers 2" wide, yellowish cream, faintly fragrant, in pale green branched spikes, 6-10" long, apparently terminal but actually in the axils of bud-scales above the leaves.

Fruits $\frac{3}{4}$ " long, flattened heart-shaped, somewhat bilobed at the apex, splitting into two parts, turning yellow then rose-red, in large clusters: seeds large, pale brown, covered except at the end by the crimson-pink pulp, 2-4 in each fruit.

India, W. Malaysia: common in the lowlands, in secondary and primary forest.



Text-Fig. 49. Kurrimia: flower × 4: fruit, nat. size.

This handsome tree, which we should do well to plant as an ornamental for the beauty of its clusters of pink fruits, strongly resembles the Oak- and Chestnut-trees in the general appearance of leaf and inflorescence, and like them, develops its flowers and leaves at alternate seasonal intervals. After a spell of dry weather, the terminal buds elongate to form a short new twig bearing only scale-leaves, from the axils of which the inflorescences develop. The terminal bud then rests until the fruits are nearly ripe, when it resumes growth and develops a set of foliage leaves. After the next dry spell, flowers are again developed followed by the fruits and then a set

of leaves. Most twigs on a tree behave alike but one can generally find a few which are flowering while the majority are leafing, and vice versa. Thus the inflorescences appear terminal and the fruit-clusters lateral.

The fruits resemble those of the European Spindle Tree (*Euonymus europæus*). A few species of *Euonymus* occur in the Malayan forests.

The pulp round the seed is edible but tasteless.

Compare the Bat's Laurel (*Pygeum polystachyum*) p. 528.

K. robusta Text-Fig. 49 Red-Flowered Malayan Spindle Tree

Like the preceding but:—buds much shorter, $\frac{1}{4}$ -½" long: leaf-blade smaller, 4-7 × 1-3", stalk $\frac{1}{2}$ -2" long: flowers red, in slender unbranched spikes 4-7" long, in the leaf-axils: fruit 1-1½" long, conical, olive yellow, with one brown seed covered with orange pulp.

N. E. India, W. Malaysia: much less common than the preceding.

Not to be mistaken for a nutmeg-tree (alternate leaves).

TERMINALIA FAMILY

Combretaceæ

(from the genus Combretum)

Leaves simple, spirally arranged (or opposite).

Flowers rather small, regular, in spikes or racemes; petals free, 4-5, or absent: stamens 6-10; ovary inferior.

Fruit 1-seeded, not opening, round or flattened.

16 gen., 500 spp., mostly tropical, few subtropical: 5 gen., 24 spp. in Malaya, in the lowlands.

In Malaya this family is rather poorly represented by some climbers, such as the Rangoon Creeper or Drunken Sailor (*Quisqualis indica*), the formal yet beautiful Terminalia-trees and the mangrove-trees, Lumnitzera, known by the Malay name *Teruntum*.

Key to the Genera

- Mangrove or coastal trees with small leaves, red or white
 flowers (with petals) in terminal inflorescences ... *Lumnitzera*
 Not so; mostly inland or, if coastal, then with large leaves;
 flowers greenish without petals, in lateral spikes ... *Terminalia*

LUMNITZERA

(St. Lumnitzer, 1750-1806, a Hungarian botanist)

Mangrove or sea-shore trees with spirally arranged, small, blunt, rather fleshy leaves.

Flowers with 5 petals and 6-10 stamens.

Fruit as small green, clustered berries with the calyx persistent at the top.

3 spp. tropical, round the Indian Ocean and W. Pacific: 2 spp. in Malaya.

Key to the Species

- Flowers red, in small bunches: fruit in bunches ... *L. littorea*
 Flowers white, in racemes: fruit in spikes ... *L. racemosa*

Both species are described and figured by WATSON in his Mangrove Forests (20, p. 53). They are known to Malays as *Teruntum* (not *Terentang* which is *Camptosperma*). They occur in mangrove swamps and on rocky, muddy or sandy coasts. *L. littorea* (called *L. coccinea* by WATSON and BURKILL) is a very beautiful tree with rugged trunk, gnarled branches and little bunches of scarlet flowers nestling in the dark green, glossy foliage. Both species may flower as shrubs but the Red *Teruntum* is commonly a fairly large tree, reaching even 100 feet high. The White *Teruntum* seems never to exceed twenty feet high, and is much less common than the Red.

TERMINALIA

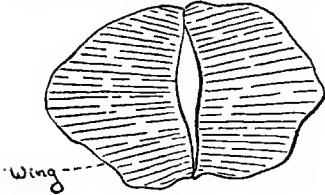
(from the rosettes of leaves at the ends of the twigs)

Big pagoda-trees with simple leaves set spirally in rosettes at the ends of the twigs.

Flowers very small, in slender inconspicuous spikes borne singly in the leaf-axils: calyx cup-shaped with 5 teeth: petals none: stamens 10.

Fruit sessile, either large, oblong (or rounded) with thick, leathery, corky rind and hard thick stone, or flattened and leaf-like with a small stone and two wings: 1-seeded, not opening.

About 140 spp., throughout the tropics: 8 spp. in Malaya, nearly all in lowland forest.



Text-Fig. 50. Fruit of *Terminalia subspathulata*,
× ½.

This genus includes a number of exotic timber-trees and several kinds the fruits of which are used medicinally or for tanning and are traded under the curious name "myrobalans". The fruit of some, like the *Ketapang* or Sea Almond (*T. catappa*), resembles small mangos (*mempelam*) but it does not become fleshy and the hard stone contains a finger-shaped, edible kernel composed of the tightly coiled seed-leaves of the embryo. It seems that the original fruit of the genus must have been pulpy, edible, and mango-like, and that this has been modified for water- and wind-dispersal by failure to develop the pulpiness of the flesh. Thus, the mango-like fruits of the Pig's Mango (*T. phellocarpa*) have a corky flesh and are distributed mainly by flood-water floating them through the forest. Those of the *Ketapang* are thinly corky and bob about in the sea to be stranded at high tide. They have a rudimentary wing, and the development of this, accompanied by the decrease in size of the stone and seed, seems to have produced the winged elm-like fruits, dangling in catkins and blown from the tree (*T. pyrifolia* and *T. subspathulata*). In Malaya, the only common species are the *Ketapang* and, in Kedah and Perlis, the *Mentalun*.

The characteristic shape of *Terminalia*-trees has been described in Part I (p. 30). It is most conspicuous in the saplings and disappears from the older trees as the branches droop at the ends and the crown is filled out.

It seems that most, if not all, our species are deciduous and flower after the new leaves have developed, but the frequency with which they shed their leaves and the season differ remarkably.

Terminalias must not be confused with the latex-bearing *Alstonias*, the leaves of which are in true whorls, or with the Pigeon-Plums (*Elæocarpus*) which differ generally from *Terminalia* in their notched or toothed leaves withering red, the knee at the top of the leaf-stalk, the resinous buds, the stalked and pulpy fruits, and, of course, their flowers. But *T. belerica* may well be mistaken for an *Elæocarpus* when sterile.

Key to the Species

- Leaves 4-7" broad, very shortly stalked, withering red: towns and sea-shores ... *T. catappa*
- Leaves 1-3½" wide, distinctly stalked, withering yellow
 - Leaf-stalks ½-1" long: side veins 6-8 pairs
 - Fruits mango-like but corky: swampy forest throughout Malaya ... *T. phellocarpa*
 - Fruits flattened, winged: rice-fields of Kedah and Perlis ... *T. pyrifolia*
 - Leaf-stalks 1-2½" long: side-veins 8-12 pairs
 - Leaves glaucous beneath: fruits flattened, winged ... *T. subspathulata*
 - Leaves not glaucous: fruits round, finely velvety ... *T. belerica*

T. belerica

(an Indian or Arabic word)

Siamese Terminalia
Uji, Jelarwei

A tall tree like *T. pyrifolia* but with the leaves often blunt, with more pairs of side-veins (8-12 pairs), longer leaf-stalks (1-2½" long) and *round or broadly oblong, finely velvety fruits*, 1-1½" long, 1-3 spike, *not winged*, but with 5 slight ridges when dry.

India, Siam, Malaya, Java: occasional in open country and forest from Malacca northward.

This species may easily be mistaken for *T. subspathulata* but the leaves of *T. belerica* are not bluish green on the underside and the fruits are different.

T. catappa Plates 44, 45
(from the Malay name)

Sea Almond, Indian Almond
Ketapang, Lingtak

A common sea-shore tree up to 80 ft. high with spreading, coarse-leaved crown: *trunk* thick, often twisted and leaning to the sea: *bark* grey, fissured and rather flaky, but not ridged: *inner bark* pinkish brown: *twigs* thick, stout, with big leaf-scars.

Leaf-blade 6-12 × 3½-7", *obovate, large*, slightly tipped or not at all, *narrowed to the heart-shaped base, rather fleshy*, with 8-12 prs. of side-veins: stalks about ½" long.

Flowers 2" wide, greenish white, in spikes up to 5" long, with a rather foetid smell, the lower 1-9 flowers on the spike being female, the rest male, or the spikes wholly male.

Fruit 1½-2½ × 1-1½", *oblong, flattened, thick, narrowly flanged round the edge*, rather pointed, green becoming yellow or pinkish yellow.

Throughout Malaysia and the Pacific Isles, on rocky and sandy coasts.

The *Ketapang* is one of the commonest Malayan trees whether wild on the coast or inland where it is planted for its shade in villages and by roadsides; and its fruits are familiar objects of the drift. They can float many days in the sea because they are buoyed up by the corky rind and the numerous tiny air-cavities in the outer part of the stone; thus they may be distributed by wind, waves and currents over considerable distances before they are washed up in a water-worn condition with the rind rubbed away, the colour gone and the edges frayed. The kernel of the fruit has a delicate flavour, like an almond, but is troublesome to remove from its tough stone.

The *Ketapang* sheds its leaves twice a year, January or February and July or August. Before they fall, the leaves of most trees turn vivid red, in a few cases yellow, and, as the greater part of the crown is affected at once, the trees become most conspicuous. After the crown is bare, all the twigs develop new leaves and again the tree becomes conspicuous from the fresh foliage. The deciduous habit begins in saplings 3-4 years old. The *Ketapang* is one of our regularly seasonal plants, practically synchronous with the yellow Flame (p. 398).

Although the *Ketapang* can generally be recognised at once from its stiff outstanding branches and its big leaves arranged in rosettes, there are two other common species which may easily be mistaken for it, especially as they are found in similar places. There is, firstly, the *Putat Laut* (*Barringtonia asiatica*) which also grows on the shore and has similar big leaves in rosettes but they are fleshier, shinier and distinctly pointed: its young leaves are pinkish olive, the old ones wither yellow or pale orange-yellow, never red: it is not deciduous: its flowers and fruit are enormous and utterly different: and its inner bark is whitish, not pink or red. And secondly there is the *Birah* (*Fagraea crenulata*) which grows in lowlying ground behind the mangrove and in villages and towns near the West coast where the *Ketapang* is often planted: it has much larger, cabbagy leaves grouped in alternating pairs: the leaves wither pale yellow: it is not deciduous: the flowers are quite different: and the trunk is strongly ridged and generally set with short woody spines.

The leaves of the *Ketapang* are unfortunately very apt to be eaten by beetles and grasshoppers and it is often difficult to protect saplings until they have grown sufficiently large to survive the attacks.

T. phellocarpa

(Gr., phellos—cork, karpós—fruit)

Pig's Mango

*Mempelam Babi, Pelawei, Jelawei*Like the *Ketapang* but :—Bark brownish grey, rather fissured and flaky; inner bark pale brownish, darkening on exposure to the air: *crown fine-leaved* (rather like a birch tree):Sapling leaves up to $12 \times 2\frac{1}{2}$ " , lanceolate, the veins rose-red on the underside of leaf.*Leaf-blade* $2\frac{1}{2}$ –5 \times 1 – $2\frac{1}{2}$ " , small, with 6–8 prs. of side-veins: stalk $\frac{1}{2}$ – $\frac{3}{4}$ " .*Fruit* 2 – $3 \times 1\frac{1}{2}$ – 2 " , much larger, mango-shaped, slightly flattened, without a flange, but with a distinct curved point, green; then ochre-yellow.

Malaya: common in the south, in lowlying swampy ground, the fruits distributed by river and floods: flowering about November and fruiting May—September.

Compare the *Pauh Kijang* (*Irvingia*) with similar fruits but with a strongly buttressed, pale trunk and alternate leaves.

T. pyrifolia

Plate 46

Kedah Tree

(Lat., pyrus—pear, folium—leaf)

Mentalun, M. Batu, Batalong

A large tree, to 100 ft. or more high, with fluted buttressed trunk and grey, or greyish buff, shallowly fissured and rather flaky bark, the inner bark pale yellowish brown: *crown fine-leaved*, the main branches ascending then spreading horizontally.

Leaf-blade 3 – $7 \times 1\frac{1}{2}$ – $3\frac{1}{2}$ " , oblong or obovate, tapered to the apex and base or rather suddenly tipped, thinly leathery, pale beneath but scarcely glaucous, with 5–8 prs. of side-veins: stalk $\frac{1}{2}$ – 1 " long.

Flower spikes 4–9" long, hairy: flowers cream colour.

Fruit flattened and winged (like an elm-fruit), broader than long, more or less deeply notched in the middle, 1 – $2\frac{1}{2}$ " wide, $\frac{1}{2}$ – 1 " long, yellow then brownish, with a rather thick keeled body between the two wings: hanging in tassels from the twigs.

Burma, Andaman Isles, Peninsular Siam and Malaya to Kedah: abundant from Alor Star northwards and in Langkawi (on the sea-shore and limestone cliffs).

This beautiful tree abounds in the extreme north of Malaya among the rice-fields and in the forest. It can easily be recognised from its rather small-leaved, flat-topped crown, sparsely decked with the bright yellow withered leaves; and in places one can distinguish it in every direction, its head raised above the surrounding vegetation. There was a row of fine specimens by the main-road about 2 miles south of Jitra.

It appears to shed its leaves in the latter half of the year, to flower only between August and December, during the rainy season, and to fruit from December–April, during the dry season. Its fruits, like those of the following species, resemble broad elm-fruits and do not suggest any connection with the *Ketapang*; only the flange round the *Ketapang*-fruit clearly represents the wing of the *Mentalun*.

The forest which lies between Burma and Malaya has the nature more of the Indian monsoon-forest than the Malayan rain-forest, because of the pronounced dry season which it suffers from December to March. A great many species of plants are, of course, common both to Tenasserim and Pahang, for instance, but there are many which are strictly confined to the one or the other region; and of these, the *Mentalun* is, perhaps, the best example. As its noble crown begins to appear against the sky about the vicinity of Alor Star, so one knows that the flora is about to change.

(*T. pyrifolia* is called *T. bialata* in BURKILL'S Dictionary).

T. subspathulata Text-Fig. 50
(Lat., like a spatula)

Malayan Terminalia
Jelaweï, Pelaweï

A big tree, to 150 ft., with tall spreading buttresses and widely conical, narrowly flat-topped crown, the upper limbs steeply ascending, the lower limbs drooping. Very like the *Mentalun*, but:—

Leaf-blade obovate, rather small, *bluntly tipped*, or scarcely tipped, *leathery*, with *narrowly recurved edges*, *bluish green beneath*, with 8-11 prs. of side-veins: stalks 1-2½" long.

Fruits flattened and winged, 1½-3¾" wide, ½-1½" long, *not or slightly notched*, the body of the fruit hardly projecting.

Malaya: rather scarce, from Perak southward.

There is a tree of this species in the Singapore Botanic Gardens and there are two fine specimens in the Lake Park at Seremban. It begins to shed its leaves about October but the crown is not completely bare until the following March, April or May, when the new leaves and flowers develop. The fruits ripen and blow away about July and August.

SUNFLOWER FAMILY

Compositæ

(from the composite nature of the flower-heads)

Leaves simple or pinnately lobed, variously arranged.

Flowers very small, set in heads surrounded by a covering (involucre) of small green or brownish scale-like bracts, the heads solitary or grouped together to form compound heads: sepals absent: corolla tubular with 5 petal-lobes: stamens 5, the anthers joined in a tube: ovary inferior, with one ovule, the style passing through the anther-tube and forked at the end.

Fruit a small, dry, 1-seeded nutlet (achene), often crowned by a circle of hairs (the pappus) or scales.

About 800 genera, 12,000 spp., throughout the world: about 30 genera, 50 spp. in Malaya, mostly introduced.

In Malaya, we know this family mainly from a few kinds of groundsel-like weeds and such garden-plants as sunflowers and artichokes (*Helianthus*), lettuce (*Lactuca*), *Cosmos*, *Coreopsis*, *Zinnia*, *Gerbera*, *Dahlia* and *Chrysanthemum*. The family is noted for its abundance of herbaceous members which, in nature, seem to prefer the open conditions of grassland, scrub and savannah-country, alpine meadows and deserts; and, so far as numbers of species go, it is poorly represented in the tropical rain forest. Comparatively few members are shrubs, fewer still are climbers, and trees are exceptional, yet one of our common indigenous species is a fairly large tree with well-developed trunk and limbs so that, without a detailed study of the flowers, it would not be taken for an ally of *Zinnia*.

What are popularly called the flowers of the Compositæ are really heads of tiny flowers, or *florets*. Their construction can be likened exactly to a bunch of *Ixora*-flowers dwarfed to the size of a thimble and set round with one or more rows of small green protective bracts. The real flowers have much the same structure as those of the *Ixora*-family, except for the anther-tube and the solitary ovule; and from this resemblance it is generally considered that the two families are related, the Compositæ being a specialized offshoot from the woody and tropical *Rubiaceæ*.

The real flowers may have two forms. Either the corolla is tubular or it is prolonged on one side into a strap-shaped arm like a single, narrow petal, such

COMPOSITÆ

florets being called *ligulate*. The flower-heads of the Tree-Vernonia consist solely of a few tubular florets: those of the sunflower have a single outer row of ligulate florets surrounding the central mass of hundreds, or thousands, of tubular florets: in other cases, such as the lettuce, all the florets in the head are ligulate.

Characteristic wild shrubs belonging to this family are the *Chapa* or *Sembong* (*Blumea balsamifera*) and the mangrove *Beluntas* (*Pluchea indica*) described by WATSON (20, p. 53). The *Sembong* is a sparingly branched shrub, up to 15 ft. high; its tissues, when bruised, smell strongly of camphor; its leaves are large, coarsely toothed or pinnately lobed and its florets are yellow and tubular. The *Beluntas* has small, blunt, toothed leaves and small heads of white or lilac, tubular florets.

Key to the Genera

Flower heads large, daisy-like: leaves opposite, pinnately lobed: mountains	...	...	...	...	<i>Montanoa</i>
Flower heads small: leaves spirally arranged, entire: low-land and mountain	...	...	...	...	<i>Vernonia</i>

MONTANOA

(L. Montana, a nineteenth-century Mexican physician)

Leaves opposite, large, pinnately lobed.

Flower-heads large, with an outer row of white ligulate florets round the yellow tubular florets.

Several spp., tropical America.

Montanoa grandiflora

Tree-Daisy

A big shrub or small tree, reaching 25 ft. high: *leaves and twigs resinous-aromatic when crushed*.

Leaf-blade 6-18" long, with 3-6 lobes on each side, rather rough hairy: stalk 2-5" long: stipules large, leafy.

Inflorescence 1-2 ft. long: flowerheads 2-3½" wide, facing outward.

Central America: *frequently cultivated in the mountains.*

This attractive plant has flowers like a single white and yellow *Chrysanthemum*.

VERNONIA

(W. Vernon, d. 1716, an English botanist)

Leaves spirally arranged, simple.

Flower-heads small, set in terminal panicles, consisting of several rows of bracts surrounding the tubular florets (without ligulate florets).

Fruits crowned by many stiff dirty-white hairs.

About 500 spp., throughout the warmer parts of the earth but mostly American: 8 spp. in Malaya, mostly herbs.

V. arborea Plate 47

(Lat., arbor—tree)

Tree-Vernonia

Medang Gambong, Merambong

An evergreen tree, up to 60 ft. high, flowering at 10 ft.; crown rather narrowly conical, or rounded: trunk rather slender: *bark* pale-greyish buff, becoming rather closely and shallowly ridged.

Leaf-blade 3-8 × 1½-4", elliptic, tapered to the apex or tipped, tapered to the base or rounded or nearly heart-shaped, light green or yellow green, rather shiny and fleshy, with 8-13 pairs of side-veins: stalks ½-1" long.

Panicles 6-16" long, up to 20" wide, large: flower-heads ¼" wide, clustered at the ends of the branches: florets about 5 in a head, white tipped lilac, fragrant like *Chrysanthemum*.

Fruits ½" long, the hairs ⅓" long.

India, W. Malaysia: common throughout Malaya, in lowlands and mountains.

A variety with pale brown or greyish velvety twigs and undersides to the leaves has been called *V. javanica*. It is common at Fraser's Hill.

The Tree-Vernonia flowers generally about June to August, during the dry spell in the middle of the year, but it may flower also at the beginning of the year. It seems a very ordinary tree until one considers how exceptional the tree-form is in the family, and then it becomes an object of great interest. Is the habit primitive and inherited through a long line of tree-ancestors or has it been secondarily developed from the herbaceous members of the genus *Vernonia*?

BEKOI FAMILY

Crypteroniaceæ

Leaves opposite, generally connected by a line across the twigs, without obvious stipules (except in saplings); buds very small, scarcely visible.

Flowers tiny, either male and female or female only, set in long hanging panicles like sparingly branched spikes: sepals 5; petals 0; stamens 5; ovary superior.

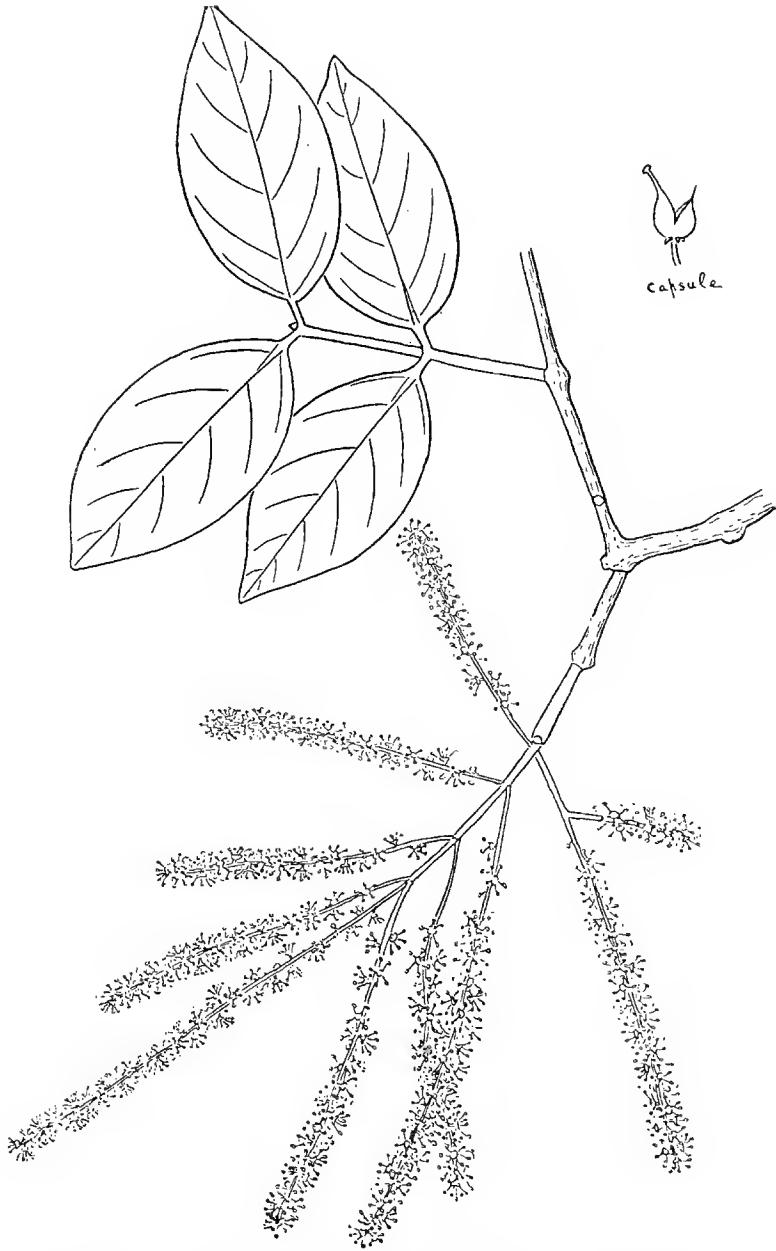
Fruit small, round, with the calyx persistent at the base and the style at the apex, splitting longitudinally into two parts so as to divide the style: seeds many.

One genus, 6 spp., N. E. India and Malaysia: 2 spp. in Malaya.

CRYPTERONIA

(Gr., *kruptos*—hidden, *eros*—love)

This aberrant genus of trees, the affinity of which is problematic, would not have found a place in this book had we not discovered that one species, called *Bekoi* (*C. paniculata*), is a common tree in Penang, where it takes the part of the *Tiup Tiup* (*Adinandra*) or *Tembusu* (*Fagraea*) in Singapore. It has, moreover, a characteristic shape which, once learnt, is not easily mistaken. The best way to get to know it is to study the named trees in the Waterfall Gardens and to compare them with these notes. It can be described as a tree with a rugged trunk like the *Tembusu*, a dull shabby crown like the *Tiup Tiup* and opposite leaves like *Eugenia*. From this last feature, indeed, it may well be mistaken for a *Eugenia* in the absence of the tiny flowers and fruits, but on the twigs there are always linear scars connecting the pairs of leaves such as one finds in *Memecylon* and the *Ixora*-family. From *Memecylon*, the *Bekoi* differs in its large size and thick bark, and from the *Ixora*-family in the absence of conspicuous stipules covering the buds. The tiny buds distinguish it also from the inland representatives of the Mangrove-family such as *Carallia*, *Pellacalyx* and *Gynotroches*. When in flower or fruit, which seems to be infrequent, the curious hanging spikes are unmistakable. The *Bekoi*, moreover, is one of the few plants the young leaves of which are deep blue (p. 85) and by this means the numerous saplings on Penang Hill can at once be detected.



Text-Fig. 51. *Bekoi* (*Crypteronia paniculata*), $\times \frac{1}{2}$: fruit $\times 2$.

Key to the Species

Blade 3-7" long, thinly leathery	...	...	<i>C. paniculata</i>
Blade 8-12" long, very leathery	...	...	<i>C. Griffithii</i>

C. paniculata Plate 48, Text-Fig. 51 *Bekoi, Bekwoi, Menkuah* (Kel.)
(from the inflorescence)

An evergreen tree reaching 100 ft. high, with rather open, uneven, dull dark shabby green crown: the trunk slightly buttressed or fluted to a height of 10 ft., prominent and breaking high up into several, thin, ascending and outcurving but not drooping branches: bark dark grey or brownish grey (often reddened from lichens), rather closely ridged and fissured, the ridges flaking in short, thick, oblong pieces: young leaves and twigs deep blue or violet turning pinkish brown then green: twigs brown, sharply 4-angled when young, narrowly 4-winged in saplings: old leaves withering yellow.

Leaf-blade 3-7 × 1½-3", elliptic, scarcely tipped, narrowed to the base, the sides slightly upcurved, thinly leathery, glabrous or softly hairy beneath: stalks ¼-½" long: side-veins 6-9 pairs.

Flowers .05" wide, pale greenish yellow, on tiny stalks: inflorescences 6-10" long, mostly from the ends of the leafy twigs.

Fruit ¼" wide.

Burma, Siam, W. Malaysia to the Philippines: Perlis, Kedah, Langkawi, Penang, Cameron Highlands: very abundant in Penang from sea-level to the top of the hill, many trees by the road to Balek Pulau.

C. Griffithii Rhinoceros' Ear
(W. Griffith, 1810-1845, doctor and botanist in the E. India Co.) *Talingga Badak*

Twigs strongly swollen at the nodes.

Leaf-blade 8-12 × 2½-5½", large, oblong, very leathery, rounded at the base, almost heart-shaped.

Flowers ¼" long, greenish purple, in hanging spikes 8-14" long, terminal or, mostly, from the swollen nodes behind the leaves.

Malaya, scattered throughout the country, much less common in Penang than the preceding species.

CUNONIACEÆ

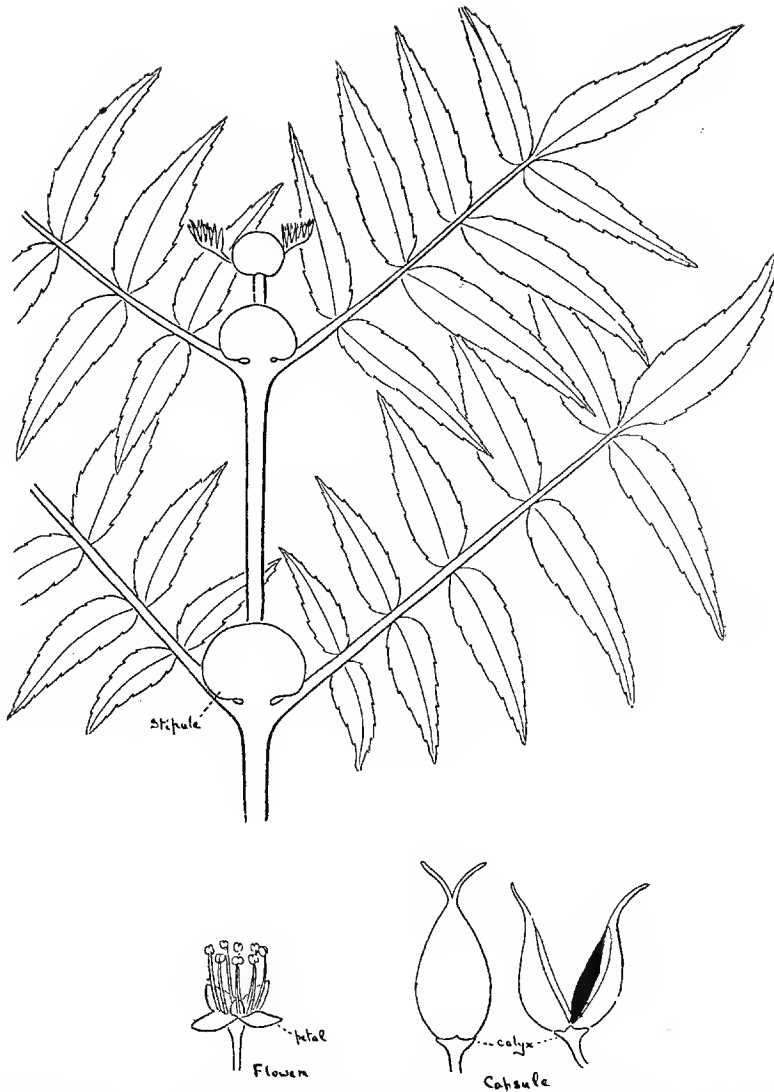
(from the genus Cunonia)

Leaves pinnate, opposite: leaflets toothed: stipules large.

Flowers small: sepals and petals free: ovary superior.

25 genera, 240 spp.: 1 genus, 1 sp. in Malaya.

This small family of the Southern Hemisphere contains no well-known plants though allied with it are the families of the gooseberries and currants (Grossulariaceæ), the Hydrangeas (Hydrangeaceæ) and the Escallonias. Formerly it was united with the Saxifrage-family. Our Malayan representative (*Weinmannia*) is a common, easily recognized mountain tree the paired pinnate leaves of which suggest an elder (*Sambucus*) or *Peronema* (*Verbena*-family), but in both these the leaflets wither yellow, whereas in *Weinmannia* they characteristically turn red.



Text-Fig. 52. Malayan Mountain Ash (*Weinmannia Blumei*), $\times \frac{1}{2}$: flower and fruit, $\times 10$.

WEINMANNIA

(J. W. Weinmann, a German herbalist of the seventeenth century)

Leaves opposite, pinnate: stipules large.

Flowers minute, in racemes: petals 4: stamens 8: ovary with 2 cavities and 2 styles, superior.

Fruit a tiny capsule splitting into 2 parts.

120 species, tropical and temperate S. America, Madagascar, Malay Archipelago, Pacific Islands, New Zealand (absent from India, Africa, Australia): 1 sp. in Malaya.

W. Blumei Text-Fig. 52

Malayan Mountain Ash

(C. L. Blume, 1796-1862, the Dutch botanist of Java)

A moderate-sized to big tree, 80 ft. high, with spreading crown: the trunk slightly buttressed: bark dark greyish brown, rather flaky and fissured: *young leaves reddish pink: leaflets withering scarlet*: twigs and leaf-stalks finely hairy.

Leaf-stalks 2-4" long (up to 10" in saplings) with 3-5 pairs of narrow, opposite, almost sessile, toothed leaflets (6-11 pairs in saplings) and a terminal leaflet: leaflets $1\frac{1}{2}$ -3 $\frac{1}{2}$ × $\frac{1}{2}$ -1" (up to 5 × 1 $\frac{1}{2}$ " in saplings), lanceolate, pointed, the edges upcurled: stipules $\frac{1}{2}$ - $\frac{1}{2}$ " wide, (1" wide in saplings), round, leafy, large.

Flowers .1" wide, pinkish white, in racemes 2-4" long, the racemes in small groups in the leaf-axils mostly at the ends of the twigs: flower-stalks pink: petals white: anthers yellow: ovary pink.

Fruit .15" long, reddish.

W. Malaysia: common in the mountains of Malaya, especially at Fraser's Hill.

The opposite, pinnate leaves with toothed leaflets and big stipules and the mountain habitat will readily distinguish this fine tree. Saplings with pink new leaves are conspicuous in the vegetation at Fraser's Hill.

SIMPOH FAMILY**Dilleniaceæ**(from the genus *Dillenia*)

Leaves spirally arranged, simple; generally large, toothed, rarely entire, obovate, and with many veins.

Flowers large, showy, solitary or in racemes or loose clusters, attached to the twig opposite a leaf: sepals 5, separate, large, fleshy, persistent: petals 5, yellow or white, large, separate: stamens many, narrow, needle-like, crowded, separate: ovary superior, of 4-10 more or less separate parts (carpels), each with a style.

Fruit covered when young by the sepals and always concealed by them or, eventually, splitting open: with many small seeds.

11 genera, 260 spp., tropics generally: 5 genera, 21 species in Malaya, lowlands.

This family includes the trees that are called *Simpoh* (or *Chimpoh*) by Malays. They form a natural group which we may soon learn to recognise from their general appearance. They are mostly forest and belukar-trees with showy flowers and big, toothed leaves that make horseshoe-like scars on the twigs when they fall, and they have pinkish, reddish, or orange brown bark, though the dead outer bark may be grey, and hard reddish wood. The bark is thick and, in section, strongly marked with fine radiating lines. The wood of trunk or branch, when cut with a parang, gives out a hissing sound, most noticeable if the ear is applied to the cut, and from this characteristic the Malay name is doubtless derived. The sound is caused by the sucking of air into the pores (the cut vessels) of the wood, as the water is drawn up the trunk by the leaves: for, if the trunk is cut higher and higher above the first place, the hissing is repeated each time but, if the cuts are made lower and no deeper, there is no further hissing or very little. Different kinds of *Simpoh* are called *Simpoh Ayer*, *S. Bukit*, *S. Padi*, *S. Paya* according to their situation but without botanical accuracy.

The *Simpoh*-trees are divided into two genera, *Wormia* and *Dillenia*, according to the structure of their fruits and seeds. In *Wormia*, the fruits split open like a star and the seeds have each a coat of red pulp, but in *Dillenia* the fruits never open but fall off the tree still covered by the fleshy sepals, so as to look like big buds or apples, and their seeds have no coat of pulp. With this distinction goes a difference in manner of dispersal. Birds visit the fruit-stars of *Wormia*, peck off the seeds and eat the pulp: whereas the fleshy acid sepals round the fruits of *Dillenia* are eaten by monkeys, squirrels and, it is said,

elephants, perhaps also by deer and pigs, or if they fall into the water, as Dilleniæ often grow by streams, they are swept down in the current and stranded on a bank. The Malayan species of Dillenia, moreover, are deciduous whereas those of Wormia are generally evergreen.

The flowers of *Simpoh*-trees, especially the yellow ones, suggest gigantic buttercups. It has been thought that the family is related to the Buttercup-family (Ranunculaceæ) of temperate climates but modern opinion prefers a connection with the Magnolia-and *Kenanga*-families, even with the Mangosteen-and Tea-families. In this respect one should note a peculiarity of the flowers. *Simpoh*-flowers face downward, sideways or upward according to the species; they are rarely scented, (the Purple *Simpoh* is an exception): and they are never axillary. Those of the Magnolia- and *Kenanga*-families nearly always face down, are strongly scented, and are more or less solitary in the leaf-axils. *Simpoh*-flowers last but one day: they open very early in the morning, before sunrise, and their petals fall by midday or late afternoon.

Beside the *Simpoh*-trees, the family includes a small forest herb (Acrotrema) and several slender, woody climbers (Tetracera), known to Malays as *Mempelas*.

Wormia is one of those peculiar genera of the Malayan rain forest, which, like the Pitcher-plants (Nepenthes), have outlying representatives in Madagascar.

Simpoh-trees must not be confused with the Yellow Cotton-Tree (Cochlospermum p. 174), which is often called the Buttercup-Tree, and has palmate leaves.

Key to the Species of Wormia and Dillenia

- Tall forest-trees with stilt-roots *D. grandifolia* p. 203
D. reticulata p. 205
- Without stilt-roots or, if stilted, then shrubby
- Leaf-stalk broadly winged and sheathing: blade large: shrubs or small trees
- Flowers yellow: wing of leaf-stalk continuous with the blade *W. suffruticosa* p. 207
- Flowers white, in hanging zig-zag strings: wing of leaf-stalk separated from the blade by a constriction *W. albiflos* p. 205
- Leaf-stalk not or scarcely winged: medium to large trees
- Flowers very large, solitary, white: fruits 6" wide *D. indica* p. 204
- Flowers yellow: fruits 1-2½" wide
- Flowers in cluster of 2-6: stamens purple: fruit-buds rose-red, also clustered . . . *W. excelsa* p. 206
- Flowers and fruits solitary, or in twos: stamens yellow
- Leaf-blade up to 5" long with few (5-8) pairs of side-veins, glabrous: flowers 1½" wide *W. pulchella* p. 206
- Blade larger, with many pairs of side-veins: fruits yellow
- Leaves almost or quite glabrous: flowers 6" wide *D. aurea* p. 203
- Leaves distinctly hairy on the underside
- Flowers 2-3" wide: fruit 1¼" wide, very hairy *D. meliosmæfolia* p. 204
- Flowers 5-6" wide: fruit 2½" wide . . . *D. ovata* p. 204

DILLENIA

(J. J. Dillenius, 1684-1747, the German botanist, professor at Oxford)

Like *Wormia* but *deciduous* and flowering before, or with, the new leaves, *the flowers in most cases solitary, often very large: the fruit not splitting open* but always covered by the thick, fleshy or pulpy sepals, and falling off as a greenish, yellow or orange ball: seeds brown or black, hard, without a pulpy covering.

About 10 spp., tropical Asia and Australasia: 6 spp. in Malaya.

D. aurea Plates 50, 51
(Lat., golden)

Burma Simpoh

A small to moderately large tree, reaching 90 ft. high, though flowering at 12 ft.: crown dark green, heavy, rounded, with rosettes of big leaves: bark greyish-orange to reddish-grey, rather flaky: young leaves purple brown, finely silky: *glabrous except for the silk young shoots*, the veins on the underside of the leaf and, often, the flower-buds: twigs stout.

Leaf-blade 4-12 × 2-6", *obovate, broad, blunt or slightly tipped*, not tapered to a point *but narrowed gradually to the stalk*, finely toothed: side-veins 20-38 pairs: *stalk* ½-1½" long, *narrowly winged along each edge*: sapling-leaves up to 30 × 10", broadly winged to the base of the stalk.

Flowers 6-6½" wide, on stout stalks 1-2" long, *upturned and solitary, or two together, on the bare stout twigs behind the new leaves* and mostly preceding them, smelling faintly of ripe plums: *flower-stalks with a cluster of small, green recurved bracts at the base*: sepals often finely hairy: *petals* 3" long, *golden yellow*, outspread: stamens yellow, the long inner ones pale: styles 7-10, pale yellow.

Fruits 1-2" wide, oblong oval, *ripening yellow to dull orange-ochre*: seeds brownish, in transparent slime.

India, Siam, Java, Malaya, Philippine Islands: Penang, Kedah, Perlis, Kelantan, Trengganu, Pahang from Kuala Lipis northward, and in Upper Perak.

This fine species is restricted to the northern half of Malaya, the southernmost record that we have being Kuala Lipis where several trees occur in the vicinity of the Resthouse and the hospital. It is typically a member of the monsoon-forest of S.E. Asia and seems unable to establish itself naturally in the less seasonal southern half of the country. In Perlis, Kedah, Kelantan and Trengganu it is a forest-tree that abounds also in belukar where its big-leafed saplings are conspicuous. In the *lalang-wastes*, that are periodically burnt, it commonly stands out as the only tree because its thick bark is able to survive the firing which destroys any other plant that may have established itself, (c.f. *Morinda elliptica* and *Eugenia grandis*).

After the beginning of the dry weather which follows between December and February on the break of the rainy season of the N.E. Monsoon, the trees shed their leaves wholly or by branches and then from February to May, they flower before and during the development of the new leaves. The big blossoms are displayed along the gaunt twigs and the golden petals flap in the wind. Each flower lasts only one day, the petals falling off in the afternoon.

The *Burma Simpoh* must not be mistaken for the *Kedah Simpoh* (*D. ovata*) which has hairy leaf-blades abruptly separated from their stalk, and which flowers from the leafy twigs. They grow together in the north of the country.

(The correct botanical name for this species is *D. obovata*)

D. grandifolia
(Lat., grandis-large, folium-leaf)

Stilted Simpoh
Simpoh Daun Merah

A stilted tree very like *D. reticulata* but the leaves nearly or quite glabrous on the underside, and without a close network of veinlets: *leaf-base tapered*, not heart-shaped or rounded: *old fallen leaves red- or purple-brown beneath, slightly hairy*: flowers ¾-1" wide, green: *petals none*.

Common in lowland and hillside forest.

See the remarks under *D. reticulata*.

D. indica Plate 52Elephant-Apple, Indian *Simpoh*
Peradun (E. Johore), *Tipor* (Kel., Tr.)

A more or less deciduous tree, up to 60 ft. high, with a few, wide-spreading limbs: bark rich orange-brown, or duller and paler in the open, thinly and often rather sparingly papery flaky, with faint transverse leaf-scars: twigs stout.

Leaf-blade 8-14 × 3-6", long, narrowly elliptic, tipped, stiff, curving out, light glossy green, edge toothed, beautifully ribbed with many (30-40 prs.) side-veins: stalk 1½-2½" long.

Flowers 7-8" wide, very massive, solitary at the ends of the twigs, facing down: sepals yellowish green: petals white, 2-3" wide.

Fruit 6-7" wide, yellowish green, hard and tough.

India, Siam, Malaya: frequent on the banks of streams and rivers in the lowland forest throughout the country, occasionally cultivated.

The flower of the Indian *Simpoh* is bigger than that of any other Malayan tree: there are few trees, indeed, from any part of the world whose flowers can rival it in bulk. The equally large, obstinate fruits are eaten, it is said by elephants but, more often, the fruits fall into the water and the seeds germinate where they are washed up on the bank. For the Indian *Simpoh* is a typical, though not very common, tree of the lower reaches of the Saraca-streams where they descend from the hills and enter the alluvial plain (p. 42): it is abundant also on the Rengas-rivers of Kelantan, Trengganu and Pahang.

The bark is like that of some species of *Eugenia* (p. 488), except for the transverse lines of the leaf-scars. But the orange bark and the large, glossy, toothed and beautifully ribbed leaves enable one always to recognise the tree in the absence of flower or fruit.

Because of its heavy fruits, this species is not suitable for planting on roadsides and it is seldom seen in gardens.

D. meliosmaefoliaHill *Simpoh*(Lat., leaves like *Meliosma*, a genus of trees)*Simpoh Bukit*

A small tree of 40 ft. high: twigs, leaf-stalks, flower-stalks and buds and undersides of leaves hairy, often thickly.

Leaf-blade 5-12 × 2-5", rather narrowly elliptic-obovate, always tapered to the point, finely or coarsely toothed, thin: side veins 12-20 pairs: stalk 1-2" long, not winged on the edge.

Flowers 2-3" wide, singly or two together on slender stalks 1-2½" long: petals yellow: styles 7-10.

Fruits 1½" wide, very hairy, yellow: pulpy, acid.

Malaya, Borneo, Sumatra: not common in the middle of the country: fruits edible. (The correct botanical name for this tree is *D. sumatrana*).

D. ovataKedah *Simpoh*

(Lat., egg-shaped)

A small bushy tree to 40 ft. high: twigs, leaves and flower-buds softly hairy: twigs rather slender.

Leaf-blade 4-9 × 2½-5½", obovate, blunt or slightly tipped but not tapered to a point, abruptly rounded and often asymmetric at the base, the underside closely velvety, edge finely toothed: side-veins 18-24 pairs: stalk 1-2" long, not winged on the edge.

Flowers 5-6" wide, perhaps more, singly on slender hairy stalks, 2-4" long, on the leafy twigs at or near the ends: petals yellow.

Fruits 2½" wide, dull yellow, rounded: seeds blackish brown.

W. Malaysia, Indo-china, Siam: not uncommon in belukar and forest in the middle and north of the country, absent from the south.

This species is commonest in the open woodland of Kedah where it grows with the Burma *Simpoh* (*D. aurea*), but it seems not to become such a big tree. Both have magnificent flowers, for which they deserve a place in cultivation. They differ in their manner of flowering, the Burma *Simpoh* flowering before and the Kedah *Simpoh* after the new leaves develop, but we have little information on the Kedah *Simpoh*. There are two trees by the Resthouse at Raub.

D. reticulata

(Lat., marked with a network)

Stilted *Simpoh**Simpoh Jangkang*, *S. Gajah*

A lofty tree, reaching 100 ft. or more, the base of the trunk with conspicuous stilt-roots: bark warm brown.

Leaf-blade 5-14 × 3-9", large, (up to 3 ft. long in saplings), oblong, rather obovate, blunt, the base narrowed or rounded or heart-shaped, edge finely toothed, velvety beneath, old fallen leaves densely hairy and golden brown beneath: veins many pairs (16-45), joined by a fine close network of raised veinlets: stalk 1½-4" long, hairy.

Flowers 2½" wide, stalked, arranged in loose clusters up to 5" long and wide, at the ends of the leaf-less twigs, or with the new leaves: petals yellow.

Fruits 1½" wide, greenish yellow.

Malaya: common in lowland forest, especially on swampy ground.

In the swampy forest that surrounds the rivers where they flow across the alluvial flats from the foothills to the coastal mangrove, there are found many kinds of trees of diverse families that develop stilt-roots from the base of the trunk, just like the mangrove trees called *Bakau* (*Rhizophora*). These stilt-roots are connected with the periodical submergence of the hole of the tree when the river rises in flood. To such a class belong this and the species *D. grandifolia* but both are remarkable because they grow also on the hillsides, away from streams, and yet in these places they are also stilted. Only one other kind of tree have we discovered that is invariably stilted in valleys or on hillsides and it is a member of the *Kenanga*-family, *Xylopia ferruginea*: it is a smaller tree with soft white wood, smaller leaves with entire edges, few veins and glaucous undersides: it is rather common and is often called *Antoi* (p. 136).

This stilted *Simpoh* is illustrated by FOXWORTHY. It and the other stilted species are the chief Malayan timber-trees of the family. It sheds its leaves after dry weather at the beginning of the year, sometimes about August too, and flowers on the bare twigs.

Lotong and gibbons eat the flowers, perhaps also the fruits.

WORMIA

(Ole Worm, 1588-1654, the Danish natural philosopher)

Fruit splitting open in a star-like manner with 5-11 rays having a bright pink or white inner surface: seeds covered with a thin, waxy or pulpy, red coat (aril) and attached to the edges of the rays.

About 20 spp., tropical Asia and Australia and Madagascar: 4 spp. in Malaya, in the lowlands.

W. albiflos

(Lat., albus—white, flos—flower)

White *Simpoh*

A small tree to 50 ft., with distinct trunk: rarely with a few stilt roots.

Leaf-blade up to 16 × 8", large, hairy when young, coarsely toothed or nearly entire at the edge: stalk 1-2½" long, winged but separated from the blade by a constriction.

Flowers 1½-2" wide, facing down, with white petals, in many flowered, hanging inflorescences up to 20" long, with zig-zig branches: flower-buds silky.

Malaya: known only from the middle and East of Johore, in lowland forest.

This graceful tree differs from all other kinds of *Simpoh* in its ropes of white flowers. It may often be seen by the roads to Mersing but it has not been found in any other part of the country. Like several other plants restricted to the East of Johore, such as the huge epiphytic pandan, it appears to have originated in

that part of the Sunda-shelf which once connected with Borneo as a tract of dry land for, otherwise, we are at a loss to account for its limited distribution. *W. albiflos* is closely related with *W. Beccariana* of Sarawak, which is said to have yellow flowers and with which we previously confused it.

The White *Simpoh* flowers twice a year after each spell of dry weather. Its petals fall off about 1 p.m. But, in spite of the short life of its flowers, it is a fascinating tree that should be brought into cultivation. In the jungle we find that the bigger the tree, the bigger are the leaves that it bears.

W. excelsa

(Lat., lofty)

Purple *Simpoh*

A medium-sized to lofty tree, reaching 80 ft. high, with heavy, dark glossy green, rounded or cylindrical crown: twigs and leaves glabrous: flower-buds generally silky hairy.

Leaf-blade 4-12 × 2½-5", elliptic, shortly tipped, rather leathery, the edge toothed or nearly entire, with 10-17 pairs of side-veins: stalk ¾-2" long, not or scarcely winged.

Flowers 3-4" wide, facing upward, in inflorescences 3-7" long, rarely more, composed of 2-6 long stalked flowers: petals yellow, recurved: stamens purple with yellow stalks: styles 5-9, generally 7, pinkish.

Fruit waxy white with red seeds: fruit-buds rose-red.

Malaya, Sumatra, Borneo: frequent throughout the country in lowland forest.

The Purple *Simpoh* is one of the more ornamental of our native trees, but it is rather uncertain in its flowering. Some individuals flower regularly after pronounced dry weather, once if not twice a year, and others only at long intervals, even of several years. But anyone who has enjoyed the sight and the scent and the murmur of a large forest tree with big buttercups all over its dark crown must have wished that it stood in his garden. The flowers have a strange penetrating odour—it might almost be called a vapour—which is carried long distances by the wind and attracts honey-bees that come to gather pollen. The purple stamens make a rich contrast with the golden petals and enable us to distinguish the species at once from all other kinds of *Simpoh*. The red fruit-buds are almost as decorative as the flowers.

Some trees of the Purple *Simpoh* have hairy sepals, others have glabrous ones. But in the south of the Peninsula there is a distinct variety with softly hairy leaves and twigs and, generally, an entire edge to the leaf: it is known as the variety *tomentella* and occurs also in Borneo.

Of the hairy variety there are trees in Singapore in the Botanic Gardens, the grounds of Raffles College and the Reservoir Jungle, where it is rather common. The flowers open before sunrise and the petals fall off from 12-3 p.m.

W. pulchella

(Lat., beautiful)

One-flowered *Simpoh*

A small tree to 40 ft. like the preceding, or in the forest up to 120 ft. high with large, heavy crown and massive trunk: all parts glabrous.

Leaf-blade 2-5½ × 1½-3½", obovate, generally blunt and often notched, sometimes slightly pointed, the edge not toothed: side-veins 5-8 pairs: leaf-stalk ½-1" long narrowly winged.

Flowers 1½" wide, on stalks 1½-3" long, singly in the leaf-axils but often clustered at the ends of the twigs: petals yellow: stamens pink: styles 4-6, generally 5.

Fruit pink, 5-rayed, 1" wide, the calyx 1½" wide.

Malaya, Sumatra, Borneo: uncommon, but widespread in lowland forest.

This species flowers at even more uncertain intervals than the Purple *Simpoh*. Its flowers are rather small, but the tree is said to be conspicuous in fruit. Little is known about it, though there are trees in the Singapore Botanic Gardens and

the Public Gardens at Kuala Lumpur. Malays do not always recognise it as *Simpoh* because its leaves are unusually small and have few veins compared with the other species.

W. suffruticosa Plate 53
(Lat., shrubby)

Shrubby *Simpoh*
Simpoh Ayer

A large evergreen shrub to 20 ft. high, with stout trunk, often rooting from the lower branches and forming thickets: glabrous or the flower-stalks, young leaves and twigs more or less silky-hairy.

Leaf-blade 5-15 × 2½-10", large, cabbage-like toothed, pointing upward: *stalk* ½-2½" long, broadly winged, the wing continuous with the blade, completely covering the bud, the young leaves poking out of the sheath.

Flowers 4-5" wide, facing down, scentless, arranged in simple or branched racemes 7-17" long, the flowers in two rows and turned to the same side: sepals green, reddening after flowering: petals yellow: stamens pale cream, the outer ones short and sterile.

Fruit splitting into 7-8 (-11) rays, pink with white borders: seeds pale brown with scarlet pulp.

W. Malaysia: common in belukar, generally in swampy ground and most conspicuous in the south of the Peninsula.

Except the climbers called *Mempelas*, this is the commonest Malayan member of the family. Its large, cabbagey leaves, luxuriant habit and blowsy flowers may cause one to regard it as a rank tropical weed, but the more we become acquainted with it, the greater is our admiration. It is a plant of enormous vigour, always producing new leaves and developing flower and fruit with remarkable rapidity; and once it has begun to flower at an age of three or four, it blooms every day of its life which may be fifty, if not a hundred, years. It is possessed, also, of a marvellous precision so that we should be thankful that there is such a fascinating plant ready to clothe our waste-land. The large flowers and fruits should become familiar in schools because they are ideal objects with which to teach.

On the same inflorescence we can find flower-buds, open flowers and developing fruits. As the sepals remain attached after the petals have fallen, it is not easy to distinguish the fruit-buds from the flower-buds but, as the young fruit is setting, the sepals redden and the flower-stalk alters its position. The flower-buds face down: the open flowers are inclined a little below the horizontal: the fruit-buds are raised higher, and fruit opens upward. Thus the flower-stalk slowly rotates from pointing down to pointing up as the flower-bud changes into the fruit. The ends of the inflorescence hang down but the fruiting sprays project horizontally with the fruits along their upper-side. The young inflorescences, like the young leaves, slip out of the sheathing stalk of the uppermost leaf on the twig. The shape of the inflorescence varies on different plants, some having branched inflorescences and others unbranched inflorescences with only 4-7 flowers. The unbranched variety is the commoner and to it the following remarks apply.

The flower-buds open one at a time in succession from base to apex of the inflorescence and there is an interval of 2-6, but generally 3 or 4, days between the opening of successive flowers. The bud begins to swell visibly and to turn yellow at the end on the morning before the day on which it opens: about 3 a.m. on the next day, the petals separate and the flower becomes bell-shaped: and by an hour before sunrise it is fully open. The petals drop off about 4 o'clock in the afternoon and the same night the sepals begin to fold back on the young fruit but they are not tightly shut until the following afternoon. Commonly every flower sets a fruit. They are pollinated, it seems, by bees, which gather pollen

from the stamens and by small beetles and flies that scramble over them; for honey and scent there are none. The fruits take exactly five weeks to set: on the 36th day after the petals fall, the fruit opens at 3 a.m. and the pink star is expanded long before sunrise. The seeds are picked off by small birds, especially bulbuls, often as soon as it is light, and, as they eat the red aril, the seeds are swallowed and are distributed by passing through their bodies. The empty husks of the fruit fall off about 8 a.m. on the next morning.

The time of opening of the flowers and fruits, about 3 a.m., is that period in the twenty-four hours when the temperature is becoming steadiest and lowest, when the humidity of the air is greatest so that dew is settling, and when the sky is darkest: it is the most inactive time of a day for a green plant. One or other, or all of these conditions, must be involved in the opening of the flowers and fruits but how they affect the plant and what its means of control, are problems beyond our understanding. On a dull rainy day, for instance, the flower-buds may begin to open at sunset. The *Durian*-flower behaves conversely to the *Simpoh* and, when they are ready, *Durian* and *Simpoh* keep watch together

MERANTI FAMILY

Dipterocarpaceæ

(from the genus *Dipterocarpus*)

Big forest trees with resinous wood.

Leaves alternate (spirally arranged on the upright twigs), *simple*.

Flowers small or large, yellow or pink, occasionally white, fragrant, in axillary panicles: sepals 5: petals 5, twisted and overlapping, often slightly joined at the base: stamens generally many: ovary with 3 cavities.

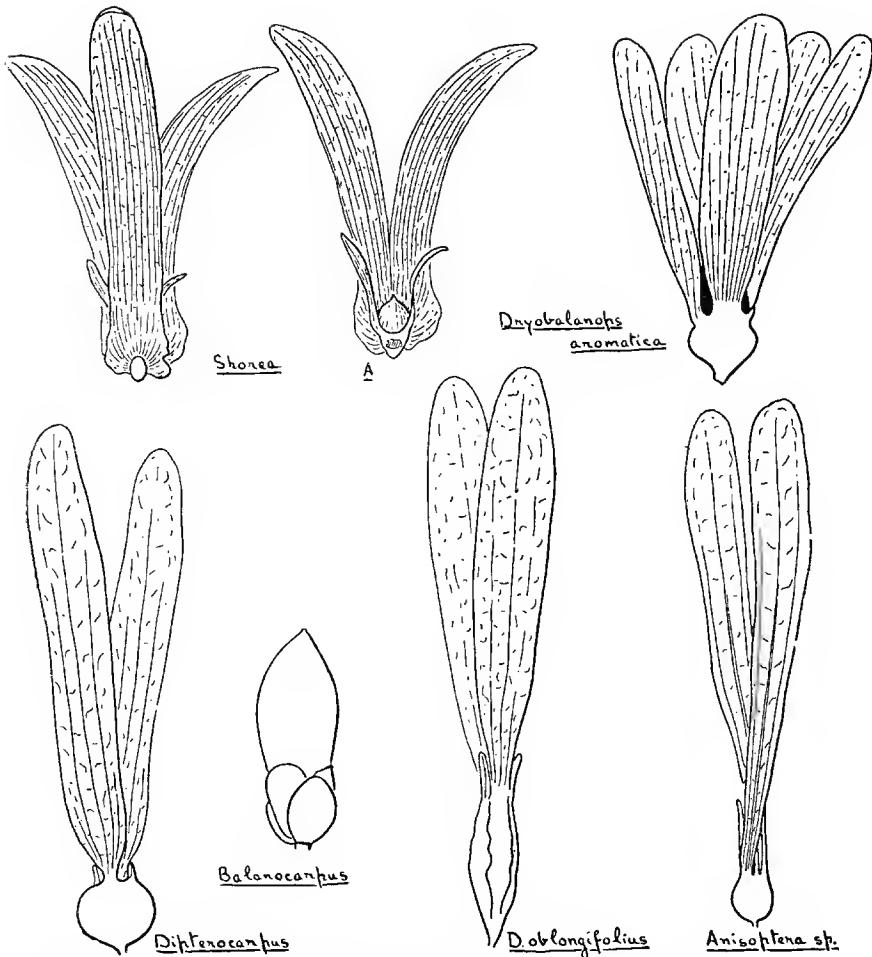
Fruit a one-seeded, acorn-like nut more or less surrounded by the persistent calyx and generally with 2, 3, 4 or 5 sepals enlarged into wings.

17 genera, 500 spp., tropical Asia, a few in E. Africa: 10 genera, about 168 spp. in Malaya, mainly lowland, not above 4,000 ft.

This family includes our most important timber-trees which are best known by the names of the timber which they produce, such as *Meranti*, *Seraya*, *Kruing*, *Kapur*, *Chengai* (or *Penak*), *Resak* and *Mersawa* (Plate 200). Our species were described in detail by FOXWORTHY (8, p. 52) who also illustrated most of the common ones (7, p. 52), and they have recently been revised by Symington in his posthumous monograph (22, p. 53), which is a grand contribution to Malayan botany.

The characteristic feature of the family is the fruit which is typically like a shuttlecock with two to five vanes, the actual number being distinctive of the genera (Text-Fig. 53). Because the sepals are twisted, like the petals in the flowers, the fruits spin as they fall so that they drop more slowly and may be carried long distances from the tree by the wind. The seeds begin to sprout as soon as they reach the ground: in some species they sprout even before they have left the tree: and they cannot withstand desiccation.

With the exception of the *Chengal Pasir* (*Hopea odorata*) in Trengganu, no Dipterocarp is planted in the towns or villages and they are seldom found in secondary jungle. In all lowland virgin forests, however, they are the most abundant kind of large tree which we soon learn to recognize from the height and shape. Their flowering and fruiting is seasonal, generally not more than once a year after pronounced dry weather, but many kinds flower only at long



Text-Fig. 53. Fruits of the *Meranti*-family (Dipterocarpaceae), $\times \frac{1}{2}$:
A, with one wing (sepal) removed.

intervals of several years. The flowering of each kind is gregarious and at such times the forest may be pervaded with the scent of orange-blossom which the flowers exhale. Two or three months later the forest-floor is strewn with the fallen shuttlecocks from which the myriad seedlings spring, often with grotesque, yellow, pink or purple, lobed and fleshy seed-leaves.

The distribution of the family is interesting because it is one which links the flora of Malaysia with that of Tropical Africa. A few species occur in New Guinea and a few in East Africa, and as one approaches the countries of the Sunda-self—Malaya, Sumatra, Borneo and Java—from either direction so the numbers increase to a maximum in Borneo and Malaya. It is the family of trees *par excellence* of our Indo-Malayan rain forests, and gives to them their splendid stature.

In the following account, we mention only a few of the more interesting and common species.

Key to the Species

- Riverside tree of the Pahang, Trengganu and Kelantan rivers: leaves 5-12" long: *Neram* *Dipterocarpus*
- Inland trees, not especially of riverbanks
 Crown light greyish blue to light olive: *Seraya* *Shorea Curtisii* p. 213
 Crown dark green
 Forest trees with light fawn brown bark, with large flakes, not fissured: leaves with very fine and close, parallel side-veins from the midrib: *Kapur, Keladan* *Dryobalanops*
 Main side-veins of the leaf well-spaced, at least $\frac{1}{8}$ " apart: bark ridged and fissured
 Forest tree with narrow, small, almost lanceolate leaves: bark dark brown, shallowly fissured: *Chengai, Penak* *Balanocarpus*
 Leaves elliptic, medium-size
Temak: Kedah and Perlis *Shorea cochinchinensis* p. 213
Chengal Pasir, C. Kampong: Kelantan, Trengganu *Hopea odorata* p. 212
Terbak: Tumpat (Kelantan) *Anisoptera* sp.

ANISOPTERA

(Gr., with unequal wings, cf. the fruit)

Like *Dipterocarpus* but with fissured bark, small stipules not leaving ring-like scars, many-flowered inflorescences, and the nut fused with the calyx-tube: style short. 14 spp., Burma to New Guinea: 7 spp. in Malaya.

The timber-trees of this genus are called *Mersawa* or *Sanai*. One unidentified species deserves mention.

Anisoptera sp. Text-Fig. 53 *Terbak* (Kelantan)

A big tree with greyish brown, deeply fissured and flaky trunk and spreading crown. Leaves about 6" long. Fruit 4-5" long, the nut edible.

Frequent in some villages near Tumpat, many trees by the Malay cemetery at Kg. Terbak.

BALANOCARPUS

(Gr., balanos—an acorn, karpos—fruit: from the shape of the fruit)

Fruit without enlarged wings, the nut like an oblong acorn.

18 spp., Ceylon, Peninsular India to Borneo and the Philippines: 8 spp. in Malaya.

B. Heimii Text-Fig 53 *Chengai, Chengai, Penak*

A vast tree with dark brown, shallowly fissured trunk.

Leaves 3-5" long, rather narrow. Flowers yellowish white, small. Fruit $1\frac{1}{2}$ -2" long, with the 5 blunt, overlapping sepals clasping the base.

Lower Siam, Malaya: generally distributed throughout the lowland forest.

On account of the great value of its timber, *Chengal*-trees are now not often seen except in forest-reserves and remote places. The acorn-like fruits cannot be mistaken for those of any other sort of tree. *Chengal Pasir* and *C. Kampong* are names given to *Hopea odorata*.

DIPTEROCARPUS

(Gr., di—double, pteron—wing, karpos—fruit)

Stipules large, conical, covering the long bud and, on falling, leaving ring-like scars on the twigs like those of *Chempaka* (*Michelia*) or the Jack (*Artocarpus*).

Flowers rather large, few in a cluster: petals pink: stamens many: style long.

Fruits with 2 long wings, 3 of the sepals undeveloped: the nut not joined with the calyx-cup.

65 spp., Pen. India, Ceylon, to the Celebes: about 30 spp. in Malaya.

The big forest-trees, known as *Keruing* or *Kuing*, belong to this genus. Many species are common in the lowlands. All have rather flaky, pale grey or brownish bark studded with small corky pustules (the breathing pores or lenticels). In the wood there is, more or less abundant, an oily resin which gives the *minyak keruing*: it is extracted, by Malays, by the wasteful method of hacking a large basin-like hole in the side of the tree and allowing the oily substance to drain into it: the flow stops after a few days and is renewed by burning the inner surface of the hole, when the resin starts to ooze again.

One species, the *Neram*, is worthy of particular mention because it is one of the characteristic riverside trees of the country.

D. oblongifolius Text-Fig. 53
(Lat., with oblong leaf)

Neram

A large, riverside tree, leaning over the water, with twisted, often flattened, trunk soon breaking up into the large limbs and, generally, with a big buttress up the bank: *old leaves withering scarlet.*

Leaves long, 5–12". Flowers very fragrant, though sour when fallen. Fruits 5–6" long, the calyx velvety, with a few wavy ridges.

Lower Siam, Malaya, North Borneo: in the watersheds of the Pahang, Trengganu, Kelantan and Perak Rivers, above the tidal reaches.

The *Neram* is the big tree that arches over the rocky rivers in the eastern and northern states of Malaya and whose boughs are draped with epiphytes (*see p. 42*). In some places the trees are so crowded that there is, on an average, one every seven yards, but in other places, as at Kuala Lipis, Jerantut and Kuala Krai, these big trees have disappeared, having been swept away by the great flood of December 1926. The Tembeling and Jelai have been damaged, seemingly irreparably, but the Tahan retains its original grandeur to delight the visitor to the National Park.

DRYOBALANOPS

(Gr., druobalanos—an acorn; from the shape of the fruit)

Leaves with fine, close, parallel side-veins like those of *Calophyllum*.

Fruit with 5 wings.

9 spp., Borneo, Malaya, Sumatra: 2 spp. in Malaya.

In this genus belong the well-known and valuable timber-tree, the *Kapur* or Bornean Camphor-Tree, and the lesser known *Keladan* or *Kuras*.

D. aromatica Text-Fig. 53

Bornean Camphor-Tree, *Kapur*

A vast tree with light fawn-brown bark with large scaly flakes, the crown very fine-leaved and elegant.

Leaves 2–4" long, pointed. Flowers $\frac{3}{4}$ " wide, white, fragrant. Fruit 3–3½" long.

Sumatra, Malaya, Borneo: Ulu Selangor, and on the East Coast from Johore to Trengganu.

DIPTEROCARPACEÆ

In parts of the East Coast States the *Kapur* may form almost pure forests, and it is at once distinguished by its beautiful, open, fine-leaved crown. It is one of the tallest trees in the Indo-Malayan tropics, frequently attaining more than 200 feet in height. Its distribution in Malaya is restricted almost entirely to the East Coast and so the tree is little known to persons other than foresters. But there are many fine specimens on the road from Kota Tinggi to Mersing; and the dense plantation of "Noah's ark trees" on the East of the road through the Kanching Forest Reserve, between Kuala Lumpur and Rawang, consists of young *Kapur*-trees. Concerning the timber, the camphor and the magic camphor-language, spoken when the camphor is to be collected, there is an account in BURKILL'S Dictionary. General flowerings occur every 3-4 years.

D. oblongifolia

Keladan, Kuras

Like the *Kapur* but with longer oblong leaves, 3-6" long, and the enlarged sepals of the fruit only $\frac{1}{2}$ - $\frac{3}{4}$ " long.

Sumatra, Borneo, Malaya: generally distributed in low-lying, swampy forests, many trees by the roads to Mersing, rare in the West of Malaya (North Perak).

The Malay name must not be mistaken for the *Keledang* (*Artocarpus lanceifolia*).

HOPEA

(J. Hope, 1725-1786, a Scottish botanist)

Fruit with two wings: stamens 10 (or 15).

70 spp., India, Indo-China, to the Philippines and Celebes: 30 spp. in Malaya.

The timber-trees of this genus are called *Merawan*. The following, however, is an exception.

H. odorata Plate 217

Chengal Pasir, C. Kampong

A big tree with somewhat fissured, greyish bark and dark green, dense and rather conical or cylindrical crown.

Leaves 3-5" long. Flowers fragrant, white. Fruits $1\frac{1}{2}$ -2" long.

Burma, Siam, Indo-China, Malaya: riversides from Perak and Trengganu northward.

In some of the villages on or near the coast of Kelantan and Trengganu this tree is occasionally met with, but in Kuala Trengganu it is abundant in the kampongs and, in a few streets, the huts have been constructed round the boles of big specimens. In appearance it resembles the Sea Apple (*Eugenia grandis*), and to Europeans it must recall the Beech (*Fagus silvatica*). The young fruits turn the crown pale green.

The species has been planted as a street-tree in Saigon, for which purpose it would seem excellent because of its shapely crown, and as such it should be encouraged in the coastal towns of Malaya. Its growth is evidently fairly rapid.

SHOREA

(Sir John Shore, 1751-1834, Governor-General of India 1793-98)

Flowers small yellowish or pinkish, in many flowered panicles: stamens 15-60.

Fruits with 3 wings.

Over 100 spp., India, Indo-China, Malaysia: about 55 spp. in Malaya.

This is by far the biggest genus of Dipterocarps and it embraces the commonest species. Indeed, there can scarcely be an acre of forest between the mangrove and the mountain-level at 3,000 feet, where several *Shorea*s may not be found. *Meranti*, *Balau*, *Resak*, *Kumus*, *Seraya*, *Nemesu*, *Damar Laut Merah* and *Damar Hitam* are their common Malay names. Most of the species are difficult to distinguish except to the trained eye; but one, the *Seraya* called *Shorea Curtisii*, is perhaps the only forest-tree that can be identified from afar by its pale, outstanding crown.

S. Curtisii

Seraya

(C. Curtis, 1853-1928, Curator of the Waterfall Gardens, Penang, 1884-1902)

A gigantic tree with fissured, brownish trunk and big buttresses: the vast, rounded and pre-eminent crown pale bluish green or whitish.

Leaves 3-4" long, glaucous underneath. Fruit 2½" long.

Peninsular Siam, Malaya: common throughout the lowland forest but especially on ridges.

From its pale bluish crown, like a vast cabbage in the distance, one recognizes this tree on the hillsides. In young leaf the crowns become light olive. In Perak, on Penang Hill and by Ginting Simpak it is very abundant. It is illustrated by FOXWORTHY (7, p. 52).

S. cochinchinensis

Temak

Crown dark green: leaves 3-6" long: fruits 3½" long.

Indo-China, Siam, N. Malaya: rather frequent in kampongs in Perlis and N. Kedah, several trees at Arau and at Kuah (Langkawi).

(According to Symington, this is probably the same as *S. talura* of India).

EBONY FAMILY

Ebenaceæ

(*Diospyros ebenum*, the Ebony tree)

Leaves simple, alternate, entire, with short stalks.

Flowers small, regular, mostly unisexual, male and female on different trees, the *male flowers* generally in small clusters, the *female flowers* generally solitary or in smaller clusters than the male, in the leaf-axils, on the twigs behind the leaves or on knobs and burs on the trunk: *sepals* 3-5, more or less joined: *petals* 3-5, *joined into a short tube, white, pink or yellow*: *stamens* as many as the petals, twice as many or more numerous, inside the corolla-tube, (in the female flowers sterile and abortive): *ovary superior*.

Fruit a leathery or fleshy berry, often large, seated on the persistent calyx: seeds few to many in a fruit, arranged in a circle round the core, large, hard, oblong, more or less flattened, brown.

About 400 spp., throughout the tropics: 1 genus in Malaya.

DIOSPYROS

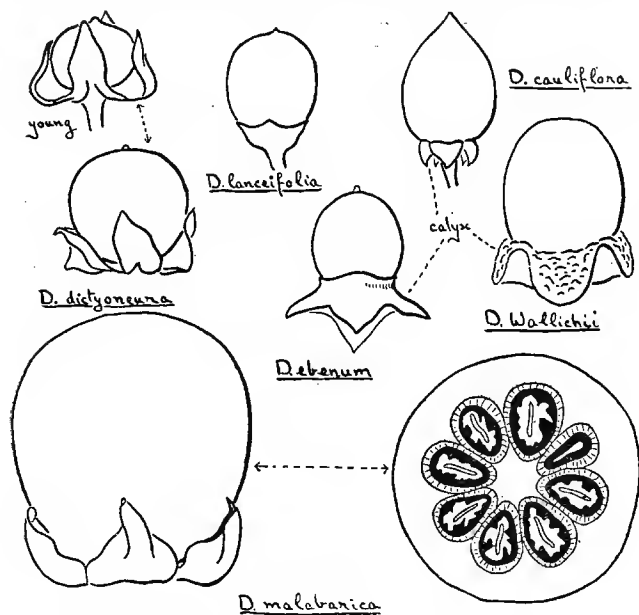
(Gr., dios-godly, puros—a grain of wheat)

About 300 spp., throughout the tropics: 70 spp. in Malaya, mostly in the lowland forest.

The species of this genus are shrubs or trees. They are typical members of our lowland forest yet, in spite of their variety, they are seldom abundant individually. Some exotic species are fruit-trees, such as the Persimmon (*D. kaki*) of N.E. India, which is now widely cultivated in China and Japan and makes its way into the Malayan markets towards the end of the year, and the

Butter Fruit (*D. discolor*) of the Philippines which is grown in Malayan villages and gardens. Three Malayan species called, locally, *Komoi*—namely *D. dictyoneura*, *D. malabarica* and *D. oblonga*—with inferior fruit are frequent in villages in the north of the country, and there are several wild species with bright yellow, pleasantly sweet fruits, like oblong persimmons, which are known only to jungle-folk and wild creatures. But it is for the black heartwood or ebony that the genus is important. The foremost Asiatic ebony-tree is *D. ebenum* of S. India and Ceylon, and it is occasionally planted in Malaya. The ebony from our local species generally has brown or yellow streaks and the trunks are seldom large enough to yield much timber: indeed, in many species the heartwood blackens only to a small extent or not at all.

Diospyros-trees are not easy to recognise except from their most characteristic bark and fruit. They have dense gloomy evergreen crowns of dull dark green leaves with grey or black twigs. The trunks also have grey or black bark, which may be smooth, fibrous-flaky or narrowly ridged with deep fissures (as in FOXWORTHY'S illustration) and the outer layer of the bark has the stony brittle consistency, as well as the blackness, of coal so that the edge of a parang grates upon it. The inner bark is pale yellow, pink or reddish brown and, like the sapwood, often darkens or intensifies its colour on exposure to the air. The fruits may be mistaken for wild mangosteens except that they have no latex and only a point-like scar to indicate the withered style and that the persistent calyx on which they are seated is generally much enlarged and often woody: until they are ripe, they are very astringent and the astringency does not always disappear. The sap of the fruit and the bark of some kinds is poisonous, being irritant to the skin like that of *Rengas* (see p. 116) and particularly poisonous to fish: and from this property the fruit or bark may be used like *tuba-root*, such



Text-Fig. 54. Fruits of *Diospyros*, $\times \frac{1}{2}$.

species being called *Tuba Buah**. In detail, the bark, leaves and fruit are distinctive of every species. In general, the leaves have strongly looping side-veins by which one may recognise them. The flowers in most, if not all, species are nocturnal: they are fragrant and open at dusk, and the detached corollas fall off next morning.

The commonest Malay name for the genus is *Kayu Arang*, which indicates the resemblance of the bark and heartwood to charcoal: likewise the name *Kayu Sihangus*, *Bui*, or *Buey*, is given to such as yield timber with lighter streaks.

* *c.f. Putat Tuba*, species of *Barringtonia* with poisonous fruit.

Key to the Species

- Flowers and fruits on burs on the trunk: forests .. *D. cauliflora*
 Flowers and fruits on the branches or twigs
 Leaf-blade small, generally less than 5 × 2"
 Blade pointed: inland and coastal *D. lanceifolia*
 Blade blunt, small
 Blade 1-2 × ½-1": sea-shores, mangrove ... *D. ferrea*
 Blade 2-3 × 1-2": cultivated *D. ebenum*
 Leaf-blade large, generally more than 5 × 2"
 Leaves densely silky underneath, narrowly oblong
 Leaves silvery or glaucous beneath: cultivated *D. discolor*
 Leaves coppery beneath: wild *D. argentea*
 Leaves not so
 Flowers and young fruits black velvety outside
 Leaves leathery, faintly veined: flowers
 axillary: fruit 2" long and wide ... *D. malabarica*
 Leaves scarcely leathery, strongly ribbed:
 flowers on the twigs behind the leaves:
 fruit 1" long and wide *D. dictyoneura*
 Flowers and young fruits not black velvety
 Leaves oblong, rounded at the base: flowers
 yellow with 5 petals and sepals ... *D. oblonga*
 Leaves narrowed to each end: flowers white
 or pinkish, with 4 petals and sepals ... *D. Wallichii*

D. argentea

Silver-leafed Ebony

(Lat., silvery)

Bedil Nyamok

A small, often spindly tree with greyish black bark: *twigs, leaf-stalks, fruits and undersides of the leaves densely orange-brown silky.*

Leaf-blade 5-12 × 1½-3", *narrowly oblong*, pointed: stalk ½-1".

Flowers white.

Fruit 2-2½" wide, clasped in the 4 big, blunt sepals 2-3" long, axillary.

Malaya: frequent in lowland forest.

If a burning match is held to the edge of the leaf, the tissue of the leaf crackles, hence the Malay name "mosquito guns".

D. cauliflora Text-Fig. 54

Stem Ebony

(Lat., caulis—a stem, flos—a flower)

Leaf-blade 3-11 × 1-4", long-tipped, glabrous.

Flowers and fruits in masses on burs on the trunk, almost from the ground.

Fruit 1" long, *ovoid*, *pointed*, dark green, with a small 4-lobed calyx ½" wide.

Common in the forest in the middle of the country.

D. dictyoneura Text-Figs. 54, 55

Sooty Ebony

(Gr., diktuon—a net, neuron—a nerve)

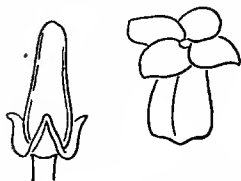
A tree to 40 ft. high, with smooth, dark grey bark: *twigs glabrous.*

Leaf-blade 5-12 × 2-5", *elliptic*, *tapered to each end*, scarcely leathery, *glabrous*, dark drab green above, rather yellowish beneath and *strongly ribbed* with 9-14 pairs of side-veins: stalk ½-¾" long.

Flowers ½-1" wide, *light ochre-yellow or buff-yellow*, faintly lemon-scented, *in rather loose branching clusters*, 2-4" wide, *on the twigs behind the leaves*, *the branches of the cluster* 1-2½" long and *black velvety like the calyx*: sepals and petals 4, black velvety outside.

EBENACEÆ

Fruit about 1" wide, round or shortly oblong, at first black velvety becoming dull yellow with sooty brown scurf, clasped by the 4 large, black velvety or scurfy, dark green sepals with reflexed wavy edges: seeds brown, with watery white, mawkish pulp round them: edible.



Text-Fig. 55. *Diospyros dictyoneura*, nat. size.

Malay Peninsula: frequent in villages, rice-fields and secondary jungle in the northern half of Malaya.

This species can be mistaken for *D. oblonga* but the two can be distinguished by the number of petals and sepals, the position of the flowers and the shape of the leaf-blade which is tapered to each end in *D. dictyoneura* and in *D. oblonga* is oblong with rounded base. See also *D. malabarica* with bigger fruits.

D. discolor Plate 54

Butter-Fruit
Buah Mentega, B. Saklat

A small tree reaching 40 ft. high, with drooping twigs: bark blackish, rather fissured and uneven: young leaves pinkish, densely silky.

Leaf-blade up to $9 \times 3\frac{1}{2}$ " , oblong, leathery, dark green above, pale and rather glaucous and finely silky underneath: stalk $\frac{1}{4}$ " long.

Flowers $\frac{3}{4}$ " wide, solitary in the leaf-axils, nearly sessile, faintly fragrant: corolla cream-white, with 4 petals.

Fruit 2-3" wide, round, large, purple-red beneath the dense covering of silky irritating hairs, with 4 persistent sepals at the base.

Philippine Islands: in villages and gardens throughout Malaya.

D. ebenum Text-Fig. 54

Ceylon Ebony

(Lat., ebony)

A rather low, gloomy tree with dense crown.

Leaf-blade 2-3 \times 1-2" , obovate, blunt: stalk up to $\frac{1}{4}$ " long.

Fruit $\frac{1}{2}$ " long, dull green then black when ripe, seated on a thickened, leathery, dull green calyx $\frac{3}{4}$ " wide, with 4 pointed sepals.

India, Ceylon: occasionally planted in Malaya.

There are two trees in Kuala Kangsar on Government Hill.

D. ferrea

Sea Ebony
Sechirik Laut

(Lat., of iron)

A small sea-shore tree up to 40 ft. high, with small-leaved, gloomy crown; glabrous.

Leaf-blade $\frac{1}{2}$ -2 \times $\frac{1}{2}$ -1" , narrowly obovate, blunt, often notched at the tip, pointing up: stalk very short, .1" long.

Flowers $\frac{1}{4}$ " long, axillary, white, with 3 sepals joined in a cup and 3 petals.

Fruit .4" long, broadly oblong, solitary in the leaf-axils, with the 3-lobed calyx at the base.

Common on all rocky coasts of Malaya, in the Terminalia-zone, also in mangrove.

Compare the False Lime (Gelonium p. 255).

D. lanceifolia Text-Fig. 54

Common Malayan Ebony
Segun

(with lanceolate leaf)

A small to moderate-sized, gloomy tree with dark grey or black, finely creviced or fissured bark.

Leaf-blade $1\frac{1}{2}$ -6 \times $\frac{3}{4}$ -2" , elliptic, pointed, tapered to the base, with upcurled sides and 6-9 pairs of side-veins: stalk $\frac{1}{4}$ - $\frac{1}{2}$ " long.

Flowers $\frac{1}{4}$ - $\frac{1}{2}$ " wide, ochre-yellow, sweet-scented: male flowers in small dense clusters in the leaf-axils: female flowers solitary or 2-3 together: sepals and petals 4.

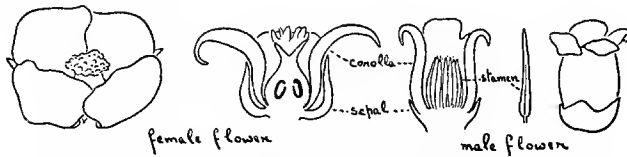
Fruit $\frac{3}{4}$ -1" wide, round or shortly oblong, green, glabrous, seated on a rather small 4-pointed calyx-cup.

W. Malaysia: common in lowland forest and on rocky sea-coasts.

D. malabarica Text-Figs. 54, 56
(from Malabar)

Malabar Ebony
Kumoi, Kumun

Like *D. dictyoneura* but:—
Leaf-blade 4-9 × 1½-3½", smaller, very leathery, with only 6-8 pairs of faint side-veins (directed very obliquely forward).
Flowers in the leaf-axils: male flowers ½" wide, in few-flowered racemes ½-1½" long; *female flowers* ¾-1" wide, solitary.
Fruit 1½-2½" wide, much larger, ripening light orange-yellow, the pulp round the larger seeds yellowish white.
 India, Indo-China, Malay Peninsula: frequent in villages and gardens in Penang, Kedah, Perlis.



Text-Fig. 56. *Diospyros malabarica*, nat. size.

This is said to be a tree of imposing shape, being conical with horizontal branches. The fruit has little value, though enjoyed by children: It tastes of raspberry and persimmon. The inner part of the rind and the pulp are scraped off the seeds.

D. oblonga Text-Fig. 57
(from the oblong leaf)

Perlis Ebony
Kumoi, Kumun

A small tree to 40 ft. high: *bark* dark grey to blackish, slightly fibrous flaky or cracked: *twigs* glabrous or finely silky.
Leaf-blade 4-12 × 1½-5", oblong, rather suddenly rounded at the base, blunt or pointed at the apex, leathery, glabrous: *stalk* ¼-¾".
Flowers ½-¾" wide, faintly fragrant of citronella, in small, almost sessile clusters in the leaf-axils: *sepals* 5, silky: *petals* 5, butter-yellow.
Fruit about 1" wide and long, rounded or oblong, with flattened top, brownish silky then becoming glabrous, the persistent calyx with 5 pointed sepals clasping the base of the fruit and with prominent lobes, folds and flanges between the bases of the sepals.
 Malaya: frequent in the forest and in villages in the north of the country.



Text-Fig. 57. *Diospyros oblonga*, nat. size.

There is some variation in the size of the calyx in the fruit of this species. Trees with the sepals large and wavy are called *D. Helferii*.

Compare *D. malabarica* and *D. dictyoneura* which have only 4 petals and sepals.

D. Wallichii Text-Fig. 54

Wallich's Ebony
Tuba Buah

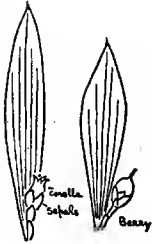
(N. Wallich, 1786-1854, the Danish botanist at Calcutta)
 A tree up to 50 ft. high, with light grey, smooth bark: *twigs* hairy, at least when young.
Leaf-blade 5-15 × 2-6", large, oblong-elliptic, pointed, strongly ribbed, rather light green, often hairy beneath: *stalk* ¼-¾" long.
Flowers ½" long, in shortly stalked clusters in the leaf-axils or on the twigs behind the leaves: *corolla* white or pale pinkish white.
Fruit 1-1½" long, massive, oblong, flat-topped, silky, seated like an acorn on a very thick (½" or more) woody 4-shouldered and 4-grooved calyx, in groups of 2-4 on the twigs.
 Malay Peninsula: common in Malaya in the lowland forest from Malacca northward.

The woody fruits of this species are most striking and must not be mistaken for acorns, *c.f.* their numerous seeds. There are trees in the Lake Park at Seremban and by the Rest-House.

EPACRIS FAMILY

Epacridaceæ

(from the genus Epacris)



Text-Fig. 58.
Leucopogon malayanus, nat.
size.

Leaves spirally arranged, simple.

Flowers with 5 sepals, a corolla-tube with 5 petals and 5 stamens attached to it: ovary superior, with 5 cavities.

21 gen., 350 spp., mostly in Australia, New Caledonia, New Zealand: 1 sp. in Malaya.

This small family, closely allied with the Heather-Family (Ericaceæ) which includes the Rhododendrons and Vacciniums, is represented only by one species in Malaya and this, like the False *Ru* (*Bæckia*), the Mountain *Gelam* (*Leptospermum*) and the Mountain *Ru* (*Dacrydium*), is a member of the Australian flora which has migrated into the Malayan region.

LEUCOPOGON

(Gr., leukos—white, pogon—beard)

Leaves with numerous fine parallel longitudinal veins without a midrib.

Flowers very small, in small axillary bunches.

Fruit small, pulpy, with a stone containing 5 cavities each with one seed.

Many spp., mostly Australian.

L. malayanus Text-Fig. 58

Malayan Heath

*Chuchur Atap, Choreng Atap,**Maki China, Tasek Timbul*

An evergreen bush or small tree, to 15 ft. high, *sparingly branched*: leaves withering yellow-brown to reddish.

Leaves $\frac{1}{2}$ –2 × 1–4", narrow, sessile, lanceolate, with a short hair-like tip, *glaucous beneath*, densely crowded round the twigs.

Flowers 15" long, white.

Fruits 15" wide, round, thinly pulpy, translucent, yellow then red.

Indo-China, Siam, Malay Peninsula, Bangka, Borneo: on all high mountains, and on the sandy shores of the East Coast from Singapore to Kelantan.

The Malay names are given also to the Mountain *Gelam* (*Leptospermum*) and, sometimes, to the False *Ru* (*Bæckia*).

HEATHER FAMILY

Ericaceæ

(Erica, the genus of the heather)

Leaves spirally arranged, simple.

Flowers regular or slightly bilaterally symmetric, in axillary and terminal racemes or clusters: calyx with 5 small sepals, often joined in a tube: *corolla small or large, bell- or trumpet-shaped with 5 petal-lobes*, white, pink, red or yellow: stamens 10, inside the corolla-tube, opening by pores at the tip of the anther: ovary superior or inferior, with 5–10 cavities.

Fruit a berry or a capsule: seeds many, minute.

50 gen., 1,400 spp., throughout the world, but few in the tropics: 9 gen., 55 spp. in Malaya, mostly in the mountains.

This family includes the heathers (*Erica*), of which we have no Malayan representatives, the rhododendrons of which we have about twenty shrubby and epiphytic species chiefly in the mountains, and the bilberries, one of which we describe below. (The Singapore Rhododendron is a *Melastoma*, p. 445).

VACCINIUM

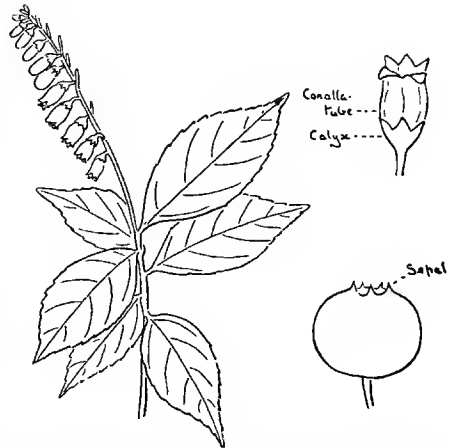
(the Latin-name for the whortleberry, *Vaccinium myrtillus*)

Flowers in axillary and terminal racemes: calyx with 5 tiny sepals: corolla bell-shaped with 5 tiny petals at the mouth, white or pink: ovary inferior.

Fruit a berry crowned by the 5 sepals, with 5 cavities filled with the tiny seeds.

About 150 spp., mostly in the tropical mountains, absent from tropical Africa: 16 spp. in Malaya.

The whortleberry, or bilberry, and cranberry of the moors of Europe belong to this genus, and the huckleberry of North America. The Malayan species are evergreen bushes, small trees or woody epiphytes with flowers like heather-bells, and they have edible, if insipid, red or purple-black berries. The mountain kinds, many of which are common, have rather broad, leathery leaves but the one described below has rather thin, narrow leaves, and it is interesting because it is one of the few plants, like *Bæckia* (p. 484) and *Leucopogon* (p. 218), which occur only on our mountain-tops or on the sandy sea-coast.



Text-Fig. 59. Sea Bilberry (*Vaccinium malaccense*), $\times \frac{1}{2}$: flower and fruit, $\times 2$.

V. malaccense Text-Fig. 59 (of Malacca)

Sea Bilberry
Mempadang, Kelampadang

A shrub or small tree to 20 ft., glabrous except for the minutely hairy flowers and berries: *young leaves reddish pink*, in erect flushes: *old leaves often withering red*.

Leaf-blade $1-2\frac{1}{2} \times \frac{1}{2}-1$ " , small, lanceolate, tapered to a rather long tip, finely but distinctly toothed, light green: stalk $1-2$ " long.

Flowers $\frac{1}{2}$ " long, fragrant, like pale pink or white heather-bells set in a row $1\frac{1}{2}-3$ " long, all facing down: bracts often conspicuous.

Berries $\frac{1}{4}$ " wide, round, reddish then dull dark purple, several in a spray.

Malay Peninsula: common on sandy coasts from Singapore to Kelantan on the East, also on mountain tops.

The mountain form of the Sea Bilberry has been called a separate species *V. pubicarpum*, but it is not distinguishable except by its slightly tougher leaves.

The little Oil-Fruit, *Elæocarpus Masterii*, must not be mistaken for the Sea Bilberry: its leaves have relatively much longer stalks.

COCAINE FAMILY

Erythroxylaceæ

(from the genus Erythroxylon)

Like the Oil-Fruit family (Tiliaceæ) but, typically, with the stamens in definite number (10, rarely 20) corresponding with the number of petals and sepals.

7 genera, 150 spp., tropics and subtropics: 2 genera, 3 spp. in Malaya.

Key to the Species

- Leaves small, $\frac{1}{2}$ – $1\frac{1}{2}$ " wide, alternate: flowers arranged
1–4 in the leaf-axils: fruit a small red berry ... *Erythroxylon*
- Leaves 1–3" wide or more, spirally arranged: flowers in
stalked clusters: fruit a brown capsule ... *Ixonanthes*
- Leaf-stalk short, not $\frac{1}{2}$ " long, the blade finely toothed *I. icosandra*
- Leaf-stalk $\frac{1}{2}$ –1" long, the blade not toothed ... *I. reticulata*

ERYTHROXYLON

(Gr., eruthros—red, xylon—wood)

Leaves alternate, rather small, *with a broad pale and faint band along the centre* (occupying about a third of the blade).

Flowers small, greenish white, 1–4 in the leaf-axils: petals 5: stamens 10 (or 12): ovary with 3 cavities and 3 styles.

Berry oblong, small, with 1 hard seed (stone).

About 100 spp., mostly American: 1 sp. in Malaya.

The Cocaine-bush of Colombia (*E. novo-granatense*) was formerly grown in Malaya as a hedge-plant, for which purpose it was excellent both for its bushiness and the contrast of its light green foliage with the bright red berries, but its cultivation is now prohibited. It is a native of Columbia but, except for its small size, it is remarkably like our harmless sea-coast tree, *E. cuneatum*. All the physiologically active species of the genus are native to America. The peculiar pale band along the small blunt leaf distinguishes a species of cocaine from any other kind of flowering plant.

E. cuneatum

(Lat., wedge-shaped)

Wild Cocaine

Baka (Kel. Tr.), *Inai Inai*

A shrub or evergreen tree, reaching 80 ft. high, with fine-leaved crown: trunk brown, the bark closely and narrowly ridged and fissured: *twigs green, flattened, marked with transverse lines* (stipule-scars).

Leaf-blade $1\frac{1}{2}$ –3 × $\frac{1}{2}$ – $1\frac{1}{2}$ " *narrowly elliptic, blunt, thin, light green, more or less glaucous beneath*, the stalk $\cdot 2$ " long, or less.

Flowers $\frac{1}{4}$ " wide or less.

Fruit $\frac{1}{2}$ " long, narrowly oblong, bright red, pulpy, with the green calyx at the base.

On sandy and rocky shores from Burma to Java, also on sandy heaths: common on the shores of Malaya, also on inland heaths in Kelantan and Trengganu, frequent on St. John's Island off Singapore.

The Malay name is the same as that of the Henna-bush (*Lawsonia*), both plants having small leaves and flowers.

IXONANTHES

(Gr., ixos—birdlime, anthos—flower; from the sticky flowers)

Leaves spirally arranged: the buds thinly varnished with resin.

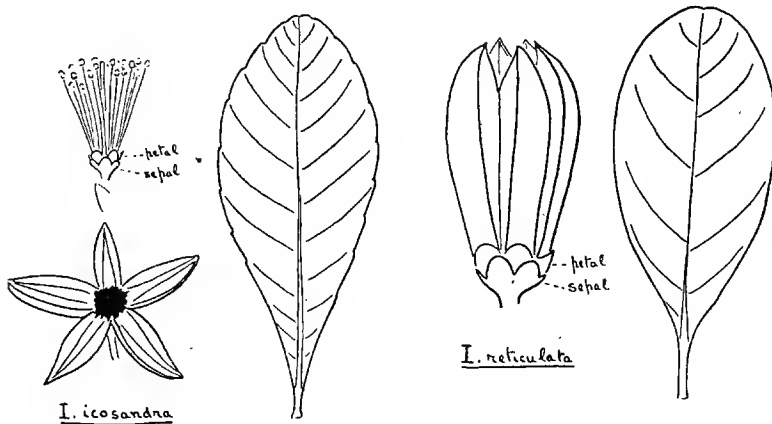
Flowers small, greenish, set in long-stalked, loose clusters from the leaf-axils, varnished with resin when young: petals 5 or 6: stamens 10-20, long, projecting in a tassel: ovary with 5 cavities and 1 style.

Capsule thinly woody, oblong, pointed, resinous-sticky, brown, splitting into 5 parts from top to bottom, seated on the persistent, resinous-sticky, brown sepals and petals: seeds winged.

11 spp., S. E. Asia to New Guinea: 2 spp. in Malaya.

Without their characteristic fruits, the species of this genus are rather difficult to recognise. The fruits resemble those of *Cratoxylon* but in that genus the leaves are in pairs and the fruits are not resinous-sticky. The resinous buds and the ochre-brown colour of the withering leaves (like those of *Cerbera*) are distinctive; and from the species of Oil-Fruit (*Elæocarpus*) with resinous buds, those of *Ixonanthes* can be told by the fact that the leaf-stalk has no knee at the top.

Both Malayan species are called *Pagar Anak*, the reason for which is not apparent. They are generally evergreen and flower seasonally, but we have found that trees of *I. reticulata* are deciduous on the East Coast.



Text-Fig. 60. *Ixonanthes*: leaves $\times \frac{1}{2}$: flower and fruit, nat. size

I. icosandra Text-Fig. 60
(Gr., eikosi—twenty, andres—men)

Twenty Men
Pagar Anak

A medium-sized tree up to 70 ft. high with rather dense crown: bark light buff grey, slightly fissured and flaky: leaves withering brownish-ochre, young leaves pale green.

EUPHORBIACEÆ

Leaf-blade 2-5½ × 1-3", narrowly obovate, gradually tapered to the short stalk, the apex rounded, notched or bluntly tipped, the edge distantly and finely toothed or notched, tending to stand upright, side-veins 7-11 pairs: stalk 1-3" long, swollen and brown at the base.

Flowers ¼" wide, in clusters 1½-3" wide on stalks 2-5" long: petals 5 or 6: stamens 20.

Capsule 6-8" long.

Sumatra, Malaya: : common in low country, in forest and belukar.

The very shortly stalked, finely toothed, spirally arranged leaves and resinous buds distinguish this species. The bark is sometimes used for tanning fish-nets.

I. reticulata Text-Fig. 60 (from the net-veining of the leaves)

Ten Men
Inggi Burong

Nyiran Burong, Pagar Anak

A small to rather large tree, over 100 ft. high in the forest, becoming strongly buttressed at the base: bark light grey, becoming slightly fissured and flaky, the inner bark of old trees deep blood red or almost black, very astringent.

Leaf-blade 2-6 × 1½-3", elliptic, blunt or notched at the apex, not toothed, leathery: stalk ½-1" long, distinct.

Flowers 3" wide: petals 5: stamens 10, projecting 1".

Capsule 1½" long, much larger than in *I. icosandra*.

Malaya, Sumatra, Borneo: not so common as the preceding species, more frequently on the coast.

When full-grown this is a handsome tree with a rather distinctive crown made up of several long upright limbs on the short side-branches of which the leafy twigs are clustered. The bark is very rich in tannin.

Saplings of this species are rather common in secondary jungle in some parts of the country. They have larger leaves, 8-16" long, and the twigs are lined or narrowly ridged along the surface, the ridges extending from the base of each leaf-stalk.

There are many trees near the West end of MacRitchie Reservoir in Singapore.

RUBBER-TREE FAMILY

Euphorbiaceæ

(from the genus *Euphorbia*)

Often with white latex.

Leaves generally simple, in a few cases compound, frequently palmate or peltate, often with spider-web veining, variously arranged but seldom opposite: stipules present.

Flowers small, about ¼" wide or less, often minute, mostly green, yellow or white, male or female, regular: sepals generally 3-5: petals as many as the sepals, generally absent, free: stamens 1-many, free or attached to a common stalk in the centre of the flower: ovary superior, with style divided into 2-3 arms, the arms often forked into two, or with 2-3 separate styles themselves often forked once.

Fruit typically a capsule with 3 shoulders or lobes and 3 cavities each containing 1 or 2 seeds, splitting into 3 or 6 parts and containing 3 or 6 seeds, in other cases a small

berry with pulpy wall and 1-3 seeds or a larger 3-shouldered fruit with leathery rind and 3-6 pulpy seeds, in some cases with the parts in 2's, rarely in 4's or 5's: seeds always few in a fruit and relatively large, with oily kernel.

280 genera over 3,000 spp., mostly tropical: 72 gen., about 350 spp. in Malaya, mostly in the lowlands.

This is the largest and most difficult family of woody plants in Malaya. The flowers are generally so small that their structure cannot be made out except with a strong lens or a microscope and there is not enough variety in the fruits to enable one to distinguish the genera by their means. Yet, if we could enter upon the details of the flower, we should find such diversity that it would be impossible to characterise the family in any particular way, and the same difficulty arises when we study the fruits and leaves. How various are the leaves will be evident from our key (p. 226) and, as for the flowers, they may be arranged in heads, spikes, racemes, clusters, catkins and panicles. It is impossible to give a set of characters by which the Euphorbiaceæ can be distinguished absolutely from all other flowering plants for there are so many exceptions even among the common members. The problem is comparable with that of the Rose-family in temperate countries: the scope of each is really far greater than that of the Bean-family (Leguminosæ) which is numerically greater and may seem more varied but can actually be defined rather narrowly by the pod and alternate or spirally arranged pinnate leaves. It is likely that the Euphorbiaceæ are not a natural family derived, that is, from the same ancestors in the distant past, but an artificial assemblage comprising the offshoots of several families brought together by botanists because of a superficial resemblance and in ignorance of the true derivation of the groups. At best we can say that a simple or lobed leaf, small unisexual flowers and a 3-shouldered fruit containing a few large seeds indicate a member of the Euphorbiaceæ. Similar fruits and small flowers are typical, also, of the Soap-Nut family (Sapindaceæ) which, however, generally has pinnate leaves.

If it be asked why such a mountain of difficulty should have been brought into this book, the reply must be that, in proportion to its numbers, the family embraces many common trees which we will be certain to meet sooner or later as we grow accustomed to the variety of vegetation. And these common trees will serve as guides up the difficult slope so that with patience we shall obtain a view over the whole family and achieve that high distinction of being able to recognise a Euphorbiaceous tree. If the flowering or fruiting twigs of every kind mentioned in this book could be displayed together, we would not dream of confusing them: the only difficulty about the key to their identification is that it obliges us to look rather closely at the leaves. We suggest that, as an introduction, a Malay should be asked to show the following trees: that specimens should be got, that they may be compared with the descriptions: and that the effort should be made to identify them from the key, because the key is a useful means of contrasting the distinguishing features of the different kinds and of impressing them upon the mind:—

Jarak (Ricinus), *Jatropha*, *Rambai* (Baccaurea), *Mahang*, *Kobin* and *Mesepat* (Macaranga), *Balek Angin* (Mallotus), *Buah Keras* (Aleurites), *Perah* (Elateriospermum), *Membulan* (Endospermum), *Jenjulong* (Agrostistachys), *Gunchar* (Antidesma), *Maya Maya* or *Gurah* (Sapium), *Kenidai* (Bridelia), *Beti Beti* (Flueggea), *Dendulang* or *Tebangau* (Glochidion), *Chermai* (Cicca), *Melaka* (Emblica).

The Rubber-tree (Hevea), the *Rambai* (Baccaurea), the Castor Oil plant (Ricinus), the Tapioca-plant (Manihot) and the Physic Nut (Jatropha) can be taken as representative and their flowers are big enough for use in classes.

The family includes, beside the Rubber-tree, many plants of economic value. As fruit-trees there are the *Rambai*, *Tampoi* and *Pupor* (*Baccaurea*), *Chermai* (*Cicca*) and *Melaka* (*Embllica*). As plants with edible or medical seeds there are the Castor Oil (*Ricinus*), Physic Nut (*Jatropha*), *Chenkian* (*Croton*), Candle Nut or *Buah Keras* (*Aleurites*), *Perah* (*Elateriospermum*) and *Gurah* (*Sapium*). As vegetables, there are the Tapioca, Cassava or *Ubi Kayu* (*Manihot*) with root-tubers, *Chekup Manis* (*Sauropus*) and *Salang* (*Claoxylon*) the leaves of which make spinach. As garden-plants, there are the Cats' Tails (*Acalypha*), with pink, red, brown or variegated foliage and long fuzzy pink or green catkins, the Garden Crotons (*Codixæum*), species of *Jatropha* with pink flowers, the Cactus-like Spurge-tree (*Euphorbia*) and the Poinsettias with red bracts (*Euphorbia*). As a timber-tree, none has any value in Malaya: the wood varies from very hard and heavy, in species of *Antidesma* and *Glochidion*, to soft and sappy in the Macaranga and the Castor Oil plant. The bark varies from thick and rugged in the *Maya Maya* (*Sapium baccatum*) and the *Perah* (*Elateriospermum*) to excessively thin, like a sheet of paper, in some kinds of *Baccaurea* and *Antidesma*.

Most wild species are small or medium-sized trees making up no inconsiderable portion of the lower layers of the forest, but very few are tall enough to enter the canopy and, excepting the *Perah* (*Elateriospermum*) and the *Maya Maya* (*Sapium baccatum*), such big trees are rare. In contrast, in secondary jungle, particularly on swampy ground, species of *Macaranga*, *Mallotus*, *Breynia*, *Glochidion*, and *Bridelia* may be the preminant trees. Few kinds are herbaceous, such as the *Dokong Anak* (*Phyllanthus*) and *Chekup Manis* (*Sauropus*); still fewer are climbers, *e.g.* *Breynia*.

All manner of tree-shapes occur in the family. In the *Perak* we find the most primitive, monopodial state with a conical crown, the trunk reaching to the vertex, the leaves set spirally on the twigs and the branching unspecialised. At the other extreme, we find the *Melaka* (*Embllica*) and the Spurge-trees (*Euphorbia*), which have two of the most specialised conditions of any tree in the world. In the *Melaka* the twigs appear like doubly pinnate leaves and the crown is inclined to be flat-topped so that it strongly resembles a Leguminous tree such as the *Petai* (*Parkia*). The Spurge-trees have fleshy green branches and are often leafless and spiny like cactuses. The *Chermai* (*Cicca*) is almost as specialised as the *Melaka*; and the species of *Mahang* (*Macaranga*) with peltate, shield-like leaves have a peculiar, unmistakeable appearance. The Moon-tree (*Endospermum*) is the only real pagoda-tree in the family, though the habit is incipient in several kinds of *Baccaurea* and *Macaranga*. In *Aporosa* we find conical Noah's Ark trees with alternate leaves set along the twigs. In the *Kenidai* (*Bridelia*) we have a tree with the lax, flopping manner of a *Cassia*. The *Jenjulong* (*Agrostistachys*) is an unbranched shrub or treelet. The Elephant's Ear (*Macaranga gigantea*) has the largest blade of any tree in the country, excepting those with compound leaves; the Sabre Leaf (*Drypetes*) has one of the longest and toughest blades: the *Melaka* has one of the tiniest blades: the Spurge-trees may have no blade at all.

It is often thought that the presence of latex is characteristic of the family. Actually, most members have no latex.

The young leaves are generally purple or brown and are pink or pale green in comparatively few species, *e.g.* *Perah* and *Rambai*. The old leaves turn yellow except in the Rubber-tree, *Buta Buta* (*Excoecaria*), *Maya Maya* (*Sapium discolor*), Penang Holly (*Longetia*), the true Crotons and some species of *Glochidion* in which they turn red.

The Sabre Leaf (*Drypetes*), several kinds of *Mahang* (*Macaranga*) and the *Jenjulong* (*Agrostistachys*) are ant-plants.

The flowers are generally small and unattractive to human beings, but they are sweet-scented, of honey or citronella, or have a foetid waxy smell like those of the *Perah*. By their scent they attract small flies, beetles, honey-bees, wasps and plant-bugs which pollinate them. None, so far as we know, is wind-pollinated, not even the species of *Antidesma*, *Macaranga*, *Sapium* and *Exccæcaria* which have minute flowers in spikes, catkins and panicles like the wind-pollinated trees of the temperate regions.

The seeds of the Rubber tree and *Perah* are scattered by the violent rupture of the fruit which hurls them away. The seeds of most kinds, however, are distributed by animals: either the seeds have pulpy, edible coats, as in the *Rambai*, or the fruits themselves are berries, as in the *Kenidai* (*Bridelia*). In *Claoxylon*, *Glochidion*, *Macaranga* and *Aporosa* the seeds have thin, red, orange or yellow pulp. Commonly the wall of the fruit splits into three or six pieces which break away from the base to the apex of the fruit and leave the bright seeds attached to the core, Text-Figs. 66, 80, 92.

One of the remarkable features of Euphorbiaceous plants is the distribution of the sexes in the flowers. Some have male and female flowers on different trees so that we may speak of them as male or female, or unisexual, trees. In others, both kinds of flowers are borne by the same tree which we then call bisexual, but in this case the male and female flowers are always produced on certain parts of the inflorescence in special relation to each other, as if the tree could call forth at will two kinds of flower. What governs the production of one sex and the suppression of the other in bisexual trees of this nature we have no idea. The arrangement of the flowers is in this manner:—

Unisexual Trees

Agrostistachys, *Antidesma*, *Aporosa*, *Baccaurea*, *Claoxylon*, *Drypetes*, *Endospermum*, *Exccæcaria*, *Gelonium*, *Macaranga*, *Mallotus*.

Bisexual Trees

(a) Male and female flowers in the same cluster, without obvious order:—*Bridelia*, *Cicca*, *Glochidion*.

(b) One female flower to each head of males:—*Euphorbia*.

(c) Male flowers-clusters towards the base of the leafy twigs, female towards the ends:—*Alchornea*, *Breynia*, *Emblica*, *Flueggea*, *Glochidion*, *Phyllanthus*.

(d) Male flowers at the base of the inflorescence, female in the upper part:—*Ricinus*.

(e) Female flowers at the base of the inflorescence, the male in the upper parts: *Croton*, *Epiprinus*, *Manihot*, *Sapium*.

(f) Female flowers singly at the ends of the main branches of the inflorescence, surrounded by the males on the smaller side-branches:—*Aleurites*, *Elatiospermum*, *Hevea*, *Jatropha*.

(g) Female flowers on one raceme, male on another, the female raceme always paired with a male:—*Codiaeum* (*Garden Crotons*).

The following wild trees should be brought into cultivation as ornamental for gardens, parks and roadsides:—

Sabre Leaf (*Drypetes*), Moon Tree (*Endospermum*), Green Cockscomb (*Epiprinus*), *Perah* (*Elatiospermum*), Penang Holly (*Longetia*), *Gurah* (*Sapium indicum*), *Maya Maya* (*Sapium baccatum*).

Key to the Genera

- With white latex in the trunk or twigs
 Cactus-like with fleshy, green, spiny stem; or leafless
 with green, cylindrical twigs like fingers ... *Euphorbia* p. 252
 Not so: ordinary leafy trees
 Sappy shrub or small tree: leaves with 3-7 fingers *Manihot* p. 273
 Not so
 Leaves trifoliate
 Big tree with 3 separate leaflets *Hevea* p. 256
 Shrub or small tree with the 3 lobes of the
 leaf joined at the base *Manihot* p. 273
 Leaves simple
 Mangrove or sea-shore: leaves rather small,
 withering red *Excœcaria* p. 254
 Inland trees
 Big tree: bark fawn brown: latex in the
 trunk: leaves leathery, mango-like ... *Elateriospermum* p. 249
 Bark grey: no latex in the trunk: leaves
 thin or rather small *see Sapium* p. 275
- Without latex
 Leaves opposite
 Leaves glabrous: stalk $\frac{1}{4}$ - $\frac{1}{2}$ " long *Longetia* p. 260
 Leaves white scurfy beneath, or the stalks over
 1" long *Mallotus* p. 269
 Leaves alternate (compare below)
 Main stem and branches without foliage leaves:
 twigs often like pinnate leaves: leaf-blade
 often small or tiny, often asymmetric at the
 base *see Glochidion* p. 278
 Not so: all the branches leafy: leaf-blade
 symmetric at the base
 Leaf-blade large, 10-20" long
 Leaves with big crescentic stipules: blade
 2-5" wide *Aporosa* p. 235
 Not so: blade 3-9" wide
 Twigs and undersides of the leaves velvety *Antidesma* p. 231
 Glabrous: blade very leathery *Drypetes* p. 248
 Leaf-blade smaller, less than 10" long
 Flowers in spikes: fruit as a spike of little
 reddish, round or flattened berries *Antidesma* p. 231
 Flowers or fruits on the twigs, singly or in
 little clusters or in yellow spikes
 Sea-shore and coastal villages: leaves
 glabrous, leathery
 Flower-clusters and fruits opposite the
 leaves: fruits smooth *Gelonium* p. 255
 Flower-clusters and fruits in the leaf-axils
 fruits bristly *Chaetocarpus* p. 244
 Riverside: leaf-blade thin, small, up to 2"
 long: small white berries *Flueggea* p. 255

- Not so: inland trees
- Leaves hairy or with the undersides
 - glaucous: flowers in little cushions ... *Bridelia* p. 242
 - Glabrous, not glaucous
 - Blade pointed, leathery, or the edge
 - toothed *Aporosa* p. 235
 - Blade thin, the edge wavy, not toothed,
 - (North Malaya) *Bridelia* p. 242
- Leaves spirally arranged
- Leaves variegated: Garden Croton *Codiaeum* p. 245
- Not so
- Leaf-blade with 3-9 lobes or points
 - Shrubs or treelets of cultivation: soft, sappy wood
 - Leaves deeply 7-9 lobed, peltate: fruit prickly *Ricinus* p. 274
 - Not so: fruit smooth *Jatropha* p. 258
 - Trees, wild or cultivated
 - Big tree: leaves white hoary on the upper-side: mature leaves spear-shaped ... *Aleurites* p. 230
 - Not so: leaves with spider-web veining
 - Inflorescences in the axils of the old leaves or on the twigs behind the leaves: stipules often large *Macaranga* p. 261
 - Inflorescences terminal or in the axils of the upper leaves of a twig: stipules very small, inconspicuous ... *Mallotus* p. 269
 - Leaf-blade not lobed
 - Blade peltate or heart-shaped or broadest near the base (ovate)
 - Mature leaves spear-shaped, white hoary on the upperside: flowers in white panicles: fruits large: big tree ... *Aleurites* p. 230
 - Not so
 - Leaf-blade glabrous, 3-veined from the base, *withering red*: village treelet ... *Croton* p. 246
 - Leaves with spider-web veining, generally hairy
 - Blade peltate, or glaucous or brown-white scurfy beneath
 - Inflorescences in the axils of the old leaves or on the twigs behind the leaves: stipules often large ... *Macaranga* p. 261
 - Inflorescences terminal or in the axils of the upper leaves of a twig: stipules very small, inconspicuous *Mallotus* p. 269
 - Not so
 - Blade with two little 'swallow-tails' at the base *Alchornea* p. 230

- Not so
- Big tree : bark grey brown : blade as broad as long, often with knob-like glands beneath ... *Endospermum* p. 250
 - Small trees : blade distinctly longer than broad
 - Blade large, softly hairy : bark whitish : seeds red ... *Claoxylon* p. 244
 - Blade rough hairy : small, scrambling shrub with bristly fruits ... *Macaranga* p. 261
 - Blade not so : broadest in the middle or near the apex (elliptic to obovate)
 - Riverside shrub with very narrow leaves whitish beneath ... *Homonoia* p. 258
 - Shrub or treelet, not or scarcely branched : blade very long, narrow, upright ... *Agrostistachys* p. 228
 - Leaves silvered brownish white beneath, *withering orange-red* ... *Croton* p. 246
 - Flowers or fruits clustered on, or hanging in strings from, the trunk or branches or twigs behind the leaves : *Rambai, Tampoi, Pupor* ... *Baccaurea* p. 238
 - Not so
 - Big tree : blade as broad as long, rather stiff, often with knob-like glands beneath ... *Endospermum* p. 250
 - Small trees : blade distinctly longer than broad
 - Flowers in pink panicles : fruit enclosed in large red sepals ... *Epiprinus* p. 251
 - Not so : flowers greenish or yellowish, in spikes
 - Fruit smooth (in some cases ridged)
 - Fruit red powdery ... *Mallotus* p. 269
 - Not so
 - Seeds red : leaves soft, thin, soon withering on plucking : old leaves yellow ... *Claoxylon* p. 244
 - Old leaves turning red* : leaves leathery, firm ... *Croton* p. 246
 - Not so : inflorescence lateral ... *Baccaurea* p. 238
 - Fruit prickly or warted
 - Inflorescences in the axils of the old leaves or on the twigs behind the leaves : stipules often large ... *Macaranga* p. 261
 - Inflorescences terminal or in the axils of the upper leaves of a twig : stipules very small, inconspicuous ... *Mallotus* p. 269

AGROSTISTACHYS

(Agrostis—a genus of grasses: stachys— an ear of corn)

Unbranched or very sparingly branched, evergreen shrubs or treelets without latex. Leaves simple, spirally arranged, very long, narrow and leathery, sessile or shortly stalked.

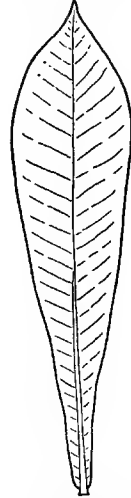
Flowers small, yellowish green, in long, upright, axillary spikes, male and female flowers on different plants: calyx with 2-3 lobes in the male flower, 4-5 in the female: petals 5: stamens 10.

Fruit a small, 3-lobed capsule like a tiny rubber-fruit, one seed in each lobe.

11 spp., tropical India, Malaysia to the Philippines: 3 spp. in Malaya.

Two common species of this genus are well-known to Malays as *Julong Julong*, *Jenjulong*, *Nulong* or *Nyunyulong*, evidently from the resemblance of the narrow pointed leaves to the snouted body of the fish called the Half-beak to which they give the same names. Both are unmistakable forest shrubs with a stiff habit and beautifully formed leaves. They flower rather seldom and, apparently, only after pronounced dry weather.

The species which we call the Malay *Jenjulong* is, in a sense, an ant-plant, not that its twigs are hollow and tenanted by ants like those of some species of *Mahang* (*Macaranga*), but that small black ants habitually make their nests on the outside of the stem among the close-set leaf-bases and fiercely resent interference with their abode.



Text-Fig. 61.
Agrostistachys sessilifolia, × $\frac{1}{2}$.

Key to the Species

- Leaves set in a dense tuft at the top of the stem and concealing it: stipules large *A. sessilifolia*
- Leaves distinctly stalked, loosely spaced round the visible stem: stipules inconspicuous *A. borneensis*

A. borneensis

Bornean *Jenjulong*

A shrub or treelet to 25 ft. high, for a long while unbranched, then sparingly branched: the leaves spaced apart with the stem visible between them: buds and young twigs coated with resin: stipules small.

Leaf-blade generally distinctly stalked.

Flowers-spikes 4-10" long.

Fruits $\frac{1}{2}$ - $\frac{3}{4}$ " wide, nearly double as big as in the other species.

Malaya, W. Borneo: not so common as the following species and generally on hillsides, often gregarious.

A. sessilifolia

Text-Fig. 61

Malay *Jenjulong*

An unbranched shrub, 2-10 ft. high, or with an occasional branch, with a dense tuft of very close-set, long, erect leaves at the top of the stem: stipules $\frac{1}{2}$ -1" long.

Leaf-blade 10-24 × 2-5 $\frac{1}{2}$ " narrowly obovate, tipped, more or less sessile, leathery, stiff, slightly toothed, dark green.

Flower-spikes 12-24" long: flowers $\frac{1}{4}$ " wide, with yellow calyx, yellowish white petals, and 5 orange nectaries, faintly fragrant.

Fruit $\frac{1}{3}$ " wide.

Malaya: common in all low-lying woods, especially in swampy ground, often gregarious, rarely on hillsides.

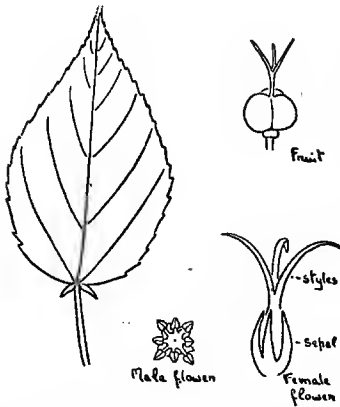
ALCHORNEA

(S. Alchorne, 1727-1800, an English botanist)

*Leaves spirally arranged, simple, rather long-stalked, toothed.**Flowers small, arranged in long spikes, male and female flowers on the same bush: male flowers sessile, very small, greenish yellow, in little groups on unbranched slender spikes, with 2-3 sepals and 6-8 stamens: female flowers singly on branched spikes, sessile, green, surrounded by numerous bracts and sepals, with 3 long styles: no petals.*

Fruit a small, 3-lobed capsule with 3 seeds.

About 60 spp., throughout the tropics: 5 spp. in Malaya.

A. villosa Text-Fig. 62
(Lat., woolly)Swallow-tail Bush
Rami UtanText-Fig. 62. *Alchornea villosa*: leaf $\times \frac{1}{4}$: flowers $\times 2$: fruit, nat. size.*A sprawling shrub or treelet to 20 ft. high, with very tough, stringy bark: twigs, leaf-stalks and undersides of the leaves softly velvety hairy.**Leaf-blade 3-9 \times 1 $\frac{1}{2}$ -7", ovate, tipped, toothed, thin, the base rounded or narrowed with two little green tails, 1-5" long, spreading on each side of the stalk and with several small glands appearing as yellow spots on the upperside: stalk $\frac{1}{2}$ -5" long.**Spikes 3-7" long, the male spikes generally 2-3 together on the twigs behind the leaves or in the leaf-axils (occasionally with a few female flowers at the end), the female spikes terminal: styles $\frac{1}{2}$ " long or more.**Fruit $\frac{1}{2}$ " wide, crowned by the long styles, seated on the green calyx with 2-6 small red eye-like glands.*

Malay Peninsula, Sumatra, Java: common in open country, secondary jungle and the edges of the forest.

The tough bark can be used for string, whence comes the Malay name. Our English name refers to the little tails at the base of the blade, by which the plant can always be recognised.

ALEURITES

(Gr., aleuron—wheaten flour)

*Leaves spirally arranged, the mature leaves simple, the leaves of saplings or of lower branches with 3-5 lobes or points: stalks long.**Flowers small, male and female arranged together in terminal panicles, the female flowers seated at the ends of the main branches with the smaller, much more numerous, male flowers arranged round them in bunches: calyx splitting into 2-3 lobes: petals 5: male flowers with many stamens: female flowers with a 2-shouldered ovary crowned by 2 small styles, each divided deeply into two prongs.**Fruit rather large, rounded but rather flattened, with a thick, fleshy rind and 1-2 large, very hard seeds, not splitting open.*

5 spp., Asia and the Pacific IIs.: none wild in Malaya.

The five species of this genus have all an economic value on account of the oil contained in their seeds, the more important being the Chinese *A. Fordii*, which supplies Tung-oil, and the Malayan Candle Nut tree or *Buah Keras* (*A. moluccana*). There is an excellent account of the species in BURKILL'S Dictionary so we shall limit our description to the Candle Nut tree which is the only common species in Malaya, though the two Chinese species, *A. Fordii*

and *A. montana*, are under cultivation at Cameron Highlands and are likely to become familiar. It has been suggested that the Candle Nut tree is wild on the East coast of Malaya, perhaps on the sandy shores of Pahang, but for this there is no evidence: we have explored long stretches of the East coast from Kuala Sedili, in Johore, to Kemaman and have walked along most of the Pahang beaches, but never did we meet with a wild specimen of *Buah Keras*.

We would draw the attention of school-teachers to the delightful construction of the panicle in this common tree. The flowers are large enough for 'class-purposes' and display in an instructive manner the differences between the sexes and the impossibility of obtaining self-pollination in the same panicle: for other details we refer to the remarks under *Jatropha* p. 258.

A. moluccana Plate 55
(from the Molucca IIs.)

Candle Nut tree, Indian Walnut
Buah Keras, Kemiri, Kembiri

A rather tall, evergreen tree with heavy, irregular, large-leaved crown appearing whitish or frosted from a distance: bark grey, rather rough with lenticels, not flaky or ridged: leaves, twigs, and inflorescences covered with whitish or pale brownish scurf, especially when young, the leaves weathering smooth.

Leaf-blade (mature) $3-9 \times 2\frac{1}{2}-5$ ", dark green with a silvery gloss, rather narrowly ovate, tapered to the pointed apex, shaped like a spear-head, drooping: stalks 2-6" long, with a pair of small, greenish or brownish glands at the top on the upperside.

Leaf-blade of saplings, or of the lower branches, 3-5 lobed, larger and with heart-shaped base.

Panicles 4-6" long, pale buff-white: male flowers $\frac{1}{2}$ " wide: petals pale yellowish white.

Fruit 2-2 $\frac{1}{2}$ " wide, olive-green with whitish flesh, with 4 faint ridges radiating from the point: 3-6 fruits in a bunch.

Cultivated throughout Malaysia, of doubtful origin: frequent in Malayan towns and villages.

The shape and frosted appearance of the leaves enable one to recognise this tree at sight. Like the *Kepayang* (*Pangium*), *Kembang Samangkoh* (*Scaphium*) and the *Terap* (*Artocarpus elasticus*) the saplings have differently shaped leaves from the adult tree. When grown to perfection the Candle Nut tree is handsome but good examples are rather few, the best in the country, to our knowledge, being that in Tanglin Barracks in Singapore.

The Malay name refers to the very hard seeds which need a heavy blow to break them. The English name refers to the former use of the oily kernel of the seeds for making candles. The seeds are offered for sale in the native shops as they are used to a small extent for food. In the villages, games of 'conquerors' are played with them and there is said to be a variety with specially hard nuts which serves this purpose. The raw kernel is poisonous. The manufactured oil is used mainly for soap and paint.

ANTIDESMA

(Gr., anti—against, desma—a band)

Leaves alternate, simple, entire, with rather short stalks: stipules often conspicuous.

Flowers minute, arranged in slender spikes, male and female on different trees: the spikes greenish, solitary or a few together forming a kind of branched inflorescence: sepals 3-5: stamens 3-5 in the male flower, projecting: ovary minute with 2 or 4 points: petals none.

Fruits as small, thinly pulpy, berries more or less rounded or oblong and pointed, ripening pink, red, purple and finally often black, set many together along each spike of the female trees: stone 1, often flattened, relatively large, faintly pitted or pocked.

About 140 spp., tropical Africa, Asia and Australia: 21 spp. in Malaya.

Excepting the village trees called *Buni* (*A. bunius*) and *Gunchak* (*A. ghæsembilla*), we are not likely to meet with *Antidesmas* until we begin to explore along the edges of woods and thickets in open country. Then, sooner or later, we are sure to wonder what are the shrubs and small trees with little red berries on drooping spikes like a string of red currants. So we will first learn to recognise *Antidesma* from its berries and later discover its flowering spikes, male and female, which are almost as distinct. These flowering spikes resemble those of the oaks and chestnuts (*Quercus*, *Castanopsis*), and their leaves, too, are not dissimilar but *Antidesmas* are never big trees. They begin to flower as shrubs, 6–8 ft. high, and gradually develop into small trees 20–30 ft. high, seldom more. They are evergreen but flower seasonally. Their bark is typically greyish, often slightly fissured, and very thin like that of the *Rambai* (*Baccarurea*) or *Nipis Kulit* (*Memecylon*). Their wood is hard and strong, in some cases reddish. The young leaves are purple or pink and the old leaves fade yellow. It is probable that the fruits of all are edible, if sour.

The Malay, name *Gunchak*, with its derivatives, is given to the village tree *A. ghæsembilla* and sometimes to the wild kinds, especially with a qualification such as *Gunchak Gajah*. *Selumar*, *Sebasa*, *Berunai* and *Beras Beras* are other Malay names for these wild species but we do not know with what certainty they are used, *c.f.* *Aporosa*, *Jackia*.

Key to the Species

- Leaf-blade small, rather broad, blunt, rounded or heart-shaped at the base, up to $3 \times 2\frac{1}{4}$ " *A. ghæsembilla*
- Leaf-blade medium to large, always tipped
- Blade very large, $7-20 \times 2\frac{1}{2}-8$ " : fruiting spike long, 6–8", solitary *A. tomentosum*
- Not so : blade smaller, elliptic to obovate with tapered base
- Leaf-stalks more than $\frac{1}{3}$ " long : leaves glabrous
- Flower- and fruit-spikes up to 3" long, in the leaf-axils, singly or clustered *A. coriaceum*
- Flower- and fruit-spikes 3–7" long, terminal, singly or in loose clusters *A. cuspidatum*
- Leaf-stalks $\frac{1}{3}$ " long or less
- Leaves very narrow : riversides *A. salicinum*
- Leaves 1–4" wide
- Twigs and undersides of the leaves persistently velvety *A. velutinosum*
- Twigs and leaves glabrous or finely hairy when young
- Stipules conspicuous, broad, $\frac{1}{2}-\frac{3}{4}$ " \times 1–3" *A. alatum*
- Stipules smaller, narrow, inconspicuous
- Wild tree with slightly hairy twigs *A. montanum*
- Cultivated tree with glabrous twigs *A. bunius*

A. alatum

(Lat., winged)

Leaf-blade $2\frac{1}{2}-6 \times \frac{3}{4}-2\frac{3}{4}$ ", the edge often wavy, yellowish green beneath : stipules leafy, yellowish green.

Fruit-spikes 1–2" long, short, solitary or 2–3 together.

Fruit $\frac{1}{4}-\frac{1}{2}$ " long, rather large when full grown, rose-red, finally black.

Malay Peninsula : rather common in lowland woods, easily overlooked unless fruiting.

A. bunius Text-Fig. 63

Buni, Berunai

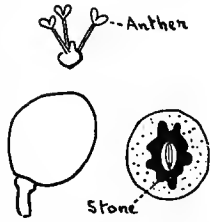
A shady, rather gloomy tree up to 50 ft. high, with dark greyish brown, slightly fissured bark becoming slightly flaky: glabrous.

Leaf-blade 4-8 × 2-3", rather oblong and narrow, pointed, drooping with upcurled sides, leathery, dark shining green: stalk 1-4" long.

Male flowers .2" wide, greenish yellow or tinged red, in long green drooping terminal spikes, 7-12" long, often tinged red, singly or with a few branches from the base: stamens 3-4, with purple black anthers.

Fruit 3-4" long, plump, round, crowded on spikes 2-4" long, white then pink and finally dark red or purple-black, sour but not unpleasant: seed whitish, slightly flattened and pitted.

India to Australia: cultivated in Malaya, occasional in villages, not wild.



Text-Fig. 63. *Antidesma bunius*; male flower, × 2: fruit, nat. size.

A. coriaceum

(Lat., leathery)

Leaves as in *A. cuspidatum*, leathery, dark green, with rather long stalks 1/2-1 1/4".

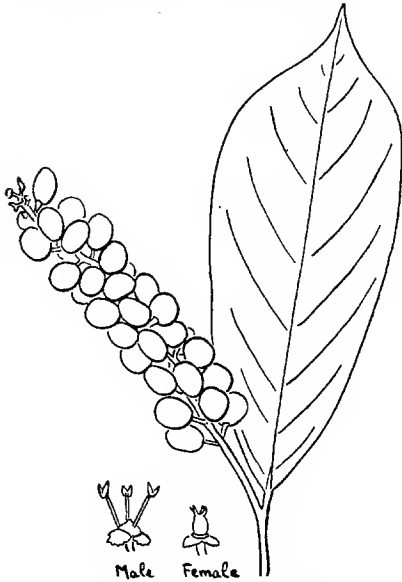
Fruit spikes short.

Fruit 1/2" long and broad.

Malay Peninsula, Borneo: frequent in lowlands woods, especially in the south.

A. cuspidatum Text-Fig. 64

(Lat., with cusp-like point)



Young twigs and leaf-stalks finely hairy, soon glabrous: twigs and leaf-stalks becoming whitish.

Leaf-blade 3 1/2-9 × 1 1/2-3 1/2", light green, with 6-9 pairs of side-veins: stalk 1/4-3/4" long.

Fruit-spikes occasionally solitary or in axillary clusters.

Fruit 1/4" long.

Malay Peninsula: frequent throughout in the lowlands and mountains.

The three species *A. coriaceum*, *A. cuspidatum* and *A. montanum* are very similar and it is possible that they merge into each other.

Text-Fig. 64. *Antidesma cuspidatum*, × 1/2: flowers × 2.

A. ghæsembilla Plate 56, Text-Fig. 65

Black Currant Tree

(a Ceylonese plant-name)

Gunchak, Gunchek, Guchek, Gunchian, Gunchin

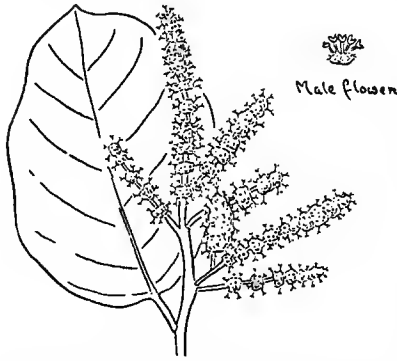
A small deciduous tree 15-40 ft. high, with dense, bushy crown conical then round and finally rather spreading, even umbrella-shaped, becoming very twiggy: the lower branches downcurving at the ends, the others rather upright, becoming gnarled: trunk rather stocky bark dull grey or brownish, slightly fissured: young leaves pink: twigs, leaf-stalks and undersides of the leaves hairy, or glabrous when old.

ERYTHROXYLACEÆ

Leaf-blade 1-3 × $\frac{3}{4}$ -2 $\frac{1}{2}$ "", broadly elliptic, dark green: stalk $\frac{1}{4}$ - $\frac{1}{3}$ ".
Flowering spikes small, 1-2 $\frac{1}{2}$ " long, erect, in short dense terminal bunches of 2-8, greenish yellow, faintly scented: male spikes light yellow from pollen, decking the twigs along the uppersides, very numerous.

Fruits $\frac{1}{2}$ " long, tiny, ripening dull reddish purple then black.

Tropical Africa and Asia: common in villages and open country in the north of Malaya and on the East coast from Pekan northward.



Text-Fig. 65. *Antidesma ghesbilla*, × $\frac{1}{2}$; flower × 2.

Sometimes this little tree recalls the bushy crown of the *Mempoyan* (*Rhodamnia*); at other times the bushy domes of the *Bedara* (*Zizyphus*). It seems to flower or to be in fruit during most months of the year, but about April on the East coast the trees have a general leaf-change followed by the flowering. When the branches have reached their full length they flower on dwarf or short axillary shoots, just as the thorny *Randias* (p. 555) with which they often grow. Most trees are male or female but a few have both kinds of flower on different branches. The rather acid fruits are eaten by children.

The *Gunchak* must not be mistaken for the *Gurah* (*Sapium indicum*) which has latex, p. 277.

A. montanum

(Lat., mountain)

Twigs rather persistently hairy: leaf-stalks always short.

Leaves as in *A. cuspidatum*, but with shorter stalk.

Fruit-spikes 3-5" long, generally a few in a terminal cluster, occasionally solitary.

S. China to Borneo and Java: common in villages and open country in Malaya, especially in the north and on sea-coasts.

A. salicinum

(like a willow, *Salix*)

Red Water-berry

Mempenai, M. Ayer, Champenai, Chapok

A riverside bush up to 10 ft. high with narrow, lanceolate leaves 1 $\frac{1}{2}$ -6 × $\frac{1}{4}$ -1", with very short stalks $\frac{1}{2}$ " long.

Flowers-spikes 2-4" long, terminal.

Fruits $\frac{1}{4}$ " long, red.

Malaya: common by swift rivers in the middle and north of the country.

Compare the Willow Spurge (*Homonoia*) with spirally arranged leaves and little grey-brown capsular fruits, p. 258.

A. tomentosum

(Lat., woolly)

Twigs and undersides of the leaves velvety.

Leaf-blade rounded to heart-shaped at the base: stipules large, $\frac{1}{2}$ -1 × $\frac{1}{4}$ - $\frac{1}{2}$ ".

Fruits $\frac{1}{2}$ " long rather large, flattened, pointed, red.

W. Malaya: frequent in lowland forest in Malaya.

A. velutinosum

(Lat., velvety)

Leaf-blade 4-10 × 1 $\frac{1}{2}$ -3 $\frac{1}{2}$ "", thin, light yellowish green, with 9-16 pairs of side-veins.

Fruit-spikes 3-6" long, solitary or two together, terminal or from the leaf-axils.

Fruits $\frac{1}{2}$ " long, pink then red.

W. Malaysia: common in lowland woods and by the sea in Malaya.

APOROSA

(Gr., without a pore)

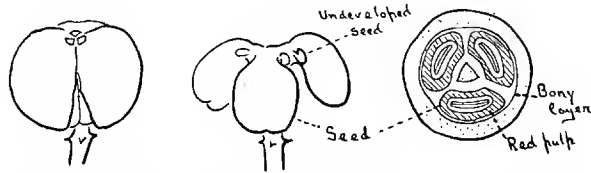
Leaves alternate, simple, shortly stalked: young leaves purple.

Flowers minute, without petals: male flowers very minute, set in continuous or interrupted catkin-like yellow spikes in the leaf-axils, fragrant: female flowers in small sessile clusters or shorter spikes: sepals 3-4: stamens 1-5 in each male flower.

Fruit a small, round or oblong capsule with a thin, often yellow, red or purple rind, crowned by the 2-3 sessile stigmas, splitting from base to apex into 2-4 thinly bony segments and exposing the seeds attached to and standing out from the core: seeds 1-6 in a fruit, typically 2 in each compartment but several often undeveloped, rather large, covered with a thin yellow, orange or red pulp.

About 60 spp., tropical Asia and New Guinea: about 20 spp. in Malaya, mostly in the lowlands.

This is a genus of ever-green shrubs and small trees, few of which exceed 50 ft. in height. Several species are common but most do not venture outside the forest. On the whole the species are difficult to distinguish except



Text. Fig. 66. *Aporosa frutescens*: fruit, nat. size.

by botanical details and our knowledge of them is imperfect. It is impossible however to wander along the edge of the forest without meeting with some; their bushy conical crowns with long leafy twigs remind one of the nutgegs; and the purple young leaves, the fragrant yellow spikes of the male trees and the curious fruits, resembling figs when unripe, attract the attention. The Crescent Tree, *A. Benthamina*, is also one of our more striking small forest trees because of its long leaves and large crescentic stipules.

Sebasa is a common Malay name for the genus but it is very doubtful if Malays recognise all the species as a single group, and they give this name also to species of *Antidesma*.

Key to the Species

- Leaves large, long, with big crescentic stipules ... *A. Benthamina*
- Leaves medium-size with uneven, toothed or lobed edge ... *A. aurita*
- Not so: leaves rather small and narrow
 - Fruit round: male catkins 1-3 in a leaf-axil ... *A. frutescens*
 - Fruit oblong: male catkins 3-5 in a leaf-axil ... *A. Maingayi*

A. aurita

(Lat., auris—an ear)

Bastard Oak
Pelangah, Pelangas, Pelangi

A small bushy tree, 10-40 ft. high, with rather open crown and spreading branches: bark light brownish grey, slightly fissured and ridged: twigs glabrous or finely hairy.

Leaf-blade $3\frac{1}{2}$ -7 × $1\frac{1}{2}$ -3 $\frac{1}{2}$ " , elliptic, with wavy, uneven, or distinctly lobed or toothed edge, leathery: stalk $\frac{1}{4}$ - $\frac{1}{2}$ " long.

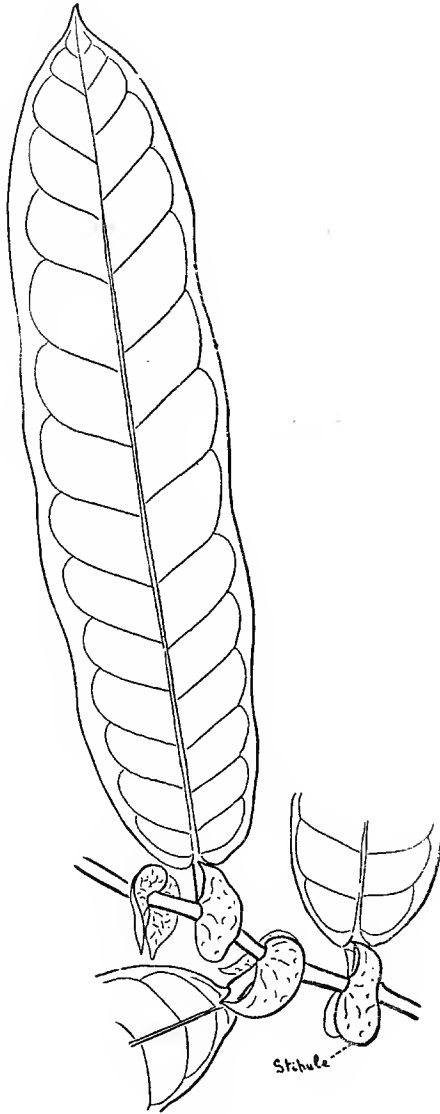
Male catkins $\frac{1}{2}$ -1 $\frac{1}{2}$ " long, greenish yellow, faintly scented, 1-several in a leaf axil: female catkins green with yellow styles, shorter, $\frac{1}{4}$ - $\frac{1}{2}$ " long.

Fruits $\frac{1}{2}$ - $\frac{3}{4}$ " long, oblong, rather small, in small bunches in the leaf-axils, generally 1-seeded, sometimes with 2 seeds.

S. China to Singapore, Java and Borneo: common in secondary jungle and lowland forest in Malaya.

EUPHORBIACEÆ

The lobed leaf is often very striking and may even suggest that of the English Oak (*Quercus robur*).



Text-Fig. 67. Crescent Tree (*Aporosa Benthamiana*), $\times \frac{1}{2}$.

A. Benthamiana Text-Fig. 67 Crescent Tree
 (G. Bentham, 180c-1884, the English botanist)

A small glabrous tree 15-40 ft. high, occasionally up to 80 ft. : *bark* grey, rather ruggedly fissured : *young leaves purple with vivid green tips*.

Leaf-blade 9-18 × 2-5", large, leathery, oblong, tipped, shining green, drooping, the base narrowly heart-shaped : *stalk* $\frac{1}{2}$ -1" long : *stipules very large*, crescentic, green, persistent, $\frac{1}{2}$ -1 $\frac{1}{2}$ " long, $\frac{1}{2}$ - $\frac{3}{4}$ " wide.

Male catkins $\frac{1}{2}$ -1 $\frac{1}{2}$ " long, in bunches on the branches behind the leaves.

Fruits $\frac{3}{4}$ " long, oblong, yellow then red, in short rows of 2-4 from the leaf-axils or on the branches.

Malay Peninsula, Sumatra : frequent in lowland forest throughout the country.

This striking tree flowers but seldom. It must not be confused with the Sabre Leaf (*Drypetes*) which has much larger leaves and lacks the big stipules.

A. frutescens Text-Figs. 66, 68 Bastard Rukam
Rukam Utan
 (Lat., shrubby)

A conical, bushy, little tree with glabrous or finely hairy twigs : *bark* pale brownish, finely flaky in tiny thin roundish pieces : crushed leaves with an earthy smell, as of alum.

Leaf-blade 3-8 × $\frac{3}{4}$ -2", rather narrow, thin, shiny, downpointing with a long tip ($\frac{1}{2}$ -1"), the base narrowed : *stalk* $\frac{1}{2}$ - $\frac{1}{2}$ " long.

Male spikes $\frac{1}{2}$ -1" long, 1-3 in a leaf-axil.

Fruits $\frac{1}{2}$ " wide, round, shortly stalked, only 1-2 in a leaf-axil, yellowish red when young, then green flushed purple brown, finally reddish : generally 3-seeded, the pulp round the seeds orange-red.

Malay Peninsula, Java : common in lowland forest and secondary jungle in Malaya.

The fruits resemble those of the *Rukam* (*Flacourtia*) but are not edible,

The bark, under the name *sasah*, is much used in Batik work for fixing the dye of *Morinda*, for which purpose it enters regularly into trade¹ (BURKILL).



Text-Fig. 68. *Aporosa frutescens*, with male spikes, × $\frac{1}{2}$.

A. Maingayi Maingay's Tree
 (A. C. Maingay, 1836-1864, doctor and botanist of the East India Co.)

Very like *A. frutescens* but :—the *leaves* rather smaller : *male catkins* always several in a cluster : *fruits* oblong, .4 × .2", yellow-red, 1-seeded, generally 2-3 fruits in a cluster, the seed-pulp orange.

Malaya : not quite so common as the preceding.

BACCAUREA

(Lat., bacca—a berry, aurea—golden)

Leaves spirally arranged, simple, generally with long stalks with a distinct swelling or 'knee' at the top.

Flowers small, often tiny, yellowish green, set in long, slender, more or less drooping, unbranched spikes or racemes, arranged in bunches from the branches or trunk, in a few species from the leaf-axils: male and female flowers on separate trees, the male flowers smaller than the female and more numerous: sepals 4-6: petals none: stamens 4-10.

Fruit a medium to large berry, oblong or round, often 2-4 shouldered, tipped by the tiny sessile stigma, containing 1-6 large, oblong seeds each surrounded with juicy or creamy pulp enclosed in a transparent skin: the fruits splitting open in some cases, not in others.

About 60 spp., tropical Asia and Australia: 22 spp. in Malaya, mostly in the lowlands.

The well-known fruit-tree called the *Rambai* (*B. Motleyana*) provides an excellent introduction to this large genus, as, indeed, it does to the whole family. Besides the *Rambai*, the genus includes the fruit-tree called *Pupor* (*B. sapida*), which is commonly planted in villages in the north of the country and on the East coast: several wild species with edible fruits like those of the *Rambai*; two, if not more, kinds of forest-tree known as *Tampoi*, *Taban* or *Merkeh* (in Kelantan), the fruits of which are larger, thicker skinned, sweeter and more delicious than those of the *Rambai*; and the curious little forest-tree called *Setambun* (*B. parviflora*), the fruit-bunches of which lie upon the ground. The strings of small, yellowish green flowers with a sour or lemon-like scent, developed from burs on the old wood, and the strings of fruits which form on the female trees, together with the spirally arranged leaves, enable one easily to recognise a species of *Baccaurea*. The bark is also characteristic because, as in the *Nipis Kulit* (Memecylon) and some kinds of *Antidesma*, it is exceedingly thin, generally no thicker than a piece or two of paper, so that a cut with a pen-knife immediately enters the wood. Such thin bark, in fact, distinguishes these three kinds of tree which, among themselves, are easily recognised from the arrangement of the leaves. The wood is hard and dense in all the species.

The Malayan species of the genus are evergreen. They develop new leaves and flowers seasonally, once or twice a year after dry weather. Most kinds have Terminalia-branching in some degree but they are not pagoda-trees like the Moon Tree (*Endospermum*). The leaves on the lower or outer sides of the twigs have larger blades than those on the upper or inner sides. The species appear to differ considerably in the colour of the new leaves, from pink or purple to light green. The old leaves wither yellow.

It seems that the fruits of all the Malayan species are edible, though most of them are acid and only a few are large enough to be worth cultivating. Nevertheless many of the jungle fruits find their way into the village-markets in their season. The name *Rambai*, with such qualifications as *R. Tikus*, *R. Burong*, *R. Ayam*, *R. Tupai* and *R. Utan*, is given to those kinds which have rather oblong, thin-skinned fruits borne on strings like those of the cultivated *Rambai*. The names *Tampoi* and *Taban*, with their modification (*see B. Griffithii*), are given to species with roundish, thick-skinned fruits borne only a few in a bunch: and such as have only small fruits are called *T. Burong*, *T. Tunggau*, *T. Bunga*, *T. Tupai* and so on. The name *Taban* must not be confused with *Taban* which indicates the Gutta Percha trees of the *Chiku*-family (Sapotaceæ). BURKELL says that *Jintek Jintek* is a name given to some kinds the fruits of which can be split open by flicking them with the hand. The

difference between the *Rambai* and *Tampoi* has a remarkable parallel in that between the *Langsat* and *Duku*, which are considered varieties of the one species *Lansium domesticum* of the *Sentol*-family (Meliaceae).

Key to the Species

- Fruits crowded along hanging strings, generally oblong and thin-skinned: *Rambai*
- Leaf-blade large 6-14" long
- Twigs, leaf-stalks and undersides of the leaves finely velvety
- Village tree: base of leaf-blade rather heart-shaped *B. Motleyana*
- Wild: base of leaf-blade tapered: seeds with blue pulp *B. brevipes*
- Glabrous
- Fruit-strings on the trunk *B. lanceolata*
- Fruit-strings on the branches and the trunk ... *B. sapida*
- Leaf-blade smaller, 3-8" long: glabrous or nearly so
- Small forest-tree with fruiting strings from the base of the trunk *B. parviflora*
- Not so
- Small wild tree: fruits rose-pink, ridged and wrinkled *B. Scortechinii*
- Wild or village-tree: fruit not so *B. sapida*
- Fruits 2-4 together in stalked bunches, round, thick-skinned: *Tampoi*
- Fruits 1½-2½" wide: fruiting from the branches or trunk
- Leaf-blade large, 7-14" long, glabrous *B. Griffithii*
- Leaf-blade smaller, 4-8" long; twigs and leaf-stalks finely downy *B. reticulata*
- Fruits about 1" wide: leaf-blade 4-8" long: fruiting on the twigs or branches
- Twigs and leaf-stalks finely velvety *B. pyriformis*
- Glabrous *B. bracteata*

B. bracteata Monkeys' *Tampoi*
 (with pronounced bracts) *Tampoi Tunggau*, *T. Kra*

Like *B. Griffithii* but:—
 Bark bright fawn brown, minutely dippled scaly.
 Leaf-blade small, up to 7 × 3½", the stalk ½-3" long: young leaves purple.
 Fruits ¾-1" wide, round, dark reddish brown, 3-shouldered and splitting into 3 parts, 1-2 together on short sprays, 2-4" long, from the leaf-axils or on the twigs just behind the leaves: pulp of seeds yellow, sour.
 Malay Peninsula, Sumatra: frequent in lowland forest, common in the Reservoir Jungle in Singapore.

B. brevipes Blue *Rambai*
 (Lat., brevis—short, pes—a foot) *Rambai Ayam*, *R. Tikus*, *R. Utan*
R. Burong.

A shrub or small tree with rather slender crown, like *B. Motleyana* but:—
 Bark finely ridged and fissured, not flaky.
 Leaf-blade narrowed to the base, not heart-shaped.
 Fruit ½-¾" wide, round, waxy white to rose-pink, the seeds with sky-blue pulp, in strings 3-12" long from the trunk, edible.
 Malay Peninsula, Borneo: common in lowland forest.

B. Griffithii Text-Fig. 69

(W. Griffith, 1810-1845, doctor and botanist of the East India Co.)

Greater *Tampoi*
Tampoi, Taban, Tabai, Tabau,
*Merkeh (Kel.), Larak (Sakai)*A tree resembling the *Rambai* (*B. Motleyana*) but:—

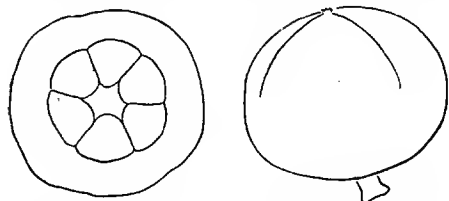
Twigs, leave and fruits glabrous.

Leaf-blade narrowed to the base, not heart-shaped.

Inflorescences 3-8" long, clustered on the branches, sometimes on the trunk also, the female ones shorter.

Fruit 1-2½" wide, larger, *oblong and 1-2 seeded, or round and rather apple-shaped with 3-6 seeds, always slightly pointed with 3 faint grooves spreading from the point: the rind* ⅓" thick, *dull brownish grey or russet-grey, slightly rough with little brown spots, internally greenish white and soon browning on exposure: seeds with the pulp cream-white and opaque, becoming translucent in ripening, sour-sweet: the fruits singly or in bunches of 2-4 at the ends of stout strings 2-8" long.*

Malaya: rather common in the lowland forest, chiefly in the F.M.S.

Text-Fig. 69. *Baccaurea Griffithii*;
fruit $\times \frac{1}{2}$.

To this and *B. reticulata* belong the commoner of jungle fruits that are called *Tampoi*. We say commoner advisedly because we think that there are still other species to be discovered or, at least, to be made known to botanists. We hope that someone living in the middle of the country will take up the question because our knowledge of *Tampoi*-trees is very meagre. It is strange that neither species should have been brought

into cultivation for their fruits are superior to those of the *Rambai* and are to be classed with the better kinds of *Duku* (*Lansium domesticum*). According to Malays, the *Tampoi* fruits at uncertain intervals, by no means every year, and the crop is often destroyed by wild bears and monkeys.

The young leaves of *B. Griffithii* are said to be dark purple, but we have found them to be pale green with a slight purple tinge.

In BURKILL'S Dictionary the *Tampoi* is referred to a Sumatran species *B. malayana* in error.

B. lanceolata

(from the leaf-shape)

Green *Rambai*
*Rambai Utan, Mempauing (Pah.)*Like *B. Motleyana* but:—

Bark pale grey, thick.

Glabrous: leaf-blade narrowed to the base, not heart-shaped, rather thin.

Fruits greenish white, glabrous, in shorter strings on the trunk, rather larger.

W. Malaysia: occasional in the lowland forest in the middle and north of the country, sometimes sold in local markets from Raub to Alor Star.

B. Motleyana Text-Fig. 70

(J. Motley, d. 1859, engineer and botanist in Borneo)

Common *Rambai*
Rambai

A tree reaching 60 ft. high, with rather low, round, bushy, large-leaved crown: *trunk generally fluted at the base: bark fawn brown, finely fissured, finely dimpled scaly with small, thin, oblong pieces: young leaves green: twigs, leaf-stalks and undersides of the leaves finely velvety.*

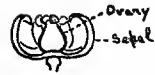
Leaf-blade 6-12 \times 3-6", large, elliptic, tipped, narrowed to the slightly heart-shaped base, the edge rather uneven and wavy: stalk 1-3½" long.

Male flowers 1" wide, light yellow, citron-fragrant, in strings 3-10" long from the branches: *female flowers* 4" wide, on strings 10-30" long.

Fruit 1-1½" long, oblong, buff-coloured, thin-skinned, finely velvety, with 1-3 seeds: *seeds with translucent white pulp.*

Cultivated throughout W. Malaysia: occasionally wild in the lowland forest of Malaya.

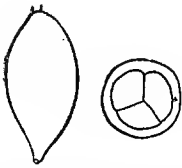
Most orchard trees have sour fruits but a sweet variety is known. In habit, trunk, bark and strings of buff-coloured fruits with green seeds and white pulp, the Rambai and Langsat (*Lansium domesticum*) are very much alike. The Langsat has pinnate leaves and 5-seeded fruits with latex in the rind. It needs some experience to tell the two kinds from a distance.



Text-Fig. 70.
Baccaurea Motleyana: female flower nat. size.

B. parviflora Text-Fig. 71
(Lat., parvus—small, flos—a flower)

Setambun



Text-Fig. 71. *Baccaurea parviflora*: fruit $\times \frac{1}{2}$.

A small tree to 20 ft. high, with Terminalia-branching: bark brownish grey, rather closely and finely ridged: young leaves pinkish: glabrous.

Leaf-blade $3-8 \times 1\frac{1}{4}-3\frac{1}{2}$ " elliptic, tipped.

Male inflorescences 4-8" long, rather upright, in tufts on ring-like burs on the trunk: female inflorescences 6-12" long, at the base of the trunk, the stalks reddish.

Fruits $\frac{3}{4}-1$ " long, oblong, pointed, pulpy, sour, dark red then purplish black, not opening, with 1-3 seeds, set on strings lying on the ground.

Malay Peninsula, Sumatra: common in the lowland forest, not in the open.

In habit the Setambun recalls the small kinds of Putat (Barringtonia). It flowers gregariously after dry weather, when the male inflorescences scent the forest.

B. pyriformis
(Lat., shaped like a pear, pyrus)

Fig. Tampoi
Tampoi Tunggau, T. Burong

Like *B. bracteata* but:—

Twigs and leaf-stalks finely velvety.

Fruiting sprays on the branches below the leaves.

Fruits rounded, fig- or pear-shaped.

Malay Peninsula: frequent in the lowland forest.

B. reticulata
(Lat., net-like, from the veins)

Lesser Tampoi
Tampoi, Taban, Merkeh (Kel.)

Like *B. Griffithii* but:—

Twigs and leaf-stalks downy, at least when young: bark orange brown.

Leaf-blade smaller, up to $8 \times 3\frac{1}{2}$ " with more crowded veins.

Fruits greyish fawn or brownish buff or yellowish brown, brighter coloured, the pulp round the seeds pale yellowish, translucent and very sweet.

Malaya, Sumatra: common in the lowland forest.

This is the better of the two species of Tampoi as yet known. The taste is sweet and pleasant.

B. sapida
(Lat., tasty)

Burmese Grape
Pupor

A small tree up to 30 ft. high, occasionally up to 70 ft., very like the Rambai (*B. Molleyana*) but:—

Glabrous, the young twigs sometimes slightly hairy.

Leaf-blade up to 9×4 ", smaller, tapered to the base, the stalks $\frac{1}{2}-3\frac{1}{2}$ " long, with 7-11 pairs of side-veins.

Fruits $1-1\frac{1}{2}$ " long, broadly oblong or nearly round, glabrous, cream-white ripening yellowish or pinkish buff or bright red, in strings 6-12" long from the branches and trunk: seeds with rather opaque, cream-white pulp, sour-sweet, some varieties apparently with yellow fruits and rose-pink pulp round the seeds.

EUPHORBIACEÆ

India, S. China to Malacca : frequent in lowland forest from Malacca northward, frequent in the villages of Province Wellesley, Kedah, Perlis and Kelantan.

The *Puþor* seems to be the only kind of *Baccaurea* other than the ubiquitous *Rambai* that is cultivated in Malaya. The smaller glabrous leaves with tapered base to the blade at once distinguish it from the *Rambai*. It varies considerably in the colour of the ripe fruit. Very little is known about it and we are much in need of information.

B. Scortechinii

Chinese Lantern Tree

(B. Scortechini, 1846-1886, the Italian missionary and botanist)

Rambai Tikus, Setambun Antan

A small tree like *B. parviflora* but :—

Bark pale fawn-drab, slightly flaky, not ridged.

Fruits with 6 ridges and a network of wrinkles between them, rose-pink, hanging in strings 4-6" long, from the branches.

Malaya : rather frequent by streams in the forest.

Fruiting trees look as if they were hung with little Chinese lanterns.

BRIDELIA

(S.E. Bridel, 1761-1828, an authority on mosses)

Leaves alternate, simple, entire, symmetrical, very shortly stalked: stipules present, at least with young leaves.

Flowers small or minute, greenish, very shortly stalked, crowded in small, sessile, cushion-like clusters in the leaf-axils or in the axils of leaf-like bracts along the ends of the twigs: sepals 5 : petals 5, minute, white, toothed : *male flowers* with 5 stamens attached to a short column in the centre of the flower and with a rudimentary style at the top : *female flowers* with an ovary and 2 short, 2-pronged styles.

Fruit a little berry with 1-2 seeds, with the remains of the 2 minute styles at the top and the calyx persistent at the base.

About 50 spp., tropics of the Old World : 8 spp. in Malaya.

A few kinds of small tree, shrubs or straggling climbers belong to this genus, which finds a place in our book because of the common and shabby little tree called *Kenidai*. The bark of all kinds is tough and stringy so that it is easily stripped from the trunk. Some of our forest species have thorny trunks, the thorns being the hardened, pointed and persistent bases of the twigs which have died back : and such thorns may occur on the branches of the *Kenidai*. Indeed a thorny tree with smooth, tough, stripping bark and small brownish cushions (the remains of the inflorescences) in the leaf-axils are a sure sign of a species of *Bridelia*, to which may be added that the leaves of some wither pinkish (*B. tomentosa*) or dull red (*B. cinnamomea*). The *Kenidai* may be mistaken for species of *Glochidion* which have glaucous undersides to the leaves but its leaves are not asymmetric and its flowers and fruits are readily distinguished. It seems that the more shrubby kinds, like *B. stipularis*, may assume the habit of climbers in the same way as the *Mengambir* (*Mæsa*).

Key to the Species

- Glabrous *B. ovata*
- Twigs and undersides of the leaves more or less hairy
 - Rather densely velvety : leaves blunt, rather broad ... *B. stipularis*
 - Finely hairy : leaves pointed, rather narrow ... *B. tomentosa*

B. ovata

(from the leaf-shape)

Like *B. tomentosa* but:—wholly *glabrous*: leaves blunt at both ends, generally rather larger, with wavy edges.

Malaysia: common in the north, in Penang, Kedah and Perlis.

B. stipularis

(with evident stipules)

Kenidai, Kernong, Kernam

Like *B. tomentosa* but:—

A bush or small tree to 20 ft. high, or a scrambling bush: twigs and undersides of the leaves rather densely velvety.

Leaf-blade 2-3½" wide, rather broadly elliptic, blunt, the base generally rounded or slightly heart-shaped.

Flower-clusters set along the leafless ends of the string-like twigs: flowers ¼-½" wide, larger.

Berries ¼" long, larger, oblong.

Tropical Africa and Asia to the Philippines: common in open country throughout Malaya.

B. tomentosa Text-Fig. 72

(Lat., woolly)

Kenidai, Kernong, Kernam

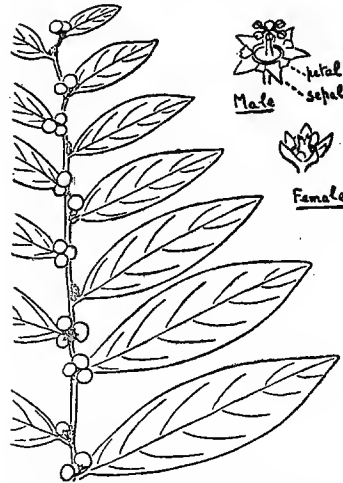
A small to medium-sized evergreen tree, reaching 60 ft. high but seldom as much: branches sometimes thorny: bark pale grey, smooth, easily stripping, with pinkish inner bark: crown open and uneven with horizontal or rather drooping sprays of small-leaved branches: young leaves pinkish brown: old leaves withering pinkish yellow, or ochre tinged red: twigs, leaf-stalks and undersides of the leaves generally finely hairy, at least when young.

Leaf-blade 1½-4 × ½-1¼", much smaller on the flowering twigs, rather larger on vigorous young stems, narrowly elliptic to obovate, tapered to a point or rather suddenly and shortly tipped, thin, dull green, glaucous beneath, with 0-14 pairs of side-veins: stalk ⅓-2".

Flower-clusters ¼" wide: flowers ⅓" wide, faintly fragrant, male and female flowers in the same clusters.

Berries ¼" wide, round, green then black.

Himalayas throughout Malaysia to N. Australia: common in open country, villages and towns in Malaya.



Text-Fig. 72. *Bridelia tomentosa*,
× ½: flowers × 2.

This is a typical tree of waste ground. The rather small and narrow, pointed leaves with glaucous undersides, set alternately along the rather stiff twigs, the general untidy, shabby look of the crown, the little clusters of flowers and the way in which the leaves become smaller and smaller toward the ends of the flowering twigs until they are no more than ½" long or may even disappear—all these distinctive features enable one with very little experience to recognise the tree at a glance. It is apparently well-known in village-medicine and it is said in folk-tales that both tiger and crocodile sprang from its shade. Strange feat for such a dreary tree! The flowering branches eventually die back for several feet.

The female flowers open before the male in the same cluster.

The species is named *B. monoica* in BURKILL'S Dictionary.

CHÆTOCARPUS

(Gr., chæte—bristle, karpos—fruit)

Leaves alternate, shortly stalked.*Flowers* shortly stalked in small sessile clusters in the leaf-axils, male and female on different trees: sepals 4: petals none: stamens 8, attached at the top of a short stalk: ovary with three 2-pronged stigmas.*Fruit* as a densely bristly capsule splitting into 3 then 6 parts and containing 3 black shiny seeds (one in each cavity of the fruit).

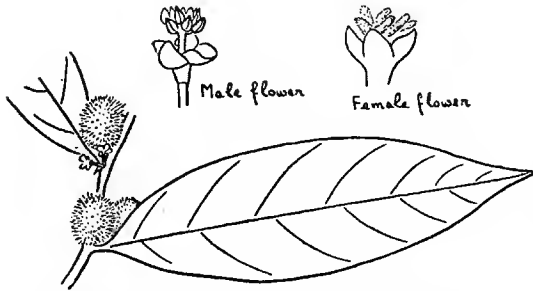
8 species, tropical Asia, Africa, America: 1 species in Malaya.

C. castaneicarpus Text-Fig. 73
(with fruit like the Chestnut, *Castanea*)Bur Beam
Batu, Membata

A small evergreen tree, up to 40 feet high, with rather bushy, dark green crown: bark light grey, rather fissured, the inner bark pinkish: glabrous: leaves withering yellow then brown.

Leaf-blade 2-6 × 1-3", elliptic, pointed, thinly leathery, with 5-8 pairs of side-veins: stalks $\frac{1}{4}$ " long or less sometimes more.Flowers $\frac{1}{4}$ " wide or less, green, the male flower with pink lobed nectary and the inner sepals whitish like petals.Capsule about $\frac{1}{2}$ " wide, shortly oblong, green then brown.

India and Ceylon to Malaya and Borneo: frequent from the latitude of Penang northward, and common in the coastal villages of Trengganu and Kelantan.

Text-Fig. 73. *Chætocarpus castaneicarpus*,
× $\frac{1}{2}$: flowers × 2.In general shape and in its leaves this tree much resembles the *Melimau* (*Gelonium*), *Pisang* (*Alphonsea*), *Mensirah* (*Ilex*) and the Rosaceous trees also called *Batu* or *Membatu* (*Parinarium*, *Angelesia*, *Parastemon*). But the small axillary clusters of flowers and, especially, the bristly green fruits will easily distinguish it.

In Kelantan and Trengganu, it is a well-known village-plant. The young leaves are cooked and eaten as spinach or chopped up with rice.

CLAOXYLON

(Gr., chlao—I break, xulon—wood)

Leaves spirally arranged, simple, rather large, with long stalks.*Flowers* small, green or yellowish, set in rather long, slender spikes from the leaf-axils, male and female on different trees: male flowers in little groups, female flowers spaced singly: sepals 3-4: petals 0: stamens 15-50 in the male flowers: ovary with 3 styles.*Fruit* a little 3-shouldered capsule, with 1 seed in each part: seeds black, thinly coated with orange-red pulp.

60 spp., Madagascar, tropical Asia to the Pacific: 4 spp. in Malaya.

Two very similar small trees with pale greyish white trunks, marked with big leaf-scars like the *Mahang* (*Macaranga*), with open spreading crowns and long, strangely curved and dangling twigs, having the leaving tufted at the

ends, belong to this genus. They are rather common in thickets, open places, by the edges of the forest and on sea-shores, and one of them, *C. longifolium*, is known as *Salang* or *Sanglong* in Kedah and Perak where its leaves are used as spinach. It is possible that this name is given to both species and we should do well to adopt it in the absence of another.

The rather large, soft, thin leaves become limp and wither quickly on plucking and this feature, together with their arrangement and long stalks, often enables one to recognise the genus without reference to botanical details.

Key to the Species

- Leaves glabrous, narrowed to the base : female spikes up to 3" long *C. longifolium*
- Leaves softly velvety, often heart-shaped : female spikes 3-8" long *C. indicum*

C. indicum Text-Fig. 74
(from India)

Lampin Budak, Laping Budak



Text-Fig. 74. *Claoxylon indicum*: flower $\times 2$; fruits, nat. size.

Like the following species but :—
Twigs and leaf-stalks softly velvety, the rather stout.

Leaf-blade ovate, rounded or heart-shaped at the base.

Male spikes 4-15" long, the flowers .2" wide : female spikes 3-8" long : stamens 15-25.

Capsule $\frac{1}{3}$ " wide, pale green when ripe. velvety.

S. China, Malaysia : frequent with the other species, especially on sandy coasts.

C. longifolium
(Lat., longus—long, folium—a leaf)

Salang, Sanglong

A shrub or small tree to 25 ft. high : bark greyish white, smooth, with big circular leaf-scars : twigs finely hairy at first, soon glabrous, rather slender.

Leaf-blade 4-12 \times 2-5", elliptic, narrowed to the base, thin, glabrous, finely toothed round the edge : stalks 1-7" long.

Male spikes 3-7" long : female spikes 1-3" long : stamens 40-50.

Capsules $\frac{1}{2}$ " wide, pale green.

W. Malaysia : frequent in open country, thickets, edges of the forest and on the sea-shore.

In exposed places on the coast this species may become a shrub with small leaves. In habit it resembles the small tree *Balek Angin* (*Mallotus paniculatus*) but it is much less branched.

CODIÆUM

(from the Ternate name *codiho*)

Leaves spirally arranged.

Male and female flowers small, on separate raceme-like axillary inflorescences; the female inflorescence standing beside a male, smaller, with longer stalks and fewer flowers : male flowers on slender stalks, with 5 sepals, 5 small petals and 20-30 stamens : female flowers shortly stalked, without petals.

Capsules small, with 3 cavities each with 1 seed.

About 12 species, E. Malaysia, Pacific Isles : 1 species introduced to Malaya.

C. variegatumGarden Croton
Puding

An evergreen shrub or small tree to 20 ft. high, glabrous: *leaves variously shaped, often curled, lobed or with a stalked cup at the end, variegated with white, yellow, red or purple, commonly spotted*: flowers yellowish white, in slender sprays.
Java to the Pacific Islands.

The well-known Garden Croton must not be confused with the true botanical Crotons which are species of the genus *Croton* (see below). The Malay name refers to the use of the leaves as a poultice, and it is given to various plants such as *Coleus*, *Nothopanax*, *Graptophyllum* and so on. The selection of the extraordinary varieties of Garden Crotons, of which there are about a hundred, is said to have been carried out in New Guinea, New Caledonia and the Pacific Isles where the Croton-plants play a part in the native religion and ceremony and where different tribes or villages have their own varieties for emblems.

CROTON(the Greek name for the Thornberry, *Palma-Christi*)

Leaves spirally arranged, simple, with 2 small glands at the base of the blade or at the top of the leaf-stalk: stalks short or long: *old leaves withering clear, bright orange-red*.

Flowers small, greenish or yellowish, arranged singly or in small clusters on a *terminal unbranched raceme*, the female flowers in the lower part of the raceme, the male in the upper part: *sepals* 5: *petals* 5, but absent or minute in the female flowers: stamens 10 or more, attached to the hairy centre of the male flowers: *ovary* with 3 styles each forked from near its base.

Fruit an oblong or 3-shouldered capsule, splitting into 3-6 parts, 3-seeded; several capsules on spike.

About 500 spp., throughout the warmer parts of the earth: 10 spp. in Malaya.

As mentioned previously in our preface to the family, the 'Crotons' of gardens do not belong to this genus but to *Codiaeum*, which is confined naturally to Papua and Polynesia. We describe four species of true Croton because they are common little trees that we will certainly meet when exploring the edges of thickets and forest-reserves and because they show very well what is meant botanically by a Croton. All the Malayan species, excepting the shrubby climber *Akar Tuko Taka* (*C. caudatum*), are evergreen shrubs or small trees. One, called *Chenkian* (*C. tiglium*), is rather frequent in villages in the middle and north of the country. The Malay names of the wild species are uncertain and should be used in identification with caution. They may be called *Melokan* like several unrelated kinds of plant.

From the spirally arranged leaves, withering clear orange-red, and the pair of glands at the top of the leaf-stalk, a Croton is easily recognised. The *Buta Buta* (*Excoecaria*), with similar leaves, has white latex.

Key to the Species

- | | | |
|---|--------|------------------------|
| Leaves silvery white or silvery brown beneath | ... | <i>C. argyratum</i> |
| Not so | | |
| Leaf-stalks 1" long or less: tidal rivers and creeks | ... | <i>C. heterocarpum</i> |
| Leaf-stalks more than 1" long | | |
| Leaf-blade often broadest near the base, with 3 veins from the base: villages | ... | <i>C. tiglium</i> |
| Blade broadest at the middle or near the apex: fruit 3-lobed: wild | ... .. | <i>C. laevifolium</i> |

C. argyratum Text-Fig. 75
(Gr., arguros—silver)

Silver Croton

A small or medium-sized tree up to 60 ft. high, flowering at 10 ft.: *twigs, buds, inflorescences and leaf-stalks brownish scurfy as if encrusted, the undersides of the leaves silvery white or silvery brown.*

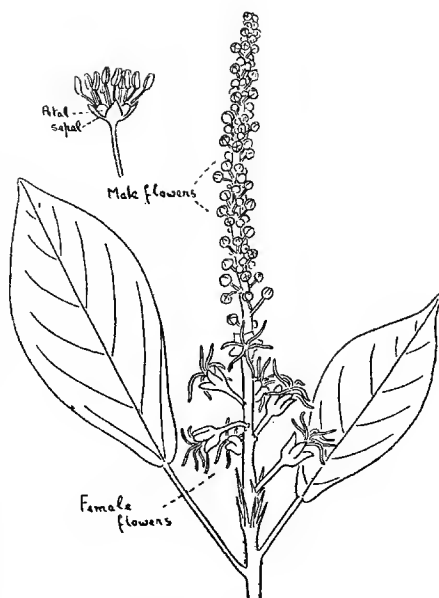
Leaf-blade $2\frac{1}{2}$ –9 × $1\frac{1}{4}$ –4", elliptic to ovate with a long point, the base narrowed, entire, with spider-web veining: *stalk* $\frac{1}{2}$ –6" long, slender, with 2 small green glands at the top on the underside of the blade.

Inflorescence 6–12" long, generally solitary: *male flowers* $\frac{1}{3}$ " wide, brownish, clustered, *the female* $\frac{1}{2}$ " wide and stalked singly.

Fruit $\frac{3}{8}$ " wide, oblong, brownish scurfy, rather large.

Burma, Malaysia: common in open country and at the edge of forest.

This plant may be mistaken for the *Balek Angin* (*Mallotus*) but the twigs and the leaves are not scurfy hairy or woolly as in the kinds of *Balek Angin* and the leaves do not wither merely yellow. It is a beautiful tree.



Text-Fig. 75. Silver Croton
(*C. argyratum*), × $\frac{1}{2}$: flower, nat. size.

C. heterocarpum

Rat-Tailed Croton

(Gr., heteros—other, karpos—fruit)

A treelet 12–20 ft. high, glabrous: *bark* grey, cracked, uneven.

Leaf-blade $1\frac{1}{2}$ –4 $\frac{1}{2}$ × $\frac{3}{4}$ –2", small, elliptic to obovate, simply pointed or blunt, toothed: *stalk* $\cdot 1$ –1" long, with 2 little glands at the top on the upperside.

Inflorescences 4–10" long, slender, solitary or several together, the flowers $\cdot 15$ " wide.

Fruit $\frac{1}{2}$ " wide, green, faintly 3-shouldered, round, set many along the drooping spikes like rats' tails.

Sumatra, Borneo, Malaya: rather frequent on the banks of tidal creeks, tidal rivers and behind the mangrove.

An elegant little tree easily recognised from the small leaves withering bright orange-red. It is common on the road near Mersing.

C. laevifolium

Woodland Croton

(Lat., laevis—smooth, folium—a leaf)

A shrub or small tree to 40 ft. high, flowering at 7 ft.: *bark* light grey, rather pimply: glabrous except the scurfy young parts.

Leaf-blade 3–12 × $1\frac{1}{2}$ –7", large, elliptic to somewhat obovate, tipped, narrowed or rounded at the base, the edge more or less toothed or entire, rather yellowish beneath: *stalk* $\frac{1}{2}$ –6" long, with 2 small, stalked glands at the top on the underside of the blade.

Inflorescence 3–11" long, solitary or several together, green: flowers greenish, $\cdot 2$ " wide, the male and female together in the lower part of the spike only the male at the top or some spikes wholly male: stamens white.

Fruit $\frac{3}{8}$ " wide, like a little 3-shouldered rubber-fruit, small, rather flattened.

Malaya: common throughout the country, in thickets, at the edge of the forest and in the forest especially by streams.

A treelet at the edge of the forest with ordinary-looking leaves withering bright orange-red is generally this Woodland Croton.

C. tiglium

True Croton

Chenkian, Chemekian

A shrub or small tree, glabrous except the scurfy young shoots: young leaves reddish.

Leaf-blade 2-7 × 1½-4", elliptic with narrowed base or ovate with round or nearly heart-shaped base, tapered to a long point, finely toothed, with a long vein from the base on either side of the midrib and reaching to the middle of the blade: stalk 1-4½" long, with 2 tiny disc-like glands at the top at the edge of the blade.

Inflorescence 2-4" long, generally solitary.

Fruits ¾-1" long, oblong, 3-shouldered, large.

India, S. China, Malaysia to New Guinea: occasional in villages in Malaya, not wild.

"The seeds contain one of the most purgative substances known which, if applied to the skin, produces pustular eruptions. This vesicant substance is a resin". There is a full account of the uses of this interesting plant in BURKILL'S Dictionary. It was tried formerly as a crop in Perak but the market for the seed, which gives Croton-oil, was too limited.

DRYPETES

(Gr., drupetes—fully ripe)

Leaves alternate, entire, simple.

Flowers small, in clusters on the twigs or branches behind the leaves, male and female on different trees: *sepals* 5: *petals* 0; *stamens* about 10, arranged round a flat disc.

Fruit a rounded berry with rather leathery rind, thin fibrous flesh and 2-3 large seeds, the calyx not persistent.

About 150 spp., throughout the tropics: 6 spp. in Malaya in the lowland forest.

D. pendula

(Lat., hanging)

Sabre Leaf

Gelugor Salak

An evergreen tree 20-70 ft. high, with irregular, open crown: *bark* greyish brown, smooth: *branches* long, heavily drooping, rather few: *young leaves* deep purple then pink, in limp tassels: *glabrous*.

Leaf-blade 10-24 × 4-9", very large, leathery, drooping, the sides curled back, very shortly stalked; shining, oblong, abruptly pointed, the base generally deeply heart-shaped and distinctly unequal-sided: stalks ¼-½" long, hidden by the leaf-base.

Flowers ¼" wide, cream-coloured, fragrant, in clusters 1-3" wide, the flower-stalks ½-¾" long: ovary hairy, with 3 broad stigmas.

Fruit 1" wide, round, slightly velvety, orange when ripe, clustered on the branches: seeds generally 3 in a fruit, ¾" long, bony, grooved, flattened egg-shaped.

Malaya: frequent throughout the lowland forest.

The very large, leathery, oblong leaves set along the weeping branches render this an easy plant to recognise among our wild trees. The young shoots are like tassels of a purple seaweed. It is remarkable too for being an ant-plant like the *Mahang* (*Macaranga*). The leafy twigs are hollow, their soft pith having been eaten out by a certain kind of black ant to make a tunnel in which to live. The tunnel communicates with the exterior by a series of little holes bitten through the soft tissue of the young twig and generally placed along the same side of the twig, one hole below each leaf. On tapping the leaf, an ant's head appears at every hole and on greater agitation the ants scurry forth to defend their home. It seems, however, that not every tree is inhabited or, even, every twig upon a tree.

One seldom meets the Sabre Leaf except where a thicket of jungle has been left along the edge of a forest-reserve. Then its curious limbs are at once

apparent, thrust, as it were, into the open. It is one of the stranger products of our forests. Its nearest ally is a species, *D. longifolia*, which ranges from India to Java and the Philippines.

The Malay name is derived from the similarity of the leaves to those of the *Asam Gelugor* (*Garcinia atroviridis*) and other kinds of wild Mangosteen. *Garcinia* has, of course, opposite leaves and, typically, latex.

ELATERIOSPERMUM

(Gr., elaterios—driving away, sperma—a seed)

Latex present in the bark, twigs etc., white, sticky, copious.

Leaves simple, spirally arranged, with long stalks bent or "knee-ed" at the apex.

Flowers rather small, male and female in the same panicle: female flowers 1-3 in a panicle, sessile, one at the end of the main stem of the panicle, and sometimes one at the end of each of the two main branches: male flowers half as big as the female, shortly stalked, numerous, clustered round the female: sepals 4-6: stamens many.

Fruit a large, 3-shouldered and 3-grooved capsule splitting from the base to the apex into 3 parts each itself partly splitting into two: with one large, oblong seed in each of the 3 parts.

One sp., W. Malaysia.

E. tapos

(a Sundanese plant-name)

Perah

A tall, monopodial tree reaching 80-140 ft., with a relatively narrow, more or less conical or cylindrical crown of dark green heavy foliage, the limbs arching out and down from the trunk, the main stem reaching to the top of the crown, the lower limbs drooping: *trunk* often fluted or slightly buttressed at the base: *bark* fawn brown, rather finely fissured and slightly scaly: *young leaves* bright pink, with 2 small bright green glands at the top of the stalk: *glabrous*: old leaves greenish yellow then brown.

Leaf-blade 5-10 × 1½-3½", narrowly oblong, suddenly tipped, narrowed to the base, rather leathery, drooping: *stalk* 1-2½" long, with 2 tiny green, shortly stalked, disc-like glands at the top on the upper side.

Panicles 3-7" long, crowded at the ends of the bare (or leafy) twigs, long-stalked and branched only near their ends, green: *flowers* pale yellowish or cream, with an unpleasant waxy smell: *female flowers* ¼" wide, the male ⅛" wide: *ovary* pale pink, seated on an orange nectary, and with 3 yellow styles.

Fruit 2-2½" long, oblong, buff-colour more or less suffused pink on the exposed side, hanging singly on stalks 1-6" long: *seeds* 1¼ × 1", shiny brown, with a faint ridge on each side.

Frequent in lowland forest throughout the country, and in villages, especially in the north.

This fine tree, which is universally called *Perah* by Malays, may be considered a wild fruit-tree, for it can scarcely be said to be in cultivation in the Peninsula: the village trees are generally relics of the forest. The seeds are eaten, but not fresh for they contain a small quantity of prussic acid: they are usually boiled or roasted or, as is the custom of the Sakai, pounded with a little water, buried in a bag and left to ferment for a few weeks: the method of preparation is the same as that for the seeds of the *Kepayang* (*Pangium*, p. 308). "There seem to be some races in which the seeds are not poisonous in a fresh state" (BURKILL). As curiosities the seeds are fascinating for their colour and shape and for the pleasant sound they give when rubbed together. "The children play with toy-beetles made from the seeds, and use the seeds, threaded on a string, for a game of 'conquerors'" (BURKILL).

"When the *Perah* tree flowers, villagers recognise that it is time to sow the rice" (WILKINSON). We believe, however, that we have noticed a renewed activity on its part after the first harvest which the villages do not emulate. It seems that, in most of the country, the *Perah* sheds its leaves and then flowers from the bare twigs during the dry weather both at the beginning of the year

and about July and August. Whether the same tree can flower twice a year, we do not know but we think it improbable. At such times the *Perah*-trees in the forest are rendered conspicuous by their pink new leaves and they can be seen to advantage, and in great abundance, in the hill-side forest from the passes of the main range. Yet, in the south of the Peninsula, we suspect that the *Perah* is evergreen. The flowers have the unpleasant waxy smell of cinnamon-blossom: on their arrangement we have remarked under *Jatropha* (p. 258). The ripening fruits, as they hang on their stalks, suggest from a distance a kind of small mango, such as the *Kwini*, or rosy apples. They are really like the fruits of the Rubber-tree, but not so prominently shouldered. As they ripen, the thin rind turns brown and contracts, exposing the deep grooves between the bony inner sections of the fruit-wall, and then the fruit explodes and scatters the seeds.

The *Perah* can always be recognised, not merely from its Malay name, but from its long-stalked, narrowly oblong and distinctly tipped drooping leaves, spirally set around the twigs, from the pair of glands at the top of the leaf-stalk, from the latex and from the light brown bark. In our opinion, as we have stated in the preface, it has the most primitive growth-form that a broad-leaved tree can take (*see* p. 27).

ENDOSPERMUM

(Gr., endon—within, sperma—a seed)

Leaves spirally arranged, simple, rather long-stalked.

Flowers minute, on unbranched or sparingly branched spikes from the leaf-axils, male and female on different trees: male flowers set in little groups, with 3-4 sepals, and 8-12 stamens attached to a cylindric stalk in the centre of the flower: female flowers arranged singly along the spike, with 5 sepals.

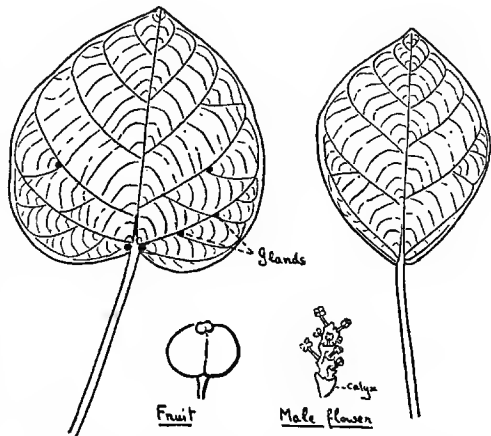
Fruit a small capsule, 2-shouldered, with 2 seeds, the disc-like stigma at the top. About 5 spp., S. China, Malaysia, New Guinea: 1 sp. in Malaya.

Although it is difficult to discover why this genus should be separated from *Macaranga* it is easy to recognise the Malayan representative because it has an unmistakable appearance and it is well-known to Malays as *Bulan Bulan* or *Membulan* (Moon Tree) and, less commonly, *Sendok Sendok* or *Sesendok* (Spoon Tree). The names refer to the shape of the leaves. It is a pagoda-tree which is best described as having the shape of the *Ketapang* (*Terminalia*), or the *Pulai* (*Alstonia*), and the leaves of the *Baru Baru* or *Sea Hibiscus* (*H. tiliaceus*). The pagoda-effect, as usual, is most striking in the saplings because the circles of branches are far apart and the leaves, pointing down, do not give a mass of foliage. The saplings are rather common on Penang Hill where their curious form contrasts strongly with that of other trees. Even the mature specimens are easy to recognise so soon as one is able to discern the leaves, the manner of branching and the main stem. The bark is characteristic and recalls in its thickness, smell and texture that of the *Mempari* (*Pongamia*). The precise shape of the leaves and their degree of hairiness are, however, variable. In the middle and north of the country, the common form of the Moon Tree has the leaves heart-shaped and velvety beneath but, in the south, most trees have the leaves only slightly heart-shaped and slightly velvety beneath, and in Singapore and Johore there are specimens which have broadly elliptic leaves ($3-5 \times 2-3''$), not at all heart-shaped. These different shapes of leaves can even be found on the same tree. The flowers and fruiting sprays are inconspicuous.

The Moon Tree is the only Euphorbiaceous tree that we have discovered to have the true pagoda-shape, although the habit is incipient in some species of

Macaranga (as *M. populifolia*) and some of the wild species of *Rambai* and *Tampoi* (*Baccaurea*). But if there are any trees for which the Moon Tree may be mistaken, they are the species of *Sterculia* called *Kelumpai*, p. 618. Without flowers and fruits, and before one has learnt to recognise the stiff leaves of the Moon Tree, there is only one way to distinguish them for certainty and that is to cut into the bark with a knife. The inner bark of *Sterculias* is pink to reddish brown and marked with white longitudinal lines or splashes so as to look like streaky bacon, and the bark strips easily: the inner bark of the Moon Tree is dull yellowish (ochraceous) and very gritty from sand-like particles and it does not strip at all.

In Borneo and the more eastern parts of Malaysia there are species of *Endospermum* which have hollow twigs that are inhabited by ants like those of some of the *Mahang*-trees (*Macaranga*). So far as we know the Malayan Moon Tree is not an ant-plant. Its twigs are solid but on the underside of the leaves there are commonly to be seen small green cushioned or knob-like glands, either as a pair at the top of the leaf-stalk or one where each of the main side-veins forks near the margin of the blade. These glands may secrete honey, but we have not noticed that insects are attracted to them.



Text-Fig. 76. *Endospermum malaccense*: leaves $\times \frac{1}{2}$: flower $\times 2$: fruit, nat. size.

E. malaccense Text-Fig. 76
(from Malacca)

Moon Tree
Bulan Bulan, Bebulan, Membulan, Sendok,
Sendok Sendok, Sesendok

An evergreen, monopodial tree up to 80 ft. tall, with conical or dome-shaped crown when full-grown, the limbs ascending steeply then curving out, with *Terminalia*-branching, the saplings with pagoda-shape: trunk becoming slightly buttressed: bark brownish grey to pinkish yellowish, smooth, often becoming slightly ridged or pimply: inner bark very thick, $\frac{1}{2}$ -1", yellowish, very gritty with sand-like particles, smelling strongly of crushed bean-pods, breaking off, not stripping: twigs stout, upturned, with numerous leaf-scars, when cut oozing out a rather copious brown sap: twigs, leaf-stalks and undersides of the leaves more or less finely velvety: stipules small.

Leaf-blade 3-8" wide, about as broad as long, generally heart-shaped, or merely rounded at the base, shortly tipped, rather stiff, rather dull soft green, drooping, entire, with spider-web veining: stalks 2-8" long, sometimes with a pair of glands at the top.

Inflorescences up to 8" long: male flowers yellowish with a strong soapy fragrance.

Fruits $\frac{1}{2}$ " wide, green, several on a string-like spike.

Malay Peninsula, Sumatra, Borneo: common in the low country, especially in secondary jungle, in Malaya.

EPIPRINUS

(Gr., epi—on, prinus—the scarlet oak)

Leaves spirally arranged, simple, long-stalked, with spider-web veining.

Flowers small, crowded in a rather large panicle of several spikes at the ends of the twigs: a few female flowers at the base of the spike, the male crowded over the rest of the spike: male flowers with a 2-4 lobed calyx and 8-15 projecting stamens: female flowers with 5-6 sepals, the ovary with a long style breaking up into 3 much branched arms: petals absent.

EUPHORBIACEÆ

Fruit a rather large 3-lobed capsule, enclosed in the much enlarged fruiting calyx and eventually splitting into 3 parts, each part itself cleft into two: 3-seeded.
2 species, Indo-China to Sumatra: 1 species in Malaya.

E. malayanus Text-Fig. 77

Green Cocks' Comb
Balong Hijau

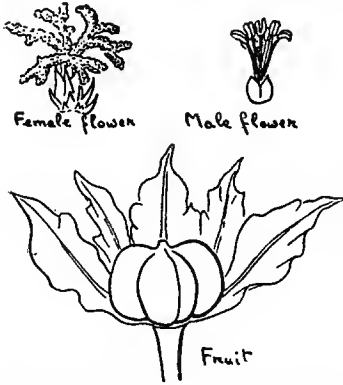
A small evergreen tree up to 50 ft., occasionally flowering as a shrub: glabrous except the young parts.

Leaf-blade 5-14 × 2-7" rather large, elliptic with a long tip, the base generally narrowed, occasionally rounded or slightly heart-shaped: stalks 1-8" long, with a few knob-like glands at the top on the upperside.

Inflorescences up to 9" long, dull rose-red, with rose-red bracts: the lower bracts without flowers and widely spaced, the next 2-4 with female flowers and closer, the rest with male flowers and very closely set: male flowers with rose-pink calyx, white filaments and yellow anthers: female flowers with greyish pink calyx, pale greenish ovary and dull rose-crimson-style: sweetly fragrant.

Fruits 1-1 1/4" wide, pink to dark red (? yellowish) enveloped in the crimson fleshy sepals of the enlarged calyx 2-3" wide, several in a bunch.

Indo-China, Malaya, Sumatra: rather common at the edge of forest reserves in the middle and north of the country.



This is a small forest-tree but when it flowers, which it seems to do gregariously about the middle of the year, it is very conspicuous at the edge of forest reserves. The fruits are nearly as striking and both the inflorescences and the bunches of fruits are strange, yet beautiful objects. It is common in the forest in Pahang and can be seen in abundance along the road to Kuantan. We hope that someone will collect the seeds so that the plant can be brought into cultivation.

Text-Fig. 77. *Euphorbia malayanus*: fruit × 1/3: flowers, nat. size.

EUPHORBIA

(a Latin plant-name)

White latex present in all parts, copious: often thorny: often with leafless succulent green stems and branches.

Flowers very small, arranged in small heads to look like single flowers: each head consisting of 4-5 bracts, often lobed or set with glands, surrounding a group of male flowers and with a stalked female flower in the centre: male flowers reduced to a single stamen each, without sepals or petals: female flowers with a 3-shouldered ovary and 3 styles, generally hanging out of the heads.

Fruit a small 3-shouldered capsule, with 3 seeds.

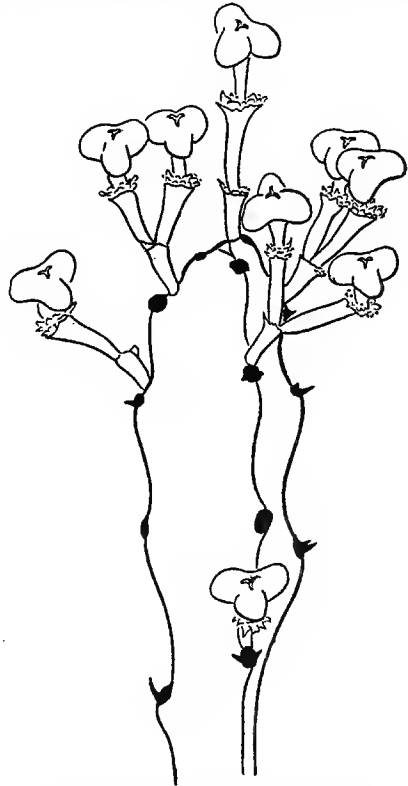
Over 1,000 spp., in all parts of the world, mainly in the warmer and drier regions: 3 spp. wild in Malaya, several introduced.

This is a large and varied genus. The cactus-like Spurge Trees, abundant in the desert regions of Africa, are the biggest members and the smallest are moss-like herbs. The garden Poinsettia, *E. pulcherrima*, represents a common sort with conspicuous red leaves surrounding the flower-heads, like subsidiary

bracts. Three kinds of Spurge Tree are grown in Malayan gardens but generally the climate is too damp for them to reach their full dimensions: one of them, *E. antiquorum*, which is most like a cactus, occurs wild on the arid limestone cliffs in the extreme north of the country. Because of their fleshy and often thorny branches, with or without leaves, the Spurge Trees are commonly mistaken for cactuses to which is reality their resemblance is merely superficial. Cactuses have no latex, large single flowers not set in heads but provided with many petals and stamens, different fruits, and spines which are set in tufts. The spines of Spurge Trees, when present, are in pairs like the horns of a bull: indeed, one has only to think of a vegetable cow, with milk and horns, to distinguish the one from the other. The Spurge Trees are inhabitants of Africa and Asia, the Cactuses of the American continent, but the Cactuses have been carried by man to so many parts of the world, where they have escaped from cultivation, that they now appear wild in many tropical and subtropical lands: fortunately the Malayan climate is too damp for them and we have been spared from the plague of *Opuntia*—the Prickly Pear.

The flower-heads of Euphorbias have a unique construction. As the flower-heads of a Composite (p. 195) may be regarded as a cluster of *Ixora*-flowers dwarfed and compressed into a bud and surrounded with bracts, so that of a Euphorbia may be likened to a condensed inflorescence of the *Buah Keras* (*Aleurites*), the *Perah* (*Elateriospermum*) or the *Jarak Pagar* (*Jatropha*), having one comparatively large and stalked female flower surrounded with minute male flowers the appearance of which is like single stamens, and the whole girt with turgid bracts. By comparison with genera related to Euphorbia, the evolution of its flower-head can be traced.

The latex of Euphorbia is generally irritant. That of the three Spurge Trees which we describe is poisonous. The varied medical uses of these species are given in BURKILL'S Dictionary.



Text-Fig. 78. Malayan Spurge Tree (*Euphorbia antiquorum*), $\times \frac{1}{2}$.

Key to the Species

- Not spiny: with cylindrical, finger-like green twigs and
no foliage leaves *E. tirucalli*
- Spiny
- Branches conspicuously angled: leaves absent or very
small *E. antiquorum*
- Branches slightly angled: leaves rather large *E. neriiifolia*

EUPHORBIACEÆ

E. antiquorum Text-Fig. 78 Malayan Spurge Tree
(Lat., belonging to the ancients) *Sudu, Sudu Sudu, Sesudu*

A cactus-like shrub or tree up to 25 ft. high: *branches* 3-6 angled, green, succulent, with pairs of brown spines on the angles in the position of the leaves.

Leaves few, small, soon dropping.

Flower-heads $\frac{1}{2}$ " wide, in small clusters above the pairs of spines.

Fruits $\frac{1}{2}$ " wide, pale brownish.

Native of the monsoon countries of India and S.E. Asia: wild on the limestone hills of Perlis and Langkawi, occasional in villages and gardens throughout the country.

E. neriifolia Indian Spurge Tree
(with leaves like Nerium) *Sudu, Sudu Sudu, Sesudu*

A cactus-like shrub or small tree to 15 ft. high: with small spines on small knobs set along the irregularly grooved, fleshy, green branches.

Leaves 1-6" long, broadest near the apex, tongue-shaped, fleshy, crowded at the ends of the branches.

Flower-heads yellowish.

Fruits $\frac{1}{2}$ " wide.

Native of the Deccan uplands in India: occasional in gardens and villages in Malaya.

E. tirucalli Finger Tree
(an Indian plant-name) *Tulang Tulang, Tentulang*

A shrub or tree to 20 ft. high, with rough, grey, cracked bark: twigs as thick as *Vanda Joaquim* leaves, cylindric, green, smooth, set in distant whorls, *without spines*.

Leaves very small, soon falling off.

Flower-heads very small, in the forks of the twigs.

Fruit $\frac{1}{4}$ " wide.

Africa: occasional in gardens and villages in Malaya, sometimes as a hedge.

The Malay name refers to the resemblance of the jointed twigs to bones.

EXCCECARIA

(Lat., cæcus—blind)

Bark, twigs etc. with white, acrid latex.

Leaves spirally arranged, simple.

Flowers minute: male flowers sessile in slender green catkins (spikes) from the leaf-axils, the female flowers shortly stalked in shorter spikes on different trees: sepals 3: stamens 3: styles 3: petals 0.

Fruit a small 3-shouldered capsule like a little rubber-fruit.

30 species, Old World tropics: 3 species in Malaya.

E. agallocha Blind-your-eyes
(a Greek plant-name) *Buta-Buta, Bebuta*

A small evergreen or deciduous tree of *mangrove and rocky shores*: young leaves pink; *old leaves withering scarlet*: glabrous.

Leaf-blade 1-4 $\frac{1}{2}$ × $\frac{3}{4}$ -2 $\frac{1}{2}$ ", *small*, elliptic, more or less tipped, downpointing with upcurled sides, *often slightly notched along the edge*, often mottled dark and yellow green: stalk $\frac{1}{2}$ -1" long.

Male catkins 2-4" long, green, *like long narrow cones* when young: female $\frac{1}{2}$ -1 $\frac{1}{2}$ ".

Fruit $\frac{1}{2}$ " wide.

Sea coasts, tropical Africa to Australia: on all rocky shores and mangrove swamps, rare on sandy shores.

This well-known tree is described and figured by WATSON (20, p. 35), and its properties and uses are given in BURKILL'S Dictionary. The latex is poisonous, blistering to the skin and damaging, or even blinding, to the eye, so that great care must be used in handling the plant. On the sea-shore and in the mangrove thickets, it can always be recognised from the small, spirally

arranged leaves with upcurled sides, the pink young leaves and scarlet old leaves. The male catkins resemble those of poplars and willows. In the structure of the flowers, it is close to *Sapium*.

The trees are deciduous in Singapore after dry weather, and where they are locally common, as in the Kranji Forest Reserve by the main road, they give a beautiful display of red and yellow autumn tints.

FLUEGGEA

(J. Flügge, 1775-1816, a German botanist)

Leaves alternate, small, shortly stalked: present on the main branches as well as the short twigs.

Flowers tiny, stalked in the leaf-axils: sepals 5: petals none: male flowers clustered, with 5 slender stamens and as many honey-glands between them: female flowers singly or 2-3 together, the ovary with 3 styles each forked.

Fruit a small white berry, shortly stalked.

About 6 species, in the tropics of the Old World: 1 species in Malaya.

F. virosa Text-Fig. 79

(Lat., poisonous)

Beti Ayer, Beti-Beti, Membeti, Membeti, Memeti

An evergreen *straggling shrub or spreading bushy little tree*, 4-20' high: stems often rather spiny from the bases of the old twigs: *glabrous*.

Leaf-blade $\frac{3}{4}$ -2 $\frac{1}{2}$ × $\frac{1}{2}$ -1 $\frac{1}{2}$ " , *small, thin, rather obovate*, pointed or blunt, narrowed to the base, generally equal sided, not or scarcely glaucous beneath: stalk $\frac{1}{2}$ -3" long.

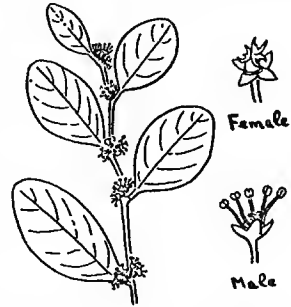
Flowers $\frac{1}{8}$ " wide, greenish yellowish, on stalks $\frac{1}{8}$ -2" long.

Fruits $\frac{1}{4}$ " wide, *small, round, white, pulpy*, 1-several in a cluster: each with 3-6 seeds.

Old World tropics: common in open country, *especially by rivers* in the middle and north of Malaya, absent from the south: *generally forming thickets*.

Membeti must not be mistaken for *Ujan Panas* (Breynia p. 279) which has glaucous, ovate leaves, red fruits and no leaves on its main twigs.

White Waterberry



Text-Fig. 79. *Flueggea virosa*, × $\frac{1}{2}$: flowers × 2.

GELONIUM

(? from the Greek gelon—laughter)

Leaves alternate, simple, entire, shortly stalked.

Flowers small, shortly stalked *in little clusters one at a node on the opposite side of the stem to the leaf*, male and female on different trees: *sepals 5: stamens numerous*, making the male flower fluffy: *petals 0*.

Fruit a small capsule splitting into 3 parts from apex to base, with 3 seeds thinly coated with pulp.

About 20 spp. Old World tropics: 3 spp. in Malaya.

G. glomerulatum Text-Fig. 80

(Lat., in little clusters)

False Lime

Limau Limau, Merlimau, Limau Hantu, Lima, Melima, Ruas Ruas, Penawa Puteh

A small, evergreen, sea-shore tree to 40 ft. high, with dense, bushy crown: *bark yellowish grey to dark grey, rather rough with fine ridges, not scaly, the inner bark whitish: twigs appearing jointed from the stipule-scars: young leaves pale green, thinly varnished: old leaves turning from green directly to ochre brown, not yellowing: glabrous*.

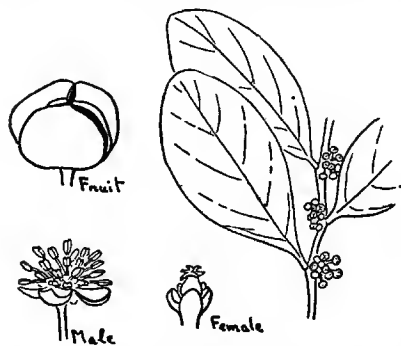
Leaf-blade $1\frac{1}{2}$ -5 × $\frac{1}{2}$ -2 $\frac{1}{4}$ " , elliptic to slightly obovate, blunt or slightly pointed, tapered to the base, rather leathery, *dark green, yellowish green beneath, more or less upright, pointing up with upcurled sides*: stalk $\frac{1}{8}$ -2" long.

EUPHORBIACEÆ

Flowers yellowish green, in clusters $\frac{1}{2}$ " wide of 4-12 flowers: male flowers $\frac{1}{2}$ " wide, the female smaller.

Fruits nearly $\frac{1}{2}$ " wide, yellow then dull orange, 3-shouldered, on stalks $\frac{1}{4}$ " long, with the sepals persistent at the top of the stalk, slightly pulpy: seeds blackish brown, thinly coated with white pulp.

India, throughout Malaysia: common on all sandy and rocky coasts of Malaya, especially on the East side, rarely inland (? if ever far from the sea).



Text-Fig. 80. *Gelonium glomerulatum*
 $\times \frac{1}{2}$: flowers $\times 2$: fruit, nat. size. ..

In general appearance this tree is like the Gunchek (*Antidesma ghaesembilla*), Plate 56. And in the shape of the leaf, the manner in which it is held, and the bushy crown it bears an extraordinary resemblance to a Lime-tree (*Citrus*) especially to the Sea Lime (*Atalantia*). It lacks, of course, the lime smell; its flowers and fruits are different in detail, and it is without the thorns of the Sea Lime, which has also longer leaf-stalks. It is recorded as having the same names as the Sea Lime but these may have been given in error. (We have not, ourselves, found that Malays recognise the False Lime). The name *Ruas Ruas* would refer to the jointed appearance of the twigs.

The False Lime must not be mistaken for the Sea Ebony (*Diospyros ferrea* p. 216) which has smaller, darker leaves and dark grey bark. The two often grow together but they can be distinguished at once from the colour of the leaves. Compare also the Bur Beam (*Chaetocarpus* p. 244) with axillary flower-clusters and bristly fruit.

The position of the flower-clusters opposite to the leaves is peculiar, *cf.* *Cordia* p. 175. So too is the colour of the withering leaves.

The male flowers open about 6 A.M. and fall off in the late afternoon.

HEVEA

(Heve—a West Indian name)

With copious white latex in all parts.

Leaves trifoliate, spirally arranged.

Flowers small, pale yellow, fragrant, the male and female in the same panicle, the panicles crowded at the ends of the twigs and appearing before or with the new leaves: female flowers at the ends of the main branches of the panicle, relatively few: male flowers smaller, much more numerous, on the smaller branches: calyx with a short tube and 5 sepals, yellow, bell-shaped: petals 0; stamens 10, as sessile anthers set in two circles of 5 anthers each on a slender rod in the middle of the male flower: ovary green, with 3 white sessile stigmas.

Fruit a large, 3-lobed capsule, with a thin rind and bony inner wall, exploding, the bony inner wall breaking into 6 pieces: each lobe of the fruit with 1 large seed.

About 12 spp., in the Amazon Valley: 1 sp. introduced to Malaya.

This is the genus of the Rubber-tree, *Hevea brasiliensis*. In BURKULL'S Dictionary the history and uses of the Rubber-tree are described. We wish to point out merely its botanical affinity and its peculiarity as a deciduous tree in our rain-forest climate.

The Rubber-tree responds very readily to short periods of dry weather by changing its leaves. There is generally a 'wintering' of all the trees throughout Malaya after the dry weather at the beginning of the year and often a second complete or partial leaf-change about August or September. At other times of the year when there is a short dry spell, the trees may change their leaves only

on one or two branches. Individual trees vary greatly in the rapidity and thoroughness with which they respond depending, perhaps, on the age of the leaves: Holttun suggests that "any dry period will affect some Hevea-trees which have leaves more than 4-5 months old." The old leaves turn vivid orange brown or red, though one may meet a tree the leaves of which fall when bright yellow. The young leaves are purple-bronze, as in many plants of this family. The flowers are developed with the new shoots: they are insect-pollinated but few insects visit the female flowers and relatively few fruits develop. The inflorescence has a peculiar structure which we have noticed under *Jatropha* p. 258.

In its growth-form the Rubber-tree is little specialised except that on the opening of the terminal bud the new twig grows very rapidly at first, producing a leafless green stem toward the end of which the leaves are clustered. The effect is most easily observed in saplings: their leaves appear to be in tiers along the lanky stems, and, when seen from above, present a very regular pattern of distribution round the bud.

The tree *Sapium baccatum*, p. 276, has leaves very similar to the individual leaflets of the Rubber-tree.

HOMALANTHUS

(Gr., homalos—smooth, anthos—a flower)

Very like *Sapium* (p. 275), but the male flowers having 2 flattened compressed sepals enclosing 6-10 stamens between them.

30 spp., Malaysia, Australia, W. Pacific: 1 sp. in Malaya.

H. populneus Text-Fig. 81 (like a poplar, *Populus*)

Mouse Deer's Poplar
Maya Maya, *Memaya*

A small spreading tree up to 40 ft. high, with greyish, roughened bark, with a tendency to Terminalia-branching: latex watery white: leaves withering yellow then more or less red.

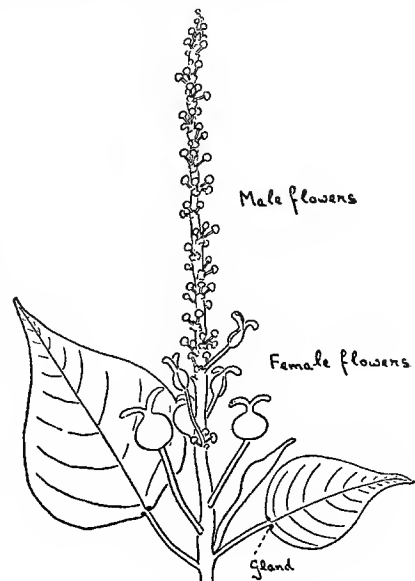
Leaf-blade $1\frac{1}{2}$ -4 × 1-3 $\frac{1}{2}$ " (up to 7 × 8" in saplings), ovate, almost or quite as broad as long, not heart-shaped, thin, entire, pointed, dark blue green, glaucous beneath, with 8-16 pairs of side-veins, and a pair of tiny green or yellowish glands at the base of the blade: stalks $\frac{3}{4}$ -2 $\frac{1}{4}$ " long, up to 6" in saplings, red or reddish.

Flower-spikes 4-10" long, like drooping catkins, terminal, green, with 2-8 long-stalked female flowers at the base, the remainder male, occasionally wholly male: ovary glaucous, with 2 yellow-green, stout stigmas.

Fruit .4" wide, flattened, blue-green, with 2 cavities each with 1 black seed.

Malaysia, Australia: frequent in secondary jungle from Kuala Lipis and Fraser's Hill northward to Tumpat, lowland and mountain, absent from the south.

The blue-green and almost, but not quite, heart-shaped leaves with red stalks will always distinguish this tree. It bears so great a resemblance to the genus *Sapium* that we have placed it under *Sapium* in our general keys to the family and species (p. 275). The leaves soon wilt on plucking. (In BURKILL's Dictionary it is called *H. populifolius*).



Text-Fig. 81. Mouse Deer's Poplar
(*Homalanthus populneus*), × $\frac{1}{2}$.

HOMONOIA

(Gr., homos—the same, nous—mind)

Leaves spirally arranged.

Flower-spikes axillary, male or female or both male and female flowers on the same spike: sepals 3 in the male flower, 5 in the female: *stamens very many, clustered at the ends of a branching stalk*: styles 3, not divided.

Fruit as a tiny 3-celled capsule.

3 species, Malaysia: 1 species in Malaya.

H. riparia Text-Fig. 82

(Lat., of river banks)

Willow Spurge

*Mempenai, Kelereh, Kayu Suarah
Champenai*



Text-Fig. 82. Willow Spurge (*Homonoia riparia*), $\times \frac{1}{2}$: flowers $\times 2$.

A bushy, evergreen shrub or small tree of the swiftly flowing rocky rivers: twigs, inflorescences and undersides of leaves finely hairy.

Leaf-blade 2-8 \times $\frac{1}{4}$ -1", lanceolate, entire, dull green above, whitish beneath; stalks .1-5" long.

Flower-spikes 2-4" long, in the leaf-axils or on the twigs below the leaves: flowers very small, crowded, shortly stalked: styles reddish.

Fruit .15" wide, greyish brown or tinged reddish, densely set in spikes.

India to the Philippines and Java: common on the banks and in the rocky beds of Neram rivers from Kuala Lipis northward in Malaya.

Compare the Red Waterberry (*Antidesma salicinum*) which has red berries and alternate leaves p. 234.

JATROPHA

(Gr., iasthai—to cure, trophe—food)

Leaves spirally arranged with long stalks, often more or less palmately lobed.

Flowers small, male and female arranged together in the same panicle, the male much more numerous than the female: calyx of 5 sepals: petals 5: stamens 10, in two rows in the male flower: ovary with 3 styles, each with 2 stigmas.

Fruit berry-like, faintly 3-shouldered, eventually splitting into 3 parts with one large black seed (with a small white cap) in each cavity.

About 150 species, mostly in tropical America and Africa: none wild in Malaya.

The Physic-Nut, or *Jarak Pagar*, and several red and pink flowered garden shrubs belong to this genus. The Physic-Nut affords an excellent introduction to the Euphorbiaceæ and, being a common village plant that flowers and fruits throughout the year, we would draw the attention of school-teachers to its usefulness.

In the Physic-Nut and the three genera which include the Candle Nut tree (Aleurities), the *Perah* (Elaterospermum) and the Rubber-tree (Hevea), we find the same kind of inflorescence which is a stalked panicle consisting of both male

and female flowers. At the end of the main stalk and of each of its main branches is a single female flower around which the male ones are clustered. In each panicle, the female flowers are relatively few: in the *Perah* and Physic-Nut there may be only one in the centre of the panicle and none at all in the smaller panicles: in the Candle Nut tree there are some half dozen and in the Rubber-tree there may be a score. The male flowers are much more evident from their greater numbers although, excepting the Physic-Nut, they are smaller than the female. In the Candle Nut tree the female flowers open several days before the male in the same panicle, while it is still young and compact, and, when the male flowers open, the female have withered except for their enlarging ovaries: self-pollination is therefore impossible in the same inflorescence. In a panicle of *Perah* or Physic-Nut, the female flowers open a day or two before the male or at the same time as the earliest males. In the Rubber-tree both kinds are open together or a few male flowers may precede the female. Self-pollination is thus possible in the panicles of these three. The male flowers are open one day and then fall off: only the female flowers persist, when pollinated. In place of a panicle of many flowers there are thus left a few female flowers which develop to give a small bunch of fruits: in the *Perah*, Physic-Nut and Rubber-tree, generally only one fruit develops from each panicle, on the thickened stalk of which it hangs down. These four genera of plants are also characterized by their oily tissues, the oil being most abundant in the seeds.

The various kinds of *Jatropha* which can be grown in Malayan gardens are described by R. E. HOLTUM in the M.A.H.A. Magazine, Vol. VIII, 1938, p. 3.

Key to the Species

Glabrous: flowers green *J. curcas*
 Hairy: flowers red: leaves often bronze *J. gossypifolia*

J. curcas Plate 59
 (a Latin plant-name)

Physic-Nut
Jarak, Jarak Pagar, J. Belanda

An evergreen shrub to 10' high, or small tree, with stout branches and copious opaque oily sap: glabrous.

Leaf-blade 2½-7" wide, as broad as long, generally with 3-7 lobes or points and heart-shaped base, waved, fresh green: stalks 2-7" long.

Panicles 2-4" long: flowers ½" wide, green, with a faint, rather unpleasant smell: the anthers yellow: the ovary pale green with deep green styles.

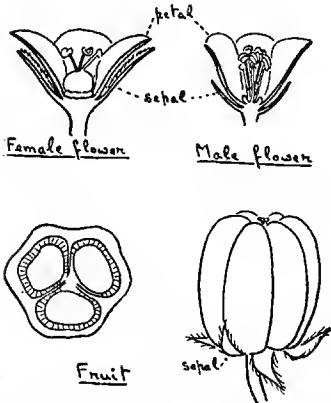
Fruit 1-1½" long, green, then yellow, one to three on a stalk.

Tropical America, now distributed throughout the tropics: common in villages in Malaya.

The seeds have a rather pleasant taste and are sometimes eaten by children, but it is unwise to allow this because the seeds are purging and contain a poison which may be fatal even in small quantity. The Malay name, meaning "Hedge Castor-oil", is derived from the medicinal property and from the fact that the bush is useful for a good hedge because animals do not eat it. The abundance of oil in the tissues of the plant is evident in the soapy sap. Children sometimes collect the drops of sap from the broken twigs and leaf-stalks in a shell and, dipping the end of a small bamboo or of the cut leaf-stalk of the bush itself into the sap, they can blow soap-bubbles. The plant has various medicinal uses as described by BURKILL.

J. gossypifolia Text-Fig. 83
(Lat., with foliage like cotton, *Gossypium*)

Cotton-Leafed Physic-Nut
Jarak Merah, J. Hitam,
J. Beremah, J. Kling



Text-Fig. 83. *Jatropha gossypifolia*: flowers $\times 2$; fruit, nat. size.

A shrub 2-8 feet high, straggly, with soapy sap: leaf-stalks and inflorescences with green-headed, glandular hairs.

Leaf-blade 2-6" wide, deeply 3-lobed, sometimes 5-lobed, the base more or less heart-shaped, fringed with fine hairs; stalks 2-5" long.

Flowers $\frac{1}{4}$ - $\frac{1}{3}$ " wide, in narrow clusters on long purple stalks; petals red.

Fruits $\frac{1}{2}$ " long, 3-shouldered, green then brown.

Tropical America, now widely dispersed through the tropics: in villages in Malaya.

This plant has two varieties, one with green leaves, the other and the more striking with copper or bronze-coloured leaves. It is common in the northern parts of Malaya and is used also for a hedge, but it is never so large a shrub as *J. curcas*.

LONGETIA

(Prof. Longet, Faculty of Medicine, University of Paris, c. 1862)

Leaves opposite, in 4 rows (decussate), simple, entire: the terminal buds hidden between the closely adpressed stalks of the last pair of leaves.

Flowers minute, in short panicles from the twigs behind the leaves: sepals 4-6: petals 0; stamens 4-6 in the male flowers.

Fruit an oblong or fig-shaped capsule, splitting from the base to the apex into 2-3 bony parts. Each part itself more or less split into two, and leaving the rather large seeds attached to the core: the unripe fruit crowned by the 2-lobed, sessile stigma: the calyx not persistent in the fruit.

6 spp., Malaysia, New Guinea: 2 spp. in Malaya.

L. malayana
(from Malaya)

Penang Holly Tree

A medium-sized tree up to 70 ft. high with dense, dark, glossy green crown, broadly conical in vigorous growth, very twiggy, with upright and spreading limbs, the trunks of old trees rather fluted from the ground: bark fawn brown, rather fissured and flaky, the inner bark pinkish brown: young leaves pale green: old leaves turning vivid orange red (yellow in some trees): glabrous.

Leaf-blade 2-5 \times 1-2 $\frac{1}{2}$ ", rather small, thinly leathery, elliptic or obovate, shortly tipped or blunt, more or less upturned: stalks $\frac{1}{4}$ - $\frac{1}{2}$ " long, often rose-red.

Flowers $\frac{1}{16}$ " wide, yellowish white, in little panicles 1-1 $\frac{1}{2}$ " long.

Fruits $\frac{3}{8}$ " long, in short-stalked clusters on the twigs, 2-3 shouldered, ripening through yellow and pink to red, hard, the bony parts yellowish.

Malaya, Sumatra, Borneo: occasional in lowland forest in Malaya, especially near the sea, common on Penang Hill at all levels.

The rather small, glistening leaves arranged in alternating pairs and the dense crown of this beautiful tree cause it to resemble a young *Tembusu* (*Fagraea fragrans*) or a species of *Eugenia* such as the Clove-tree. From a sapling *Tembusu* it can be distinguished at once by the bark, which is paler pinker brown and not ridged, while the manner in which the leaves wither to a vivid orange red

will generally distinguish it from both the Tembusu and a *Eugenia*. We say generally, because there are trees in which the leaves fall when they are yellow and they never turn red. The terminal buds are concealed like those of the Mangosteens (*Garcinia*).

The name Penang Holly is given to the tree because its general aspect, when young, and its red fruits suggest the English Holly (*Ilex aquifolia*, p. 328), though it lacks the prickly leaves and has capsules, not berries. Penang Hill is the only part of the country where it is common, but it occurs on the hills and headlands of Lumut and the East Coast, and there are a few trees in the neighbourhood of Bukit Timah in Singapore.

MACARANGA

(a vernacular name from Madagascar)

Often with red gum in the bark or pith: twigs often hollow.

Leaves spirally arranged, simple or palmately lobed, often peltate, with spider-web veining: stalks generally long: stipules often large and conspicuous.

Flowers minute, in panicles from the leaf-axils or on the twigs behind the leaves, male and female on different trees: male flowers microscopic, in little clusters in the axils of the bracts, each with 3-4 sepals and 1-many exceedingly small stamens: female flowers solitary in the axils of the bracts, with short style: petals 0.

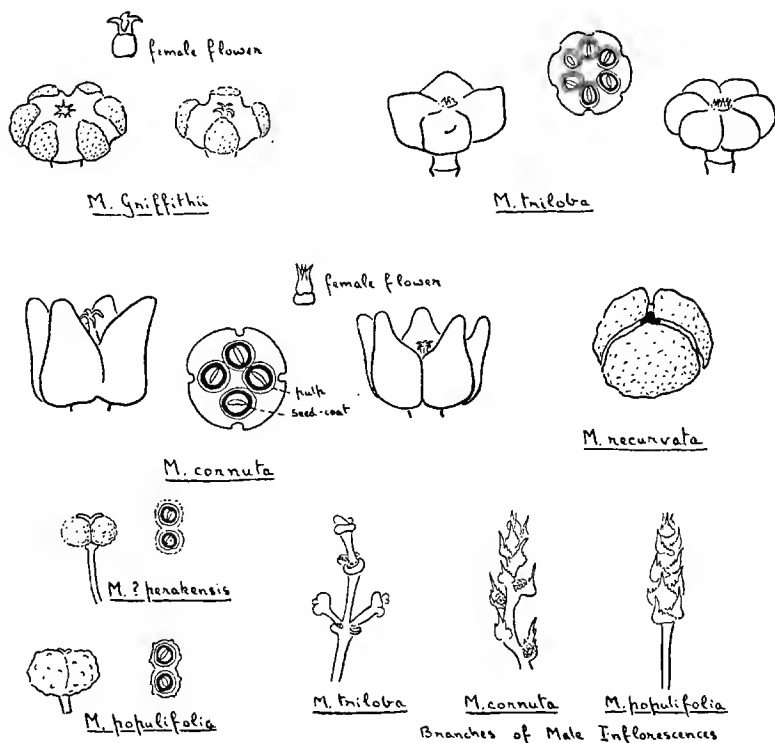
Fruits 2-6 shouldered capsules (rarely 3-shouldered), pulpy, smooth or set with horns or bristles, the shoulders breaking off and exposing the seeds: seeds black, hard, thinly covered with pink, orange, red or purple pulp, one to each shoulder.

About 200 species, Old World tropics: about 24 species in Malaya.

To this genus belong many kinds of small tree, common in secondary jungle. A few occur in the shade of the high forests, but the majority, needing a large amount of sunlight, cannot tolerate the gloom. Like other belukar-plants, they must have lived of old a precarious existence at the edge of rivers, by the coast and on landslips. But, with the opening of the country, the Macarangas have spread forth and become one of our notable kinds of wayside tree, whether they be in village-thickets, in waste land, at the edge of forest-reserves or, as they evidently prefer, in swampy ground. All those shabby bluish-green crowns, made up of shield-like leaves held aloft on long stalks and set on edge to the mid-day sun, are members of the genus. They are known to Malays variously as *Mahang*, *Mesepat*, *Melokan* and *Kubin*, less commonly *Tapu* or *Setapu*, or *Mehe* in Kelantan and Trengganu: but we do not know exactly how the names are used. One or two with brownish undersides to the leaves are called *Balek Angin* like the species of *Mallotus*.

Macarangas are remarkably alike in general features, but their leaves differ so much in shape and attachment to the stalk that nearly every kind can be recognized at first glance. They are quick growing, soft-wooded, evergreen trees reaching a height of 70 ft., generally much less. Their crowns are open and uneven or, if well-developed, rather compact and rounded and made up of several large limbs; but, though the leaves are large, they cast little shade on account of their tilt. The bark is pale grey or pinkish, smooth or rough with lenticels, always lined transversely with the leaf-scars, pink to reddish brown internally, tough and easily stripping: and it is generally astringent from the tannin-bodies that it contains. Most kinds have a watery, colourless, pink or red-grown gum which oozes from wounds in the bark and from the pith of cut twigs: it is called 'kino', like the sap of wild nutmegs and the gum of the *Angsana* (*Pterocarpus*). On account of the astringent bark and gum, the species find various uses in native medicine. In several kinds the twigs and

undersides of the leaves are glaucous, that is, covered with a thin layer of bluish-white wax: the most notable is the White *Mahang* (*M. hypoleuca*). Many have little stalked glands along the edges of leaf, very conspicuous as purple blobs in young leaves but shrivelling into tiny teeth or points on the mature leaves. A few have a pair of flat glands at the base of the blade. On the fruits and on the undersides of the leaves there may be hundreds of tiny dot-like yellow, brown or black glands, for which reason the fruits of some species look as if they have been powdered with golden dust. But the most striking peculiarity of the leaves, which occurs also in the related *Mallotus*, is the beautiful veining: the ribs are joined by fine parallel concentric veinlets having the effect of spider-webbing: and when one considers how the water is laid on through the system of these veins, the huge blade of the Giant *Mahang* (*M. gigantea*) becomes a miracle of engineering. Peltate leaves are characteristic of several kinds. The leaves of saplings are often purple beneath, and they are generally larger and more deeply lobed or toothed than in the adult plants: it seems, too, that in some the blade of the sapling is peltate or lobed whereas that of the adult is not. As some kinds flower in the sapling stage, one is apt to mistake them therefore for 'new species': unfortunately we know very little about the characters of the saplings. The young leaves of mature plants are purple, in some cases shading pink or brown, often richly purple beneath: the old leaves become intensely yellow. The flowers are too tiny to dissect without a microscope.



Text-Fig. 84. *Macaranga*: fruits, inflorescences, and flowers, nat. size.

Eight species of Macaranga (*M. triloba*, *M. cornuta*, *M. Griffithiana*, *M. Kingii*, *M. hypoleuca*, *M. Hosei*, *M. Maingayi* and *M. puncticulata*) are ant-plants like the Sabre Leaf (*Drypetes*). Their twigs are hollow and the ants live inside. The ants bite holes through the twig between the leaves, by which they come out and run over the surface, and in their dark galleries they keep multitudes of scale insects like herds of blind cattle. The scale-insects suck the sugary sap of the twig and from its abundance they exude through their bodies a sweet excretion that the ants devour. The plants, moreover; form what are called 'food-bodies', which are tiny white spheres (1 mm. wide) composed of oily tissue, which provide another article of food for the ants. In the first four species, the food-bodies are borne on the underside of the down-turned stipules; in Hose's and Maingay's *Mahang* they are borne on the upperside of the young stipules below the young leaves which cover the bud; in the White *Mahang*, they are on the underside of the young leaves: thus, in all cases they are in positions protected from the rain: (it is thought that they are modified glands, such as those on the edges of the leaves). If a twig of one of these trees is cut, the ants run out and bite. It is said that the ants protect the tree from marauding insects which would damage the foliage, especially from caterpillars, but there is no satisfactory explanation of the relation between plant and animal or of how it arose in the first place, and there is still much to be learnt concerning it. Occasionally one can find these plants without ants. The ants obtain their entry into young plants through the winged females which bite their way into the twigs. The seedlings may be inhabited before they are a foot high, when they have curiously swollen, sausage-like internodes. The hollows in the twigs arise from the shrivelling of the wide pith between the nodes, as in bamboos, and the ants turn the separate hollows into galleries by biting through the partitions at the nodes. Only one kind of ant inhabits the Malayan species of *Mahang*, but many sorts visit the glands on the leaves and suck the sugary excretion. There is an account of the Ant-*Mahang* by J. A. BAKER in the Gardens Bulletin, S.S., Vol. VIII, 1934, p. 63. (The ant is *Cremastogaster borneensis* var. *Macaranga*.)

Key to the Species

TWIGS HOLLOW, ANT-INHABITED

- Leaves not lobed or rarely so, peltate
 Leaves up to 6" wide oblong, thin: fruit with horns *M. cornuta*
 Leaves 5-15" wide, broad, leathery: fruit without horns *M. puncticulata*
- Leaves always lobed
 Leaves 3-5 lobed, with 7-8 points, purple beneath, very large *M. Kingii*
- Leaves 3-lobed, not purple beneath
 Leaves not peltate but heart-shaped at the base ... *M. Hosei*
 Leaves peltate
 Leaves not glaucous beneath, thin; stipules purple
 Young leaves often purple: fruit without horns *M. triloba*
 Young leaves never purple: fruit with horns ... *M. cornuta*
- Leaves glaucous white beneath
 Stipules spreading, green, persistent ... *M. Maingayi*
 Stipules purplish, recurved: leaves shortly lobed *M. Griffithiana*
 Stipules small, inconspicuous: leaves deeply lobed, very white beneath *M. hypoleuca*

TWIGS SOLID, NOT ANT-INHABITED

- Leaves not peltate or very slightly, or with non-peltate leaves on the same tree
 Leaves distinctly glaucous beneath
 Young shoots rusty scurfy: inflorescences mostly behind the leaves on the bare twigs *M. javanica*
 Not so: inflorescences in the leaf-axils ... *M. populifolia*
- Leaves not glaucous beneath
 Leaves rough hairy on both sides: straggling plant *M. trichocarpa*
 Leaves glabrous, heart-shaped or narrowly peltate *M. aff. populifolia* p. 269
- Leaves always distinctly peltate
 Blade with 3-5 lobes
 Blade white beneath *M. Maingayi*
 Blade purple beneath *M. ? tenuifolia* p. 269
 Not so: blade very large: twigs very stout ... *M. gigantea*
- Blade not lobed (occasionally with 3 small points)
 Leaves neither whitish nor glaucous beneath: glabrous *M. Diepenhorstii*
- Leaves whitish or glaucous beneath, or hairy
 Twigs and inflorescences brown scurfy: leaves dull green and hoary on the upper side *M. denticulata*
 Not so: twigs glaucous or glabrous
 Twigs finely hairy
 Leaves with a pair of yellow-brown glands on the upper side at the insertion of the stalk: fruit small, 2-lobed: mountains *M. aff. perakensis* p. 269
 Leaves without such glands: fruits with long soft bristles: lowlands ... *M. tanaria*
- Twigs glabrous
 Leaves entire, thin: fruit bristly ... *Mallotus floribundus* p. 271
 Leaves toothed, often finely: fruit not bristly
 Twigs glaucous: leaf 3-7" wide: stipules inconspicuous: mountains *M. aff. puncticulata* p. 269
 Twigs not glaucous: leaf 5-15" wide: stipules conspicuous: lowland swamps *M. recurvata*

M. cornuta Text-Fig. 84
 (Lat., with horns)

Horned Ant-Mahang

Very like *M. triloba* but:—young leaves never purple underneath: leaf-blade light green, varying from shortly 3-lobed to entire without lobes: male inflorescences pale greenish yellow with pointed, glabrous bracts and with a distinct stalk 3-8" long: female inflorescences 2-4", generally spike-like and unbranched, distinctly stalked: fruits with 4-5 horns, set in a head on a stalk 1-3" long.

W. Malaysia: common throughout the lowlands.

Unlike most trees with lobed and entire leaves, the lobed leaves are not necessarily the sapling leaves but may be borne on the crown of well-developed trees, and saplings may have entire leaves, cf. *Ficus hirta* p. 682.

M. denticulata

(Lat., with fine teeth)

Mildew Mahang
Mesepat, Balek Angin

A tree 15-70 ft. high: *young leaves and twigs rusty scurfy*, becoming grey or white hoary: stipules inconspicuous.

Leaf-blade 3-10" wide, nearly as broad as long, slightly toothed, the upperside dull green and greyish hoary (as if mildewed), the underside more or less glaucous-white.

Inflorescences short, rusty scurfy, mostly on the twigs behind the leaves, the male 3-7" long, the female 2-4" long: styles red.

Fruit .2" wide, 2-shouldered, green with sticky yellow dust.

India, S. China, W. Malaysia: common in the middle and north of Malaya.

This must not be mistaken for the species of *Mallotus* called *Balek Angin*. The shabby, hoary, peltate leaves enable one to distinguish *M. denticulata* from afar.

M. Diepenhorstii

(H. Diepenhorst, 1811-1860, the Dutch botanist)

Diepenhorst's Mahang
Setapu

Very like *M. recurvata* but:—

Leaf-blade dull dark green, *not glaucous beneath*, the stalk generally finely hairy at the top.

Inflorescences crowded on the twigs behind the leaves, glabrous.

Fruits .3" wide, 2-shouldered, in bunches, green with sticky yellow dust.

Malaya, Sumatra: common in Perak, Pahang and Kelantan, up to 2,000 ft. altitude at Ginting Simpak.

This is the common big-leafed *Mahang* with shiny purple young leaves by the passes of the main-range. Compare *Mallotus floribundus* with the same Malay names, p. 271. *M. floribundus* has smaller, glaucous leaves, not toothed.

M. giganteaElephant's Ear, Giant Mahang
Telingga Gajah, Kubin, Kubang,
Mengkubang

A bushy tree up to 60 ft. high, with coarse, large-leafed crown and massive twigs; *shoots and undersides of leaves hairy, generally sticky: stipules* 1-2" long, *very large, flat*.

Leaf-blade 10-30" wide, about as broad as long, with 3-5 lobes or points: stalks 6-20" long.

Male panicles 8-15" long, much branched: female 5-8" long.

Fruit .3" wide, 2-shouldered, in bunches.

W. Malaysia: common throughout the lowlands except Singapore.

This *Mahang* has bigger leaves than any other Malayan tree. Those of saplings may be a yard across, as big as shields.

M. Griffithiana Text-Fig. 84

(W. Griffith, 1810-1845, doctor and botanist of the E. India Co.)

Griffith's Mahang

Like *M. triloba* but:—young leaves never purple: *leaf-blade* stiff, leathery, shabby, glaucous beneath with pink veins and stalk: *twigs and leaf-stalks* more or less

EUPHORBIACEÆ

glaucous: *stipules* soon falling off. *inflorescence stalks* white powdery: *fruits* 4-5 shouldered, cushion-shaped, glaucous, the shoulders flattened and sticky with yellowish powder: *seeds* black, without red pulp.

W. Malaysia: very common in swampy ground in the lowlands.

The leaves wither an intensely vivid yellow.

M. Hosei

Hose's Mahang

(Bishop G. F. Hose, 1838-1922, of Singapore)

Like *M. hypoleuca* but: the *twigs* set with the persistent, pale green, spreading, down-turned, semi-circular *stipules* $\frac{1}{2}$ - $\frac{1}{2}$ " wide: *leaf-blade* simply heart-shaped, not or scarcely peltate: *fruit* $\frac{1}{4}$ " wide, 2-shouldered, 2-seeded.

W. Malaysia: common in swampy places.

M. hypoleuca

White Mahang

(Gr., hupo—under, leukos—white)

Mahang Puteh

A tree up to 70 ft. high: *twigs, leaf-stalks and undersides of the leaves* blue-white from a waxy bloom: *stipules* small, soon falling off, inconspicuous.

Leaf-blade 6-12" wide, deeply divided into 3 lobes, toothed, the lobes drooping: stalks 3-9" long.

Male panicles 8-15" long, the female 3-6" long, on the leafy twigs.

Fruits $\frac{1}{2}$ " wide, 3-shouldered, light glaucous green with 6 dull yellow sticky masses, set in dense spike-like clusters 2-6" long: *seeds* 3, black with thin, dull red pulp.

W. Malaysia: very common in the lowlands.

M. javanica

Plate 60

Blue Mahang

(from Java)

Mahang, Melokan, Mesebat, Tapu Hitam

A shrub or small tree to 50 ft. high, generally much less, with rather long slender spreading limbs with upturned ends giving an even bushy crown when well-grown: *young shoots* rusty brown scurfy: *stipules* $\frac{1}{4}$ " long, pointed, small.

Leaf-blade 3-8 × 1 $\frac{1}{4}$ -3 $\frac{1}{2}$ ", narrowly ovate, scarcely peltate being rather cup-shaped at the base with only a narrow rim on the upperside of the stalk, pointed, the edge uneven but not toothed, rather leathery, drooping, the leaves on the upperside smaller than those on the lower, dark green above, bluish green glaucous beneath and rusty scurfy on the veins, glabrous when old: *stalk* 1-4" long, reddish: with a pair of yellowish glands at the base of the blade.

Panicles 4-9" long, standing up from the branches behind the leaves as rusty brown tassels, a few from the leaf-axils: bracts toothed.

Fruit not $\frac{1}{4}$ " wide, 2-shouldered, yellowish green or brownish-powdered, sticky, with a black seed in each lobe (without any red pulp).

Indo-China, Siam, Malaya Peninsula, Sumatra, Java: very common in secondary jungle throughout the country.

Generally, this *Mesebat*, which is one of the commonest woody plants in the country, is an untidy, shabby, little tree but if well grown, it has a shapely crown and stout trunk as much as a foot thick, and it is useful where only a light shade is needed. It will grow quickly on a poor soil and will give some cover on the stoniest. Its tissues are strangely dry and thus the trunk and limbs make excellent firewood: even the leaves, when rubbed between the fingers, break into green powder.

M. Kingii

Devil's Mahang

(Sir G. King, 1840-1909, the English botanist at Calcutta)

A sparingly branched shrub or treelet to 20 ft. tall: *twigs* stout, glabrous, waxy-glaucous: *stipules* $\frac{3}{4}$ -1 $\frac{1}{2}$ " long, pointing down the stem like a pair of horns, purple-brown, hard.

Leaf-blade 10-24" wide, enormous, with 3-5 large lobes and (altogether) 7-8 points, peltate, yellowish green above, reddish purple beneath with lurid yellowish green veins: stalks 8-15" long.

Fruits $\frac{1}{2}$ " wide, slightly 4-shouldered, set in a stalked head.
Borneo, Malaya: rather rare in swampy forest in Johore.

Because this is one of the more grotesque Malayan plants, we cannot withhold it from our book. It may be commoner than is supposed.

M. Maingayi

Maingay's Mahang

(A. C. Maingay, 1836-1869, doctor and botanist of the E. India Co.)

Like *M. Hosei* but the leaves always peltate, thus differing from *M. hypoleuca* in the conspicuous, spreading stipules (generally upward pointing) and the 2-shouldered fruits: often with solid twigs without ants.

W. Malaysia: frequent in swampy ground.

M. populifolia Text-Fig. 84Poplar Mahang
Mesebat, Mahang

(with leaves like a poplar, *Populus*)

Very like *M. javanica* but:—

A taller tree, up to 80 ft. high, with well-formed trunk and conspicuous Terminalia-branching: not rusty scurfy on the twigs and inflorescences but glabrous or finely hairy.

Leaf-blade often broadly ovate, not cup-shaped at the base, occasionally narrowly peltate (especially in saplings), often on the upperside with two yellow eye-like glands at the base.

Inflorescences much shorter, 1-3" long, like bunches of green catkins, from the leaf-axils or on the twigs just behind the leaves.

Fruit $\frac{1}{2}$ " wide, larger, green with sticky yellow-green powder.

Malay Peninsula, Sumatra, Borneo: common in Malaya.

This species may be called *Maya Maya*, probably in mistake for *Sapium discolor*, p. 276. At first sight the leaf suggests the common *Balek Angin* (*Mallotus paniculatus*) but it is glabrous. Saplings may have 2-4 yellow glands at the base of the leaf-blade and their blades are often slightly peltate.

M. puncticulata

Swamp Ant-Mahang

(Lat., full of little points)

A small to fairly large tree up to 70 ft. high, often with a few stilt-roots: twigs, inflorescences and undersides of the leaves finely hairy, at least when young: twigs generally hollow, glaucous: stipules $\frac{1}{4}$ " long, soon falling off, inconspicuous.

Leaf-blade 3-9" wide, often small, finely toothed, glaucous beneath: stalk 2-8" long.

Inflorescences in the leaf axils, the male 4-9" long, female 2-4" long.

Fruit $\frac{1}{2}$ - $\frac{3}{4}$ " wide, hump-like, with 3 grooves, covered with sticky yellow dust, set in a small head on a stalk 1-3" long.

Malaya, Borneo: in lowland swampy forest.

Compare the mountain species, *M. aff. puncticulata* (p. 269). *M. recurvata* is similar but differs in the glabrous, solid twigs and large stipules.

M. recurvata Text-Fig. 84Swamp Mahang
Kubin

A tree 20-70 ft. high, of swampy forest, with stout, tough twigs and large leathery leaves, often with a few stilt roots: glabrous: young leaves violet-purple: copious red gum in the pith of the twigs: stipules $\frac{1}{2}$ -1" long, large, green, pointed, upright with incurved sides, conspicuous and persistent.

Leaf-blade 5-16" wide, glaucous beneath, toothed.

EUPHORBIACEÆ

Inflorescences 4-8" long, green, about as long as the leaf-stalks, in the leaf-axils.

Fruits $\frac{1}{2}$ " wide, hump-like, with 3 (occasionally 2 or 4) grooves, glaucous green, covered with very sticky yellowish powder: the fruits spaced in clusters along a stalk 4-6" long.

Malaya: common in the lowland swamps.

Compare *Mallotus floribundus* with small leaves, not toothed; *Macaranga puncticulata* with ant-twigs; and *Macaranga Diepenhorstii* with thinner leaves not glaucous beneath, differently placed and shorter inflorescences, and small 2-shouldered fruits.

M. tanaria

Hairy Mahang

(? tannin-providing)

A small to medium-sized tree up to 70 ft. high: *twigs, leaf-stalks and underside's of leaves glaucous and finely velvety*: stipules $\frac{1}{4}$ -1" long, pale green, rather narrow, pointed, upright, fairly persistent.

Leaf-blade 3-9" wide (-14" in saplings), occasionally with 3 points, about as long as broad, *light green, soft*: stalk 2-8" long.

Inflorescences 4-8" long, pale green, axillary, the male much branched, the female not or scarcely branched: bracts toothed.

Fruits $\frac{1}{2}$ " wide, 2-3 shouldered, *set with long soft bristles* $\frac{1}{4}$ - $\frac{1}{2}$ " long, *covered with sticky yellow powder*.

S. China, India to Australia: common in open country in the middle and north of Malaya, especially near the sea: abundant on Penang Hill.

This is the most widely spread species of *Macaranga*. The soft, light green, hairy, peltate foliage, glaucous underneath, distinguishes it. The blades of saplings may not be glaucous, but their stalks and veins are generally pink.

M. trichocarpa

Bur Mahang

(Gr., thrix— a hair, karpos—a fruit)

A shrub or sprawling treelet to 15 ft. high, *often climbing*, with tough stems: *twigs and leaf-stalks velvety, leaves rough hairy on both sides*: stipules small, inconspicuous.

Leaf-blade up to 6 x 4", *rather small, ovate, tipped, toothed, not peltate*, the base narrowed or round, often rather glaucous beneath: stalk $\frac{1}{2}$ -3" long.

Panicles 1-2" long, *very short*, in the leaf-axils, with toothed bracts.

Fruit $\frac{1}{2}$ " wide, 2-shouldered, *set with many short thick bristles themselves covered with stiff hairs*.

W. Malaysia: common in Malaya, especially in the south, often forming thickets.

M. triloba

Plate 61, Text-Fig. 84

Common Mahang

(with 3-lobed leaves)

A small tree to 40 ft. high, with uneven, open, shabby crown: glabrous, or the twigs and leaves finely hairy: *young leaves often reddish purple beneath for a long time*.

Blade 4-12" wide, divided about $\frac{1}{3}$ its length into 3 pointed lobes, *thin, finely toothed*: stalk 2-9" long.

Male inflorescences 5-9" long, *dull brownish crimson*, much branched, with short stalks $\frac{1}{2}$ -3" long, in the leaf-axils or on the twigs behind: bracts green, powdered white, minute, blunt.

Female inflorescences 3-5" long, *much branched, sessile or with short stalks*, brownish crimson.

Fruits 4-5" wide, 4-6 shouldered, reddish brown, with a sticky yellow patch on each shoulder (the patches green in unripe fruits), pulpy with red juice: seeds 3-6, black, thinly covered with reddish or pinkish purple pulp.

W. Malaysia: very common throughout Malaya, *our commonest ant-species*.

M. ? tenuifolia

Purple Mahang

A shrub or treelet to 20 ft. high, glabrous except the underside of the leaf often hairy: *twigs set with the green or brownish green, thin, decurved and persistent stipules* $\frac{1}{2}$ - $\frac{3}{4}$ " wide.

Leaf 6-16 × 5-12", toothed, generally deeply 3-lobed, sometimes 5-lobed in saplings: always reddish purple beneath except when old.

Inflorescences light green, the bracts white powdery: as in *M. cornuta*.

Fruits $\frac{1}{2}$ " wide, with 4-5 horns covered with sticky yellow granules, and 4-5 styles: seeds 4-5, with thin red pulp.

Malaya: common in lowland and mountain forest.

This is generally mistaken for *M. cornuta* but can always be distinguished by the solid twigs, the stipules not purple and the beetroot-red undersides of the leaves.

M. aff. perakensis Text-Fig. 84

Greater Mountain Mahang

Like *M. tanaria* but:—stipules rather broad and persistent, reflexed: *leaf-blade with a pair of elliptic, yellow or brown eye-like glands on the upper side at the insertion of the stalk: inflorescences short, mostly on the twigs behind the leaves, and with zig-zag branches*, the male 2-4 $\frac{1}{2}$ " long with spreading bracts (each with 1 or 2 large glands): *fruits* $\frac{1}{2}$ " wide, 2-shouldered, smooth but with sticky yellow powder, the seeds black with thin orange pulp.

Malaya, common in the mountains above 2,000 feet.

The hairy leaves and twigs and the eye-like glands on the leaf-blade distinguish this from *M. Diepenhorstii* which is closely allied but which seems not to ascend high into the mountains.

M. aff. puncticulata

Lesser Mountain Mahang

Very like *M. puncticulata* but:—twigs solid, not ant-inhabited, generally glabrous, more or less glaucous: (? leaves glaucous beneath): *inflorescences covered with glistening white hairs: fruits spaced along a stalk 2-8" long*.

Malaya: rather common in the mountains above 2,000 ft.

M. aff. populifolia

Shabby Mahang

A tree 20-70 ft. high, glabrous except the young leaves: twigs rather slender.

Leaf-blade 3-6" wide, heart-shaped or narrowly peltate, dull green, rather yellowish beneath, thinly leathery: stalk 1-5 $\frac{1}{2}$ " long.

Inflorescences 2-4" long, the female unbranched: bracts toothed.

Fruits .4-.5" wide, 2-shouldered, 2-seeded, covered with sticky yellow powder, set along or at the end of axillary stalks 1-3" long.

Borneo, Sumatra, Malaya: common on the Eastern side of the peninsula, also in Perak, in swampy ground.

MALLOTUS

(Gr., velvety)

Like Macaranga but:—

Without red gum.

Leaves opposite or spirally arranged: stipules small, inconspicuous.

Panicles on the leafy twigs, generally terminal, sometimes in the leaf-axils or opposite to the leaf, not on the branches: male flowers larger, with many conspicuous

EUPHORBIACEÆ

stamens projecting from the flower: *sepals* 3-5: *ovary* with rather long, conspicuous, often feathery styles.

Fruit a small 3-shouldered capsule, smooth or woolly or set with soft bristles, often in strings.

About 100 spp., tropical Asia (2 in Africa): 25 spp. in Malaya.

The trees called by Malays *Balek Angin* (Turn-in-the-Wind) belong to this genus. Their leaves have whitish undersides, like Aspens (*Populus*), and when the wind blows, a silver shimmer runs through the crown. The genus is very close to *Macaranga* and the trees of both are similar in aspect except that those of *Mallotus* are never ant-inhabited. *Mallotus* differs chiefly in the position of the inflorescence, the large male flowers, the long styles, and the 3-shouldered fruits. Malays are apt to confuse the species of both genera so that their names must be followed with caution.

Key to the Species

- Leaves peltate
 - Twigs and leaf-stalks brownish woolly ... *M. barbatus*
 - Not so
 - Glabrous: leaves rounded, glaucous beneath, entire *M. floribundus*
 - More or less hairy: leaves oblong, toothed ... *M. peltatus*
- Leaves not peltate
 - Leaves very coarsely toothed, large, often with 3-5 points: fruits smooth *Melanolepis* p. 273
 - Leaves entire or finely toothed or white beneath: fruit spiny, scurfy, woolly or warted
 - Twigs not brown scurfy, leaves not white beneath, the blade oblong *M. Porterianus*
 - Twigs brownish scurfy, at least when young: leaves slightly glaucous, white or brownish white beneath, generally ovate
 - Leaves opposite, in unequal pairs: East coast *M. tiliifolius*
 - Leaves spirally arranged, or a few opposite
 - Leaves nearly glabrous, slightly glaucous beneath: fruits red *M. philippinensis*
 - Leaves white, or brownish white, scurfy beneath
 - Blade up to 5" wide: fruit shortly bristly *M. paniculatus*
 - Blade up to 11" wide: fruit very woolly ... *M. macrostachyus*

M. barbatus

(Lat., bearded)

Siamese Pom-Pom Tree

Balek Angin, Tapu, Sedangar

A shrub or tree to 25 ft. high: *twigs, leaf-stalks, inflorescence and undersides of the leaves thickly brownish white woolly: young leaves pale crimson then pink.*

Leaf-blade 3-12" wide (up to 16" in saplings), *peltate*, as broad as long, generally with 3 points, toothed, light green, often yellowish: stalks 2-10" long, up to 20" in saplings.

Inflorescences 6-12" long, either with female flowers or with both male and female, both kinds on the same plant: *ovary* flushed crimson, with 4 yellow styles.

Fruits 8-9" wide, like pale brownish woolly balls set along strings up to 12" long, splitting into 4-6 parts each with a black seed.

India, W. Malaysia: frequent in open country from Trengganu and Upper Perak northward:

A very striking woolly plant! The presence of both kinds of flower on the same plant is unusual in *Mallotus*.

M. floribundus Text-Fig. 85
(Lat., abounding in flower)

Blue Blade
Passu, Passu Passu, Pəpassu,
Taping, Təmping, Tetaping, Tetəpai

A riverside or streamside tree to 40 ft. high: *glabrous, except the fruits: young leaves pinkish brown.*

Leaf-blade 3-6" wide, *peltate*, ovate, tipped, *very glaucous beneath*, not lobed, with tiny yellow hairy glands on the underside between the main veins and their junction with the midrib: *stalk* 1½-7" long.

Panicles 4-7" long, the female unbranched: styles long, hairy.

Fruit ¾" wide, *set with soft, rather sparse bristles* 1-3" long.

Indo-China, Malaysia: common by streams in Malaya.

This is an attractive tree with leaves like the *Mahang* (*Macaranga*), thin and very glaucous beneath, but with characteristic capsules. Compare *Macaranga puncticulata* and its allies, which have sparsely toothed leaves, and *Macaranga Diepenhorstii* with the same Malay names: the *Macarangas* have big stipules.

M. macrostachyus Text-Fig. 85
(Gr., makros—long, stachus—an ear of corn)

Common Pom-Pom Tree
Balek Angir.

Like *M. paniculatus* but:—

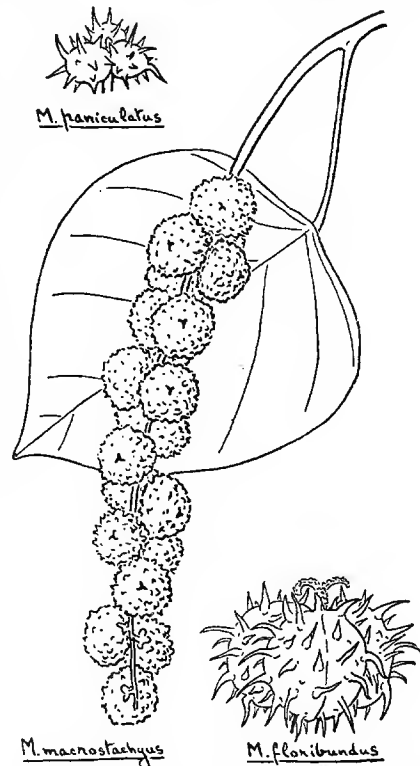
Leaf-blade larger and much broader, 3½-11" wide and long, heart-shaped with the base cut off straight, the underside coarsely brownish white scurfy: stalks 1-10" long: the leaves often opposite.

Panicles larger: male flowers in much branched panicles 15-24" long: female flowers closely set in long, unbranched or sparingly branched, hanging spikes up to 18" long.

Fruits ½-¾" wide, round, very woolly, set in hanging spikes.

W. Malaysia: common in secondary jungle throughout the mainland.

This species is more conspicuous than the commoner *M. paniculatus* because of its larger leaves and fruits like strings of woolly pom-poms. It must not be mistaken for the Silver Croton *C. argyratum*, p. 247) which is not woolly.



Text-Fig. 85. *Mallotus*: twig $\times \frac{1}{2}$:
fruits, nat. size.

M. paniculatus Plate 62, Text-Fig. 85
(from the inflorescences)Turn-in-the-Wind
Balek Angin

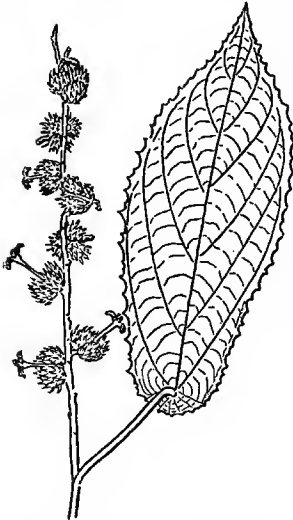
A small tree up to 25 ft. high, seldom as much as 60 ft., with light, rather open crown, often flat-topped, with spreading branches: *twigs, leaf-stalks, inflorescences and undersides of the leaves thinly brownish white scurfy, the young shoots rusty scurfy.*

Leaf-blade 3-7 × 1½-5", ovate, pointed, *simple or with 2-3 pointed lobes*, the edge entire or slightly toothed, the base narrowed or broad and straight, with a pair of eye-like glands at the base on the upperside: stalk 1-5" long.

Panicles up to 12" long, drooping from the ends of the twigs, the female less branched than the male: male flowers ¼" wide, as fluffy balls of stamens, shortly stalked, very fragrant.

Fruits with the tiny 3-lobed body ⅓" wide, set with soft bristles ⅓" long, in strings.

S. China throughout Malaysia to N. Australia: very common in open ground, villages and by the edge of the forest in both lowlands and mountains throughout Malaya.

M. peltatus Text-Fig. 86
(Lat., shield-bearing)Wild Castor Oil
Jarak Utan

A bushy shrub or treelet to 20 ft. high, *the twigs, leaf-stalks and undersides of the leaves more or less velvety: young leaves pale green.*

Leaf-blade 4-9 × 2-4", *ovate-oblong*, rather narrow, pointed, *toothed, distinctly though narrowly peltate*, dark green with pale yellowish gland-dots round the edge: stalk 1-4½" long.

Inflorescences 6-12" long, terminal, unbranched, spike-like, the male flowers clustered, the female separately stalked.

Fruits ½" wide, covered with short soft curved bristles, surmounted by the style ⅓" long.

S. W. Malaysia: frequent in the middle and north of Malaya, especially by the passes of the main range.

Text-Fig. 86. Wild Castor Oil (*Mallotus peltatus*) × ½.

M. philippinensis
(from the Philippines)Red Berry
Kasirau, Minyak Madja, Rambai Kuching

A small tree like *M. paniculatus*: *twigs, leaf-stalks and veins on the underside of the leaf thinly brown scurfy.*

Leaf-blade 3-8 × 1½-6", elliptic or ovate, pointed, *toothed, yellowish green* when fresh becoming darker green and *slightly glaucous beneath*, with 2 small eye-like glands at the base on the upperside: stalk 1-3" long.

Fruit ½" wide, covered with red granular powder, set in terminal and axillary spikes 2-5" long.

India to Australia: frequent in the middle and north of Malaya.

This tree is not easy to recognise except when it is in fruit; the tassels of cinnabar-red, 3-shouldered capsules are then unmistakable. The red powder of the fruit was formerly used as a dye and it is also medicinal: it is described in BURKILL'S Dictionary. There is a small tree in the grounds of Sri Menanti in Negri Sembilan.

M. Porterianus

Wild Caster Oil

(G. Porter, 1800-1834, an English botanist at Calcutta)

Jarak Utan

A shrub or small tree to 25 ft. high, the leaves spirally arranged or opposite: twigs, leaf-stalks, inflorescences and undersides of the leaves slightly hairy or nearly glabrous.

Leaf-blade 4-10 × 1½-3" narrowly elliptic, tipped, toothed or nearly entire, thin, not lobed or glaucous, the base narrowed or slightly heart-shaped: stalks ½-3" long.

Inflorescence up to 7" long, unbranched, erect: female flowers with reddish brown ovary.

Fruit ½" wide, set with very short reddish brown knobs or bristles.

Malay Peninsula, Sumatra: common like *M. paniculatus* but not so conspicuous.

M. tiliifolius

Linden-leaf Turn-in-the-Wind

(with leaves like the Linden, Tilia)

Balek Angin

A sea-shore shrub or treelet to 15 ft. high, bushy: twigs, leaf-stalks and undersides of the leaves yellowish white scurfy: leaves opposite, in unequal pairs, those on the upperside of the twig being smaller.

Leaf-blade 2½-7 × 2-6", ovate, tipped, nearly as broad as long: stalks 1-3" long.

Inflorescences as unbranched spikes up to 5" long, terminal and axillary.

Fruit nearly ½" wide, set with little warts.

Malaysia: common in secondary jungle on the sandy East Coast of Malaya, not known from the West.

MANIHOT(the Brazilian name for *cassava*)

Twigs, leaves etc. with white latex.

Leaves spirally arranged, deeply palmately lobed.

Inflorescences as lax terminal panicles consisting wholly of male flowers or with a few female flowers at the base: calyx-cup deeply divided into 5 sepals: petals none: stamens 10, with slender stalks and orange-red nectaries between them: ovary with three 2-lobed stigmas.

Capsule with 6 angles or wings, containing 3 seeds.

About 100 species, tropical America: 1-2 species introduced to Malaya.

The well-known Cassava or Tapioca-plant, *Ubi* or *Ubi Kayu* (*Manihot esculenta*) belongs to this genus. It is generally a lanky herb or shrub with pinkish-green flowers, tuberous roots and a capsule marked with 6 narrow wavy wings: the leaves have 3-7 finger-like lobes and red stalks. But in several Malayan villages and rice-fields, especially in the neighbourhood of Kuala Pilah, there grows a small sappy tree reaching 25 feet high with light spreading crown, which appears to be only a variety of the Tapioca or it may be the closely allied species *Manihot dulcis*. Its leaves have generally only 3 lobes, its flowers are bigger (5-6" long; only 3-4" long in the Tapioca) and its capsules are not winged but have 6 faint ridges or shoulders. In all other respects it looks like an overgrown Tapioca-bush, and it is called *Ubi*.

Formerly the botanical name for the Tapioca was *M. utilissima*.

MELANOLEPIS

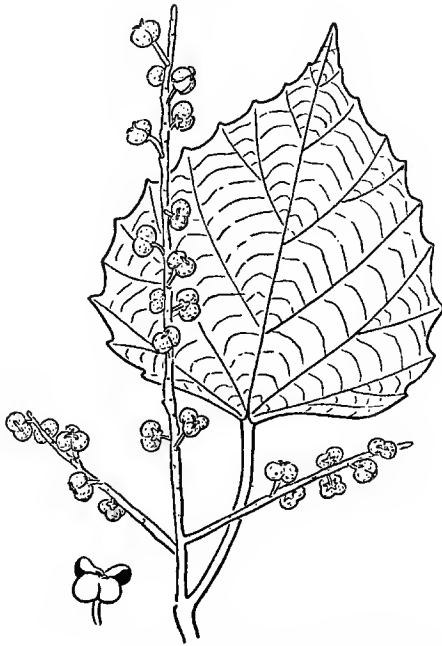
(Gr., melas—black, lepis—scale)

Like *Mallotus* but the flowers without a honey gland and the stamens very numerous (200 or more) in the male flower.

1 species.

M. multiglandulosa Text-Fig. 87
(Lat., with many glands)

Charwan, Jarak Kayu



Text-Fig. 87. *Charwan (Melanolepis multiglandulosa)*, $\times \frac{1}{2}$: fruit, nat. size.

A shrub or small tree to 40 feet high, spreading, with smooth grey bark: *young shoots and inflorescences brownish scurfy, weathering smooth.*

Leaf-blade $3\frac{1}{2}$ -12" wide, about as broad as long, ovate or heart-shaped, coarsely toothed, the leaves of suckers or saplings with 3-5 points or lobes, not peltate: stalks 2-11" long.

Inflorescences 5-12" long, terminal, erect, simple and spike-like or with a few branches from the base, some with male flowers, others with female, and yet others with both kinds of flower, the three sorts of inflorescence on the same plant: male flowers $\frac{1}{2}$ " wide with 4-6 green sepals, densely crowded, facing up or side-ways, stamens yellow: female flowers smaller, facing down, opening long before the male on the same inflorescence, with 2-3 white styles.

Fruits $\frac{1}{2}$ " wide, 2-3 shouldered, green, splitting open from the base, with 2-3 hard black seeds thinly coated with pale orange pulp.

India to the Pacific: frequent from the middle of Malaya northward, in villages and open country, common at Kuala Trengganu.

This cabbage plant can be told from other trees, which have leaves as broad as long, by the coarsely toothed edge of its leaves.

RICINUS

(a Latin plant-name)

Leaves spirally arranged, peltate, palmate, deeply cut into 7-9 fingers: stalk long, with a gland at the top.

Flowers in panicles, terminal or opposite the leaves: male and female flowers in the same panicle, the male at the base, stalked: sepals 3-5: petals 0: stamens many, much branched: ovary set with soft spines, with 3 styles, each forked.

Fruit a 3-shouldered capsule covered with soft spines, splitting into 6 parts, 3-seeded: the fruits in bunches: seeds with a hard coat and a small knob at one end. 1 sp., tropical Africa: cultivated throughout the tropics.

R. communis

(Lat., common)

Castor Oil Plant

Jarak

An evergreen shrub or small tree to 25 ft. high, with sappy trunk like a Papaya (Carica).

Leaf-blade 6-24" wide, the stalk 3-14" long.

Panicle 3-9" long: sepals green: stamens yellow: ovary green, with red styles.

Fruit $\frac{3}{4}$ -1" long, stalked down-turned.

Common in Malayan villages.

The Castor Oil Plant is the only species of its genus, yet in every feature it is so variable that many races have been distinguished. In its leaves it recalls the Papaya, but the branching habit is different. Were it not for its luxuriance and abundance, we would certainly regard it as an ornamental tree. The variety with copper-coloured leaves is the most beautiful.

Flowers and fruits are developed throughout the year. From the position of the panicles we can see that the growth of the branches is sympodial; that is, continued by side-shoots. The position of the male flowers at the base of the panicle is unusual.

For the history and uses of the plant we refer to BURKILL's Dictionary.

SAPIUM

(a Latin plant-name)

White latex abundant in the twigs, flowers and fruits, but none in the trunk and main branches.

Leaves spirally arranged or alternate, simple.

Flowers minute, set in spikes or catkins, the spikes solitary or clustered into panicles: male and female flowers on separate spikes or, generally, the male flowers occupying most of the spike with one or a few female flowers at the base: calyx as a tiny cup: stamens 2-3: styles 2-3: petals 0.

Fruit a small 2- or 3-shouldered capsule, splitting into 4-6 pieces: seeds 2 or 3, large.

About 100 spp. throughout the tropics, mostly American: 3 spp. in Malaya.

The three Malayan species of Sapium are common trees, well-known to Malays, yet so different among themselves that they can hardly be taken at first sight for members of the same genus. Their flowers and fruits are small and not particularly attractive but, as a large shady tree, the first species, *S. baccatum*, is notable, and the third, the Mock Willow (*S. indicum*), is one of the few Malayan trees that develops weeping branches. The leaves and fruits of the two species *S. baccatum* and *S. discolor* are used for baiting traps set for mouse-deer which, according to Malays, nibble them eagerly: hence their Malay names.

Birds and small mammals devour the thin pulp round the seeds of both these species, and hence their wide distribution.

Some American species of the genus yield rubber, but there is little or no latex in the trunks of the Malayan trees.

The two species with narrow leaves, *S. discolor* and *S. indicum*, must not be mistaken for the Indian Willow (*Salix*, p. 581) which has no latex.

Key to the Species

Leaves alternate, finely toothed, their stalks $\frac{1}{2}$ " long or less	... ..	<i>S. indicum</i>
Leaves spirally arranged, entire, glaucous beneath, their stalks longer		
Blade almost or quite as broad as long, the stalk reddish	... ..	<i>Homalanthus</i> p. 257
Blade considerably longer than broad, oblong		
Blade small, up to $1\frac{3}{4}$ " wide, withering blood red: slender tree	... ..	<i>S. discolor</i>
Blade larger, $1\frac{1}{2}$ -3" wide, withering yellow: stout tree	... ..	<i>S. baccatum</i>

S. baccatum

(Lat., bacca—a berry)

Mouse Deer's Rubber Tree
Ulam Pelandok, Ludai, L. Pelandok,
Maya Maya, Memaya, M. Pelandok

A tall tree reaching 120 ft. high in the forest, generally not more than 60 ft. in the open, flowering at 20 ft. : *crown* rounded or uneven, the branches passing obliquely upward from the trunk then arching out and drooping at the ends : *bark* (see below) : old trees in the forest with short, steep buttresses : twigs and leaves glabrous : young leaves pinkish brown : *old leaves withering pale clear yellow with red stalks*.

Leaf-blade 3-8 × 1½-3¼", elliptic or slightly ovate, very pointed, drooping, shaped and veined like the leaflets of the Rubber-tree (Hevea), thin, the underside more or less bluish green or glaucous, the edge entire, the veins yellowish : *stalk* 1-3" long, slender, red or pink : generally with a pair of disc-like glands on the underside of the blade near the base.

Inflorescences as loose clusters of slender spikes arranged in terminal panicles 5-9" long, some spikes with male flowers, others female and yet others with female flowers at the base and male at the top.

Fruit ½" wide, 2-shouldered, 2-seeded, green then purple black, crowned with the 2 small recurved styles, set in terminal drooping clusters 4-7" wide : seeds black.

E. Himalaya, S. W. China, W. Malaysia : rather common in the middle and north of Malaya, at the edge of the forest or in open country : common on Penang Hill at all altitudes, occasionally planted in Georgetown, frequent in Perak.

The spreading, leafy branches render this a pleasant shade tree but, except in Penang, we have not found that it is anywhere put to such purpose. The ripe fruits are sweet and are much sought after by birds, especially pigeons, and by mousedeer, which distribute the seeds; hence the abundance of the tree in some parts of the country. There is a very easy way to identify it. If you should find on the ground a yellow leaf, shaped and veined like a leaflet of the Rubber-tree but with a thin red stalk attached to it, it must have fallen from a twig of this species : the red colour in the stalk persists long after the rest of the leaf has withered.

The bark changes remarkably in its figure and, sometimes, in its colour as the trunk expands. Young and medium-sized trees have pale grey bark which becomes roughened with large, brown, swollen, knobby lenticels crowded together : as the tree ages, the lenticels join up and the bark becomes greyish brown and fissured with rather broad flat ridges. The trunks of old trees strongly resemble those of the *Tembusu* (*Fagraea fragrans*) or those of *Balau* (*Shorea*), and the resemblance is heightened by the pale yellow inner bark and wood : the ridges of the bark, however, are flatter or less bold and the wood is surprisingly soft.

S. discolor

(Lat., discoloured)

Mouse Deer's Delight

A rather small, slender tree, eventually reaching 60 ft. high, with the branches towards the top of the long, lanky stem, the crown small : *bark light grey, smooth* : twigs and leaves *glabrous* : young leaves pinkish, soon green : *old leaves blood red*.

Leaf-blade 1½-4 × ¾-1½", rather small, narrowly elliptic, shortly pointed, often malformed, thin, dark shabby green above, bluish glaucous beneath, entire, those on the upperside of the twig smaller than those on the lower : *stalk* 1-2" long, slender, often pink, with a pair of little knob-like green or purple glands at the top on the upperside.

Flower-spikes 1-3" long, singly at the ends of the twigs, each spike with a few large stalked female flowers at the base and the remainder covered with minute male flowers : ovary with the style divided into 3 arms.

Fruit ½-¾" wide, 3-shouldered and 3-seeded, green then yellowish and finally black, splitting into 6 parts : seeds ¼-½" wide, black, very hard, thinly covered with a pale cream, pulpy layer : the fruits in small bunches at the ends of the twigs.

S. China, W. Malaysia : common in villages and open country throughout Malaya.

Like the preceding, this tree is also most easily recognised from its fallen leaves which are rather small, blood red and with two little purple knobs at the top of the red stalk. As a sapling it is distinguished by the shabby blue-green leaves, the latex and the spindly appearance. It has the same Malay names as the preceding species. It is deciduous and changes its leaves after a pronounced dry spell: the crown remains bare for 1-2 weeks.

S. indicum Plate 63, Text-Fig. 88
(from India)

Mock Willow

Gurah, Guring, Gayan, Buah Saminyak (Joh.)

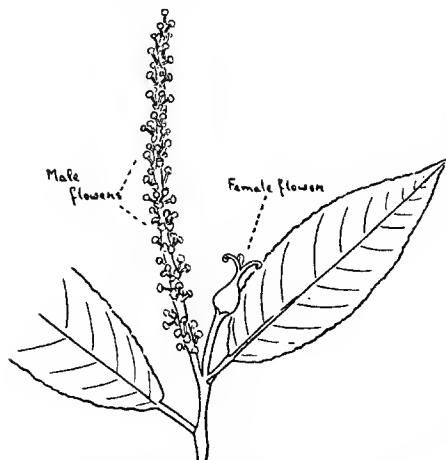
A small tree reaching 60 ft. high, generally much less, with short stocky trunk up to 2 ft. thick, not buttressed: *bark dark grey*, becoming shallowly and closely ridged and fissured: *crown bushy*, not very spreading, *with upright limbs and slender, drooping or trailing, twigs strung with hanging fruits, the sprays of old trees weeping to the ground: twigs often reddish on the upperside, rather zig-zag especially in the opening bud: twigs and leaves glabrous: young leaves in pale green sprays: old leaves yellow with reddish stalks: latex copious.*

Leaf-blade 2-5 × $\frac{1}{2}$ -1 $\frac{1}{2}$ "", narrowly elliptic or lanceolate, tapered gradually to a point, *finely toothed or notched*, the sides upcurled, *dark glossy green above*, pale or yellowish beneath, not glaucous: *stalks* $\frac{1}{4}$ - $\frac{1}{2}$ " long, short, often pink on the upperside: with a minute yellow gland at the edge of the blade on either side of the base.

Flower-spikes 2-5" long, singly from the leaf-axils or appearing terminal: *female flowers* solitary at the base of the spike, the style with 3 long arms, and the remainder of the spike set with male flowers, or the whole of the spike male.

Fruits 1-1 $\frac{1}{4}$ " wide, *rather large, round, hard green then brownish grey*, slightly rough, stalked, with 3 sepals at the base, *containing 3 seeds*, each with a light brown, woody shell, *the latex copious in unripe fruits.*

India, Malaysia: *very common by tidal creeks and rivers* and along streams in rice-fields near the sea, throughout Malaya: especially in Kedah and Perlis and on the East Coast from Pekan north.



Text-Fig. 88. Mock-Willow (*Sapium indicum*), × $\frac{1}{2}$.

The short, pink stalks of the narrow, Willow-like leaves with finely notched edges and the large round fruits hanging from the drooping sprays enable one to distinguish this tree. It has several uses and is accordingly well-known in the villages. As described by BURKILL, a green dye is obtained from it. The ripe seeds are eaten but they have a slight medicinal action, and care must be taken to avoid the latex because it is apt to blister the skin. The fruits are taken by Malay children to play marbles. The wood burns well.

Except for its dense crown, the *Gurah* is superficially very like the Indian Willow (*Salix*, p. 581) but it can always be distinguished by the latex in the twigs. It must not be confused with the *Gunchor* (*Antidesma ghæsembilla*)

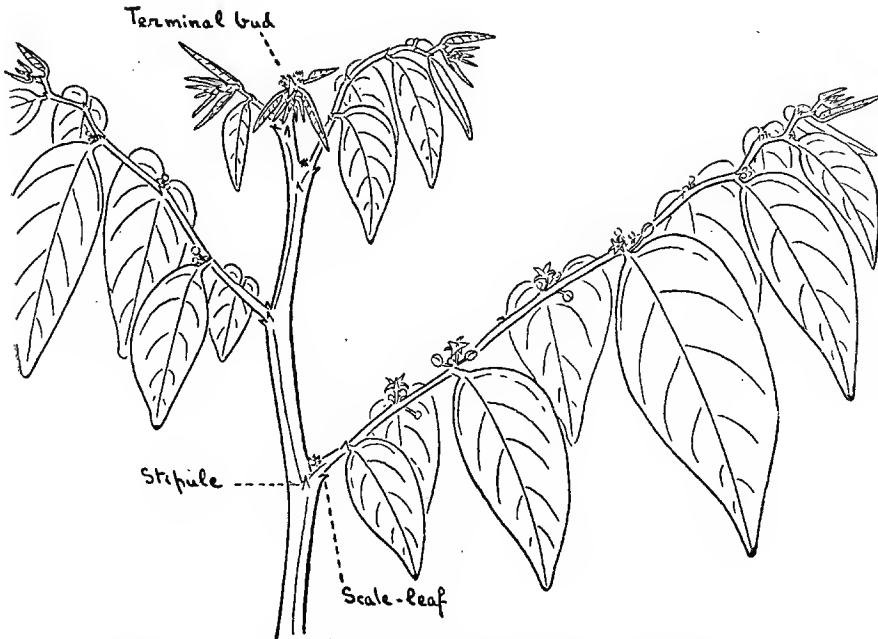
which has different leaves and fruit and no latex, though of rather similar habit, and the two commonly grow together in the villages of the north. Compare also *Buta Buta* (*Excoccaria*, p. 254) with smaller leaves withering scarlet, though also a plant of tidal creeks.

Old *Gurah*-trees with weeping limbs and gnarled bole have the picturesque charm of the willow-pattern.

BREYNIA, CICCA, EMBLICA, GLOCHIDION and PHYLLANTHUS

In these five genera we find a peculiar construction of the twigs which gives them the appearance of pinnate leaves. The construction is common enough among climbing plants but is exceptional among trees and, apart from the curious Leechwood (*Anisophyllea*), it is found in no others that are mentioned in this book: it occurs, too, in the little shrubby or herbaceous vegetable *Chekup Manis* (*Sauropus*) which is closely allied to these five genera. As it gives to the trees an unusual aspect rather difficult at first to appreciate, we must explain it in detail.

The foliage leaves in these genera are borne only on special, short, unbranched twigs. The main stem and the main branches of the tree have no large leaves, not even on their young twiggy ends, but merely what are called scale-leaves, that is to say tiny, rudimentary, pointed leaves which soon become brown and resemble bud-scales. In the axil of every one of these scale-leaves is a bud which develops into a normally leafy twigs with the foliage leaves set alternately along it. But, instead of growing on throughout the life of the tree and branching and becoming a limb as an ordinary twig may do, these special leafy twigs stop growing when they are a certain size, which varies from 6" long to 40" long according to the species of tree. And so they remain until their leaves fall, which they do in succession from the base to the apex of the twig, and at last the bare twig itself is cast. Thus, taking a small branch of such a tree, as drawn in Text-Figs. 89 and 90, we find a stem with leafy sprays arranged upon it, spirally in most cases but alternately in the Emblic (Plate 57), and the whole appears as a single twig with pinnate leaves, such as a *Rambutan*-twig (*Nephelium*) or one from the Stinking Mahogany (*Cedrela*): the leaves suggest leaflets and the twig which bears them the leaf-stalk. On careful examination we shall



Text-Fig. 89. Pin-Flower Tree (*Glochidion laevigatum*), × $\frac{1}{2}$.

see that each leafy spray has developed from the axil of a scale-leaf on the branch and that each leafy spray has not only a terminal bud but a bud in the axil of every leaf. Such a spray cannot therefore be a pinnate leaf. This is obvious, furthermore, in all kinds except the *Chermai* (*Cicca*) because the flowers and fruits are developed from the axillary buds on the leafy sprays, cf. Text-Figs. 89 and 90, and Plate 58 of *Glochidion superbum* which has large leaves. It happens, however, that most of the trees of these genera have small asymmetric leaves very like the leaflets of pinnate leaves, and thus they are easily mistaken for some kinds of pinnate-leafed tree. The Emblic resembles the *Petai* (*Parkia*), cf. Plates 57 and 107; the Pick-a-back (*Phyllanthus*) resembles a small tree of the *Sentol*-family (*Meliaceæ*) such as *Telur Belangkas* (*Aglaia*); the common *Glochidion lævigatum* resembles the *Senyamok* (*Guioa*, Plate 178). Most remarkable of all is the *Chermai* (*Cicca*), which is so like the *Bilimbing* (*Averrhoa*), that Linnæus himself described it under the name *Averrhoa acida* and did not discover his mistake for several years. Such 'catches' in identification we have mentioned under each species because it is curious to find 'mimicry' in plants, and satisfactory to be able to elucidate it.

(Botanically, leafy sprays resembling pinnate leaves are known as phyllomorphic branches, from the Greek words *phullon*—a leaf, *morphos*—form).

Key to the Genera

- Leaves very narrow, not $\frac{3}{4}$ " wide: leafy sprays alternate ... *Emblica* p. 282
 Leaves broader: leafy sprays spirally arranged or alternate
 Flower and fruit on the trunk or main branches: village treelet ... *Cicca* p. 281
 Flower and fruit on the leafy sprays ...
 Fruits like red berries set along the upperside of the twigs: female flowers solitary ... *Breynia*
 Fruits turned to the underside of the twigs
 Bushy shrubs or medium-sized trees: leaves large or very unequal-sided at the base: seeds orange to red: flowers clustered ... *Glochidion* p. 283
 Forest shrub or treelet with narrow, nearly sessile leaves not asymmetric: seeds black ... *Phyllanthus* p. 290

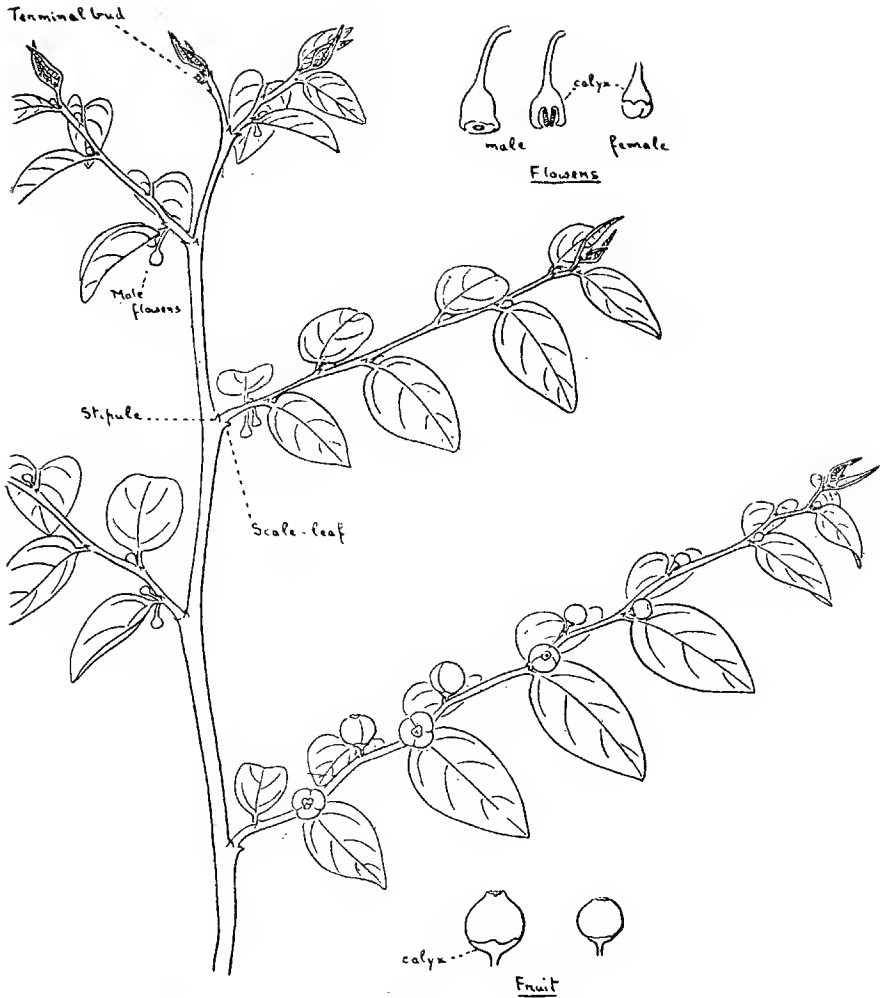
BREYNIA

Leaves alternate, simple, small, generally symmetric, shortly stalked.

Flowers minute, clustered in the leaf-axils, turned to the underside of the twigs and facing down: calyx as a small cup with 6 more or less distinct lobes: petals 0: male flowers pear-shaped or top-shaped, with 3 stamens joined together as a column inside the calyx, stalked, few, 2-3 together near the base of the leafy sprays: female flowers very shortly stalked, singly in the leaf-axils throughout the greater length of the leafy spray.

Fruit a little round red capsule, appearing like a berry, with 6 faint grooves or lines, seated on the persistent calyx, erect on a short upturned stalk, the fruits all along the upperside of the leafy sprays, eventually splitting into 3 then 6 parts: seeds 6, black or brown, flattened, more or less covered with orange mealy pulp.

20 spp. tropical Asia and Australasia: about 4 spp. in Malaya.



Text-Fig. 90. Red Rain (*Breynia coronata*), $\times \frac{1}{2}$: flowers $\times 2$: fruit, nat. size.

The species of this genus are shrubs, climbers or little trees, at first sight resembling *Glochidion*, *Phyllanthus* and *Flueggea* but readily distinguished by the characteristic disposal of the red fruits along the upperside of the twigs. From this feature is derived their Malay name *Hujan Panas*, which may be transcribed Red Rain, the fruits suggesting drops of hot rain. *Hujan Panas* is the name for some climbing plants, also with small red fruits (of the family *Connaraceæ*). The fruiting sprays of *Breynia* are most decorative but, unfortunately, when cut they wilt very quickly and do not revive in water.

At the time of pollination the female flowers are situated near the end of the twig and are turned down. After pollination and as the fruit begins to set, their stalks bend and turn the fruits to the upperside of the twig, by which time they are removed some distance from the growing point.

Compare *Flueggea* (p. 255) with white berries and foliage leaves on every stem and branch.

Key to the Species

Twigs and leaves glabrous *B. coronata*
 Twigs and undersides of the leaves hairy *B. discigera*

B. coronata Text-Fig. 90
 (Lat., crowned)

Red Rain
Hujan Panas, Sendok Dua (Kel.)

A graceful, bushy, evergreen shrub or small tree 4-20 ft. high, with slender wide-spreading branches of *small, dull, bluish green leaves*: glabrous.

Leaf-blade 1-3½ × ¾-1½", *small, thin*, ovate or elliptic, pointed, the base narrowed or round, *the underside bluish white or greenish white*: stalk 1-15" long.

Female flowers yellowish green with pinkish or purplish calyx, 1" wide: male flowers pale yellowish.

Fruits ½" wide, *white then red, rather flat-topped often with a ring round the remains of the minute style*: the persistent calyx slightly lobed, split on one side.

Malaya: common in open country, by the sea and by rivers.

Closely allied with this species is another, *B. rhamnoides*, which is a shrub or scrambling bush often forming thickets but never becoming a tree. It is common in sandy and rocky ground near the sea. From *B. coronata* it differs particularly in the fruit which is more pointed and has no ring round the top, in the persistent calyx which is minute, 1" wide, and distinctly lobed, and in the leaves which are only slightly glaucous beneath.

B. discigera
 (Lat., disc-bearing)

Red Rain
Hujan Panas

Very like the preceding but with the twigs, flowers and underside of the leaves hairy: *leaf-blade* small, ½-1½ × ¼-¾", glaucous white beneath: the persistent calyx of the fruit distinctly lobed.

Malay Peninsula, Sumatra: common with the other species.

CICCA

(Gr., kikkos—a belfry)

Leaves simple, small, alternate, very shortly stalked.

Flowers minute, shortly stalked, male and female together in little groups on short slender racemes from the thick main branches below the leafy twigs, one or two female flowers among several male: *sepals* 4: *petals* 0: *male flower* with 2-4 stamens and honey glands: *female flower* larger than the male, with a 3-4 lobed ovary and 3-4 forked styles (appearing as 6-8 in 3-4 pairs).

Fruit pulpy, with acid juicy flesh and a small stone, not splitting open.

1 sp., cultivated throughout the Eastern tropics: of doubtful origin.

C. acida Text-Fig. 91
(Lat., sour)Malay Gooseberry
Chermai, Chermela

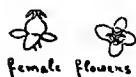
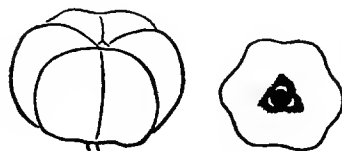
A little crooked evergreen tree, 10-25 ft. high, with a few thick wide-spreading forking branches having the slender leafy sprays, 10-20" long, clustered at their ends: crown rather broken and uneven: bark pale, rather pimply: the lower leaves on a twig much smaller and rounder than the upper ones: glabrous: young leaves pink.

Leaf-blade 1-3 × ½-1½", rather small, ovate or elliptic, tapered to the point, the base tapered, rounded or nearly heart-shaped, sometimes unequal-sided, thin, often slightly glaucous beneath, drooping: stalks ¼" long or less.

Racemes 1-3" long, unbranched, singly or several together: male flowers with red calyx, female with pale pink calyx: anthers yellow: ovary green with pale yellow styles.

Fruit ¾" wide, rounded, rather flattened, with 6-8 shoulders, the calyx sunk in a little pit at the attachment to the stalk, the style in a pit at the other end, ripening waxy greenish white to pale yellowish white: stone small: stalk ¼-2" long: hanging in little bunches from the branches.

A common village tree in Malaya, especially in the north, infrequent in the south.



Text-Fig. 91. *Cicca acida*:
flowers × 2: fruit, nat. size.

This very sour-fruited little tree bears such a close resemblance to the equally sour *Belimbing* (*Averrhoa Bilimbi*) that it is not at all easy to distinguish them from a distance, and without flowers or fruit one has often to look rather closely at the structure of the twigs to be certain. In their basal parts near the branch which bears them, the leafy sprays produce small round leaves in exactly the same way as the lower leaflets of the *Belimbing*. The branches of the *Chermai* are rather more spreading and open than those of the *Belimbing*, but the crown is more compact.

The fruits are eaten cooked, as a flavouring. The root is medicinal but is poisonous to some extent.

EMBLICA

(from the Bengal plant-name *amlaki*)

Leaves minute, very narrow, crowded, alternate, on short leafy twigs.

Flowers minute, in little axillary clusters on the underside of the leafy sprays: sepals 6: petals 0: male flowers stalked, several in a cluster, each with 6 honey-glands, and 3 anthers on the top of a little peg: female flowers sessile, singly near the ends of the twigs or with a few males beside them, the ovary with 3 styles, each with a forked stigma.

Fruit pulpy, sessile, with a 6-angled stone, not opening.

11 spp., tropical Asia and America: 1 sp. in Malaya.

E. officinalis Plate 57
(Lat., sold in a shop)Emblic, Malacca Tree
Laka, Laka Laka, Melaka, Asam Melaka

A small to medium-sized evergreen tree with graceful, light, feathery, uneven crown, up to 60 ft. high, the trunk fluted at the base: bark pale greyish brown, the old grey bark peeling in rather oblong, scroll-like patches exposing the very smooth,

pale fawn buff, new bark, the inner bark pinkish brown, green below the surface: *twigs* finely brownish hairy: *leafy twigs* reaching 6-9" long: *young leaves pink*.

Leaves $\frac{3}{4}$ -1 × .05-.2", mostly .5 × .1", *linear*, the apex pointed, the base rounded, the edge slightly incurved, *glaucous beneath, with brown tips, very shortly stalked*.

Flowers .15" wide, pale green.

Fruits $\frac{3}{4}$ -1" wide, *round, juicy, firm, smooth, ripening greenish yellow with paler stripes*, glabrous, sour, generally set singly near the end of a leafy spray, on the underside, and causing the spray to hang down.

S. E. tropical Asia: frequent in villages and in lowland forest in Malaya.

It is very easy to mistake this tree for small specimens of the *Petai* (*Parkia*, p. 414, Plate 107) unless one notices the distinctive bark, which is rather like that of the *Guava* and *Mempat* (*Cratoxylon ligustrinum*), or the fruit, or the pink growing tips to the leafy sprays which show that they are not pinnate leaves. The tiny flowers are very inconspicuous and can be found only by turning up the leafy sprays.

The cooked fruits of the Emblic, known as *Buah Melaka*, are eaten as a sour relish like those of the *Chermai* (*Cicca*). The bark is used for tanning and dyeing. The leaves, roots and raw fruits are medicinal. The timber has various uses but it is seldom obtainable in quantity because the tree is slow-growing and big specimens are now rare to come by. Trees of 60 ft. can be found in the forest and, in the remoter parts, there are occasional specimens of 100 ft.

"The name of Malacca river and town is believed to have been derived from the name of this tree. The origin of the name is sanskritic" (BURKILL).

GLOCHIDION

(Gr., glochin—a point; referring to the point-like staminal column of the male flower)

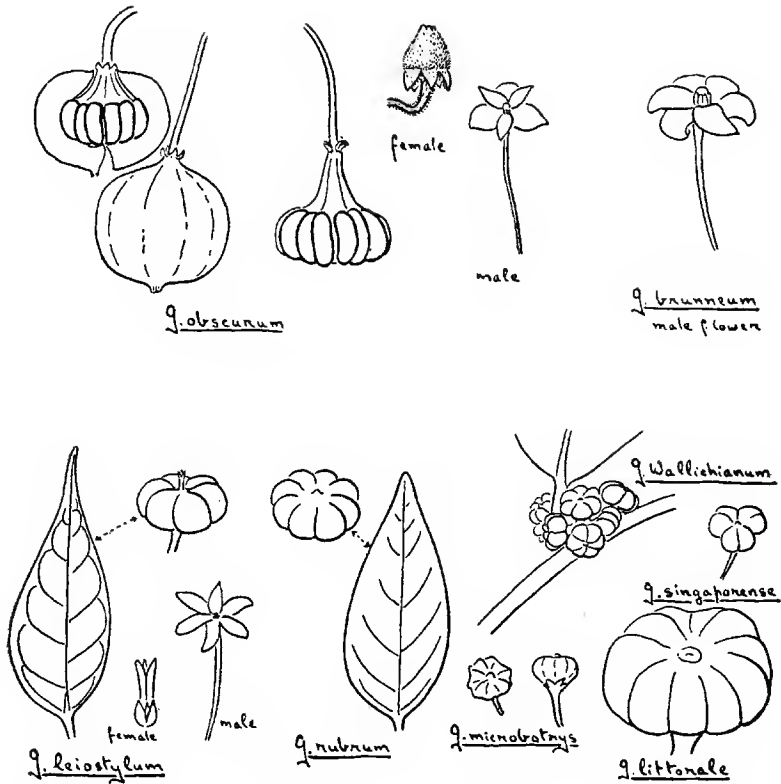
Leaves alternate, simple, entire, generally asymmetric especially at the base, very shortly stalked: the leafy sprays 1-3 ft. long.

Flowers small, male and female in small clusters in the leaf-axils, generally fragrant: sepals 6: petals 0: male flowers with a slender stalk and a little coloured, trumpet-like calyx of 3 inner and 3 outer sepals, the stamens joined to form a slender column in the centre: female flowers inconspicuous, generally sessile, with a sessile stigma or a simple peg-like style, the flower-stalks lengthening after pollination to give the stalked fruits.

Fruits as small stalked capsules, round or flattened, smooth or 3-8 angled or shouldered, splitting from base to apex into 6 or more parts (twice as many as the shoulders of the capsule), and exposing the pairs of shining red or orange seeds attached to the core (as many pairs as shoulders to the capsule).

About 250 spp., tropical Asia and Australia: about 24 spp. in Malaya, in the lowland and mountain forest.

After the Figs (*Ficus*), the *Eugenias* and the *Mahang*-trees (*Macaranga*), it seems that *Glochidion* is the next genus in order of abundance that occurs in the secondary jungle and open country. It contains several very common species and together they represent a distinct kind of little tree which we may soon learn to recognise from the drooping pointed leaves with short stalks and asymmetric blades, the alternate arrangement of the leaves on the *unbranched* leafy sprays, the tiny flower-clusters that are usually turned to the underside of the twig and the downturned capsules containing red seeds. The *Dendulang* (*G. obscurum*) of the middle and north of the country is, perhaps, the most typical representative. To Malays the different species are variously known as *Ubah*, *Bangau*, *Sebangau*, *Tebangau*, *Tebangar*, *Temangau*, *Tasek*, *Terasek*, and, in Kelantan and Trengganu, *Chukelan*: but it may be said that excepting *Dendulang*, their local names are very uncertain: *Ubah* and *Temangau* seem the more usual. Unfortunately the names *Ubah* and *Dendulang* are given also to some species of *Eugenia*.



Text-Fig. 92. *Glochidion*: leaves $\times \frac{1}{3}$: fruits, nat. size: flowers $\times 2$.

All our species are evergreen. They develop new leaves and flowers seasonally after dry weather, with the possible exception of *G. sericeum* which seems to flower throughout the year. The new leaves are more or less intensely purple or violet. The old leaves wither yellow, orange or red, the exact colour being typical of each species. The bark is generally pale or brownish grey, or yellowish, finely fissured and flaky. The lowest flower-clusters on a leafy twig are generally male, the uppermost generally female, and the intervening ones are mixed so that one can find in them the little stalked, gaily coloured male trumpets, the sessile female flowers, the stalked female flowers that are setting fruit and the old fruits of the preceding season. The male flowers of several, perhaps of all, species open about dusk and exhale a scent that, considering the size of the flower, is remarkably strong. They last only 24 hours. The female flowers last for several days. What kind of insect, presumably nocturnal, pollinates them is not known.

Despite the number of its species and the abundance of the individual trees, the genus has few uses. Some species have tan-barks. The wood of several is hard and heavy, sinking in water, but is seldom large enough to be of value. A few have found their way into native medicine.

Key to the Species

Twigs and leaves glabrous

Leaves more or less glaucous beneath, *withering scarlet* *G. lævigatum*

Leaves not glaucous beneath

Seaside or mangrove shrub or treelet: fruits $\frac{1}{2}$ - $\frac{3}{4}$ " wide, rose-pink, round, apple-like *G. littorale*

Trees: generally inland

Mountain tree with big fruits 1" or more wide: leathery leaves *Glochidion sp.*Fruits smaller, $\frac{1}{4}$ - $\frac{1}{2}$ " wide

Flower-clusters shortly stalked, at least the fruiting ones

Fruit $\frac{1}{2}$ " wide, not flattened: male flowers $\frac{3}{4}$ " wide, pink or yellow: leaves withering yellow *G. brunneum*Fruit less than $\frac{1}{4}$ " wide, flattened: male flowers 1" wide: *leaves turning red* *G. microbotrys*

Flower-clusters always sessile

Fruit $\frac{3}{4}$ " wide, sessile, 3-shouldered: male flowers green: the style of the fruit point-like, minute *G. glomerulatum*Fruit $\frac{1}{2}$ - $\frac{1}{2}$ " wide, 3-6 shouldered or hardly at all, stalkedMale flowers pink or red: fruit dark red, with a peg-like style at the top: *leaves withering red* *G. leiostylum*Male flowers yellow: fruits brownish *G. perakensense*

Hairy, at least the twigs and leaf-stalks when young

Leaves more or less glaucous beneath

Leaf-base very unequal-sided: male flowers yellow: fruit $\frac{1}{2}$ " wide, green *G. obscurum*Leaf-base nearly or quite symmetrical: male flowers cream-white: fruit $\frac{1}{2}$ " wide, woolly pink *G. sericeum*

Leaves not glaucous beneath

Leaves large, leathery, velvety, strongly ribbed, the base heart-shaped *G. superbum*

Not so: leaves thin, rather small: fruits mostly 6-8 lobed

Fruits 3-4" wide, shortly stalked, 2-4 in a cluster or solitary

Leaves hairy beneath: fruit with a peg-like style *G. coronatum*Leaves glabrous: fruit with a tiny knob-like style *G. rubrum*Fruits $\frac{1}{4}$ " wide or less, rather long-stalked, with a minute point-like styleFruits 3-shouldered, 2-5 in a cluster: leaf-blade narrowly oblong, very asymmetric, *withering scarlet*: *south Malaya* *G. singaporense*Fruits 5-6 shouldered, 4-12 in a cluster: leaf-blade rather broad, withering yellow: middle and north of Malaya *G. Wallichianum*

G. brunneum Text-Fig. 92
(Lat., brown)

Malayan Pin-Flower Tree

A small tree to 40 ft. with rather dense, round crown: *bark* pale greyish brown, shallowly fissured: young leaves pinkish fawn or purple: *old leaves withering yellow: glabrous*, except the fruits and, sometimes, the flower-buds: *young twigs red on the upperside*.

Leaf-blade 2-8 × 1½-3½", rather large, broadly elliptic, pointed, rather fleshy-leathery, shining light green: *stalks* ¼-⅓" long, red on the upperside, green when old.

Flowers honey-sweet: *male flowers* in sessile or very shortly stalked clusters, rather large, .3-.4" wide, with the three outer sepals pink, the three inner ones yellow, the buds dull crimson: *female flowers* greenish yellow, sessile or nearly so, in shortly stalked clusters, the stalks ¼-⅓" long.

Fruit .4-.5" wide, round or fig-like, not flattened, with 5-6 faint grooves, green, shortly stalked, rather silky hairy, 2-6 in a cluster, with 5-6 pairs of red seeds.

Malaya: not uncommon in secondary jungle and open country in the south.

G. coronatum
(Lat., crowned)

Penang Pin-Flower Tree

A shrub or small tree to 25 ft. high, flowering at 6 ft., with drooping branches: twigs, leaf-stalks, flowers, fruits and undersides of the leaves finely hairy: *leaves withering red*.

Leaf-blade 1½-7 × ¾-2½", generally rather small, elliptic, rather long-tipped, thin, yellowish green: *stalk* .1" long or less.

Flowers in tiny sessile clusters: male flowers .15" wide, pale greenish yellow, their stalks .2-.3" long: *female flowers* with conspicuous style.

Fruits .3-.4" wide, small, flattened, rounded, about 6-lobed, shortly stalked (stalk .1-2" long), pink then rose-red, for a long while crowned by the peg-like style (.1-2" long), 2-4 fruits in a cluster.

Malay Peninsula: common in open country from Negri Sembilan northward, especially in Penang and Kedah.

G. glomerulatum
(Lat., in little clusters)

Clustered Pin-Flower Tree

Twigs and leaves glabrous: young leaves purple: *old leaves turning yellow*.

Leaf-blade 1-4½ × ¾-1¾", pointed, thin, dark green, not glaucous beneath: *stalks* .1-1½" long.

Flowers in tiny sessile clusters: male flowers pale green.

Fruit ¼" wide or less, bluntly 3-shouldered, green, finely hairy, sessile, 6-12 in a compact cluster, the style as a minute point: seeds orange-red, 6 in a fruit.

India, Malaysia: frequent in secondary jungle in the southern half of Malaya.

Compare *G. Wallichianum* with larger leaves and stalked, 5-6 shouldered fruits: also *G. leiostylum* with pink male flowers and larger fruits with peg-like style at the top.

G. lægigatum Text-Fig. 89
(Lat., smoothed over)Blue-leaved Pin-Flower Tree
Senkam (Joh.)

A small, bushy tree to 25 ft. high, occasionally reaching 50 ft., with dense, light green crown: *bark* greyish brownish, becoming fissured, the inner bark whitish: *wholly glabrous*: young leaves purple: *old leaves* fading yellow, orange then dull scarlet.

Leaf-blade 1½-4½ × ¾-2", rather small, narrowly to broadly elliptic, thin, tipped, more or less glaucous beneath: *stalk* .1".

Flowers honey-sweet, in tiny sessile clusters: *male flowers* .15-.2" wide, pale yellowish white or cream, on stalks .15-.3" long: *female flowers* sessile, green.

Fruits ⅓" wide, rather small, flattened, rounded, with 8-12 faint grooves, not shouldered or lobed, shortly stalked, glabrous, white more or less flushed pink or red, 2-4 in a cluster or solitary, the style as a tiny knob: seeds orange.

Malay Peninsula: common in secondary jungle and open country throughout Malaya, lowland and mountain.

In some plants the leaves are distinctly glaucous beneath, in others scarcely so and such appear like *G. leiostylum* but they can be told by the colour of the male flower and of the bark and by the shape and colour of the fruit. The species is, however, easily recognised from its glabrous twigs and leaves which wither red, though it may be mistaken for the *Senyamok* (*Guioa pubescens*, Plate 178), which has pinnate leaves withering yellow.

G. leiostylum Text-Fig. 92 Red-berried Pin-Flower Tree
(Gr., leios—smooth; botan. style) Senkam, Tetimah (Joh.)

Like the preceding species, *G. laeigatum*, but:—

Bark greyish white, peeling in small thin, papery, pieces curling at the edges, the inner bark brownish or pinkish brown.

Leaf-blade 1-3 × $\frac{1}{2}$ -1 $\frac{1}{2}$ ", smaller, lanceolate-elliptic, long-tipped.

Male flowers .15" wide, pink or rose-red, on finely hairy stalks $\frac{1}{2}$ " long.

Fruits $\frac{1}{2}$ " wide, small, flattened, rounded, 5-6 lobed, dull dark red, on short finely hairy stalks $\frac{1}{4}$ " long, 2-4 in a cluster, surmounted by the peg-like style .1-2" long.

Malay Peninsula: frequent in open country and secondary jungle, generally in wet places.

G. littorale Text-Fig. 92 Monkey Apple
(Lat., of the sea-shore) Jambu Kera, Selensur (Pah.)

A sea-shore and mangrove shrub or treelet, 4-16 ft. high: glabrous: old leaves orange more or less suffused or blotched red.

Leaf-blade 1 $\frac{1}{2}$ -4 × $\frac{3}{4}$ -2", elliptic or obovate, blunt or notched at the apex, not or scarcely unequal-sided at the base, rather leathery: stalk up to $\frac{1}{2}$ " long.

Flowers in small sessile clusters, greenish: male flower $\frac{1}{4}$ " wide.

Fruits $\frac{1}{2}$ - $\frac{3}{4}$ " wide, large, round or fig-shaped, shortly stalked, white flushed rose-red, splitting into 10-14 narrow parts, 1-3 fruits in a leaf-axil.

India to the Philippines: common on all sandy and rocky coasts and at the edges of the mangrove swamps in Malaya.

The unripe fruits look like pink crab-apples. In the withering of the leaf, the species is intermediate between those with yellowing and those with reddening leaves, cf. *Glochidion* sp. p. 289.

G. microbotrys Text-Fig. 92 Lesser Pin-Flower Tree
(Gr., mikros—small, botrus—a bunch of grapes)

A small tree to 50 ft. high, wholly glabrous: leaves withering red.

leaf-blade 1 $\frac{1}{2}$ -6 × $\frac{1}{4}$ -2 $\frac{1}{2}$ ", oblong-elliptic, tipped, thin: stalk .1-2".

Flowers very small, in tiny stalked clusters: the stalks .1-4" long.

Fruits .15" wide, very small, flattened, obscurely 3-4 angled, with stalks .1-2" long, several in a cluster, the style as a minute knob.

Malaya: frequent in the south of the country, in secondary jungle.

G. obscurum Text-Fig. 92 Yellow-leafed Pin-Flower Tree
(Lat., obscure) Dendulang, Tebangau, Tasek (Kel.)

A dainty tree, 20-60 ft. tall, flowering at 8 ft., with round, rather open crown and small leaves set closely along the branches in flattened sprays generally drooping at the ends: bark greyish brown, becoming rather deeply ridged and fissured: young leaves purple brown, changing through light yellowish green to dark green: old leaves withering bright yellow then often orange, not truly red: twigs, leaf-stalks, flowers, fruits and undersides of the leaves finely hairy.

Leaf-blade 1 $\frac{1}{2}$ -3 × $\frac{3}{4}$ -1 $\frac{1}{4}$ ", small, oblong, shortly tipped or simply pointed, very unequal-sided at the base, rather glaucous beneath: stalk .1" long, very short.

Flowers fragrant of citron, in small sessile clusters: male flower $\frac{1}{4}$ " wide, with a stalk $\frac{1}{4}$ - $\frac{1}{2}$ " long, light yellow: female flower very shortly stalked or sessile, green.

EUPHORBIACEÆ

Fruit $\frac{1}{2}$ " wide, *round or fig-shaped*, not lobed or shouldered, *green, hairy, on a rather long stalk* ($\frac{1}{2}$ -1" long), *hanging down singly from the leaf-axils*, splitting into 8-12 parts.

China to Java: common in open country in Malaya, especially from Seremban northward to Penang: very abundant on Penang Hill and in the deserted mining areas of Kinta.

This pretty tree is one of the easiest to recognise in the whole country if we note its hairy twigs with remarkably unequal-sided, rather small, alternate, drooping, shortly stalked leaves, rather glaucous beneath and withering bright orange, its tiny yellow flowers and the rather large, stalked, solitary fruits hanging along the undersides of the twigs. The seeds are brilliant red.

G. perakense (from Perak)

Perak Pin-Flower Tree

Very like *G. brunneum* in general appearance but:—

Twigs and leaf-stalks not red.

Leaf-blade $2-5\frac{1}{2} \times \frac{1}{2}-2$ ", smaller, thinly leathery, generally narrowly elliptic or lanceolate, often appearing curved, shining dark green.

Flowers smaller, *always in sessile clusters: male flowers* $\frac{1}{4}$ " wide, *wholly light yellow*, the flower-buds green.

Fruit $\frac{1}{2}-\frac{3}{4}$ " wide, distinctly flattened, obscurely 5-lobed or not at all.

Malaya: occasional in open country, commoner in the northern parts, especially round Kuala Kangsar.

G. rubrum Text-Fig. 92 (Lat., red)

Pink-berried Pin-Flower Tree

Like *G. coronatum* but:—

Leaf-blade smaller, $1-3\frac{1}{2} \times \frac{1}{2}-1\frac{1}{2}$ ", *not hairy beneath*, the point rather blunt, *withering yellow*.

Male flowers greenish white to greenish yellow.

Fruits *pink, on very short stalks*, $\cdot 1$ " long, *the style as a tiny knob*.

Malaya, Sumatra, Java: frequent in open country, especially in the north.

G. sericeum (Lat., silky)

Woolly Pin-Flower Tree

A shrub or small tree to 30 ft. high, with straggling limbs and open crown: *old leaves withering yellow: all parts downy or silky hairy*.

Leaf-blade $1-4 \times \frac{1}{2}-2$ ", generally rather small, oblong, blunt or pointed, the base rounded or even heart-shaped, not or scarcely asymmetric, thin, dark green above, very blue glaucous beneath: stalk $\cdot 1$ " long.

Flowers in tiny sessile clusters: *male flowers* $\cdot 15$ " wide, on stalks $\cdot 15-2$ " long, *cream-white*: female flowers with 3 separate styles.

Fruits $\frac{1}{2}$ " wide, *small, flattened, round, woolly, 3-lobed*, shortly stalked, *pink or red*, splitting into 3 parts, *several in a cluster*: seeds 6, in 3 pairs.

Malay Peninsula, Borneo, Java: very common in open country, and secondary jungle and at the edge of the forest in Malaya.

The small clusters of woolly, 3-lobed, pink fruits in the axils of leaves with bluish white, hairy undersides distinguish this little tree from all others in Malaya.

G. singaporensis Text-Fig. 92 (from Singapore)

Singapore Pin-Flower Tree

Twigs and undersides of the leaves distinctly hairy: young leaves deep purple: *old leaves withering scarlet*.

Leaf-blade $3-7 \times 1-2$ ", *narrowly oblong*, pointed, *very asymmetric*, rather strongly ribbed by the veins: stalk $\cdot 1-2$ " long.

Male flowers pale yellow: female flowers greenish.

Fruits $\frac{1}{2}$ " wide, bluntly 3-shouldered, rather flattened, sessile, pink then purple, with slender stalks $\frac{1}{4}$ - $\frac{1}{3}$ " long, 2-6 fruits in a cluster, the style point-like: seeds 6, pale orange.

Malaya: occasional from Selangor southward.

G. superbum Plate 58

Great-leafed Pin-Flower Tree
Tebangau Gajah

A sparingly branched tree to 60 ft. high, flowering at 10 ft., with short limbs and narrow open crown: twigs, leaf-stalks, flowers, fruits and undersides of the leaves hairy or velvety: young leaves deep violet, then pink: old leaves withering scarlet: twigs yellow-green velvety.

Leaf-blade $3-11 \times 1\frac{1}{2}-5$ ", large, oblong or ovate, tipped or simply pointed, the base heart-shaped and rounded, rather stiffly leathery, dark green on the upper side with the veins as furrows, yellowish green velvety on the underside with the yellowish veins as a very intricate raised net-work: stalk $.1-.2$ " long, short.

Flowers fragrant like crushed banana-leaves, in shortly stalked clusters $1-2$ " wide, the stalks $\frac{1}{4}-\frac{1}{2}$ " long, often turned to the undersides of the twigs: male flowers $.1-.15$ " wide, on stalks $\frac{1}{2}-\frac{3}{4}$ " long, pale yellowish: female flowers sessile or shortly stalked.

Fruits $\frac{1}{4}-\frac{1}{2}$ " wide, flattened, somewhat 3-lobed, pink then rose-red, looking like flower-buds, on stalks $\frac{1}{4}-\frac{1}{2}$ " long, many in a cluster.

Malaya and Sumatra to the Philippines: common in open country and secondary jungle throughout Malaya.

This species has much bigger leaves than any other in Malaya. There is no other plant with which it can be mistaken. Male and female flowers and fruits often occur together in the same cluster, and the full fruiting clusters look like pink rosettes.

G. Wallichianum Text-Fig. 92

Wallich's Pin-Flower Tree
Tebangau Kelasur

(N. Wallich, 1786-1854, the Danish botanist at Calcutta)

A shrub or small tree to 40 ft. high, very like *G. coronatum* but:—

Leaf-blade generally rather large, oblong, withering yellow or slightly reddish: stalk $.1-.2$ " long.

Female flowers with minute inconspicuous style.

Fruits $\frac{1}{4}$ " wide, much smaller, 5-6 lobed, with distinct stalks $\frac{1}{4}-\frac{1}{3}$ " long, 4-12 in a cluster, the style as a tiny knob.

Malaya: fairly common in open country from Malacca northward.

Glochidion sp. (unidentified)

Mountain Monkey Apple

A small to lofty tree of mountain forests, up to 70 ft. high: twigs and leaves glabrous: old leaves withering dull yellow, spotted or slightly suffused red.

Leaf-blade $2-6 \times 1\frac{1}{2}-3$ ", rather large and leathery, pointed, shiny, with upcurled sides: stalks $\frac{1}{4}-\frac{1}{3}$ " long.

Flowers?

Fruits $1-1\frac{1}{2}$ " wide, large, round, faintly ribbed or shouldered, with sunken apex, pale apple green becoming suffused pink or red, solitary, shortly stalked, splitting into 7-10 parts.

Malaya: in the mountain forests of the main range, frequent at Fraser's Hill.

The large fruits, like pink crab-apples, distinguish this species. They are like those of *Glochidion littorale* of the sea-shores but they do not split into so many parts. In the withering of its leaves the species is intermediate between those with yellowing and those with reddening leaves.

PHYLLANTHUS

(Gr., phullon—a leaf, anthos—a flower)

Leaves alternate, simple, symmetrical, small, very shortly stalked, withering yellow.

Flowers minute, in little clusters turned to the underside of the leafy twigs: sepals 6: petals 0: male flowers with 3 stamens more or less joined together: female flowers with 3 forked styles.

Fruit a little 3-lobed capsule, turned to the underside of the twig.
450 spp., throughout the tropics: 18 spp. in Malaya.

The Malayan species of this genus are herbs and shrubs except for the one species, *P. frondosus*, which grows into a small tree. The rows of little *down-turned* fruits along the undersides of the leafy twigs, which look like pinnate leaves, are most characteristic, and this feature readily distinguishes the genus from *Breynia* (p. 279). The Malay name for the herbaceous kinds, *Dokong Anak*, is derived from this feature which suggests the carrying of a child pick-a-back.

P. frondosus

Pick-a-back Tree

(Lat., leafy)

An evergreen shrub or much branched, crooked, little tree, 5-15 ft. high: *leafy twigs* 6-15" long, rather upright, glabrous.

Leaf-blade 1-4 × ½-1", narrowly elliptic, tapered to the point, *the base narrowed, rounded or nearly heart-shaped, small, not glaucous beneath: stalk* .05" long, *very short.*

Flowers .1" wide, pale green.

Fruits ½" wide, green: *seeds* 3-6, black, ¼" long, *rather kidney-shaped, without pulp.*

Siam, Malay Peninsula: common in lowland and mountain forest, occasional in open country, throughout Malaya.

The Leechwood (*Anisophyllea*, Plate 15) must not be confused with this plant, for they often grow together. The Leechwood has red, oblong berries, unequal-sided leaves and drooping twigs. At first sight the Pick-a-back Tree may be mistaken for a sapling of a tree belonging to the Sentol-family (*Meliaceæ*), such as *Aglaiia*, because its leafy twigs closely resemble pinnate leaves.

OAK FAMILY

Fagaceæ

(Fagus—the Beech tree)

Twigs with 2-several stout buds at the ends.

Leaves alternate or spirally arranged, simple: *the blade* generally elliptic, often silvery beneath, more or less tipped, generally tapered to the base, the edge entire or, in a few cases, toothed: *stalk* short: *stipules* small, soon falling off.

Flowers very minute, sessile, unisexual, arranged in spikes or catkins, the male and female catkins on the same tree: *male flowers* with 6 (4-7) sepals and 12 (or 6) stamens, very crowded on the spikes: *female flowers* with an ovary surrounded with minute scales or 2-4 female flowers together in a ring of scales, rather spaced along the spikes: petals none.

Fruit a nut containing a large seed: *the nut* seated singly on a cup or 1-4 nuts entirely covered by the cup: *the cup* made from the enlarged scales surrounding the ovary, and smooth, scaly or spiny.

.5 genera, about 400 spp., temperate and tropical regions, but absent from tropical and South Africa: 2 genera and some 60 spp. in Malaya.

This is a family the botanical affinity of which is most uncertain on account of the extreme simplification of the flower and the elaboration of the fruit. But it embraces many well-known kinds of tree, such as the Beeches of Europe, Temperate Asia and N. America (*Fagus*), the Southern Beeches of Australia, New Zealand and S. America (*Notofagus*), the Oaks (*Quercus*), and the true Chestnuts (*Castanea* and *Castanopsis*). The Horse-Chestnuts (*Aesculus*) belong to the *Rambutan*-family (*Sapindaceæ*) and bear only a superficial resemblance, in their spiny fruits and large brown seeds, to the true Chestnuts. The Oak-family seems to be related to the Birches (*Betulaceæ*) and Hornbeams (*Corylaceæ*), perhaps also to the Willows and Poplars (*Salicaceæ*), but the resemblance may be superficial and derived from the reduction of their inflorescences to catkins and their fruits to one-seeded nuts.

The Malayan species of the family are placed in two genera, *Quercus* and *Castanopsis*, the distinction between which is so ill-defined that they should be united. Nevertheless, there is a tendency among botanists nowadays to divide even *Quercus* into genera, though the limitation of such categories is not only unsatisfactory but artificial and involves the separation of species that are closely allied. We have followed therefore the classification used by BURKILL and FOXWORTHY, as being the most expedient in our present ignorance.

Key to the Genera

- | | |
|--|-----------------------|
| Nut (acorn) seated singly on or in a smooth or scaly cup : | |
| or the cup set with a few tufts of spines ... | <i>Quercus</i> p. 293 |
| Nuts enclosed 2-4 together in a knobby or warted cup : | |
| or the cup thickly spiny all over and enclosing 1-3 | |
| nuts | <i>Castanopsis</i> |

MALAYAN CHESTNUTS

CASTANOPSIS

(like *Castanea*—the Spanish Chestnut)

About 40 spp., tropical and subtropical Asia, one species in California: 15 spp. in Malaya, in lowland and mountain forest.

The Malayan Chestnuts differ from the Spanish, Japanese and American Chestnuts (*Castanea*) in details of the female flower. They are so nearly related to the Malayan Oaks that it is impossible to find any character by which they can be absolutely distinguished and, in keeping them apart in two genera, we merely follow custom: without fruits it may be impossible to determine to which genus a tree belongs. Our remarks on the habit, bark, growth, flowering and fruiting of the Oaks apply equally to the Chestnuts, but the Chestnuts are neither so abundant nor so varied. Their nuts are always hidden by the 'cup', which corresponds exactly with that of the Oaks, though it is not cup-shaped. It is generally very thorny like that of the Spanish Chestnut, and contains in some cases several nuts. It is probable that the Oaks have been derived from the Chestnuts by the limitation of the number of nuts to one in each cup and by the reduction in size of the cup until the typical acorn has been reached. The English Oak, with short catkins and few simple acorns, thus appears one of the mostly highly evolved members of the family. In any case, the Spiny Oak (*Q. discocarpha*) and the *Rambutan*-Oak (*Q. laffacea*) are species that connect the two genera.

Some of the Malayan Chestnuts are edible. The Lesser Chestnut (*C. Wallichii*) is said to be as good as the Spanish Chestnut. Other species are poisonous and, as we are not yet certain of the properties of all, it is unwise to eat them without the assurance of a knowledgeable Malay.

Local names for Chestnuts are *Berangan* and *Berangan Duri*, if the fruit is spiny. *Kertak Tangga* and *Sertak Tangga* are used for species with purgative fruits: they refer to the creaking steps of the house-ladder, when one has been so unfortunate as to have eaten such.

Key to the Species

- Fruits set with warts arranged in bands or clusters, and containing 1-3 nuts: leaves silvery beneath
 - Fruits round, densely thorny, usually containing 1 nut: leaves brownish and thinly felted or downy beneath
 - Fruit 2-3" wide across the spines: spines very sharp, branched at the base and tufted
 - Leaf-blade 5-12" long: seeds 1½" wide or more
 - Leaf-blade 2-5" long: seeds ½-¾" wide ...
 - Fruit 1-1¾" wide across the spines
 - Fruits wholly covered with unbranched, rather flattened spines ¼-⅓" long: fruit-spikes 1-4" long
 - Spines set in tufts on the cup ½-¾" wide: fruit-spikes 4-7" long
- C. inermis*

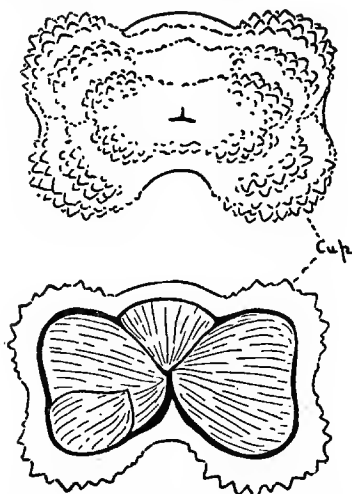
C. megacarpa
C. malaccensis

C. Wallichii

Quercus discocarpa

C. inermis Plate 219, Text-Fig. 93
(Lat., inermis—unarmed)

Braided Chestnut,
Berangan



Text-Fig. 93: *Castanopsis inermis*: fruit (one in section), nat. size.

Leaf-blade 3-8 × 1-3", silvery beneath, the stalk ¼-¾" long: fruit-spikes 4-8" long, densely set with the lumpy fruits: fruits ¾-1½" wide, irregularly rounded, 2-4 shouldered, often distorted by mutual pressure on the spike, bearing 3-5 irregular transverse or crescentic bands of short, crowded, pointed warts separated by smooth intervals, and appearing as if embroidered: nuts 1-3 (rarely 4) in each fruit, silky.

Sumatra, Malaya; rather common in the lowland forest or secondary jungle, also in rice-fields in the north of the country.

The curiously shaped, knobby fruits are not uncommonly found on the floor of the jungle. The seeds are edible. It is said that the tree is cultivated in the north of Malaya. The species is illustrated by FOXWORTHY under the name *C. sumatrana* (7, p. 52). The flowers smell strongly of rancid fat like those of the wild cinnamon: they exude honey and attract many insects.

C. malaccensis

Lesser Malayan Chestnut

Very like *C. megacarpa*, but with smaller leaves, 2-5 × 1-2", rather smaller fruits each containing 1-3 smaller oblong seeds, the fruit splitting into 3 parts and the seeds falling out.

Malaya: rather scattered in lowland forest, several trees in the Reservoir Jungle at Singapore.

The nuts are edible in small quantities, but too many may cause ill-effects.

C. megacarpa Text-Fig. 94

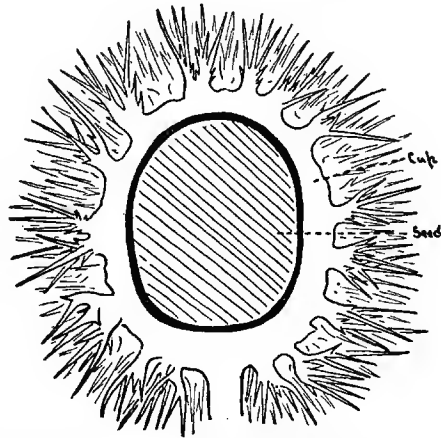
Greater Malayan Chestnut

(G., megas—great, carpos—fruit)

Twigs finely velvety: leaf-blade up to 12 × 4½", rather large, coppery brown beneath with fine down, the stalk ½-1¼" long: fruits singly on the stalks, round, densely set with sharp thorns: nut 1, large, closely adhering to the spiny cup.

Malaya: not infrequent in lowland forest.

The fruits of this species are like big, round, horrid Spanish Chestnuts, but they contain only one nut. Whether this is edible is uncertain because reports are conflicting. Certainly in Johore, where it is called *Sertak Tangga*, it is reputed to be poisonous. The species is illustrated by FOX-WORTHY (7, p. 52).



Text-Fig. 94. *Castanopsis megacarpa*: fruit in section, × ½.

C. Wallichii

Wallich's Chestnut

(N. Wallich, 1786-1854, the Danish botanist at Calcutta)

Leaves alternate; leaf-blade characteristically undulate, 2-5 × 1-2", rather small, brownish and downy beneath, silvery and brownish hairy when fresh, the stalk ¼-½" long: fruit-spikes 1-4" long, with 1-4 fruits: fruits 1-1¼" wide containing 1 silky nut.

Malaya: frequent throughout the country, but rarely fruiting.

The nuts are as good to eat as those of the Spanish Chestnut. Care must be taken not to confuse the species with the Spiny Oak (*Q. discocarpa*) which has the spines arranged in small tufts on the cup, the tufts being separated by smooth areas, and which also has longer fruiting spikes: but the two are very closely related.

OAK-TREES

QUERCUS

(Lat., the Oak)

About 400 spp., Europe, Asia, New Guinea, N. America and the equatorial part of S. America: more than 40 spp. in Malaya, in lowland and mountain forest.

That Oak-trees occur in Malaya often comes as a surprise because our ideas on the nature and distribution of plants are sadly distorted through ignorance of tropical botany. In speaking of Oaks, we think of trees that have wavy edges to the leaf, like the English and some North American species, and we overlook the acorns which are their distinguishing feature. The wavy edge is an exception,

not the rule, because most species have, like the Qork and Holm Oaks of the Mediterranean, leaves with entire edges, and even the toothed edge of the Turkey Oak is uncommon. In fact, just as the English Holly, the Ivy, the Bedstraw and the Horse-Chestnuts are aberrant, northerly outliers of large tropical families, so the English Oak is an aberrant member of a family the headquarters of which appear to be in Asia. It seems, even, that Oaks have had their origin in the Indo-Malayan rain-forest, where they abound in greatest variety, and that they have spread thence through temperate Asia to Europe and N. America. Deserts, it would seem, they have been unable to cross and thus they have not penetrated Peninsular India and Ceylon, Africa south of the Sahara or Australia.

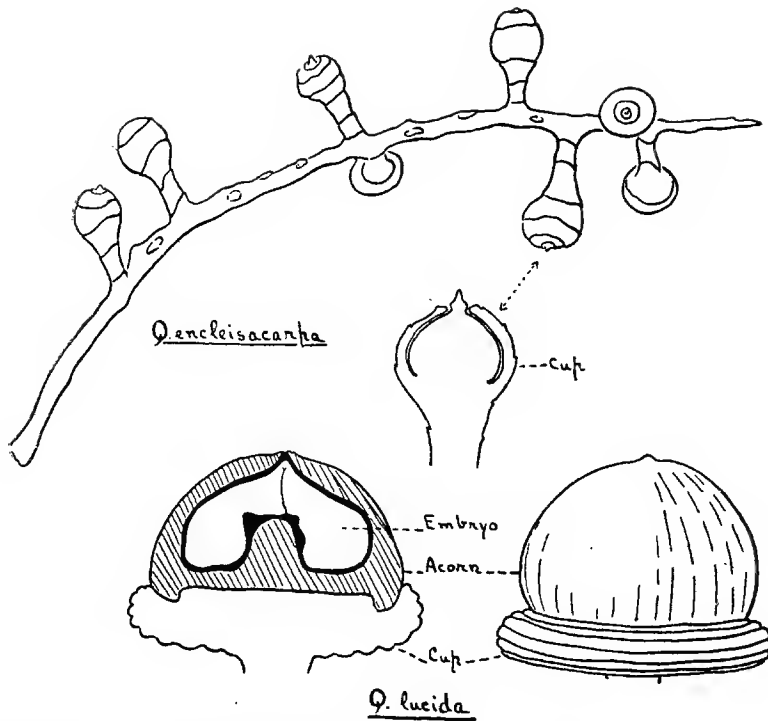
In contrast to the English Oak, which is a deciduous tree with rugged brown bark, wavy-edged leaves, drooping male catkins and only one or two acorns on each fruiting spike, the Malayan Oaks are evergreen and generally have smooth or pimply, pale grey bark, entire leaves that are often silvery beneath, stiff upright male catkins that have more the appearance of spikes, and many acorns on each fruiting spike. Only a few, uncommon, Malayan species have brown or somewhat rugged bark, toothed leaves and drooping catkins. The appearance of the twig of a typical Malayan Oak is shown in our Plate 49 and in FOXWORTHY'S illustrations (7, p. 52)

In size, our Oaks are never very large, seldom exceeding 120 feet, generally much less, and in shape they have dense, bushy, dark green or grey-green crowns over which a pale shimmer may pass as the wind blows, should they have silvery backs to their leaves. Some species have short, sharp buttresses but most have none at all. A smooth greyish white trunk without buttresses and a heavy, rounded crown of medium height is typical of most of our species.

The bark is thick and breaks from the wood without stripping: the leaf-scars are generally visible, even on old trunks. The inner bark is pale pink to deep reddish brown and astringent from the abundance of tannin that it contains. The wood varies from white to reddish brown and is characterized by big rays which appear often as slits in the wood when one cuts the trunk with a parang or where the bark is broken off. Such peculiarities enable one to recognize Oaks and Chestnuts among forest without examining the leaves.

When in flower, the crowns of our Oaks become white or yellowish with the copious spikes that project from the ends of the twigs, (Plate 219). They then resemble the Spanish Chestnut (*Castanea sativa*), than which, on visiting Europe, no flowering tree strikes us as more tropical when we have become familiar with the Malayan Oaks. The male and female flowers are on different spikes on the same twig, or the female spikes have also some male flowers at the end: the male spikes far outnumber the female. The male flowers have a strong sweet scent, like Willow-flowers, but no honey: yet they attract large numbers of small bees, hoverflies and beetles so that trees in blossom hum with innumerable insects. The female flowers have no scent, nevertheless we cannot doubt that they are pollinated by the insects which settle indiscriminately on male and female spikes and buzzing round, seemingly in vexation at finding no food, carry the pollen from the one to the other. Our Malayan Oaks thus make a great contrast to the deciduous, temperate species, which are pollinated by wind, for the pollen is blown out of their catkins when they dangle from the twigs in the spring before the new leaves are fully developed. But in countries where insects abound at all times, wind-pollination is a rare phenomenon.

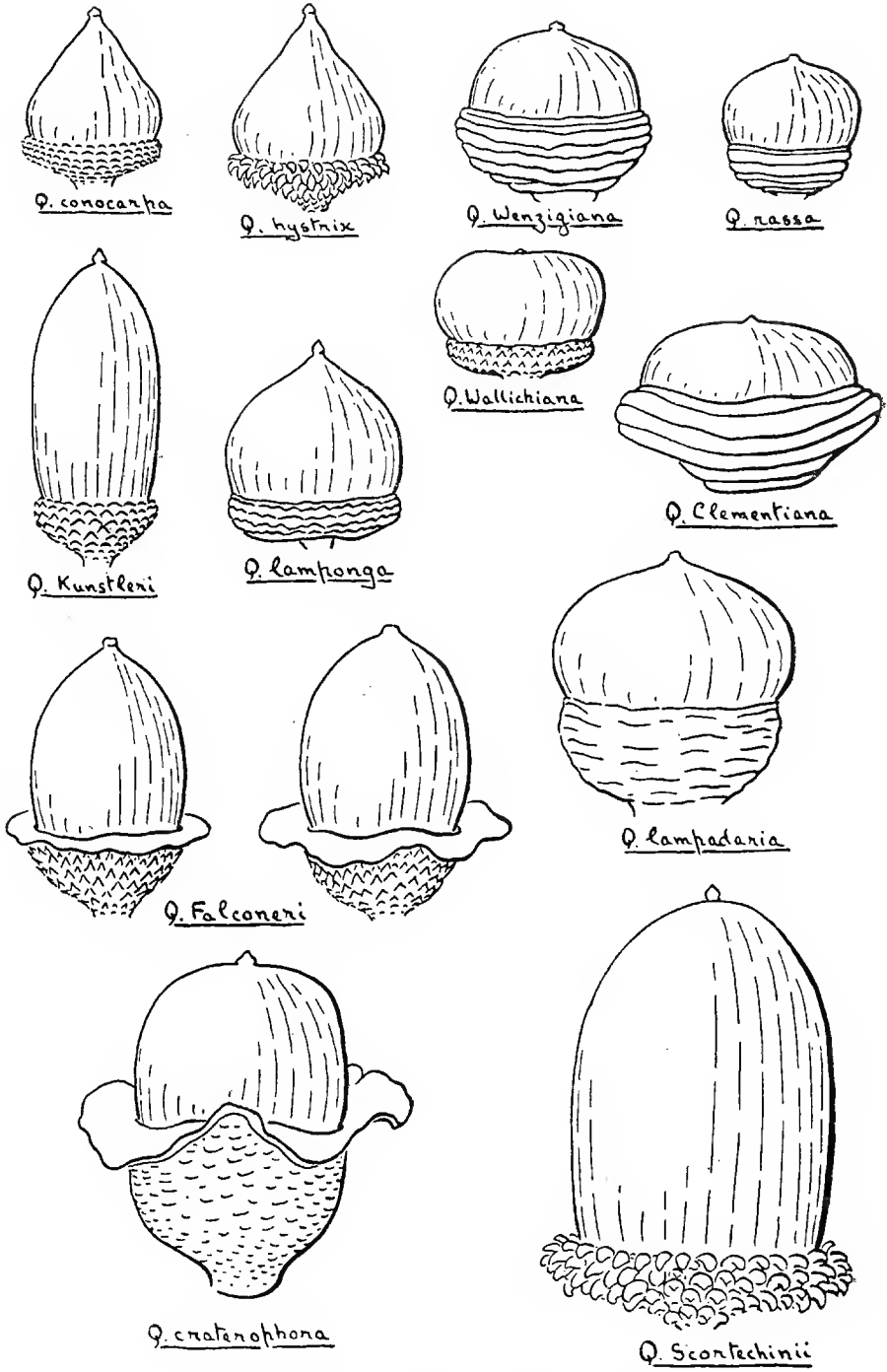
The fruit of an Oak consists of a pointed nut, or acorn, which has a more or less woody wall surrounding the seed, and a cup on which the acorn is seated (Text-Fig. 95). The nut is derived from the ovary of the female flower



Text-Fig. 95. *Quercus enclisacarpha*, young fruit-spike $\times \frac{1}{2}$, young fruit in section $\times 1\frac{1}{2}$: *Quercus lucida*, nat. size.

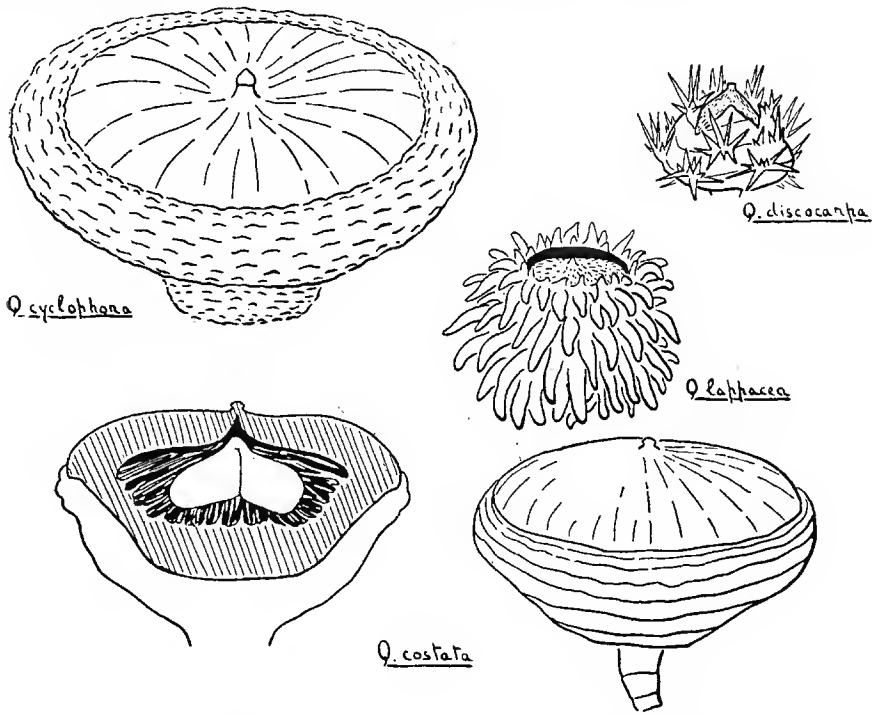
and the cup from the cluster of tiny scales or bracts around the ovary. Thus the female flower-spike ripens into a fruit-spike along which the fruits are disposed, every fruit representing one flower. While the acorns are young, they are covered up to the point by the developing cup which enlarges after pollination more rapidly than the acorn: then, as the acorn swells, it presses out the cup and projects from it. In some of our Oaks, as the Common Oak (*Q. lamponga*), the cup covers only the base of the mature acorn; in others, it embraces one third to one half of the acorn; and in yet others, as the Covered Oak (*Q. enclisacarpha*), the cup develops enormously and the acorn never manages to grow out of it so that the mature fruit is a round, conical or top-shaped lump, marked with rings or scales, and representing the cup in which the acorn is hidden. To see the acorn in such a case it is necessary to break off the cup: and, if it is difficult at first sight to interpret this kind of fruit, still more is it to recognise that in which the acorn has fused with the cup except at the top which is concealed by the overlapping edge of the cup. Of this last we have only a few kinds, but two of them, *Q. Maingayi* and *Q. Burkillii*, are rather common in the mountains: and their fruits are to be reckoned among the wonders of Botany.

It is from the ripe, fallen acorns that we identify Oaks, for the leaves and flowers of our species are mostly very similar. Squirrels and monkeys eat the acorns and, in doing so, break off the fruit-spikes so that we can generally find whole spikes as well as detached fruits lying on the ground. It is fascinating to make a collection of acorns with their cups, for they keep well when dried and do not lose their shape: the more fanciful occur in the mountains and are commonly to be gathered on the paths at Fraser's Hill and Cameron Highlands.



Text-Fig. 96. Acorns of *Quercus*, nat. size.

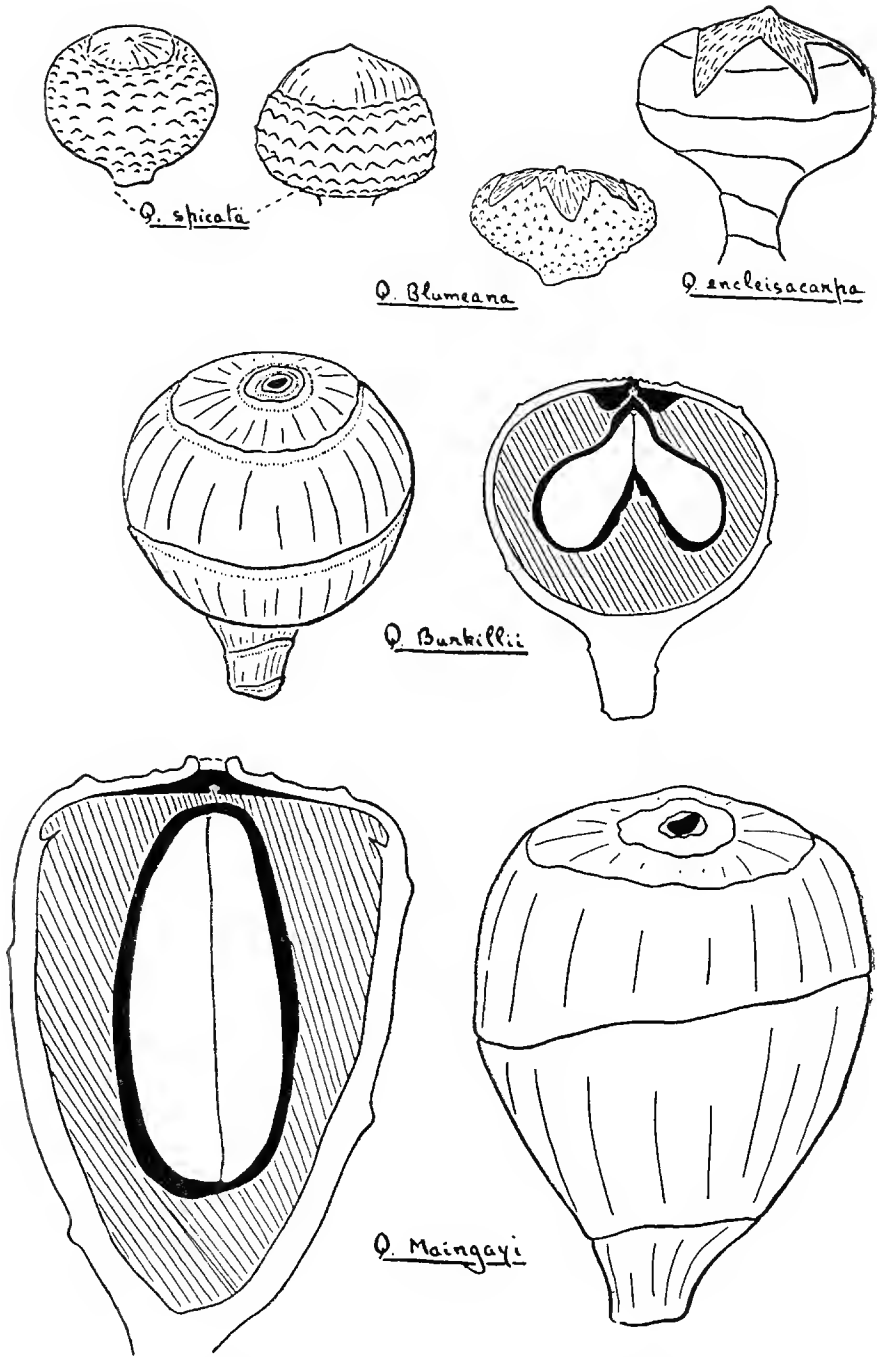
Squirrels are very destructive of some kinds, especially those acorns with woody walls because they gnaw through them and extract the kernel; thus they may interfere seriously with the natural regeneration of the Oaks.



Text-Fig. 97. Acorns of *Quercus*, nat. size.

If our Oaks are evergreen, they are certainly seasonal in growth and they appear to have a rhythmic development of flowers and new leaves. In some kinds, as the Singapore Oak (*Q. conocarpa*), the terminal buds on the twigs will develop new twigs set with flowering spikes and only reduced leaves, or none at all: when the flowering is over, the terminal buds resume their activity and develop a leafy twig without flowers: on the next occasion, they produce flowers to be followed again by leaves, and so on. Thus we find the flower-spikes at the ends of the twigs and the fruit-spikes on the leafy twigs, often behind the leaves. Whether an alternation of flowering and leafing occurs in all our species is not known, but it is easy to see how such a habit can be converted into the procedure of the temperate, deciduous Oaks in which the catkins are developed in spring on the bare twigs before the leaves. The stimulus to flowering and leafing appears to be the incidence of spells of dry weather, but we have no accurate observations on any of our species.

Malayan Oaks are forest-trees. A few, like the Kedah Oak (*Q. Falconeri*) and the Common Oak (*Q. lamponga*), are conspicuous in *belukar*, but none has been brought into cultivation, which is to be regretted, for many are fine trees and we shall do well to study them. There are many species in the lowland forest and perhaps as many in the mountains; but our knowledge of the mountain kinds is meagre and there are probably several new ones to be discovered. In lowland forest, the Oaks seldom partake in the canopy though common enough



Text-Fig. 98. Covered acorns of *Quercus*, nat. size.

as big trees in the lower storeys. In the mountains, above 4,000 feet, the Oaks and the Laurels become more evident and occupy a large part of the canopy, so that this mountain-forest is sometimes called the Oak-Laurel forest; but, as we have mentioned under the Laurels, it is likely that this predominance of Oaks is due not to a special exuberance on their part so much as to the disappearance of other kinds of lowland tree, principally the Dipterocarps, the lofty Leguminosæ and those of the families Anacardiaceæ and Burseraceæ.

Of Malay names for Oaks, those most commonly heard are *Berangan Babi*, meaning the Pig's Chestnut as *Berangan* is the name for *Castanopsis*, and *Mempening* or the "Spinner" from the way in which the acorns can be spun as tops by a dexterous twirl between the fingers. *Kertak Tangga*, *Berih* and *Bereh* are less common names.

Of the uses of Oaks there is a full account in BURKILL'S Dictionary.

It is just possible that the fruits of some members of the Ebony- and Laurel-families may be mistaken for those of oaks. Ebony-fruits (*Diospyros*) contain more than one seed, are often pulpy and are seated on a 3-5 lobed, or star-shaped, calyx. Some of the Laurel-fruits (*Lauraceæ*) are seated on a cup like that of an acorn, but both the cup and the fruit-wall are fleshy, or pulpy, never leathery or woody as in acorns.

Key to the Species

Mature acorns more or less completely covered by the cup	...	Group A
Mature acorns projecting from the cup, or with an open flat top		
Acorns much broader than long, flattened, not or scarcely projecting beyond the cup	... ..	Group B
Acorns oblong or conical, projecting well beyond the cup		
Cups set with spreading scales or distinct scale-points: without distinct rings or the rings concealed by the scales or very vague	... ..	Group C
Cups marked with distinct rings or circular lines: without scales or with minute scale-points not concealing the rings	... ..	Group D

GROUP A

Cup strongly knobbed, scaly or spiky		
Cup knobbed or set with <i>Rambutan</i> -like scales or hairs	... ..	<i>Q. lappacea</i>
Cup spiky	... ..	<i>Q. discocarpa</i>
Cup smooth, generally marked with distant rings, or with tiny scale-points		
Cup thin, generally splitting radially and exposing the pointed top of the acorn: acorns silky, many in a spike		
Cup marked with tiny scale-points pressed to the surface: mountains	... ..	<i>Q. Blumeana</i>
Cup marked with distant rings	... ..	<i>Q. enclisacarpa</i>
Cup completely covering the acorn, attached to it firmly all round except at the extreme top, large: acorn very hard, massive: mountains		
Cup (without stalk) pear-shaped, 1½-2½" long, dark, finely velvety: acorn flat-topped	... ..	<i>Q. Maingayi</i>
Cup (without stalk) round ¾-1½" long, pale grey, glabrous	... ..	<i>Q. Burkilli</i>

GROUP B

- Acorn glabrous, woody, pale brown, with a slightly
 .. convex surface: cup top-shaped *Q. costata*
- Acorn distinctly, but finely silky
- Cup very large, $1\frac{1}{2}$ - $2\frac{1}{2}$ " wide: acorn with the point
 in a shallow depression *Q. cyclophora*
- Cup about 1" wide: acorn pointed *Q. clementiana*

GROUP C

- Cup 1-2" wide, deep, with more or less recurved wavy
 edge, indistinctly scaly or not at all, or with vague
 rings *Q. craterophora*
- Cup smaller, up to $1\frac{1}{4}$ " wide
- Cup with spreading scales or, at least, with the tips of
 the scales curved out
- Mature acorns silky: cup with conspicuous
 Rambutan-like scales *Q. lappacea*
- Mature acorns glabrous
- Acorn longer than broad, very thick-walled,
 woody, $1-1\frac{1}{2}$ " high: mountains *Q. Scortechinii*
- Acorn almost or quite as broad as long *Q. hystrix*
- Cup with small scale-tips pressed to the cup and
 not spreading
- Mature acorns silky-hairy
- Acorns crowded in spikes 4-7" long, often
 shouldered *Q. Wallichiana*
- Acorns not crowded: fruiting spikes 3-5" long *Q. lamponga*
- Mature acorns glabrous (often silky when young)
- Acorns cylindric, much longer than broad
- Acorns very pointed, rather slender: cup
 $\frac{1}{2}$ - $\frac{3}{4}$ " wide *Q. Kunstleri*
- Acorns rather blunt: cup $\frac{3}{4}$ - $1\frac{1}{4}$ " wide, silky
 outside and inside, often with the edge
 frilled or wavy and recurved *Q. Falconeri*
- Acorn not or slightly longer than broad
- Acorns not crowded in spikes, very pointed:
 twigs hairy *Q. sundaica*
- Acorns very crowded in spikes: leaves and
 twigs glabrous
- Cup disc-like: leaves large, rounded or heart-
 shaped at the base: mountains *Q. grandifrons*
- Cup covering the lower $\frac{1}{3}$ - $\frac{2}{3}$ " of the acorn:
 leaves tapered to the base *Q. spicata*

GROUP D

- Acorns rounded, blunt, more or less hemispheric: cup $\frac{3}{4}$ " wide: mountains
 Mature acorn glabrous: cup with broad, raised rings *Q. Wenzigiana*
 Mature acorn silky: cup thin, the rings faint and not raised *Q. lampadaria*
- Acorn markedly conical or distinctly tapered, pointed at the top, or with smaller cups
 Mature acorn silky, about $\frac{1}{2}$ " wide
 Acorns crowded in spikes 4-7" long, often shouldered *Q. Wallichiana*
 Acorns not crowded: spikes 3-5" long *Q. lamponga*
- Mature acorns glabrous
 Cup $\frac{3}{4}$ " wide or more
 Acorn conical, pointed, shouldered: leaves narrowly obovate with short stalks *Q. lucida*
 Acorn more or less flattened, not shouldered: leaves small, distinctly stalked *Q. Bennetti*
- Cup $\frac{1}{2}$ " wide
 Cup with raised rings: acorns round, pointed: mountains... .. *Q. rassa*
 Cup with flat rings: acorn very conical and pointed: lowlands
 Cup with distinct scale-tips: leaf-blade 5-9 x 2-4" *Q. sundaica*
 Cup with very minute scale-tips or none: leaf-blade 2-5 x 1-1 $\frac{3}{4}$ " *Q. conocarpa*

Q. Bennetti Bennett's Oak
 (J. J. Bennett, 1801-1876, the English botanist)

A buttressed tree with pale grey pimply bark: *leaf-blade* up to 5 x 2", elliptic, thin: *acorn-cup* $\frac{3}{4}$ -1" wide, thick, distinctly ringed.
 W. Malaya: lowland swampy forest and in the mountains, occasional.

Q. Blumeana Blume's Oak
 Text-Fig. 98
 (C. L. Blume, 1796-1862, the Dutch botanist of Java)

Leaf-blade up to 7" long, silvery beneath: stalk $\frac{1}{4}$ - $\frac{1}{2}$ " long: *acorn* $\frac{3}{4}$ " wide, crowded on thick woody spikes 3-5" long.
 W. Malaysia: frequent in the mountains.

Q. Burkillii Burkill's Oak
 Text-Fig. 98
 (I. H. Burkill, b. 1870, Director of Gardens S.S., 1912-1925)

Cups rounded, or narrowed to a short stalk and appearing pear-shaped, set with 3-5 distant rings: *acorn* completely covered by the cup, rounded, stony, with the point set in a shallow, saucer-like, depression.
 Malaya, frequent in the mountains, especially on Fraser's Hill.

The extraordinary fruits look like snail-shells. The acorns themselves look like pebbles when the cup has rotted off. The leaves are small as in the Common Oak (*Q. lamponga*).

Q. Clementiana Clementi's Oak
 Text-Fig. 96
 (Sir Cecil Clementi Smith, Governor of the Straits Settlements)

Leaf-blade 5-8" long, the stalks $\frac{1}{4}$ - $\frac{1}{2}$ " long: *acorns* crowded in spikes 2-4" long: *cups* 1-1 $\frac{1}{2}$ " wide, thick, massive, rather top-shaped, with distinct flat rings.
 Penang Hill and mountains, generally, in Malaya.

Q. conocarpa Plate 49, Text-Fig. 96 Singapore Oak
(Gr., with conical fruit)

Twigs, leaf-stalks and flower-spikes with khaki-coloured hairs: *leaf-blade* small, dark glossy green, with upcurled sides, silvery beneath, finely hairy (at least on the veins): *fruit-spikes* 3-6" long.

W. Malaysia: from Perak southward, but common only in Singapore.

This species is close to the Sunda Oak (*Q. sundaica*) but has smaller leaves and the cups of the acorns have very minute scale-tips or none at all.

Q. costata Text-Fig. 97 Squirrel's Oak
(Lat., ribbed)

Leaf-blade up to 7" long: *fruit-spikes* up to 7" long: *acorn-cups* $1\frac{1}{2}$ - $1\frac{3}{4}$ " wide, massive, embracing half of the remarkably flattened, cushion-shaped, woody acorn.

Sumatra, Malaya, Java: occasional in the lowland forest of Malaya.

The remarkably top-shaped acorns at once distinguish this Oak. They are generally bored by squirrels.

Q. craterophora Text-Fig. 96 Great Oak
(Gr., krater—a bowl, pherein—to bear)

Leaf-blade 8-15 × 4-8", *very large, leathery, oblong*, glabrous, silvery beneath, with rather a long tip: *fruit-spikes* 6-12" long: *acorns* 1- $1\frac{1}{4}$ " long, massive, shortly cylindric, finely silky downy: *cups* massive, crowded, finely silky hairy inside, with faint scale-like marks outside or faint rings, with tiny scale-tips when present.

Malaya: occasional in lowland forest throughout the country, frequent in East Johore.

The big leaves and giant acorns set in stout spikes distinguish this Oak.

Q. cyclophora Text-Fig. 97 Broad Oak
(Gr., kuklos—a circle, pherein—to bear)

Leaf-blade 5-12 × 2-5", *large, leathery*: stalk $\frac{1}{2}$ " long: *fruit-spikes* 4-6" long: acorn remarkably flattened: *cup* very thick, massive, with indistinct rings.

W. Malaysia: not uncommon in the lowland forest in Malaya.

The magnificent acorns are broader than those of any other Malayan Oak.

Q. discocarpa Text-Fig. 97 Spiny Oak
(Gr., with disc-like fruit)

Leaves small to medium-size *brownish beneath*: *fruit-spikes* 4-7" long: *acorn-cups* set with sharp spines, $\frac{1}{4}$ - $\frac{3}{4}$ " long, often tufted and branched at the base and often set in circles with smooth areas between: *the cups* $\frac{1}{2}$ - $\frac{3}{4}$ " wide without the spines, eventually splitting at the top to expose the small, pointed, silky acorn.

W. Malaysia: not common in the lowland forest of Malaya.

This species is one which connects the Oaks with the Chestnuts (*Castanopsis*) and may well be classed with either. It comes especially near the Malayan Chestnuts, *C. megacarpa* and *C. Wallichii*, which have bigger fruits entirely covered by thorny spines but have the same kind of leaf with brownish underside.

Q. enclisacarpa Text-Figs. 95, 98 Covered Oak
(Gr., enkleiein—to shut in, karpos—fruit)

Leaf-blade up to 8 × $2\frac{1}{2}$ ", silvery beneath: *fruit-spikes* 6-9" long, with few to many, stalked acorns: *cups* $\frac{3}{4}$ -1" wide, often purplish when young.

Malaya, Sumatra: common in the lowlands.

This common species is at once recognized from its silky acorns more or less covered by the thin cup with distant rings. Some trees, however, have the mature acorns only half covered by the cup. The commoner form, with covered acorns, is illustrated by FOXWORTHY.

Q. Falconeri Text-Fig. 96 Kedah Oak
(H. Falconer, 1808-1865, the English botanist of India)

A bush or small tree: young twigs hairy: *young leaves purple*, limp: *leaf-blade* 5-14 × 2-4", narrowly oblong, pointed, very leathery, yellowish green beneath, the stalk $\frac{1}{2}$ " long: *fruit-spikes* 7-12" long, set with many acorns: *cups* embracing $\frac{1}{2}$ of the acorn.

Tenasserim, Siam, Malaya: very common in Kedah, Perlis, Langkawi and Upper Perak, in *belukar* and in the forest, not known farther south.

Q. grandifrons Big-leafed Oak
(Lat., grandis—great, frons—leaf)

Leaf-blade 8-16" long, broadly elliptic, silvery beneath, very shortly stalked: *fruit-spikes* 5-8" long: *cups* $\frac{1}{2}$ - $\frac{3}{4}$ " wide, rather thin: *acorns* conical.

Malaya, frequent in the mountains: also in lowland swampy forest.

Q. hystrix Text-Fig. 96 Porcupine Oak
(Lat., porcupine)

Very like *Q. sundaica* but:—*leaf-blade* always hairy beneath: *acorn-cups* with conspicuous scales with recurved tips: twigs and undersides of leaves brown hairy.

W. Malaysia: frequent in the lowlands.

Q. Kunstleri Text-Fig. 96 Kunstler's Oak
(H. H. Kunstler—Sir George King's collector at Calcutta)

Twigs olive-hairy: *leaf-blade* 4-8" long, generally hairy on the underside of the midrib and veins, the stalk $\frac{1}{4}$ " long or less: *fruiting spikes* 4-9" long: *acorns* $\frac{3}{4}$ -1 $\frac{1}{2}$ " long × .6" wide: *cups* $\frac{1}{2}$ - $\frac{3}{4}$ " wide.

Malaya, Borneo: occasional throughout the country, with very elegant fruits.

Q. lampadaria Text-Fig. 96 Clustered Oak
(Gr., lampas—torch)

Leaf-blade 7-11 × 3-4 $\frac{1}{2}$ ", large, leathery, the stalk $\frac{1}{2}$ " long: *fruit-spikes* 3-5" long, massive: *cups* $\frac{3}{4}$ -1" wide, rather thin, with indistinct rings: *acorns* $\frac{3}{4}$ -1" wide: cups and acorns often misshapen by crowding and pressure on the spike.

Malaya: not uncommon in the mountains, especially at Cameron Highlands.

Q. lamponga Text-Fig. 96 Common Oak
(the Lampong district of Sumatra)

Leaf-blade 2 $\frac{1}{2}$ -5 $\frac{1}{2}$ " long, *silvery beneath*, the stalk $\frac{1}{4}$ - $\frac{1}{2}$ " long: *fruit-spikes* 3-5" long, rather slender: *cups* $\frac{3}{4}$ " wide, with distinct scale-tips arranged in rings: *acorn* $\frac{3}{4}$ " wide.

Throughout Malaysia to New Guinea: perhaps the commonest Malayan Oak in lowland forest, at least in the south of the Peninsula: abundant in the Reservoir Jungle in Singapore.

Q. lappacea Text-Fig. 97 Rambutan Oak
(Lat., lappa—a bur)

Twigs and undersides of leaves hairy: *leaf-blade* 4-7 × 1-2", lanceolate, the stalk very short .1-2" long: *fruit-spikes* 3-6" long with several fruits often crowded: *cup* 1-1 $\frac{1}{4}$ " wide, thickly set with knobby or recurved, *rambutan*-like scales or soft spines .05-3" long, the tips of the scales incurved: *acorns* $\frac{3}{4}$ " wide, conical, silky.

N.E. India, Tenasserim, Malaya: frequent in the middle and north of the country.

The development of the cup is even more variable in this species than in the Covered Oak, (*Q. encleisacarpa*). In some trees it is an ordinary cup embracing the lower $\frac{1}{3}$ or $\frac{1}{2}$ of the acorn, and in other trees it covers the whole acorn so that the fruit looks like a 1-seeded chestnut.

Q. lucida Text-Fig. 95 Shining Oak
(Lat., lucidus—shining)

Twigs angled: *leaf-blade* 3-8 × 1 $\frac{1}{4}$ -2 $\frac{1}{4}$ " , oblong obovate, blunt or slightly pointed, leathery, shining, tapered to the very short stalk, the fallen dried leaves yellow-brown: *fruit-spikes* to 6" long: *cup* 1-1 $\frac{1}{2}$ " wide.

W. Malaysia: rather common in lowland forests, with characteristic leaves and fine, big acorns.

FOXWORTHY has a photograph of the trunk of this species.

Q. Maingayi Text-Fig. 98 Maingay's Oak
(A. C. Maingayi, 1836-1869, doctor and botanist of the East India Co.)

Twigs finely brownish velvety: *leaf-blade* 6-11 × 2 $\frac{1}{2}$ -4" , large, leathery, silvery beneath, the stalk $\frac{1}{2}$ -1" long: *fruit-spikes* 5-8" long, with only one or two, rarely 3, fruits: *cup* 1 $\frac{3}{4}$ -2 $\frac{1}{2}$ " long, 1 $\frac{1}{4}$ -1 $\frac{3}{4}$ " wide, pear-shaped, finely velvety, marked with 4-5 faint distant rings, the top rather flattened and with a small conical mouth: *acorn* strong, very thick-walled, completely hidden in the cup.

Malaya: Penang Hill to Johore, not infrequent in the mountains, especially on Fraser's Hill, occasional in lowland forest.

The monstrous fruits of this Oak are bigger than any other Malayan acorn. Not until they are examined attentively, can their true nature be discovered.

Q. rassa Text-Fig. 96 Dwarf Oak
(a Malay plant-name *rasa*)

A shrub or small tree: *leaf-blade* 1-4" long, small: *fruit-spikes* up to 3" long: *cup* $\frac{1}{2}$ - $\frac{1}{2}$ " wide.

W. Malaysia: rather common in the mountains.

Not to be mistaken for Wenzig's Oak which has bigger leaves and acorns.

Q. Scortechinii Text-Fig. 96 Scortechini's Oak
(B. Scortechini, 1845-1886, the Italian missionary and botanist)

Leaves 4-8" long, narrow: *acorns* sometimes with the point sunk in a depression: *cup* 1-1 $\frac{1}{2}$ " wide, $\frac{1}{4}$ - $\frac{1}{2}$ " deep.

Malaya: occasional in the mountains, especially on Fraser's Hill.

The acorns look like giant specimens of the English Oak.

Q. spicata Text-Fig. 98 Spike Oak
(Lat., with ears of corn)

Leaves medium to rather large, the stalks $\frac{1}{2}$ - $\frac{3}{4}$ " long: *fruit-spikes* 7-12" long, with densely crowded fruits: *cups* $\frac{1}{2}$ - $\frac{3}{4}$ " wide, covering $\frac{1}{2}$ - $\frac{2}{3}$ of the acorn: *acorns* $\frac{1}{2}$ - $\frac{3}{4}$ " wide, about $\frac{1}{2}$ " high, varying conical to subglobose and often with the point in a depression.

India, W. Malaya: rather common in lowland forest.

The long fruit-spikes densely set with small acorns, at once distinguish this species.

Q. sundaica

Sunda Oak

(from the Sunda Islands)

Twigs and undersides of leaves hairy, the old leaves glabrous: *leaf-blade* 4-9 × 2-4", rather large, rounded or shortly tapered at the base: *fruit-spikes* 3-6" long: *cups* $\frac{1}{2}$ - $\frac{3}{4}$ " wide, with scale-tips and rather inconspicuous rings: *acorns* very pointed, dark brown.

W. Malaysia: rather common in lowland forests.

Compare *Q. hystrix*. In swampy forest, these two species develop an extraordinary profusion of stilt-roots from the lower part of the trunk.

Q. Wallichiana Text-Fig. 96

Wallich's Oak

(N. Wallich, 1786-1854, the Danish botanist at Calcutta)

Twigs and undersides of leaves hairy, the old leaves glabrous: *leaf-blade* 4-9 × 1 $\frac{1}{2}$ -3", rather narrow, silvery beneath, gradually tapered to the stalk $\frac{1}{4}$ - $\frac{1}{2}$ " long: *fruit-spikes* up to 7" long.

Malaya: frequent in lowland forest.

This species closely resembles the Common Oak (*Q. lamponga*) especially in its fruits, but it has hairy twigs, larger leaves and longer fruit-spikes with many more acorns on them.

Q. Wenzigiana Text-Fig. 96

Wenzig's Oak

(J. T. Wenzig, 1824-1892, a German botanist)

Leaf-blade up to 5 × 2", rather small, the stalk $\frac{1}{4}$ - $\frac{1}{2}$ " long: *fruit-spikes* 4-8" long: *cups* $\frac{1}{2}$ to nearly 1" wide, with strongly marked, swollen rings and tiny scale-tips squeezed between.

Malaya: Penang Hill and mountains in the middle and north of Malaya, occasional.

Easily known by the swollen rings on the cup, but not to be mistaken for the Dwarf Oak (*Q. rassa*).

RUKAM FAMILY

Flacourtiaceæ

(from the genus Flacourtia)

Leaves simple, arranged spirally or alternate.

Flowers generally small, often male and female: sepals 4-6: petals 4-6, or absent, free: *stamens numerous*: ovary superior, with the ovules attached in 2-3 rows on the wall (parietal placentas).

Fruit generally a berry, in some cases splitting open.

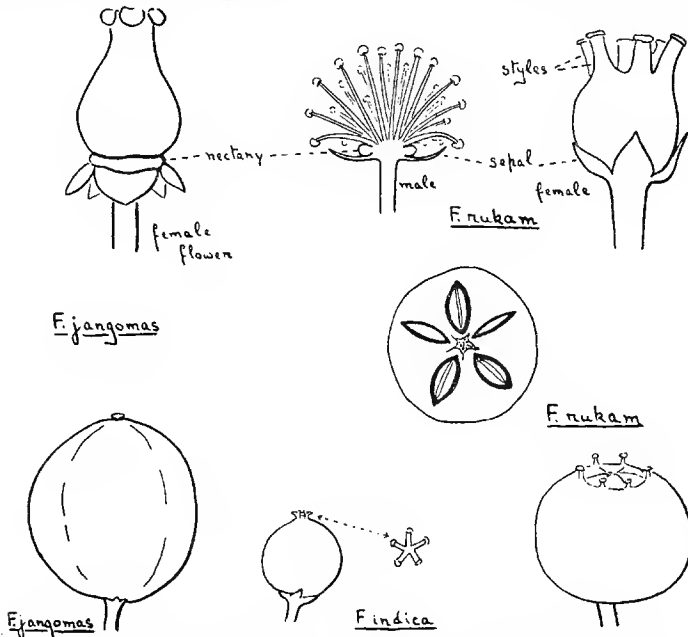
80 genera, 800 spp., tropics generally: 11 genera, 44 spp. in Malaya, mostly in the lowlands.

There belong in this family the village fruit-trees *Rukam* and *Krekup* (Flacourtia) and the *Kepayang* (Pangium). It is a difficult family to define because there is much variety and its limits are by no means certain: botanically, the structure of the ovary is its chief feature.

Beside the fruit-trees, there are the genera *Hydnocarpus* and *Taraktogenus* from the seeds of several species of which the chaulmoogra-oil used in the treatment of leprosy is obtained. The important species are *H. anthelmintica*, *H. Wightiana* and *T. Kurzii*, which are being grown experimentally in Malaya. Several species of both genera are wild in Malaya: they have round fruits, with a hard rind and many large seeds embedded in pulp.

Key to the Genera

- Small thorny trees, occasionally unarmed: leaves shortly stalked, with notched edges: fruit $\frac{1}{2}$ -1" wide
 Mangrove tree or shrub, with unbranched spines ... *Scolopia* p. 309
 Inland or village trees with branched thorns ... *Flacourtia*
 Thornless tree, often large and buttressed: leaves large, with long stalks: fruit very large ... *Pangium* p. 308



Text-Fig. 99. *Flacourtia*: flowers $\times 4$: fruit, nat. size.

FLACOURTIA

(E. de Flacourt, 1607-1660, a Governor of Madagascar)

Small trees, often with spiny trunks: leaves alternate, or spirally arranged, notched though often faintly: young leaves pink: old leaves withering yellow.

Flowers small, without petals, male and female generally on different trees: sepals 4-6: stamens many: nectary yellow or orange, surrounding the base of the stamens or of the ovary: ovary with 4-7 separate, or more or less joined, styles.

Fruit a round berry with the styles at the top and the minute calyx at the bottom: containing 4-7 large, flat seeds arranged in a star (as seen in cross-section).

10 spp., Indo-Malaysia: 4 spp., in Malaya.

Key to the Species

- Leaf-blade blunt, 1-2" long: fruit $\frac{1}{4}$ " wide: Kedah, Perlis ... *F. indica*
 Blade pointed, larger: fruit larger
 Blade 2-4" long, with 3-6 pairs of side-veins: fruit tipped with a single peg: deciduous: north of Malaya ... *F. jangomas*
 Blade 3-8" long, with 5-10 pairs of side-veins: evergreen
 Thorny: fruit crowned with a circle of 4-7 pegs ... *F. rukam*
 Thornless: fruit tipped with a cluster of 4-6 pegs ... *F. inermis*

F. indica Text-Fig. 99Lesser *Krekup*
Krekup

A bush or small tree to 40 ft. high, deciduous like *F. jangomas*: trunk and branches set with thorns as *F. rukam*: bark greyish buff, rather fissured and flaky: *crown bushy, spreading, with many arching branches with drooping ends* and set with tufts of upright twigs.

Leaf-blade 1-2" long, small, blunt, most leaves narrow and obovate, slightly notched and set in clusters on the old branches: *other leaves larger, deeply notched and more or less heart-shaped*, as wide as long, spaced along the vigorous young shoots and with thorns in their axils: stalks .1-.4" long.

Fruits .3-.4" wide, small, singly or in small clusters on the short leafy twigs, ripening dull red, rather translucent, astringent, with 5-6 short styles radiating from a short stalk.

Indo-Malaysia, in the more seasonal parts: in Malaya, only in N. Kedah and Perlis, frequent in villages.

F. inermis

(Lat., unarmed)

Thornless *Rukam**Rukam Masam* (Pen.), *Lobeh-Lobeh* (Sing.)

As *F. rukam* but:—*thornless*, ? leaves withering red: flowers bisexual, the stamens persistent round the base of the fruit: *styles 4-6 in a compact cluster at the top of the sour, red-pink fruit*, intermediate in shape between *F. jangomas* and *F. rukam*.

Cultivated, of unknown origin: occasional in villages.

F. jangomas Plate 64, Text-Fig. 99(from the vernacular name *jan-gama*)Greater *Krekup*
Krekup, *K. Bakoh*

A small tree to 40 ft. high like *F. rukam* but:—*deciduous; trunk and branches commonly thornless in old trees*: bark light brown to pinkish buff, slightly flaky: *leaf-blade* 2-4 × ½-2", smaller, narrow, only slightly notched, with a slender stalk .1-3" long: *flowers fragrant of honey, with white or yellow nectary: fruit* ¾-1" wide, dull brownish red then blackish, *tipped with the single, short style-column* (with 4-6 minute points).

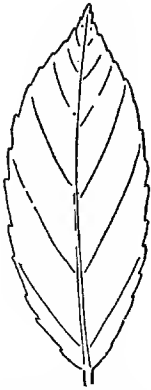
Cultivated throughout the tropical east, not known to be wild: common in villages, coastal areas and rice-fields, especially in the north.

The fruits are pleasant to eat and suggest cider-apples. When the trees develop their new leaves, which they do very shortly after shedding the old ones at the beginning of the dry season (January-April), they can be recognised at once on the landscape from the shimmer of pinkish-brown new foliage over their bare branches. At such times, they will be seen in all odd places where the seeds have been cast and the saplings permitted to grow. The flowers are borne in small clusters on the twigs before or with the young foliage.

F. rukam Text-Figs. 99, 100
(the Malay vernacular name)Indian Prune
Rukam, *Rukam Manis*

A small evergreen tree to 40 ft. high, often with crooked, gnarled branches: trunk and branches spiny with strong, woody, often branched thorns up to 4" long, occasionally thornless: *bark* brown, smooth.

Leaf-blade 2½-10 × 1¼-4", elliptic, *the base rather broad* and often nearly heart-shaped, gradually tapered to the long tip, *rather coarsely toothed, with 5-10 pairs of side-veins*, the stalk .2-.4" long.



Text-Fig. 100. *Flacourtia rukam*, $\times \frac{1}{2}$.

Flowers $\frac{1}{4}$ " wide, in small clusters in the leaf-axils and on the bare twigs, *greenish yellow, scentless*: male flowers fuzzy with small yellow stamens, *the nectary orange*.

Fruits $\frac{1}{2}$ – $\frac{3}{4}$ " wide, purplish green to dark red with whitish pulp, *crowned by the 4–7 small peg-like styles, set in a circle*.

Indo-Malaysia: common in Malaya in lowland and mountain forest, especially by streams, also in villages.

This species is rather variable in the shape, size and colour of the fruit, as well as in the thorniness of the trunk. It is a wild plant that has been little, if at all, improved by village-cultivation. The ripe fruit is acid and astringent but rubbing it between the hands bruises the flesh and causes a chemical change to take place which renders it sweet and palatable. In Singapore, the *Rukam* flowers two or three times a year, apparently after short spells of dry weather, but we have no accurate records concerning it. The fruits take about three months to ripen.

PANGIUM

(from the Malay vernacular name *Pangi*)

An unarmed tree with large, long-stalked, spirally arranged leaves grouped near the ends of the stout twigs: with Terminalia-branching.

Flowers large, green, mostly male or female (on different trees): the calyx forming a cup, enveloping the bud, and splitting into 2–4 parts: petals 5–8, each with a large silky scale at the base: stamens many: ovary with sessile stigma.

Fruit large, oblong, not splitting open, containing many large, somewhat flattened seeds piled on top of each other.

One sp., cultivated throughout the Malayan Archipelago, apparently wild in parts of W. Malaysia.

P. edule

(Lat., eatable)

Payang, Kepayang

A medium-sized large deciduous tree reaching 80 ft., with more or less conical, heavy crown and drooping branches: *the trunk becoming buttressed* and fluted, giving off the branches singly and curving away from each at its origin: bark brownish grey, smooth.

Leaf-blade 6–9 \times 5–8", *ovate or heart-shaped, pointed, rusty scurfy* beneath especially on the veins, dark shiny green, the stalk 3–8" long: *sapling with the leaf-blade 3–5 lobed* and up to 25" long and wide.

Flowers $1\frac{1}{2}$ –2" wide, the male in few-flowered raceme, up to 4" long, from the leaf-axils, the female larger, solitary on stalks up to 3" long: flower-bud rusty scurfy: *petals bright pale green*.

Fruit 6–12 \times 3–5", *massive brownish, rather scurfy and rough, bluntly tipped at each end, hanging*; the wall $\frac{1}{3}$ " thick, becoming soft and mushy in the ripe fruit: *seeds greyish white, obscurely triangular, hard, leathery, about 2" wide*.

Occasional in Malayan villages: apparently wild in parts of Selangor, Perak and Pahang.

The *Kepayang* is one of Nature's monsters. It is a poisonous tree with ungainly fruits suggesting a stomach crammed with big seeds. The poison occurs in all parts of the tree; it is a glucoside which readily yields prussic acid but it can be extracted simply by washing. Natives have found this out and have devised various ways of treating the leaves and, especially, the seeds so that they can be eaten: the methods are described in BURKILL'S Dictionary. The oil that can be extracted from the seeds is used by jungle-folk for cooking when coconut-oil is scarce. The uncertainty about the origin of the tree is due to its cultivation by such people for it must be little, if at all, removed from the

wild state; its seeds, moreover, are readily transported, and saplings can maintain themselves in forest. The seed can also float for a long while and can thus be distributed by rivers. The trees fruit at 15 years and live to a great age.

The leaf-arrangement is interesting and such as one finds in several trees with large, long-stalked leaves disposed spirally at the ends of the twigs, e.g. *Sterculia*. The leaves on the underside of the twig have the largest blades and longest stalks: the leaves on the flanks of the twig are of intermediate size. Thus the biggest leaf in each cluster at the end of a twig is thrust out on the underside, and the other leaves are placed to overshadow it as little as possible.

SCOLOPIA

(Gr., skolops—a thorn)

Thorny trees like *Flacourtia* but:—flowers with small petals: stamens and ovary in the same flower: style rather long.
30 spp., Old World tropics: 2 spp., in Malaya.

S. rhinantha

(Gr., rhis—a nose: bot.—anther)

Marsh *Rukam*, Mangrove Thorn

Rukam (Pen.)

A bush or small tree to 20 ft., occasionally 50 ft.: *trunk set with unbranched, spirally arranged thorns, 1-3" long*: young leaves brownish red.

Leaf-blade $3-6\frac{1}{2} \times 1-3"$, more or less ovate, tapered to a point, thinly leathery, more or less notched round the edge, with 5-8 pairs of side-veins, drooping with upcurled sides, rather yellowish green: *leaf-stalk* $\frac{1}{4}-\frac{3}{4}"$ long, *reddish pink with 2 black spots* (glands) at the top on the upperside, like a pair of black eyes.

Flowers $\frac{1}{2}"$ long, *greenish white*, slightly fragrant, stalked, *in axillary and terminal inflorescences 1-4" long*: stamens many, white: ovary and style commonly flushed dull crimson.

Fruit $\frac{1}{2}"$ wide, *blackish, pointed*, with the sepals and withered stamens at the base.

W. Malaysia: at the back of mangrove and by swampy creeks, common in Malaya.

The situation and the long, unbranched spines will distinguish this tree. An inland species, *S. spinosa*, has few side-veins to the leaf (3-5 pairs), a short inflorescence only 1" long, a larger fruit nearly $\frac{3}{4}"$ wide and generally branched spines: it is not common. The leaves of both are very like those of the *Rukam* (*Flacourtia rukam*).

SEA-LETTUCE FAMILY

Goodeniaceæ

(the genus *Goodenia*—S. Goodenough, 1743-1827, botanist and bishop of Carlisle)

Leaves simple, spirally arranged.

Flowers in stalked, axillary clusters; sepals 5: *corolla bilaterally symmetrical, the corolla-tube split to the base on the upperside and expanding at the end into a lip with 5 petals* (no upper lip): stamens 5: *ovary inferior with a long style ending in a cup-shaped hairy stigma*.

Fruit pulpy, with one large seed, or stone, crowned by the sepals.

12 genera, 300 spp., all but a few Australian: 1 sp. in Malaya.

This small family of shrubby trees, bushes and herbs is allied with the *Lobelia*- and *Campanula*-families but it seems, like the *Eucalyptus*- and *Wattle*-trees and the *Marsupials*, to have been a product of Australia. The single

GUTTIFERÆ

Malayan species must be regarded as an extension of the Australian flora which, like *Bæckia*, *Leptospermum* and *Casuarina*, has crept along the sea-shores of the Malay Archipelago.

SCÆVOLA

(Lat., left-handed: surname of the Roman Caius Mucius, B.C. 500)

Characters of the family.
About 60 spp., mostly Australian.

S. frutescens Text-Fig. 101 (Lat., shrubby)

Sea-Lettuce Tree

Ambong Ambong, Merambong, Pelampong

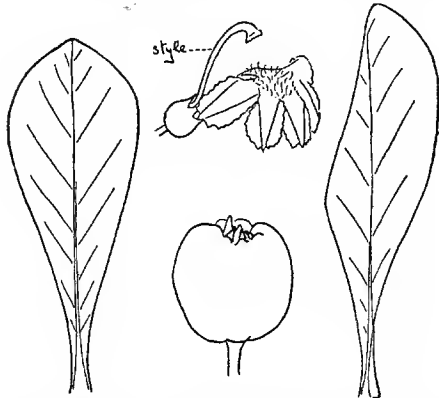
A bushy seashore shrub or small tree, 4-20 ft. high: twigs stout: *young leaves pale green, with the sides rolled back in the bud*: old leaves yellow.

Leaf-blade 3-10 × 1½-4", obovate, blunt, gradually tapered to the base, *light green, fleshy, with recurved sides*, glabrous or hairy beneath: stalk short.

Flowers $\frac{3}{4}$ -1" wide, scentless, in clusters 2-3" wide with the common stalk $\frac{1}{2}$ -1" long: *corolla 1" long, white often tinged very pale lilac, each petal edged pale ochre and with 2 lilac stripes on the outside, fading pale brown, the tube yellowish and hairy*: stamens yellow, soon withering: style green.

Berries $\frac{1}{2}$ " long, oblong, green then white, crowned with 5 small green sepals, faintly ribbed, juicy: in bunches in the leaf-axils.

India to Polynesia: on all rocky and sandy coasts of Malaya, very abundant.



Text-Fig. 101. Sea-Lettuce Tree (*Scævola frutescens*): leaves $\times \frac{1}{4}$: flower and fruit, nat. size.

This is one of our commonest seashore shrubs that reaches, on occasions, the size of a small tree. It is evergreen and flowers throughout the year, being in fact one of those trees, like the *Simpoh* (*Wormia suffruticosa*) and *Tiup Tiup* (*Adinandra*), that never ceases from flowering after an early age. The leaves are succulent like those of the Lettuce-Tree (*Pisonia*) but are bitter and scarcely edible. The juice of the ripe fruits is most soothing and refreshing if squeezed into inflamed eyes and offers itself as a natural remedy against the glare of the shore. The large pith in the young twigs is sometimes used by Malays to cut fancy flowers and other objects.

MANGOSTEEN FAMILY

Guttiferæ

(Lat., from *plantæ guttiferæ* or latex-bearing plants)

Trees or shrubs with yellow, or white, resinous latex.

Leaves opposite, simple, entire, without stipules.

Flowers often bright and showy, variously arranged but generally clustered and axillary: sepals 4 or 5, free: petals 4 or 5, free: stamens numerous: ovary superior with 1, 2 or many cavities.

40 genera, about 550 spp., throughout the tropics: 5 genera, 80 spp. in Malaya

This tropical family is related with the St. Johnswort-family (*Hypericaceæ*). We have no exotic species in cultivation but several well-known indigenous plants such as the Mangosteen, *Penaga*, and Ironwood trees.

Key to the Genera

Leaves with very fine, crowded parallel veins, connecting the midrib with the margin	<i>Calophyllum</i>
Not so	
Flowers white, large, 3-4" wide: leaves white beneath	<i>Mesua</i> p. 320
Flowers generally yellow, pink or red: leaves not white beneath	<i>Garcinia</i> p. 312

CALOPHYLLUM

(Gr., kalos—beautiful, phullon—leaf)

Latex yellow or whitish, generally transparent and gum-like.

Buds conical, projecting, often brown-scurfy.

Leaves leathery, shiny, oblong, with very crowded slender veins, like parallel lines, connecting the midrib with the margin.*Flowers* bisexual, in racemes or small panicles in the leaf-axils, white, very fragrant when fresh, often foetid like garlic when fallen; *sepals* not persisting in the fruit: petals thin, recurved, (absent from many wild species): *stamens* many, free, slender: *ovary* with a long style, 1-celled.*Fruit* round or oblong, small or medium-size, with a green (rarely yellow or orange) rind and one large seed, the sepals not persistent, not opening.

About 70 spp., throughout the tropics, mostly in the East: 25 spp. in Malaya.

This genus consists of many common trees of the lowland and mountain forests. Most are medium-sized, but a few are large trees whose crowns reach the canopy. They are one of the easy kinds of forest-tree to recognize, from the characteristic veining of the tough leaves, though the leaves themselves vary considerably in size. In habit they resemble the wild Mangosteens (*Garcinia*), having the straight monopodial trunks and conical crowns, but the bark is typically thick, fibrous, and ruggedly fissured longitudinally (from the lenticels). In contrast with most forest-trees, they are unbuttressed and have massive boles cylindrical from the very base. Botanically, the species are difficult to distinguish; and most are little known. There are no consistent records on their seasonal changes, but it seems that a few are deciduous; that all flower seasonally, some like the *Penaga Laut* (*C. inophyllum*) after dry weather and others toward the end of the year during prolonged wet weather. The seeds are distributed by bats and, in the case of the riverside species, by fish which eat the fruits which fall into the water: (*Bintangor*-fruits are used by Malays as bait).

The Malay name for the genus is *Bintangor* or *Bintangor Batu*, but a few kinds with hard wood are called *Penaga*, (see the remarks under *Mesua* p. 320). The timber is useful especially for masts and spars in ship-building because of its straightness, and also for furniture because of its lustre, figure and grain.

C. inophyllum Plate 65
(Gr., is—fibre, phullon—leaf)*Penaga Laut*
Paku Achu (Tr., Kel.)

An evergreen *sea-shore* tree, up to 60 ft. tall, generally much branched, crooked and leaning over the sea; *trunk* short, soon breaking up into several large ascending limbs: *crown* dense, dark green, rather irregular and untidy, with many upright main branches and horizontal or drooping side-branches: *bark* dark, rugged, greyish brown, fissured and cracked: *gum* yellowish white, rather opaque, resinous: *buds* brown scurfy.

Leaf-blade 3-7 × 2-3 $\frac{3}{4}$ " , elliptic to obovate, apex blunt and often notched, stalk $\frac{1}{2}$ - $\frac{3}{4}$ " long.*Flowers* 1" wide, white, very sweetly fragrant, in stiff, erect racemes, 2-8" long, bearing 4-15 flowers, the terminal flower often the largest: *ovary* clear pink.*Fruit* 1 $\frac{1}{4}$ " wide, subglobose, pointed, green.

Indian and W. Pacific Oceans: common on all sandy and rocky shores, often planted as a roadside tree.

GUTTIFERÆ

The seashore-habit and the twisted timber of this tree differ from those of other species of the genus and hence comes its distinctive Malay name.

In Singapore, the trees flower twice a year. April-June and October-December, evidently in response to the weather. The actual time of flowering in one district is only about two weeks. The flowers begin to open between 3 and 4 a.m., are wide open by sunrise and wither the next day: their fragrance, which is perhaps the sweetest of any Malayan tree, attracts innumerable insects which pollinate the flowers. It is said that young trees grow slowly and take many years to blossom. It seems that the tough resistant leaves depress the activity of the whole plant, like so many other slow-growing tropical plants, e.g. the Mangosteen and the *Lanjut* (*Mangifera lagenifera*).

The *Penaga Laut* finds many native uses. The gum, the bark, the leaves, the roots, the flowers, and the oil from the seeds are put to such an astonishing variety of cures in native medicine that we could well call the tree "All Heal", like the European Valerian (*Valeriana officinalis*). The oil which sweats from the drying seeds is poisonous. Full details of the economic aspect of the tree are given in BURKILL'S Dictionary.

GARCINIA

(L. Garcin, 1683-1751, a Swiss botanist)

Evergreen trees, generally of medium height, seldom exceeding 60 ft.

Latex opaque yellow or in a few species white.

Buds concealed between the bases of the uppermost leaf-stalks.

Flowers singly or in small clusters in the leaf-axils, occasionally in short racemes, unisexual, male and female on different trees: sepals 4 or 5, rather fleshy, persistent in the fruit: petals 4 or 5 rather fleshy, white, yellow or reddish: stamens short, joined in 4-5 clusters or united in a ring or a central mass, the anthers sessile: ovary with a large sessile stigma, and several cavities: male flowers with sterile ovary, female flowers generally with sterile stamens.

Fruit large, fleshy, often with a rind, with 1-many large pulpy seeds, the sepals persistent at the base.

About 200 spp., Old World tropics: about 40 spp. in Malaya, lowland and mountains.

Garcinia is an important genus for the Malayan botanist because many species occur in the East Indian forests to which they impart a characteristic tone and from which a few of the species with better developed fruits have been brought into cultivation by primitive man. The Mangosteen (*G. mangostana*), the *Asam Gelugor* (*G. atroviridis*), the *Kechupu* (*G. Prainiana*), the *Mundu* (*G. dulcis*) and the village *Kandis* (*G. Cowa*) are common village fruit-trees, the last three being found chiefly in the northern half of the country, particularly in Kedah and Kelantan: they are all native in the forest. An acquaintance with these fruit trees should enable one to recognize any of the wild species. They are monopodial trees, the straight trunk tapering to the top of the conical crown, and the branches, which are arranged in alternating pairs, arise from the trunk at an acute angle, then curve horizontally or sag down, (as may be seen in Plate 66). In the forest, the branches are restricted to the upper part of the trunk, the dead snags of the lower branches persisting for a long time as woody knobs. This habit, together with the yellow (or white) latex, enables one to distinguish a Garcinia from other small forest trees with opposite leaves, such as Eugenia, Memecylon and the Rubiaceæ. Like the *Mempisang*-trees (Annonaceæ) and the Wild Nutmegs, the Mangosteen-trees are second-storey forest-trees, adapted to the shade.

The flowering of Mangosteens is seasonal. It recurs after pronounced dry weather and commonly twice a year about the same time as the *Durian*, *Rambutan* and *Mango*-trees. The flowers of several wild species (*G. parvifolia*, *G. Griffithii*, *G. Forbesii*), perhaps of all, are nocturnal: they open at sunset and exhale a powerful and rather overpowering odour suggesting highly seasoned gravy. The smell is characteristic and assails the nostrils as one takes an evening walk in the forest, but what insects it attracts we have not been able to discover. (There are many wild Mangosteen-trees in the Reservoir Jungle and on Bukit Timah in Singapore).

The fruits of the Mangosteen-trees vary much in shape and colour in the different species and the fallen fruits afford the best means of identifying them. Some kinds have a thick rind, as in the true Mangosteen, but others have thin-skinned fruits which are pulpy throughout; such are called *Kandis* by Malays.

The young leaves of *Garcinias* are pink except in *G. Prainiana* and *G. dulcis*, perhaps in all the species with five-petalled flowers.

The yellow latex of the Siamese *G. Hanburyi* and the Indian *G. Morella* is the source of gamboge-paint. The latex of other species cannot be used because it does not readily form an emulsion.

Key to the Species of *Garcinia*

- Sepals and petals 5: young leaves pale green
 Leaves nearly sessile: fruit yellow, flattened, with-
 a button-like stigma: flowers pink *G. Prainiana*
 Leaves stalked: flowers yellowish white
 Leaves 4-12" long: cultivated *G. dulcis*
 Leaves 1-2 ft. long, strongly ribbed: wild *G. nervosa*
- Sepals and petals 4: young leaves pink or reddish
 Ripe fruits red, pink or purple
 Fruit pointed, red: petals cream white: wild sea-
 shore tree *G. Hombroniana*
 Fruit not pointed: petals suffused pink or red
 Fruit purple with woody rind: cultivated *G. mangostana*
 Fruit rose-red, pulpy: wild *G. Forbesii*
- Ripe fruits yellow, orange, brown or green
 Fruits 2" or more wide
 Leaves 1-3" wide: petals red *G. atroviridis*
 Leaves 4-9" wide: petals yellow tinged pink *G. Griffithii*
- Fruits less than 2" wide
 Leaf 2-5" wide, leathery: fruit not beaked:
 riverside *G. bancana*
 Leaf mostly 1-2½ (-3)" wide: stigma minutely
 pimply
 Fruit with several longitudinal grooves:
 villages in the North *G. Cowa*
 Fruit not grooved, though maybe faintly ribbed
 Fruit beaked *G. nigrolineata*
 Fruit not beaked
 Fruit pulpy, yellow-ochre, with the stigma
 sunken in a pit: seeds 1-many in the
 fruit *G. parvifolia*
 Fruit leathery, green, the stigma not
 sunken: seeds 4 *G. Gaudichaudii*

G. atroviridis Text-Fig. 102
(Lat., ater—black, viridis—green)

Gelugor, Asam Gelugor

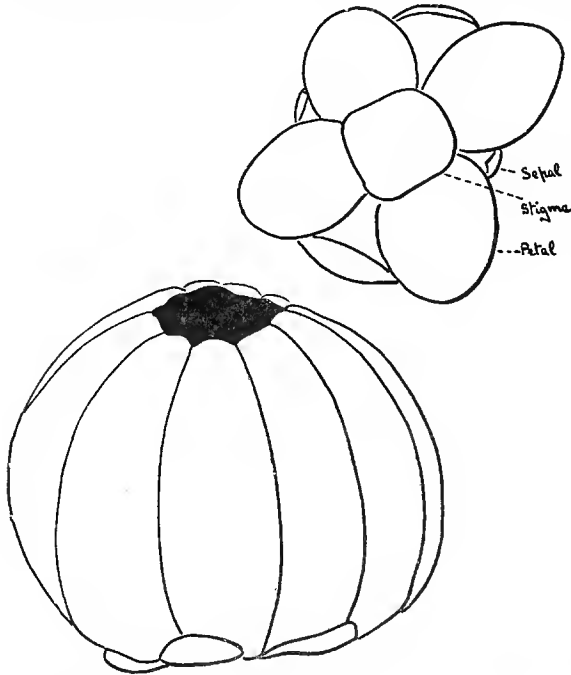
A rather lofty tree with narrowly cylindrical or conical crown, up to 80 ft. high, the trunk fluted at the base: bark dull grey, rather cracked and fissured in small pieces: latex watery and colourless, scant.

Leaf-blade 5-12 × 1½-3", narrowly oblong, abruptly tapered at the apex, fleshy-leathery, dark glossy green, with fine dark wavy lines on the underside, pointing down with upcurled sides: stalk ½-1" long.

Male flowers in terminal clusters, female flowers solitary, large, faintly fragrant or scentless, 1½-1¾" wide: petals crimson: ovary green with a dull crimson stigma.

Fruit 2½-4" wide, nearly round, large, fluted with 12-16 ribs and grooves, ripening orange-yellow, with the large brownish disc-like stigma ½-¾" wide, both petals and sepals persistent at the base, the fully ripe fruit separating into pegs: seeds with bright orange pulp.

Burma, Malaya: in lowland forest: rather common in villages, especially in the north of the country.



Text-Fig. 102. *Garcinia atroviridis*: female flower and fruit, nat. size.

The narrow crown is distinctive of the *Gelugor*. Among cultivated trees, it can be mistaken only for the *Meninjau* (*Gnetum gnemon*) and, among wild trees, only for some of the Nutmeg and *Kenanga* families, both of which have alternate leaves. J. N. MILSUM has recently described the village industry which centres on the *Gelugor*-trees (of. Malayan Agric. Journ., vol. XXVI, 1938, p. 181). The unripe, but full-grown, fruits are cut into slices which are placed in trays and set to dry in the sun by the roadside. The dried slices—like apple-rings—are sold in the shops and are used in place of Tamarind-pulp or *Asam Jawa* (*Tamarindus indicus*) in curry and, particularly, for dressing fish.

Male flowers seem to be uncommon, most trees being female and, therefore, productive of fruit. The colourless scant latex is deceptive for a *Garcinia*, but the fine wavy lines on the underside of the leaf are characteristic.

G. bancana Text-Fig. 103
(from the island of Banca)

Banca Mangosteen
Chepurah, Chempurah

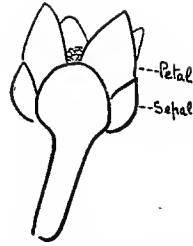
Like *G. parvifolia* but with larger leathery leaves and larger fruits with smooth stigma.

Leaf-blade 4-11 × 2-5", obovate, thick and leathery, the veins almost invisible: stalk ½-1½".

Male flowers $\frac{1}{3}$ " wide, with pale yellowish white, scarcely spreading petals: female flowers $\frac{1}{2}$ " wide: stigma smooth.

Fruit about 2" wide, round, the stigma sunken in a shallow pit, ripening dull orange-yellow and pulpy.

Sumatra, Malaya, Banca: frequent in lowland forest, especially by rivers, occasional in rice-fields.



Text-Fig. 103. *Garcinia bancana*: male flower $\times 2$.

G. Cowa Plate 66, Text-Fig. 104

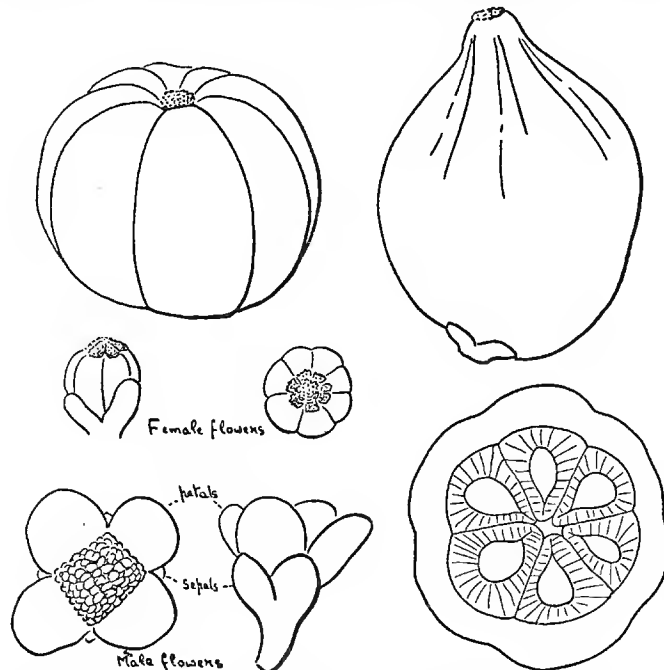
Village *Kandis*, Cowa Mangosteen *Kandis*

Like *G. parvifolia* but:—

Leaves simply pointed, not tipped (the sides of the blade upcurled, the side-veins almost or quite invisible).

Flowers larger 4-5" wide, with short, thick stalks, *the petals yellow with a pink or reddish purple inner face*: male flowers in clusters of 4-12 mostly on the twigs behind the leaves: female flowers in 2-3 at the ends of the twigs with or before the new leaves, or solitary in the leaf-axils.

Fruit 1-2" long, 1-1½" wide, larger, on the leafy twigs, round or oblong, generally pointed (the point capped by the pimply stigma), *set with 5-8 deep grooves* in the upper half only or extending from base to apex, *ripening dull orange-yellow* with pale orange flesh, and pale orange pulp round the seeds: sour.



Text-Fig. 104. *Garcinia Cowa*: flowers $\times 2$; fruit, nat. size.

Bengal through Burma, Siam, to N. Malaya: common in the villages of Kedah, Province Wellesley, occasional in Penang and Upper Perak.

This is a well-known village tree in the North of Malaya. Whether it is wild in our forests has yet to be proved though it seems to occur in the coastal forest at Lumut and on the East Coast as far south as Kuala Sedili in Johore. The grooved fruits distinguish it from the Wild *Kandis* (*G. parvifolia*) and the Pointed *Kandis* (*G. nigrolineata*). The copious sticky latex is used by Malays to put into knife-handles in order to fix the blade.

GUTTIFERÆ

G. dulcis Text-Fig. 105
(Lat., sweet)

Mundu, Munu

A rather small bushy tree like the Mangosteen: twigs and undersides of the leaves often hairy: twigs stout: latex white, slowly turning buff on exposure, but yellow in the fruit: young leaves pale green.

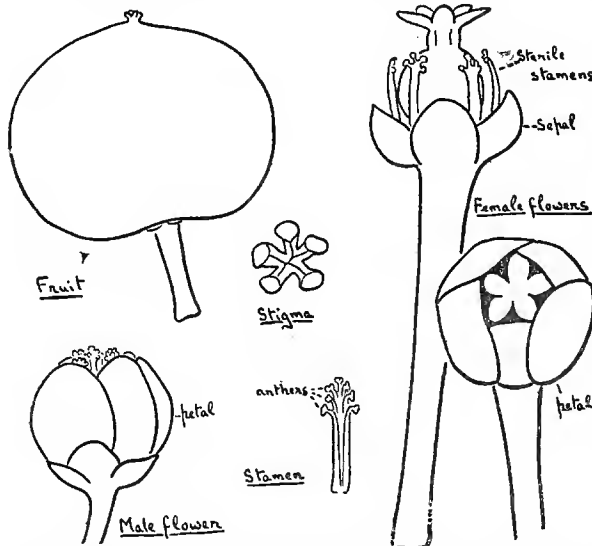
Leaf-blade 4-12 × 1½-5½", oblong-elliptic, broadest near the base, gradually tapered to the apex, leathery, dark green: stalk ¼-1" long, stout.

Male flowers ¼" wide, with rather a faint smell of lime and sour milk, cream white, bell-shaped with a short stalk ¼" long or less, arranged in small clusters mostly on the twigs behind the leaves: petals 5, scarcely separating: stamens 5, with shortly branched heads: no sterile ovary.

Female flowers ¾" wide, like the male flowers but with a much stronger smell, longer stalks ½-1¼" long, the opening of the flower blocked by the 5-rayed stigma: with 5 sterile stamens and copious honey.

Fruit 2-3" wide, round, slightly pointed, often rather compressed, ripening light yellow, pulpy, with 1-5 large brown seeds surrounded with pale orange pulp: the stigma raised on a short stalk, with 5 brown arms.

Java, Borneo, Philippines: frequent in Malayan villages and orchards especially in the north of the country, not wild.



Text-Fig. 105. *Garcinia dulcis*: flowers × 2: fruit × ½.

The bell-shaped flowers with only a small opening between the petals appear very different from those of our other *Garcinias*, but the latex and the Mangosteen-like foliage at once place it in the genus. The fruits are too sour to be eaten raw but they may be candied and they are said to make excellent jam.

(The buds are hidden by two flanges, one from the upperside of each leaf-stalk, and tightly pressed together).

G. Forbesii Text-Fig. 106

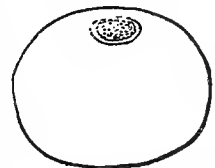
Rose-Kandis

(H. O. Forbes, 1851-1932, the British naturalist and explorer of the East)

Like *G. parvifolia* but:--leaf-blade 3-7 × 1¼-3½", elliptic, tipped, rather thin, with many veins: flowers ½-¾" wide, with rose-red or pinkish yellow petals, clustered on the branches behind the leaves: fruits 1-1½" wide, rounded-flattened, smooth, not ribbed, rose-red to purplish, with watery flesh, sweet, edible: the stigma, ½" wide, papillate, slightly sunken in the fruit.

Sumatra, Malaya: common in the mountains and lowlands.

The flowers open at dusk and the petals fall off at sunrise. Their smell is very strong and rather foetid. Red is an unusual colour for a nocturnal flower.



Text-Fig. 106. *Garcinia Forbesii*: fruit, nat. size.

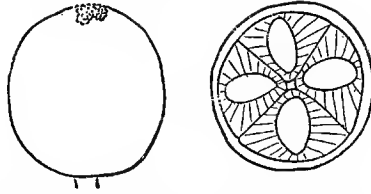
G. Gaudichaudii Text-Fig. 107

(C. Gaudichaud-Beaupré, 1789-1854, the French botanist)

Crab-Kandis

Like *G. parvifolia* but :—
leaf-blade 2-4½" × 1-2½",
 with 6-8 pairs of rather
 distant side-veins: fruit ¾-1"
 thick, globose, green when
 ripe, with a small papillate,
 4-lobed sessile stigma 15"
 wide, containing only 4 seeds.

Indo-China, Malaya:
 common in the forest

Text-Fig 107. *Garcinia Gaudichaudii*: fruit, nat. size.**G. Griffithii** Text-Fig. 108

(W. Griffith, 1810-1845, doctor and botanist of the East India Co.)

Apple-Kandis

Kandis Gajah

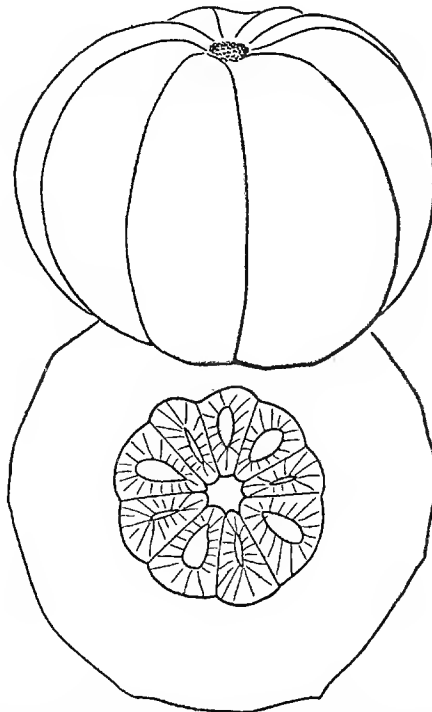
Latex yellowish white.

Leaf-blade 9-16 × 4-9", very large and cabbagy, broadly elliptic, pointed, the edges incurved, strongly ribbed: stalk ½-¾" long.

Flowers ½" wide, with short stalks or nearly sessile, in the leaf-axils or on the twigs behind the leaves: petals yellow flushed red at the base.

Fruits 2-3¼" wide, globose, flattened at the top, faintly ribbed, clustered on the branches, like green apples, turning brownish yellow with watery acid flesh, edible: the sunken stigma ¼" wide, greyish brown, set with brown dots.

W. Malaysia: common in lowland forest, conspicuous from the large leaves and fruits.

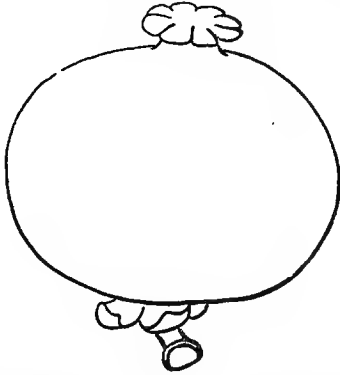
Text-Fig. 108. *Garcinia Griffithii*: fruit, nat. size.

GUTTIFERÆ

G. Hombroniana Text-Fig. 109

Seashore Mangosteen

(J. B. Hombron, 1798-1852, a French physician and explorer) *Bruas*



A small tree with grey bark, peeling off in small oblong flakes and leaving the pale grey-buff new bark: very like the Mangosteen but:—*latex white: flowers smaller: male flowers 1-1½" wide, slightly fœtid sweet, with rose-red stalks, the sepals rose-red or pink outside and cream colour inside, the petals yellowish cream: stamens in 4 clumps, yellowish cream (like the stigma): fruits round, 2" wide, bright rose red (not purple), scented of apples, with the flat, disc-like stigma generally raised on the pointed end of the fruit, the rind thin.*

Nicobar Islands, Malaya: common on sandy and rocky coasts and in secondary jungle on sandy heaths near the sea.

Text-Fig. 109. *Garcinia Hombroniana*: fruit, nat. size.

The pulp round the seeds is edible but sour: it is said to cause severe constipation.

G. mangostana

Mangosteen

Manggis, Mesetor, Sementah, Semetah

Latex yellow.

Flowers 2" wide: petals yellow-buff flushed pink round the edge, the inner pair of sepals light crimson on the inside: stigma cream-buff.

Fruit purple, with 4-7 (rarely 8) wedge-shaped lobes to the stigma.

This small tree with dark heavy foliage is one of the typical village-trees of the Malayan region. Its exact origin is stated to be unknown but we have found indubitably wild specimens in the virgin forest in Kemaman: it may have been brought into cultivation in Siam or Burma. The tree grows very slowly and rarely fruits before 15 years of age: (it is curious that a tropical plant should be so sluggish, yet tropical plants are not all of rapid growth). Only one variety is known, so uniform is the fruit: it occurs in the Sulu Islands and it has a thicker rind and more acid flesh.

It seems that Mangosteen-seeds are developed parthenogenetically, that is to say, without fertilization. Male trees have never been found in Malaya, though they are said to occur rarely in Indo-China: nor have fertile stamens been found in the female flowers: no pollen, therefore, can be formed.

The names *Mesetor* and *Sementah* are used in Kelantan and Trengganu.

The rind of the fruit is used medicinally as an astringent, for which reason sliced and dried husks are exported to China.

G nervosa

(Lat., with strong nerves)

Pear-Mangosteen

Pokok Lapan Taun (Tembeling)

Asam Garam, Kandis Gajah

A tall forest tree up to 100 ft. high, *easily recognized from the very large, very strongly ribbed leaves: twigs and undersides of leaves finely hairy: twigs strongly angled.*

Leaf-blade 12-24 × 5-10", oblong, very leathery, the base more or less heart-shaped: stalk 1-1½" long, very stout.

Flowers as in *G. dulcis*.

Fruits as in *G. dulcis*, often rather pointed.

Sumatra, Malaya, Borneo: rather common in the lowland forest, especially by rivers.

Apparently seldom flowering, as the *Tembeling*-name indicates.

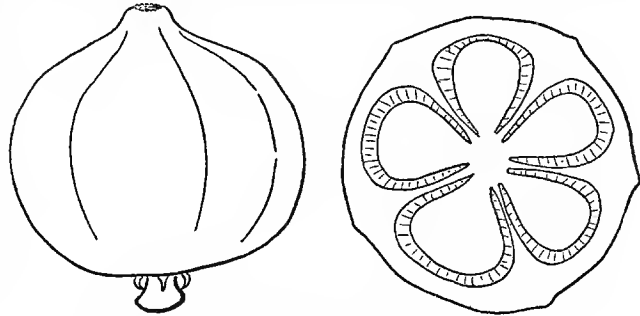
G. nigrolineata Text-Fig. 110
(from the black lines in the dried leaf)

Wild Beaked *Kandis*
Kandis

Like *G. parvifolia* but:—
Leaves often larger, up to 9 × 3".
Flowers larger: male flowers .5" wide, on stalks .4–.6" long: female flowers .5–.6" wide: the petals rather long and narrow, yellow.
Fruit 1–1½" wide, rounded with a short beak-like cone capped by the minutely pimply stigma, green then orange yellow, often slightly ribbed, containing 1–6 large seeds with little pulp.

Burma, Malay Peninsula: throughout the lowland forest but not common.

From the Village *Kandis* (*G. Cowa*), this species is distinguished by its narrow yellow petals and its fruit without grooves.



Text-Fig. 110. *Garcinia nigrolineata*: fruit, nat. size.

G. parvifolia Text-Fig. 111
(Lat., parvus-small, folium-leaf).

Wild Yellow *Kandis*
Kandis

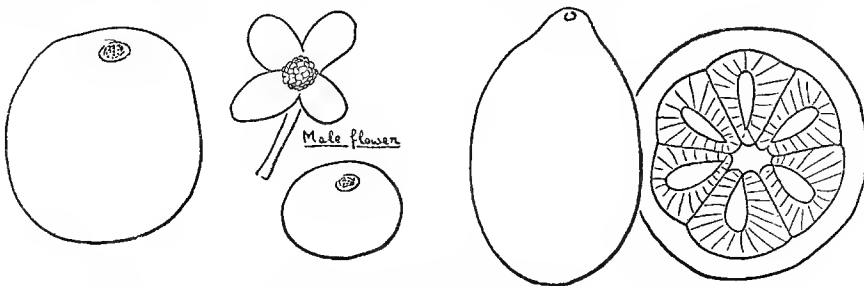
A small to medium-sized tree up to 80 ft. high, with narrow crown, often fluted at the base: bark dark greyish brown, rather closely fissured and becoming flaky in small oblong pieces: latex yellow: twigs dark brown or grey.

Leaf-blade 2–6 × ¾–2½", rather narrowly elliptic, tipped, thin, small especially on tall trees, the stalk ¼–½" long.

Male flowers .3–.4" wide, grouped in clusters on the leafy twigs, pale yellow without any pink, the stalks .2–.4" long; the stamens in a central square mass: opening at dusk and giving out a strong smell of gravy: female flowers slightly larger than the male, with shorter stalks, pale yellow, the stigma covered with minute pimples.

Fruit .5–1.3" long, .5–1" wide, varying rather small and round to more or less oblong, sometimes oblong and humped at the end, mostly on the branches behind the leaves, ripening yellow to dull orange-ochre or orange brown, with watery acid flesh, very thin skin and watery white pulp round the 1–8 seeds, the stigma more or less sunken at the apex of the fruit, often concealed in a small pit.

Malaya, Sumatra, Borneo: common in the lowland forest or secondary jungle, rarely in villages.



Text-Fig. 111. *Garcinia parvifolia*: flower × 2: fruits, nat. size.

The small leaves and yellow-brown, watery-pulpy fruits with small, sunken stigma distinguish this species which is perhaps the commonest wild *Garcinia* in Malaya. It is most likely to be confused with the Village *Kandis*, *G. Cowa*, which has a larger fruit set with grooves and has the leaves simply pointed without a tip. A common mountain species, unidentified, resembles *G. parvifolia* but is larger in all its parts. Compare also *G. nigrolineata*.

G. Prainiana Text-Fig. 112
(Sir David Prain, b. 1857, the British botanist of
Calcutta and Kew)

Button Mangosteen
Kechupu, Menchupu

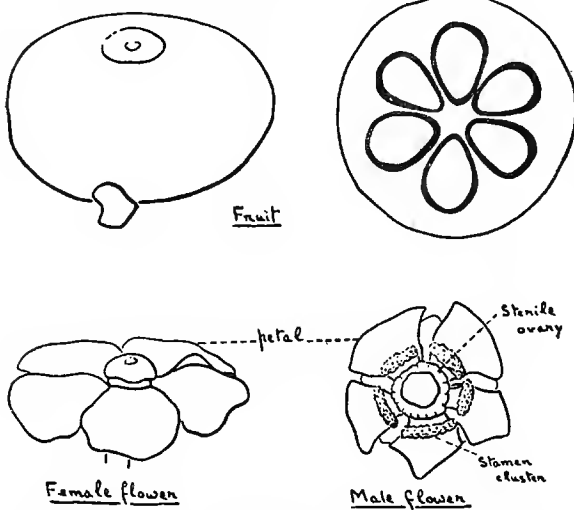
A small to moderate-sized tree, up to 60 ft. high, like a leafy Mangosteen, the narrow crown dense and bushy: bark dull grey: latex white: young leaves pale green: leaves in alternating pairs.

Leaf-blade 4-9 × 1¼-4½", (up to 16 × 8" in young plants), large, elliptic, simply pointed or rather blunt, almost or quite sessile, the base narrowly to broadly heart-shaped and often clasping the stem, dark glossy green, distinctly but not strongly veined: stalk 0-1" long.

Flowers in dense clusters on the leafy twigs, with a curious, rather foetid, lemony smell, the five spreading petals pale yellowish or buff tinged pink or wholly pink: male flowers 1" wide, with 5 pink masses of stamens with yellow anthers, and a pinkish orange slimy stigma covering the sterile ovary: female flowers 1-1¼" wide, with a deep carmine stigma and pink ovary.

Fruit 1-1¼" wide, round, rather flattened and bun-like, smooth, ripening golden to orange-yellow with the blackish button-like stigma, the rind thin, the flesh pale orange, pulpy and sweet.

Lower Siam, Malaya: common in the villages in Kelantan, less common in Perlis, Kedah, Upper Perak and Trengganu: occasional in the forest as far south as Malacca, though common in parts of Kemaman.



Text-Fig. 112. *Garcinia Prainiana*: flowers and fruit, nat. size.

The large, many-ribbed and almost sessile leaves and the white latex distinguish this species in the absence of the pink, 5-petalled flowers and characteristic, flattened fruits with button-like stigma: It seems to be a day-flowering tree because the flowers are full open at noon.

MESUA

(J. Mesue, 777-857, John of Damascus)

Latex whitish, gummy, very scant, mostly in the bark.

Flowers as in *Calophyllum* but large, showy, solitary: ovary with 2 cavities: the sepals persistent in the fruit.

Fruit thinly woody, embraced by the sepals, containing 1-4 dry seeds.

2-3 spp., India to Java: 2 spp. in Malaya.

M. ferrea Plates 67, 68
(Lat., belonging to iron)

Ironwood Tree
Penaga, P. Lilin, Lenggapus

An evergreen monopodial tree, up to 60 ft. high, with dense conical crown (when in full vigour), shortly buttressed at the base: bark greyish-reddish-brown, shallowly fissured and flaky: young leaves vivid yellowish pink, hanging limply in tassels.

BUCKLANDIA.

Leaf-blade 2-6 × .7-1.5", narrow, oblong, lanceolate, pointed, dark green above, white with a waxy bloom beneath: stalk .2-.3" long, slender.

Flowers 3-4" wide, white, very fragrant: sepals and petals 4, rather fleshy: stamens yellow with orange anthers: ovary pale cream.

Fruit 1-2" long, ovoid, conical, dark brown: seeds compressed.

Himalayas to Malaya: occasional in the lowland forest, frequently planted in gardens and by roadsides.

Because of its regular, conical shape, bushy crown, vivid young leaves and large fragrant flowers, the Ironwood is an excellent avenue-tree: and, as such, it can be seen to advantage in the Public Gardens at Kuala Lumpur; but it grows slowly and takes many years to flower. In the forest its appearance is lanky, but, when it is planted in the open, the lower branches are retained, even from the ground-level so that the trunk is completely hidden. The finest specimen in the country is unquestionably that in the Residency Grounds at Penang. Flowering occurs during the dry weather about January-February and July-August; and the new leaves follow with the rainy weather in March and September or October. The flowers open for one day: they begin to open between 3 and 4 a.m., are wide open at sunrise, begin to close an hour before-dusk, and are shut in an hour after sunset: the withered petals remain on for a few days.

In India, the Ironwood is a sacred tree. The Malay name *Penaga* is said to be derived from the Sanskrit. *P. Lilin* refers to the distinctive waxy bloom on the leaves in contrast with *P. Laut* (*Calophyllum*).

The timber is valuable. The heartwood is dark reddish brown, very hard, dense, strong and durable like ebony. It is used principally in machine-work, vehicles, agricultural implements and so on.

The narrow, pointed, opposite leaves with waxy white undersides at once distinguish the Ironwood from all other Malayan trees.

WITCH-HAZEL FAMILY

Hamamelidaceæ

(from the genus of the Witch Hazel, *Hamamelis*)

Leaves alternate or spirally arranged, simple or palmately lobed: with stipules.

Flowers small, in small clusters, spikes or heads, often unisexual: ovary more or less inferior, with 2 cavities and 2 styles.

Fruits as small woody capsules splitting into 2-4 lobes and set in heads like the flowers: the styles splitting along their length: seeds small.

23 gen., 100 spp., S. Africa, S. and E. Asia, N. America, mostly Chinese: 4 gen., 6 spp. in Malaya, all in the mountain forests.

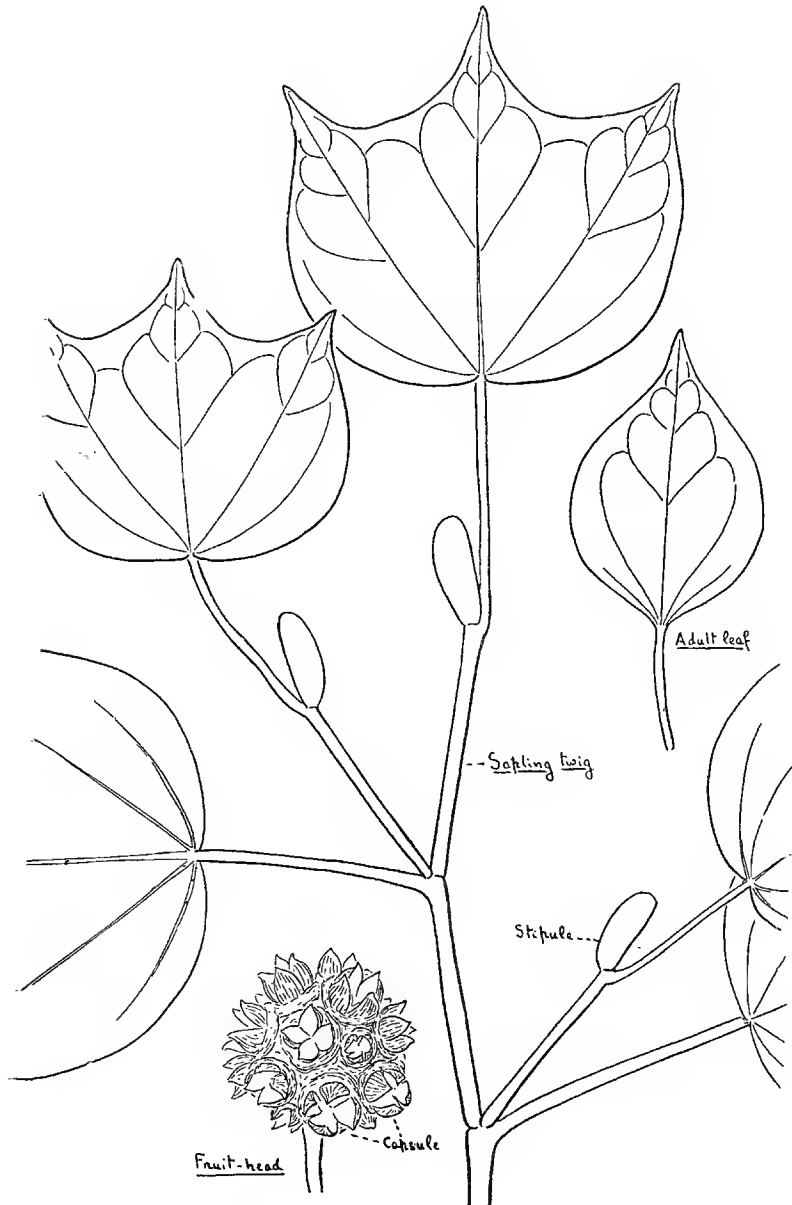
BUCKLANDIA

(W. Buckland, 1784-1856, the English geologist)

Flowers small, bisexual or female, joined together at the base (by the calyces), set in heads of about 8 flowers: petals narrow, variable in number, absent from the female flowers: stamens 10-14: ovary half-inferior, the projecting.

Fruits in woody heads (like those of *Casuarina*), the capsules half-projecting: seeds 6 in each cavity of the capsule, the upper seeds sterile and wingless, the lower ones fertile and winged.

1 sp., mountains of N. E. India, S. China, Malaya and Sumatra.



Text-Fig. 113. Malayan Aspen (*Bucklandia populnea*), $\times \frac{1}{2}$: fruit, nat. size.

B. populnea Text-Fig. 113
(with leaves like a poplar)

Malayan Aspen
Tiga Sagi, Drok or Groh (Sakai)

A big tree up to 100 ft. high, with massive trunk: bark dark brown, fissured and flaky: buds covered by the large, flat, oblong, blunt stipules, $\frac{3}{4}$ -1 $\frac{1}{4}$ " long, $\frac{1}{4}$ - $\frac{3}{4}$ " wide: the stipules dropping off, as each new leaf unfolds, leaving ring-like scars on the twigs: the leaves withering apricot-pink or pinkish orange.

Leaf-blade 3-8" wide, palmately lobed with 3 long points, the base more or less heart-shaped or abruptly cut off: upper leaves of mature trees small, ovate-elliptic, not lobed, tapered to each end: stalk 1-3" long, shorter in the upper, small leaves.

Fruiting head $\frac{3}{4}$ -1 $\frac{1}{2}$ " wide.

Common in the mountain forests, apparently seldom flowering.

This handsome tree has been planted at Fraser's Hill and Cameron Highlands. The leaves quiver on their long stalks like those of aspens.

SEA-HEARSE FAMILY

Hernandiaceæ

(from the genus *Hernandia*)

4 gen., 35 spp., throughout the tropics: 3 gen., 4 spp. in Malaya.

HERNANDIA

(F. Hernandez, d. 1578, a Spanish naturalist and explorer)

Leaves spirally arranged, simple, long-stalked.

Flowers small, unisexual, set in long-stalked axillary panicles: the flowers set in groups of three, a central female with a male on each side, each group surrounded by 4-5 bracts: male flowers with 6 sepals, female with 8: petals none: male flowers with 3 stamens, each with 2 club-shaped glands at the base of the stalk.

Fruit consisting of a black nut enclosed in a large, round, inflated, waxy-fleshy, envelope or cup with a hole at the top.

About 10 spp., throughout the tropics: 1 sp. in Malaya.

H. ovigera Text-Fig. 114
(from the egg-like fruit)

Sea-Hearse
Buah Keras Laut

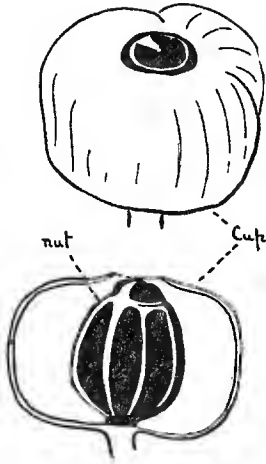
An evergreen sea-shore tree up to 60 ft. high, with uneven, open, rounded crown: trunk becoming shortly buttressed at the base: bark silvery grey-buff, slightly fissured, rather pimply, the inner bark pale brownish buff with broad whitish streaks, thick.

Leaf-blade $4\frac{1}{2}$ -11 × 3-8", large, peltate, broadly ovate with a short tip, entire, rather fleshy-leathery, dark green with yellowish veins and midrib, glabrous: stalk 2 $\frac{1}{2}$ -8" long, attached about $\frac{1}{2}$ - $\frac{3}{4}$ " from the edge of the blade.

Flowers $\frac{1}{2}$ " wide, yellowish white: panicles 4-12" long, upright.

Fruits in drooping clusters on stalks 3-10" long, the black nut about 1" long, with 8-10 grooves or ridges and a smooth round top: the cup $1\frac{1}{2}$ -2" wide, pale green then greyish white.

On the coasts of the Indian and West Pacific oceans: rather common on most sandy and rocky coasts of Malaya, especially at Pangkor and on the East Coast, in the Terminalia-zone just above the high water.



Text-Fig. 114. Sea-Hearse (*Hermandia ovigera*): fruit $\times \frac{1}{2}$.

The peltate leaves and curious fruit at once distinguish this strange tree. It flowers during most of the year, so that the fruits can generally be found: they suggest little black, carved coffins with pale shrouds. Superficially the tree looks like the *Baru Laut* (*Thespesia*) or the Sea Trumpet (*Cordia*), especially the former, but both have very different flowers and fruits and their leaves are not peltate: moreover the inner bark of *Thespesia* is pinkish brown so that a cut in the trunk suffices to distinguish it.

How the fruits are distributed and what is the use of the waxy cup are questions to be answered: presumably the black nuts are water-borne.

ST. JOHN'S WORT FAMILY

Hypericaceæ

(Huperikon—the Greek name of a plant)

Leaves opposite, simple, entire, minutely dotted with glands, more or less resinous or fragrant when crushed or dried: stipules none.

Flowers medium-sized, singly, in clusters or in panicles, regular: sepals 5, free: petals 5, free: stamens very many, joined into 3 or 5 bundles: ovary superior, with 3 or 5 cavities and styles.

Fruit a capsule with many small seeds, the sepals generally persistent.

8 genera, 400 spp., temperate and tropical regions of the whole world: 2 genera and 6-7 spp. in Malaya.

This small, but widespread family, named after the genus *Hypericum* (the St. John's Worts of the English flora), is represented in Malaya by one introduced weed with yellow flowers, *Hypericum japonicum*, and by 5 or 6 species of tree of the genus *Cratoxylon* which is most characteristic of the Malayan region. To Malays the trees are generally known as *Mempat*, *Beluchus* and *Derum*, without specific value, though the chief timber-tree, *C. arborescens*, is usually called *Geronggang*. They are common trees with pretty red or pink flowers, white only in *C. Maingayi*, and, as they grow well in the open, they should be planted as ornamental trees. There are interesting differences in their manner of flowering. None of them develops buttresses even though they may grow to a large size in the forest. The saplings of the three species, *C. formosum*, *C. ligustrinum* and *C. cochinchinense*, have their stems set with woody thorns, 1-4" long, like those of the *Rukam* (*Flacourtia*): the thorns are the stiffened bases of twigs and they fall off as the trunk thickens.

CRATOXYLON

(Gr., kratos—strength, xulon—wood)

Trees with the inner bark generally amber yellow and exuding an orange, yellow or reddish gum: *petals red, pink or white: stamens in 3 bundles: nectaries yellow or red, one between each bundle of stamens: styles 3: capsule splitting into 3 parts*, dark brown: seeds winged, brownish, small.

About 12 spp., tropical S. E. Asia to Celebes and the Philippines: 5 or 6 spp. in Malaya, lowlands and mountains.

The trees called *Pagar Anak* (*Ixonanthes*) have similar capsules but these are always resinous, sticky or varnished, on the outside and their leaves are spirally arranged.

Key to the Species

Flowers in small clusters on the bare twigs	
Flowers pink	<i>C. formosum</i>
Flowers white (Penang, Kedah)	<i>C. Maingayi</i>
Flowers on the leafy twigs: flowers red or pink	
Big, evergreen tree with upright panicles of small crimson flowers: a forest-tree with flaky brown bark	<i>C. arborescens</i>
Deciduous trees, small or with smooth bark: flowers axillary or in drooping, leafy panicles	
Bark very smooth, pale: flower pink: medium to large tree	<i>C. ligustrinum</i>
Bark rough, flaky, grey brown: flower crimson: shrub or small tree in the north of Malaya ...	<i>C. cochinchinense</i>

C. arborescens

(Lat., like a big tree)

Geronggong, Geronggang

An evergreen tree, 30-150 ft. high, with rounded, spreading, gloomy, small-leaved crown: *bark* warm brown, ridged and fissured, becoming flaky or shaggy with oblong, fibrous scales, that of saplings merely cracked.

Leaf-blade 3-5 × 1-2½", elliptic or obovate, bluntly tipped, *leathery, with numerous very faint side-veins*: stalk .2-.4" long.

Flowers ⅓" wide, in panicles 3-10" long.

Capsule .3-.4" long, covered for ⅔ of its length by the sepals.

Malaya, Sumatra, Borneo: common in lowland and mountain forest in Malaya, abundant on Penang Hill and Fraser's Hill.

Though evergreen, the flowering is seasonal like that of the other species, once or twice a year after dry weather. The mountain trees have narrower, more pointed and less leathery leaves than the lowland ones, and they have been called the variety *Miquelii*: such are common in the neighbourhood of Fraser's Hill and have been planted by some of the roads.

C. cochinchinense

Tree-Avens

Kemutong, Kayu Arang (Kelantan)

A deciduous shrub or small tree to 30 ft. high: *bark* grey brown, rough, flaky or cracked, rather ridged: *young leaves* deep purple, then pinkish brown.

Blade 2¼-5 × 1-1¼", *oblong elliptic*, generally blunt or slightly pointed, distinctly glaucous beneath: side-veins conspicuous: stalk .1-.2" long.

HYPERICACEÆ

Flowers $\frac{1}{2}$ " wide, in pairs, in drooping terminal and axillary racemes 2-6" long or leafy panicles, faintly fragrant, buds purplish: petals crimson: nectaries 3, yellow, large and helmet-shaped.

Capsule 4-5" long, covered for $\frac{2}{3}$ - $\frac{3}{4}$ of its length by the sepals: the withered petals generally persistent also.

Burma, Indo-China, Siam: North of Malaya (Penang, Kedah, Perlis, Kelantan), common in belukar, sandy heaths and waste land.

This beautiful little tree, which develops its tresses of crimson flowers on the new twigs after they have covered themselves with the fresh foliage, should become one of the ornamental trees in the more seasonal parts of Malaya, at Malacca for instance or on the East Coast. At the beginning of the dry weather it sheds its leaves and then flowers a month or so later, about April in Kelantan and January or February in Kedah and Perlis. The English name we give to it because the flowers resemble the red Water-Avens, *Geum rivale*, of Western Europe.

(This is not the species called *C. cochinchinense* in BURKILL'S Dictionary: see *C. formosum*).

C. formosum Plate 69
(Lat., beautifully shaped)

Pink *Mempat*
Mempat, Derum

A small to lofty, deciduous tree very like *C. arborescens* but with ashen or greyish brown bark not so coarsely ridged or scaly: young leaves reddish pink, the colour persisting for a long time on the underneath of the leaves: old leaves falling green.

Leaf-blade 2-7 × 1 $\frac{1}{4}$ -3", varying broadly to narrowly elliptic, bluntly tipped or tapered to a point when small, the side-veins well spaced: stalk rather long, $\frac{1}{2}$ - $\frac{3}{4}$ ".

Flowers $\frac{1}{2}$ " to nearly 1" wide, stalked and set in small clusters of 3-5 on the bare twigs, fragrant, petals clear pale pink: nectaries orange-red, conical.

Capsule $\frac{1}{2}$ - $\frac{3}{4}$ " long, the sepals covering only the basal third.

Indo-China, W. Malaysia, Philippines: common throughout Malaysia in belukar and forest.

Outside the forest, this is the commonest species of *Cratoxylon* in Malaya. It is rather variable so that we can recognise two forms, the one smaller in all its parts than the other. The small one does not exceed 50-60 ft. high and is commonly much less: it has small, pointed leaves up to 1 $\frac{1}{2}$ " wide, small flowers little over $\frac{1}{2}$ " wide and narrow capsules $\frac{1}{5}$ " wide: its bark, moreover, is more narrowly fissured and smaller scales. The other commonly reaches 80-120 ft. high in the forest, has coarsely fissured and scaly bark, broader and rather blunt leaves, larger flowers $\frac{3}{4}$ -1" wide, and bigger capsules $\frac{1}{4}$ " wide or more.

When in blossom, this *Mempat* is easy to recognise because the crown is more or less leafless, or reddened with the opening buds, and the twigs are sprayed with pink flowers, like almond-blossom. For a week or more, the ground beneath the tree is carpeted with the fallen petals, though the crown soon recovers its leafiness and hides the last stages of flowering. Each flower lasts but one day: it opens about 8 a.m. and closes in the afternoon, about 3-5 p.m. according as the sun strikes the tree. Unlike the fruits, which point up, the flowers face down.

The larger variety is wholly deciduous and flowers, therefore, on all its twigs simultaneously. But, in Singapore, the smaller variety sheds its leaves gradually by a branch or two at a time and thus it flowers by branches also, from below upwards, and is less spectacular. The time of leaf-fall on the mainland seems to occur generally during the first half of the year after the main spell of dry weather. By the Sedili River in the East of Johore, for instance, one can distinguish this *Mempat* in the forest by the bare crowns about March or April to June and a little later when they begin to blush with flowers.

On the other hand, the careful study of *individual* trees in Singapore has shown no such annual rhythm but that they shed their leaves at intervals of six to eleven months. Such irregularity is perhaps to be correlated with the irregularity of Singapore's climate and, therefore, we are anxious to have observations on individual trees from other parts of the country. It should be noted that the flowers in this species, and in *C. Maingayi*, are borne in the axils of the leaves which have just fallen, that is on the twigs of the preceding season, whereas they are borne at the ends of the new twigs in the other species.

(This species is called *C. cochinchinense* in BURKILL'S Dictionary).

C. ligustrinum

(Ligustrum—the privet: from the leaf-shape)

Smooth-barked *Mempat*

Mempat, Beluchus

A deciduous tree up to 70 ft. high: bark very smooth, light buff to pale brownish yellow, (reddish when wet), peeling with a few thin, flat, angular pieces like bits of a jig-saw puzzle, not fissured: trunk generally fluted: inner bark pale emerald green, very sappy: young leaves purple-pink.

Leaf-blade $1\frac{1}{2}$ – $3\frac{1}{2}$ × $\frac{3}{4}$ – $1\frac{1}{4}$ " , narrowly elliptic, tapered to each end, thin, faintly veined, more or less glaucous beneath: stalk .1–.2" long, short.

Flowers .3–.4" wide, in groups of 2–3 in the axils of the fresh, new leaves near the ends of the twigs, or in short panicles 1–2" long, with a dull scent: petals translucent pink.

Capsules .3–.4" long, as in *C. cochinchinense*.

Northern India, W. Malaysia, Philippines: frequent in forest and belukar in Malaya.

In flower and leaf this species is very like the Tree-Avens, *C. cochinchinense*, but it is a big tree with a most peculiar smooth trunk recalling that of the *Pelawan* (*Tristania*) or *Kedah Bungor* (*Lagerstrœmia floribunda*). Observations on two trees in the Singapore Botanic Gardens have shown that they shed their leaves at some time between February and May every year and that they remain bare for three weeks. As a handsome tree with beautiful trunk, this species is rivalled in Malaya only by the *Pelawan* (*Tristania*).

C. Maingayi

(A. C. Maingay, 1836–1869, doctor and botanist of the East India Co.)

White *Mempat*

Mempat, Derum

A deciduous tree very like the form of *C. formosum* with narrow pointed leaves but having white or very pale pink flowers.

Penang, common on the hill, Kedah: perhaps also in Siam, Indo-China and Sumatra.

This species flowers about February and March in Penang.

HOLLY FAMILY

Ilicaceæ

(from the genus *Ilex*)

Leaves spirally arranged or alternate, often toothed: with short stalks.

Flowers small, generally unisexual, the male and female on different plants, borne in small axillary clusters, regular: sepals 3–6, slightly joined at the base: petals 4–8, slightly joined at the base: stamens 4–5, attached to the petals: ovary superior, the style very short and thick.

ILICACEÆ

Fruit a small berry with 2-many small hard seeds.
3 gen., 300 spp., throughout the world, chiefly tropical, few in Africa and Australia: 1 gen. in Malaya.

The Holly-tree, *Ilex aquifolia*, of Europe is the best known member of this family yet it must be regarded as an exceptional, outlying species with an unusual leaf-form in a genus which is mainly tropical, very much as the European Oaks, Ivy and Bedstraws are outlying members of their tropical families. The spiny leaf of the Holly is found in few other species of the genus and these appear to belong to the North temperate region. The tropical species have simply toothed leaves or, as in most cases, entire leaves. The berries of the Malayan species, too, are small and rather inconspicuous, as they generally ripen dull purple or black: *Ilex macrophylla* is an exception.

Another well-known species in some parts of the world is the Paraguay Tea, or Yerba Mate, *Ilex paraguariensis*, a small tree of South America. The dried leaves are used to make a refreshing, stimulating drink and at one time they gave rise to a considerable trade.

Many species of *Ilex* occur in the mountains in the tropics. At least a dozen occur in the Malayan mountains but they are very little known except for two common species.

ILEX

(a Latin plant-name)

About 200 spp., distributed as the family: about 20 spp. in Malaya.

Key to the Species

- Mountain shrub or treelet with small, toothed leaves:
 - berries solitary, black *I. triflora*
- Lowland trees with entire leaves: berries clustered
 - Berries purple then black: leaves 1-2" wide: bark greyish white *I. cymosa*
 - Berries red: leaves 2-3½" wide: bark dark silvery grey
 - Leaves very leathery with stout stalks, with a glaucous bloom beneath *I. Maingayi*
 - Not so *I. macrophylla*

I. cymosa Plate 70
(from the flower-clusters)

Marsh Holly
Mensirah, Mesirah

A small glabrous, evergreen tree up to 50 ft. high, occasionally reaching 80 ft., without buttresses: bark white or light grey, entire, even or rather pimply with lenticels; the inner bark thick, ochre-brown, and coarsely gritty: twigs silvery white: young leaves pale green, mottled darker on the veins.

Leaf-blade 2-5 x 1-2½", elliptic with a blunt tip, dark green, pale beneath with 6-8 pairs of side-veins: stalk up to ¼" long.

Flowers 2" wide, greenish white, in small, rather loose, axillary clusters 1-2" long: petals 4-8.

Berries .15-.2" wide, pinkish purple then black, like small currants, with about 8 seeds.

W. Malaysia: abundant in lowland forest and secondary jungle, especially in swampy ground, also in the rice-fields.

This tree is well-known to Malays and is always correctly identified by them though it is not of any particular use. It seems indistinctive, but it is really easy to recognise if attention is paid to the white bark, silvery white twigs, short leaf-stalks and clusters of little berries. Moreover the young leaves are pale green with much darker green veins on the upperside so that they are characteristically mottled. The flowers are developed with the new leaves and are borne mostly in the axils of bud-scales or reduced scale-leaves at the beginning of each new shoot: the fruits therefore generally develop on the twigs behind the leaves.

The Marsh Holly must not be mistaken for the Malay Olive (*Linociera*) or the Sea Olive (*Olea*), p. 513, which have opposite leaves though they may be given the same Malay name (? in mistake). The White Kelat (*Eugenia verecunda*) and *Krian* (*E. pseudosubtilis*) are also similar but have opposite leaves and different flowers and fruits.

I. macrophylla Text-Fig. 115
(Gr., makros—long, phullon—a leaf)

Malay Holly

Like *Ilex cymosa* but:—
Bark dark grey, rather silvery.

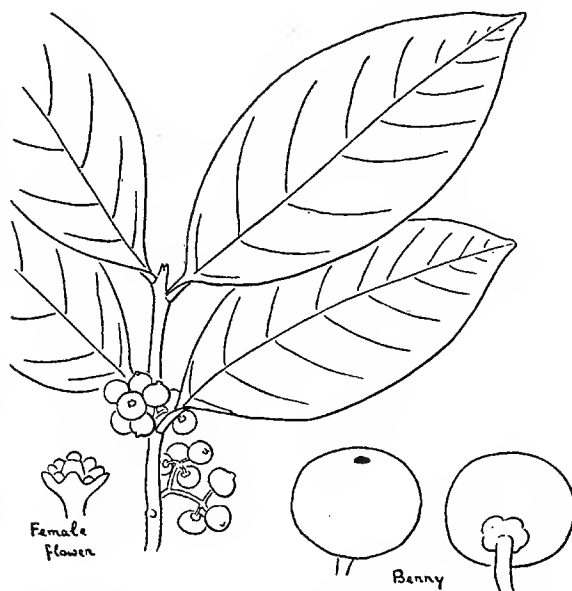
Leaf-blade larger, 4-8 × 2-3½", more leathery.

Flower-clusters smaller, 1-1½" long, the flowers in each cluster grouped generally into two compact bunches.

Berries bigger, .3-.4" wide, ripening dark scarlet.

Of similar distribution: generally on drier ground.

Except for its entire leaves this tree much resembles the English Holly. A specimen on Bukit Timah in Singapore sometimes fruits about Christmas: it is more or less completely deciduous after the dry weather about July or August, perhaps also in the early part of the year.



Text-Fig. 115. Malay Holly (*Ilex macrophylla*), × ½: flower and fruit × 2.

I. Maingayi

Glaucous Holly

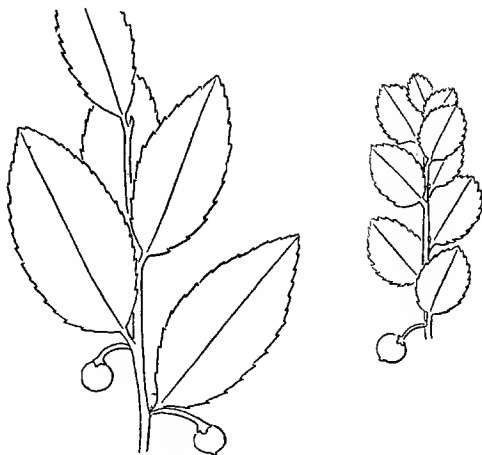
(A. C. Maingay, 1836-1869, doctor and botanist of the East India Co.)

Like *I. macrophylla* but the leaves very leathery, oblong-obovate, the undersides yellowish green with a distinct glaucous bloom, the leaf-stalk very stout.

Malaya: lowland forest, especially in swampy ground.

I. triflora Text-Fig. 116
(with three flowers)

Mountain Holly



Text-Fig. 116. Mountain Holly (*Ilex triflora*), $\times \frac{1}{2}$: small and large-leaved varieties.

A mountain bush or small tree, glabrous or with the twigs, leaf-stalks and, in some cases, the undersides of the leaves finely velvety: twigs slightly angled.

Leaf-blade $\frac{1}{2}$ - $3\frac{1}{2}$ \times $\frac{1}{2}$ - $1\frac{1}{2}$ ", broadly elliptic, pointed, dark green, leathery, the edge finely toothed and often incurved: stalk $\cdot 1$ - $\cdot 2$ ".

Flowers $\cdot 2$ " wide, pale pink, stalked, in small clusters: petals 4.

Berry $\frac{1}{2}$ " wide, black, with 4 seeds.

Indo-Malaysia, China, Indo-China: common on mountain-tops and ridges above 3,000 ft., throughout the country.

Some plants have their leaves consistently small, $\frac{1}{2}$ - $\frac{3}{4}$ \times $\frac{1}{2}$ ", and can be mistaken for mountain heaths or bilberries (*Ericaceæ*).

WALNUT FAMILY

Juglandaceæ

(Lat., juglans—the walnut)

Leaves spirally arranged, pinnate, without a terminal leaflet: stipules none.

Flowers very small, in short or long catkins on the bare or leafy twigs: male and female flowers in different catkins on the same tree: calyx generally of 4 sepals: petals 0: stamens 4-12, seated on the sepals: female flowers with an inferior ovary with a short forked style.

Fruit a 1-seeded nut, large and with a fleshy rind, or small and attached to a winged bract, not enclosed in a cup.

5 genera, chiefly North Temperate, few tropical: 1 genus in Malaya.

To this family belong, in Europe, the Walnut (*Juglans regia*) and, in N. America, the Butternut (*J. cinerea*) and the Pecan and Hickory Nuts (species of *Carya*). In Malaya we have only a few rather uncommon trees of the genus *Engelhardtia*, the fruits of which are tiny, inedible nuts but little developed in comparison with those of their northern relatives though in reality strangely and perfectly modified for distribution by the wind. The little nuts are placed upon, or wrapped in, the base of a large 3-fingered vane which is the bract that subtended the female flower in the catkin and that, on its pollination, rapidly enlarged to serve firstly as a shield for the young fruit and finally as an aerofoil to carry the seed from its parent. The ripe fruits with their attendant wing are detached from the catkin by a puff of wind and reach the ground by a devious, spinning and encircling flight like the shuttlecocks of the *Dipterocarps*

and the *Rengas* (Melanorrhœa), the opened pods of the *Mata Lembu* (Erythropsis) and *Kembang Samangkoh* (Scaphium), and the flat, twisted pods of the *Kempas* (Koompassia). These fruits and catkins of Engelhardtia bear so great a resemblance to those of the Hornbeams (Carpinus), of Europe and temperate Asia, that we are persuaded in the absence of any common vernacular name to call our trees the Malay Beams. But there resemblance ceases, for the Hornbeams, having simple leaves and differently constructed flowers, belong to the affinity of Oaks, Beeches, Birches and Hazels (Fagaceæ): nor do they penetrate so far to the south.

The Malay Beams are large forest trees that prefer the slopes of hills and mountains to an altitude of 5,000 ft. They can be recognized from the fallen fruits and the bits of fruiting catkins broken off by the wind or by squirrels and monkeys. The fruits are so characteristic that they cannot be mistaken (Text-Fig. 117). But, in their absence, the Malay Beams may be passed as members of the *Rambutan*-family (Sapindaceæ) because they have exactly the same kind of pinnate leaf in which the leaflets are distinctly asymmetric at the base and increase in size from the lowest on the leaf-stalk to the uppermost, and in which there is no terminal leaflet but merely a short spike at the end of the leaf-stalk.

Concerning the habits of the Malay Beams we have little information. Only the Brown Malay Beam (*E. nudiflora*) is known to be deciduous. The crown of *E. chrysolepis* becomes thin on leaf-change, but is never bare. What we have called the Great Malay Beam (*E. spicata*) is a magnificent tree with the huge umbrageous crown like the *Angsana* and prodigious catkins that may be two feet long: we hope that it will be brought into cultivation for its gigantic "lamb's tails" dancing in the wind make a quixotic spectacle, a little reminiscent, it is true, of the gruesome Gibbet-trees in Arthur's Knights.

There is no common Malay name for these trees and whether the recorded names are constantly used, we do not know.

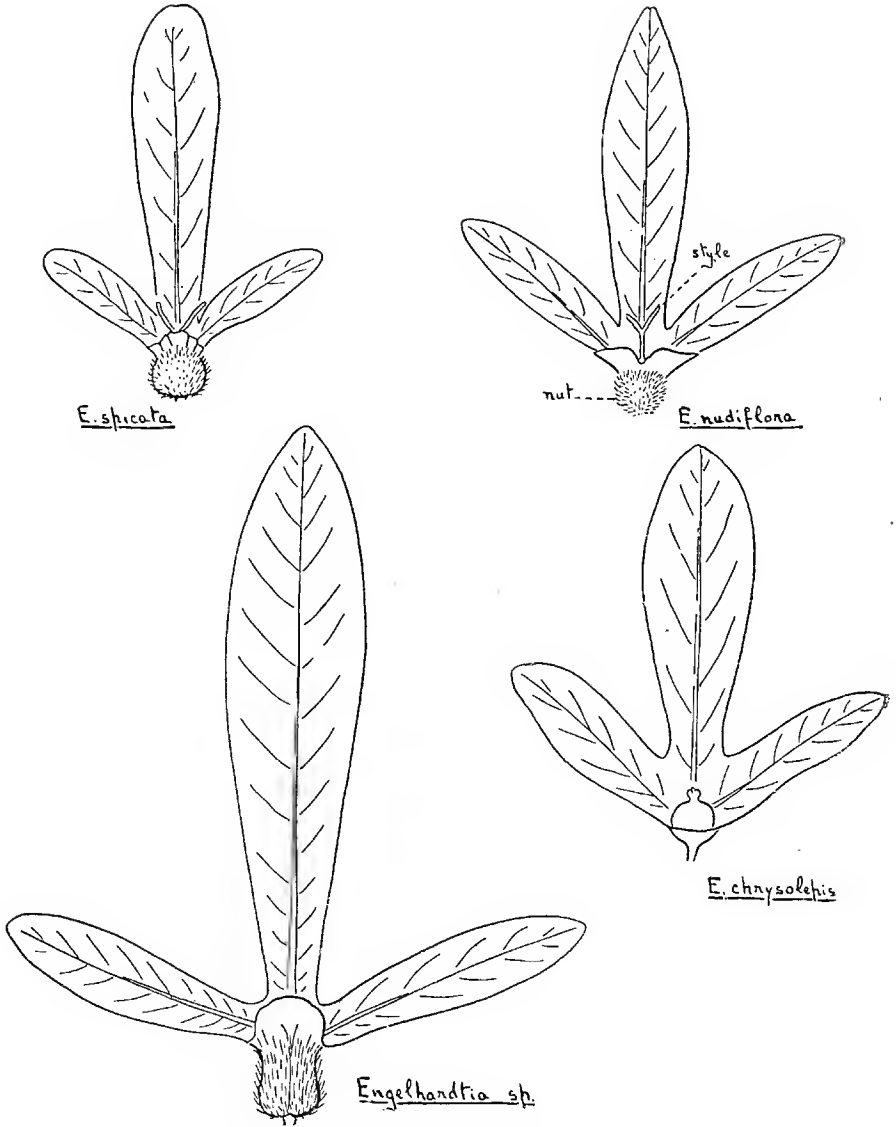
ENGELHARDTIA

(N. Engelhardt, 1761-1831, a Governor in Java 1801-1808, and patron of Botany).

Buds, young twigs, and catkins brown scurfy.
Fruit a very small nut $\frac{1}{4}$ " wide or less, attached to the base of a large 3 (-4) lobed, net-veined wing (bract): fruits crowded in catkins.
 About 10 species: 4 spp. in Malaya.

Key to the Species

Nut (at the base of the 3-lobed wing) hairy		
Nut oblong, .3" long: wing 3" long	... ..	<i>Engelhardtia sp.</i>
Nut round, .2" long or less		
Wing 2" long: leaflets large 3-10" long, stalked, entire	... ..	<i>E. spicata</i>
Wing 1½" long or less: leaflets small 2-5" long, sessile, toothed, brown beneath	... ..	<i>E. nudiflora</i>
Nut yellowish brown, not hairy: seated on the cup-like base of the wing	... ..	<i>E. chrysolepis</i>



Text-Fig. 117. Fruits of Engelhardtia, nat. size.

E. nudiflora Text-Fig. 117
(Lat., nudus—
naked, flos—flower)

Brown Malay Beam
Changgal Petri (Pen.) *Sepoh Petri, Kedi* (Joh.)
Mengkedi, Leban Chondong (Rompin)
Melampai Bukit (Sel.)

A small to medium-sized deciduous tree, reaching 80 ft.: *crown very dingy, brownish green, fine-leaved*, rather dense, irregular or rounded conic when young: bark dull greyish brown, somewhat fissured and flaky.

Leaf-stalk 2–5½" long, with 3–5 pairs of leaflets: *leaflets 2–5 × ¾–2"*, small, elliptic or ovate, *the edge generally notched* (in some cases entire), *sessile*, leathery, *dark green above, dingy brown beneath*; side-veins 6–11 pairs.

Male catkins 1–2" long, on the bare twigs, scarcely drooping.

Fruits with the wing 1–1½" long, in catkins 3–6" long on the leafy twigs, the small nut round, bristly hairy, .15" wide.

Malay Peninsula: scattered throughout Malaya.

The Brown Malay Beam is rather common on Penang Hill where it is conspicuous from its very dingy, dense, fine-leaved crown, like some sorts of *Kranji* (*Dialium* p. 393). There is a tree beside the Crag Hotel and several near the path leading to it. The leaves are shed after dry weather, about August or September, and also at the beginning of the year. The leaflets fall while they are still greenish brown and they do not fade into "autumn tints". The male catkins develop on the old twigs before they shed all their leaves and the female catkins develop at the base of the new shoots after the old leaves have been shed. In swampy ground the trunks are buttressed.

E. spicata Text-Fig. 117
(Lat., spica—an ear of corn)

Great Malay Beam

A big tree, 100 ft. or more, with very dense, rather light green, lofty, rounded crown, the branches scarcely drooping: old trees strongly buttressed to 8 ft.: *bark* light brownish grey, slightly fissured: *glabrous* or the twigs finely scurfy.

Leaf-stalk 6–15" long, with 4–6 pairs of leaflets: *leaflets 3–10 × 1½–3½"*, elliptic, tipped, thin, edge entire, with 11–18 pairs of side-veins: the stalks of the leaflets 1–5" long, distinct.

Catkins 10–24" long, hanging.

Fruits with the wing 2" long: the nut round, .15–.2" long, set with bristly hairs.

India to the Philippines and Java: frequent in Upper Perak, by the hot Springs at Grik, and probably in other parts of Malaya but difficult to detect unless in fruit.

E. chrysolepis Text-Fig. 117
(Gr. chrusos—gold, lepis—scale)

Golden Malay Beam

Like *E. spicata* but:—*bark* finely ridged, slightly flaky: new shoots olive-yellow.

Leaf-stalk 4–7" long, with only 2–3 pairs of leaflets: *leaflets 2½–7 × ¾–2¼"*, narrow, tapered to a long, rather blunt tip, with 8–12 pairs of side-veins.

Male catkins 2–4" long.

Fruits with the nut (.2" wide) golden yellow or golden brown, not hairy, seated on the cup-like base of the bract: fruits in catkins 4–8" long.

Malaya, Borneo: in the mountains from Fraser's Hill to Penang Hill and Kedah Peak, common.

Engelhardtia sp. Text-Fig. 117
(unidentified)

Mountain Malay Beam

Like the preceding but:—*bark* with broad shallow fissures, not scaly or ridged.

Leaflets smaller, up to 5 × 1½", *generally finely notched, the base abruptly rounded*; *the stalk of the leaflet very short, .1" long or less*.

Catkins up to 12" long.

Fruit with larger wing, 3" long: the hairy nut larger and oblong (.3" long).

Malaya: Fraser's hill, Cameron Highlands, frequent.

LAUREL FAMILY

Lauraceæ

(Laurus—the Mediterranean laurel)

Evergreen trees with more or less resinous or aromatic bark and leaves: twigs often grooved.

Leaves simple, entire, variously arranged but generally spiral, often finely dotted with glands: no stipules.

Flower tiny, regular, greenish, white or yellow, arranged in panicles or in short clusters, rarely conspicuous, fragrant or with a rancid smell: calyx of 6 small sepals in two rows of 3 each: petals none: stamens 6, 9 or 12, in 2-4 rows of 3 each, occasionally more, small, crowded together, the anther of each opening with two or four little upturned flaps: style one, short; ovary superior.

Fruit a small to large one-seeded berry with pulpy rind, oblong or round and seated on, or more or less enclosed in, the persistent calyx: the rim of the fruiting calyx entire or with 6 lobes or teeth: seed rather large.

About 1,000 species, throughout the warmer regions of the earth: 16 genera and some 180 species in Malaya.

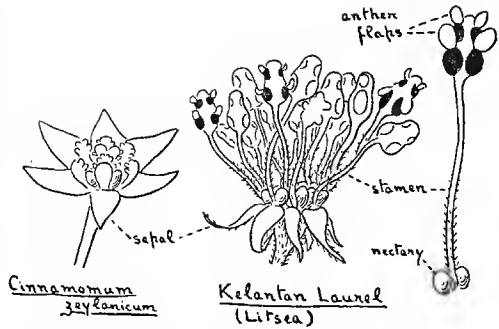
To this large and most difficult family belong a great many trees of our lowland and mountain forest. They are called *Medang* or *Tejur* by Malays, often with a variety of epithets the significance of which has yet to be discovered because of the uncertainty in identifying the species and because of our meagre knowledge of them. Several other kinds of tree are called *Medang*, such as the Oil-fruits (*Elæocarpus*) and *Pygeum*, but there is a tendency to restrict the name to the wild Laurels and this course is advocated by the Forest Department. Among the better known exotic members of the family are the Bay Laurel (*Laurus nobilis*) of Europe the branches of which garlanded the brows of Roman Emperors, the Avocado Pear (*Persea gratissima*) of Tropical America, the Cinnamon and Japanese Camphor trees (*Cinnamomum* p. 339), the Sassafras of N. America and the Greenheart Wood of British Guiana. The Cherry Laurel (*Prunus laurocerasus*), often miscalled the Laurel by English people, is really a member of the Rose-family.

In the lowlands of Malaya the wild Laurels are typically small trees of the lower stories of the forest and, indeed, they are as characteristic of the undergrowth as the wild Nutmegs and Mangosteens, *Eugenia*-trees etc. (p. 487): a few reach over a hundred feet high but it is doubtful if any enter into the canopy of the lofty virgin forest unless it is on the sandy coast or in the swamps beside the rivers. In the mountains, in contrast, the Laurels, like the Oaks, become more abundant relative to other kinds of tree, many of them participating in the canopy, and thus the term Oak-Laurel Forest is sometimes given to this vegetation which lies in the region from 4000-8000'. Such Oak-Laurel forest is a feature of the mountains of tropical Asia from the Himalayas to New Guinea, but the apparent dominance of the two kinds of trees depends rather on the inability of other genera of lowland trees to survive at such altitudes than on a greater development of these families which, so far as numbers and variety of species are concerned, are probably better represented in the lowlands. Yet, a walk of half a mile in any part of the forest will take one past some dozen species of Laurel.

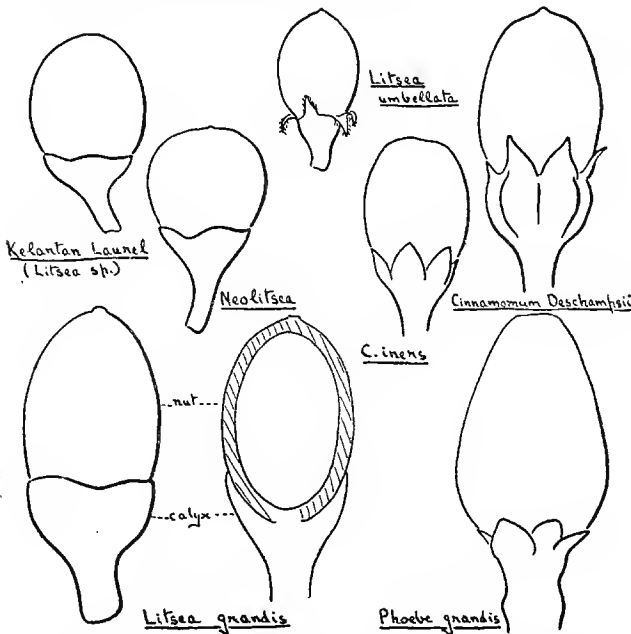
The most typical features of the family are the small flowers with their closely packed sepals and stamens, arranged in circles of threes, and the curious little flaps by which the anthers open and let out the pollen. The fruits, too, are generally distinctive, especially those of the genera allied with *Litsea* (p. 347)

DESCRIPTION.

which represent a type of forest fruit not likely to be mistaken for those of any other trees, unless it be the Oil-fruits (*Elæocarpus*) the stone of which is hard. The presence of aromatic substances in the tissues makes the crushed leaves or the cut bark or fruit smell of resin, turpentine, citronella, cinnamon, cloves and other such essential oils: a few Laurels, however, have little or no smell. This property the Laurels share with others such as the *Kenanga*- and *Eugenia*-families (*Annonaceæ* and *Myrtaceæ*), but a fruity, resinous smell about the leaves and bark coupled with the *spiral* arrangement of leaves with entire edges generally enables one to recognize a Laurel in the absence of flower or fruit. The features of the wood and bark are described by FOXWORTHY (7, p. 52). The bark is often yellowish brown to reddish brown, smooth and entire, or pimply or slightly scaly, and generally thick. The wood is commonly pale yellow or golden, darkening on exposure to the air, and often with a satiny lustre when fresh and a soapy feel when dry. Some kinds have poisonous or irritating substances in the bark—*Medang Miang*—but there is little exact knowledge concerning them. The trunks seldom have buttresses. The leaves of many kinds are glaucous beneath and often have closely set parallel veinlets between the main veins of the leaf so as to give a spider-web effect. The leaves generally wither yellow, but a few interesting exceptions are known (*c.f.* *Cinnamomum*) and doubtless others wait discovery.



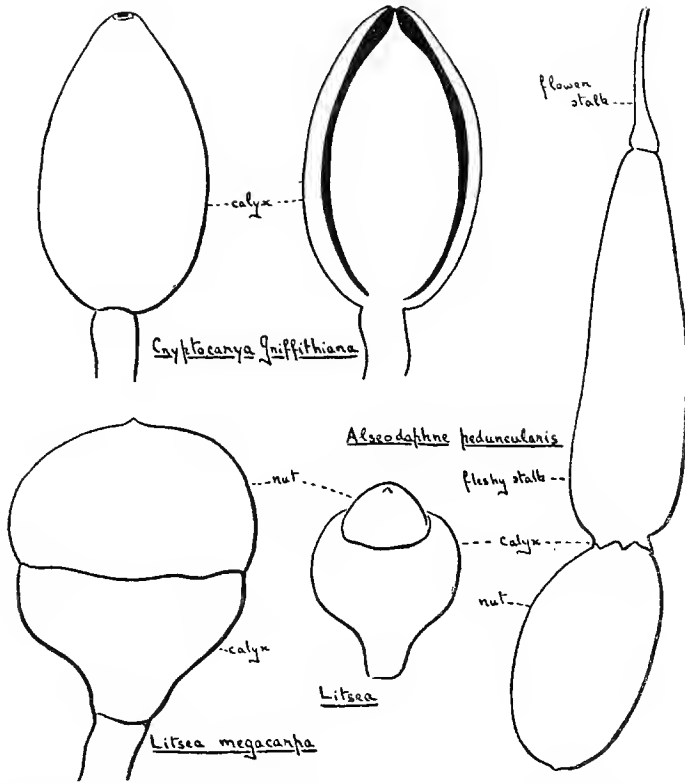
Text-Fig. 118. Flowers of the Laurel-family (*Lauraceæ*), $\times 3$: stamen, $\times 6$.



Text-Fig. 119. Fruits of the Laurel-family (*Lauraceæ*), $\times 2$.

It seems that most of our species are ever-green, though seasonal in flowering and in the development of new leaves. The Kelantan Laurel (*Litsea sp.*) is, however, deciduous. The colours of the new leaves vary from nearly white to pink, purple, yellow and brown. The flowers are pollinated chiefly by flies and beetles attracted by the smell which varies from sweetly fragrant to foul as rancid fat, for the flowers themselves are insignificant. The fruits are eaten by monkeys, squirrels, bats, musang and birds.

If little is yet known about our wild Laurels, it is not because they are



Text-Fig. 120. Fruits of the Laurel-family (Lauraceæ), nat. size.

uninteresting or difficult to distinguish in the living state, but because no one has found the opportunity for studying them at all fully as they grow. Many have exceptionally beautiful foliage, trunks and crowns, and it is to be hoped such will find their way into cultivation as they well deserve. *Litsea megacarpa*, *Phœbe grandis*, and *Cinnamomum parthenoxylum* may be mentioned as examples.

The Lauraceæ may be mistaken for Annonaceæ, Euphorbiaceæ, Myristicaceæ, Tiliaceæ or Sterculiaceæ, but attention to the special points mentioned under each should avoid any doubt. The Oil-fruits (*Elæocarpus*) are superficially like Laurels, in the absence of flowers and fruits, but they have not resinous tissues, their leaves are often toothed and the leaf-stalks are jointed or "knee-ed" where they meet the blade.

Botanically, the genera of the Lauraceæ are distinguished by details of the stamens which are difficult to make out. The characters given under the genera in this book are far from being universal but as they fit most Malayan species they are sufficiently exact. In the first six genera—*Cinnamomum*, *Cryptocarya*, *Phœbe*, *Alseodaphne*, *Dehaasia* and *Persea*—the flowers and, therefore, the fruits are arranged in relatively long-stalked panicles produced from the leaf-axils or the ends of the twigs. In the last four genera—*Actinodaphne*, *Litsea*, *Neolitsea* and *Lindera*—the flowers are grouped in little heads which are themselves put together so as to form dense little clusters in the leaf-axils, on the twigs behind the leaves, or on the branches and trunk.

Key to the Common Laurel-Trees

- Twigs, leaf-stalks and underside of the leaves more or less brown hairy or brown velvety
- Leaves appearing alternate
- Leaf-blade rather small, 1½-3" wide, stalk ¼-⅓" long *Litsea umbellata* p. 348
- Leaf-blade large, 2-6" wide, very leathery and stiff: stalk ½-1" long *Cryptocarya Griffithiana* p. 342
- Leaves appearing in whorls, rather large, 2-5" wide: stalks 1-2" long: mountains *Actinodaphne Maingayi* p. 345
- Leaves spirally arranged, rather crowded at the ends of the twigs, very leathery and stiff
- Mountain plant with small 3-veined leaves glaucous beneath *Lindera rufa* p. 347
- Not so
- Leaves with a long tip: flowers in velvety panicles: fruit completely covered by the calyx-cup: side-veins of leaf generally less than 11 pairs *Cryptocarya Griffithiana* p. 342
- Leaves blunt or scarcely tipped: flowers in short dense clusters: fruit not half-covered by the calyx-cup: side-veins of leaf generally more than 11 pairs *Litsea* p. 347
- Leaf-blade 1-2½" wide: fruit ½" long or less *L. firma* p. 347
- Leaf-blade 2½-5" wide, or more
- Leaf stiffly leathery, stalks ½-1" long: fruits ⅓-⅔" long: common *L. grandis* p. 347
- Leaf thinly leathery, stalks ¾-1¾" long: fruits not ½" long: Kedah, Perlis, Kelantan *Litsea* sp. p. 348
- Twigs etc., glabrous or with pale or colourless hairs only
- Leaves opposite or nearly so, 3-ribbed *Cinnamomum* p. 339
- Leaves appearing alternate, small to medium-size
- Leaves 1½-3" wide, dark green, rather broad *Lindera lucida* p. 346
- Leaves ¾-1¾" wide, pale green, small: mountains *Lindera pipericarpa* p. 346

LAURACEÆ

- Leaves appearing in whorls *Actinodaphne sesquipedalis* p. 345
- Leaves spirally arranged, often crowded at the ends of the twigs
- Leaves small or narrow, 1-3" wide
- Leaves more or less glaucous beneath
- Cultivated tree with large pearlike fruits *Persea* p. 343
- Not so
- Sea-shore tree with smooth bark: leaves scarcely aromatic when crushed *Neolitsea zeylanica* p. 349
- Mountain tree or bush: leaves 3-veined *Lindera rufa* p. 347
- Inland trees: leaves strongly smelling when crushed, withering red *Cinnamomum* p. 339
- Leaves not glaucous red
- Leaves oblong, leathery, faintly veined: fruit half-covered by the calyx-cup *Litsea myristicæfolia* p. 348
- Leaves thin, distinctly veined: fruit black, on a scarlet fleshy stalk *Alseodaphne peduncularis* p. 338
- Leaves medium to large, 2-8" wide
- Fruit 1½-2" long, black on a scarlet fleshy stalk *Dehaasia microcarpa* p. 343
- Not so
- Fruit oblong pointed, black, on a small 6-lobed calyx-cup: several in a panicle *Phœbe grandis* p. 343
- Fruit round, orange-red, on a saucer-like cup: not in panicles *Litsea megacarpa* p. 347

ALSEODAPHNE

(Gr., alsos—a grove, daphne—a laurel)

Leaves spirally arranged.
 Flowers in panicles: the anthers with 4 flaps.
Fruit an oblong pulpy berry ripening jet-black, seated on the end of a swollen, rather pear-shaped, scarlet, fleshy, hanging stalk.
 About 15 spp., India, S. China, Malaysia: 8 spp. in Malaya.

The genera *Alseodaphne* and *Dehaasia* differ in minute details of the flowers, so that they cannot be distinguished in fruit. Yet it is by this grotesque and lurid fruit, unlike any other in the country, that our attention is drawn to them. One species of each is not uncommon and their fruits are said to be highly poisonous.

A. peduncularis Text-Fig. 120
(from the stalked fruits)

Lesser Devil's Laurel
Medang Tandok Kechil

A small tree 15-40 ft. high, with pale greyish drab bark.

Leaf-blade 3-7 × 1-2½", rather small, elliptic, bluntly tipped, pale green.

Panicles with pink stalks.

Berry ¾-1" long.

Common in lowland forest in the middle of Malaya.

CINNAMOMUM

(from the Greek *kinnamomum*)

Leaves either opposite (or nearly so) and with 3 main longitudinal veins, or spirally arranged and with only one longitudinal vein (midrib).

Flowers very small, .1" wide, creamy-white or yellowish, in rather long-stalked panicles, mostly in the leaf-axils or at the ends of the twigs.

Fruit round or oblong, about ½" long, ripening blue-black, seated on the enlarged, 6-toothed calyx.

About 150 spp., tropical Asia, Australia and W. Pacific: 17 spp., in Malaya, mostly in the lowlands.

This is one of the better known genera of the Laurel-family. It includes the Indian Cinnamon tree (*C. zeylanicum*), the Japanese Camphor tree (*C. camphora*), and the Chinese Cinnamon tree (*C. cassia*) which supplies the "Cassia bark" and "Cassia-buds" of commerce. In Malaya the genus is typified in a very common and easily recognised species, the Wild Cinnamon tree (*C. iners*), which very closely resembles the Indian Cinnamon but is much less aromatic. All the species contain aromatic substances from which cinnamon-oil, clove-oil, camphor and saffrol are obtained. These substances generally occur in all parts of the tree but especially in the bark, and the cut bark or the crushed leaves have a characteristic smell so that it should be possible to identify each species by this means: saffrol is the cause of the peculiar smell of *Medang Kemangi* (*C. parthenoxylon*). In BURKILL'S Dictionary there is an excellent account of the history, cultivation and preparation of the various products of the genus and of the origin of the local names.

Kayu Manis and *Tejur* are the Malay names for species with 3-veined leaves like the Wild Cinnamon which smell of cinnamon. *Kulit Lawang* is the name for those which smell of cloves. *Medang Kemangi* is used for those with the strange smell of saffrol, but the name may well be restricted to *C. parthenoxylon* with its distinctive leaves. The Japanese Camphor tree must not be confused with the Bornean Camphor tree, *Kapur* or *Dryobalanops aromatica*, which is a vast timber-tree of the *Meranti*-family.

The genus *Cinnamomum* is divided into two sections according to the veins of the leaves. Most species have the characteristic 3-veined leaves like the Wild Cinnamon but the Japanese Camphor tree and the *Medang Kemangi* have a single midrib with ordinary side-veins: the colour of the withering leaves also seems characteristic of the two groups. The genus is typical of the Indo-Malaysian tropical flora and nowadays occurs only in Asia and Australasia. However, at a remote period, it must have been common in what is now Europe because fossil leaves are found there. In fact, the Cinnamon-trees, like the Breadfruit-tree and the *Nipa*-palm, supply one of the indications that the Indo-Malaysian flora was formerly, and perhaps originally, much more extensive than it is now (p. 39).

Key to the Species

- Leaves opposite, or nearly so, with 3 longitudinal veins, not or slightly glaucous beneath, *withering yellow*
- Leaves glabrous, smelling of cinnamon, faintly or strongly
- Leaves narrowly oblong, about 3 times as long as broad: common *C. iners*
- Leaves broadly oblong or ovate, twice as long as broad or less *C. zeylanicum*
- Leaves hairy with a rather sour, resinous smell
- Outer longitudinal veins with conspicuous inarching side-veins: panicles lateral, slender *C. mollissimum*
- Not so: panicles terminal, rather stout *C. javanicum*
- Leaves spirally arranged, with one longitudinal vein (the midrib), distinctly glaucous beneath, *withering red*
- Leaves smelling of camphor, $\frac{1}{2}$ -1" wide: cult. *C. camphora*
- Leaves not so, 1-2 $\frac{1}{2}$ " wide: bark rugged: wild *C. parthenoxylon*

C. camphora

Japanese Camphor Tree

A small tree resembling *C. parthenoxylon* but:—
Leaves and bark smelling of camphor when cut or bruised: leaf-blade small, 1-3 × $\frac{1}{2}$ -1", with 3-4 pairs of side-veins, the lowest pair reaching $\frac{1}{2}$ - $\frac{2}{3}$ the length of the blade, very glaucous beneath, withering dark red-brown.
 Japan, E. China, Formosa, Tonkin: planted in a few parts of Malaya.

This tree is yet little known in Malaya. It grows moderately well in the plains but it will undoubtedly do better in the mountains where it is likely to become common.

C. iners Plate 71, Text-Fig. 119
(from the inert tissues)Wild Cinnamon
Kayu Manis (Utan)

An evergreen tree up to 60 ft. high, with dense, bushy, dull green, rounded or cylindrical crown: *bark greyish brown, rather smooth and even: glabrous except for the finely hairy panicles: bark and leaves smelling faintly of cinnamon.*

Leaf-blade 3-10 × 1-3", narrowly oblong, blunt or scarcely pointed, thinly leathery, often with upcurled sides, often slightly glaucous beneath, the two outer longitudinal veins reaching the end of the blade: stalk $\frac{1}{4}$ - $\frac{1}{2}$ ".

Panicle 4-10" long: flowers with a waxy, unpleasant smell.

Berry $\frac{1}{2}$ " long, smelling like a mixture of lime and cinnamon when crushed and staining the fingers purple: *the fruiting calyx .2" long, with blunt lobes.*

India, W. Malaysia: common in open country and secondary jungle and about towns and villages, occasional in the high forest.

This is not only our commonest species of Cinnamon but one of our commonest trees of thickets and waste places: birds, bats and squirrels spread the seeds. It is very closely allied with the true Cinnamon, *C. zeylanicum*. To detect the aroma in the leaves they must be held to the nose and then crushed, for the aroma disappears in a few seconds.

The Wild Cinnamon is a quick-growing tree though it does not produce leaves continuously through the year. At certain seasons, twice or perhaps three times a year, when rainy weather follows a pronounced dry spell, the buds open and develop new shoots of limp leaves which are at first reddish pink but change rather quickly, in a few days, through cream to pale fresh green, and they render the trees most conspicuous. At such times, too, the flowers

generally develop: the inflorescences are produced at the ends of some twigs instead of new shoots or they are produced at the base of new shoots and from the axils of the lower new leaves. The waxy, almost rancid, smell attracts hover-flies, certain metallic small beetles and many miscellaneous small insects.

C. javanicum

Medang Wangi

A beautiful tree, like *C. mollissimum* but.—

Leaf-blade 6–16 × 2–5", often larger, *abruptly tipped, the outer two longitudinal veins without conspicuous inarching side-veins but joined to the midrib by numerous almost straight veinlets across the blade giving a ladder-effect.*

Panicles terminal, much-branched, rather stout, 6–12" long, 4–8" wide.

W. Malaysia: in lowland forest from Perak southward, occasional.

C. mollissimum

Medang Wangi

(Lat., most soft)

A small, rather spindly tree to 40 ft. high: *twigs, leaves, panicles densely velvety: leaves and bark with a rather sour resinous scent: young leaves pale green.*

Leaf-blade 4–9 × 1½–3½", oblong, *gradually tapered to a long tip, the two outer longitudinal veins giving off on their outer sides several conspicuous side-veins arching to the edge: stalk* ½–¾" long.

Panicles 1½–4" long, *small, lateral from the leaf-axils, with slender stalks branched only near the base.*

Malaya: frequent in lowland forest, from Penang southward.

C. parthenoxylon

Saffrol Laurel

(Gr., parthenos—maiden, xylon—wood)

Medang Kemangi, M. Losoh

A medium-sized to tall tree, up to 150 ft. high, *with open conical crown of small leaves, with the limbs ascending then wide-spreading with slightly upturned ends, not drooping, gnarled in old trees: without buttresses: bark dark grey or greyish brown, deeply ridged and fissured, with rather broad flat ridges: young leaves pink, old leaves orange to red: leaves, twigs and bark smelling of mint and eucalyptus when cut or bruised: twigs slender: buds small, round, with many scales.*

Leaf-blade 2–6 × 1–2½", elliptic or ovate, pointed, *rather small and thin, the undersides generally distinctly glaucous, with 3–7 pairs of side-veins: stalk* ½–1" long, slender.

Panicles 2–4" long, 1" wide, *small, slender, with rather long stalks, branched only near the end, axillary: flowers* .05" wide, *very small, yellowish, sweet-scented.*

Fruit ¼" wide, round, small, dark purple, seated on the cup-shaped calyx, .2" wide, without teeth, the stalk below the calyx distinctly swollen.

W. Malaysia: frequent in hill-forest from sea-level to 4,000 ft., from Malacca northward.

This fine tree is little known in Malaya though in places it is not uncommon, notably on Penang Hill where it occurs at all altitudes. There are named specimens in the Waterfall Gardens from which it may easily be learnt. In many respects it resembles the *Tembusu* (*Fagraea fragrans*). Common to both are the dark ridged bark, dense small-leaved conical crown, especially of saplings, and the shape of the leaf with its slender stalk. The *Medang Kemangi* also has a tendency to Terminalia-branching. But the *Tembusu*, of course, has very different flowers and fruit, opposite leaves, which are not resinous, hanging twigs and differently coloured young and old leaves. It is interesting to compare the two because the peculiarities of the one reveal, by the contrast, those of the other. The *Medang Kemangi* may also be mistaken for an Oil-fruit (*Elæocarpus*) in the absence of flowers, but the small resinous-smelling leaves with glaucous undersides distinguish it.

The *Medang Kemangi* is more or less deciduous, the old leaves falling as the new leaves develop, and the flowers appear with the new leaves. The fruits are often deformed into large corky brown galls.

The bark, the wood and the oil that can be extracted from them find a variety of uses in native medicine, as described by BURKILL.

C. zeylanicum Text-Figs. 118, 119
(Lat., of Ceylon)

Cinnamon
Kayu Manis

Like *C. iners* but:—

Bark and leaves having a strong smell of cinnamon.

Leaf-blade 2-6 × 1½-3½", ovate or elliptic to broadly oblong, about twice as long as broad or less, *pointed or shortly tipped*, rather distinctly glaucous beneath, *the outer two longitudinal veins reaching only ¾ the length of the blade*.

Fruit ½-¾" long; *the fruiting calyx* .3-.4" long, *with about 12 strong ridges* and grooves in between.

S.W. India and Ceylon, widely cultivated through the East: occasional in gardens and villages in Malaya.

The true Cinnamon is rather scarce in Malaya but in Penang, Kuala Lumpur and Singapore, perhaps in other towns, there occur a number of trees of a variety called var. *Deschampsii*, which differs only in the absence of strong ridges from the fruiting calyx (Text-Fig. 119), the slightly smaller and crowded flowers and the usually blunt ends to the leaves. Whether this variety is wild or has been introduced is uncertain because it has not yet been found in our forests or in other countries. However there is a common big Cinnamon tree in the forest at Fraser's Hill which seems to be identical with *C. zeylanicum*: unfortunately neither flowering nor fruiting specimens have been obtained.

CRYPTOCARYA

(Gr., krupton—hidden, karuon—a nut)

Leaves alternate, or nearly so on the horizontal branches, spirally arranged on the upright branches.

Flowers in terminal and axillary panicles.

Fruit wholly covered in the enlarged, slightly fleshy, calyx-tube.

About 50 spp., throughout the tropics and subtropics: about 17 spp., in Malaya, in lowland and mountain forest.

C. Griffithiana Text-Fig. 120
(W. Griffith, 1810-1845, doctor and
botanist in India and Malaya)

Covered Laurel
Medang Bulu Merah

A small or medium-sized evergreen tree 20-80 ft. high: *bark reddish brown*, sometimes dingy, closely set with warts or pimples: *twigs, leaf-stalks, inflorescences and veins on the leaf densely brown velvety*; young leaves fresh green (? pink when very young).

Leaf-blade 4-12 × 1½-6", *large, stiffly leathery, hard, deep green on the upperside with the veins as sunken lines, very glaucous and strongly ribbed beneath*, elliptic with a long tip, with 5-9 pairs of side-veins, narrowed or rounded at the base: *stalk* ½-1" long, stout.

Flowers ¼" wide, in terminal panicles up to 9" long or in shorter axillary panicles up to 3" long.

Fruit ¾-1½ × ½", *pear-shaped, green then bluish-purple and finally black*.

Malay Peninsula, Borneo: frequent in secondary jungle and lowland forest.

The brown velvety twigs and hard stiff leaves, with strongly ribbed glaucous undersides and dark green uppersides marked like ginger-nut biscuits, at once distinguish this tree. It must not be confused with the brown-velvety Oil-fruit (*Elæocarpus ferrugineus*). A closely related species, *C. crassinervia*, has blunt or shortly tipped leaves and oblong fruits: it is not so common.

DEHAASIA

(D. de Haas, d. ca. 1700, a Dutch patron of science)

Like *Alseodaphne* but the anthers with only 2 flaps.
15 spp., India, S. China, Malaysia: 5 spp. in Malaya.

D. microcarpa

Greater Devil's Laurel
Medang Tandok

(Gr., mikros—small, karpos—a fruit)

A small tree 15-50 ft. high.

Leaf-blade 6-14 × 2½-7", rather leathery, elliptic, tapered to the apex.

Berry 1½-2" long.

W. Malaysia: frequent in lowland forest in the middle of the country.

PERSEA

(the Greek name of an Egyptian tree with sweet fruit)

Leaves spirally arranged.

Fruits massive, with fleshy oily rind and big seed.

About 50 species, tropical S. America, a few in the Mediterranean region, 1 species introduced to Malaya.

P. americana

Avocado, Alligator Pear Tree

A small tree reaching 30 feet high, with rather dull shabby crown and somewhat fissured brown bark.

Leaf-blade 3-6 × 1-2½", narrowly elliptic or ovate, *glaucous beneath*: stalks ¼-1" long.

Flowers small, fragrant, yellowish, in axillary inflorescences crowded at the ends of the branches.

Fruits 2½-4" wide, *round or pear-shaped, yellowish green or*, in other varieties, *more or less intensely purple*: rind lurid yellow.

Central America, occasional in Malayan gardens.

Of this fruit tree there is a full account in BURKILL'S Dictionary. Though introduced to Singapore between 1830 and 1840, it is yet little known in Malaya. There are two old trees in the garden of the Gap Resthouse on the way to Fraser's Hill.

PHŒBE

(the Greek goddess)

Leaves spirally arranged, inclined to be in rosettes at the ends of the twigs.

Flowers in long-stalked panicles from the leaf-axils.

Fruit an oblong black berry seated on the 6-lobed, slightly enlarged calyx.

About 40 species, half in tropical Asia, half in tropical America: 6 species in Malaya, lowlands and mountains.

P. grandis Text-Fig. 119

Sun Laurel
Medang Tanah, Medang Ketanah

An evergreen tree reaching 80 ft. tall, flowering at 15 ft.: crown cylindrical, full, even, becoming rather high and wide: *bark pale to dark fawn-brown, uneven and rather rugged*, somewhat warted, slightly flaky: *young leaves* pale yellowish, pinkish beneath: *twigs, leaf-stalks, inflorescences and veins of the leaf finely hairy*.

Leaf-blade 5-14 × 1½-7", *rather large*, broadly or narrowly obovate, shortly and bluntly tipped, gradually tapered to the base, thinly leathery, *rather strongly ribbed and glaucous beneath*, with 9-12 pairs of side-veins: stalk ½-2" long.

LAURACEÆ

Flowers $\frac{1}{4}$ " wide, dull ochre: panicles 4-12" long, branched only in the upper third, the long stalk and the branches green turning red when fruiting.

Fruit $\frac{3}{4}$ " long, ellipsoid, bluntly pointed, ripening purple-black white a grey bloom, seated on the persistent calyx $\frac{1}{4}$ " long.

W. Malaysia: fairly common in lowland and mountain forest to 4000', throughout Malaya.

This delightful tree is rather frequent in the middle of Malaya in open country and at the edges of Forest-Reserves. A fine specimen stands some fifty yards behind the Resthouse at Seremban. The black fruits with grey bloom hanging in red-stalked clusters, contrast with the deep green foliage, and a bluish shimmer passes over the tree when the wind turns the leaves. In the mountains the foliage is often small.

The Sun Laurel fully deserves cultivation, for as yet there is no other tree quite comparable with it in our parks and gardens.

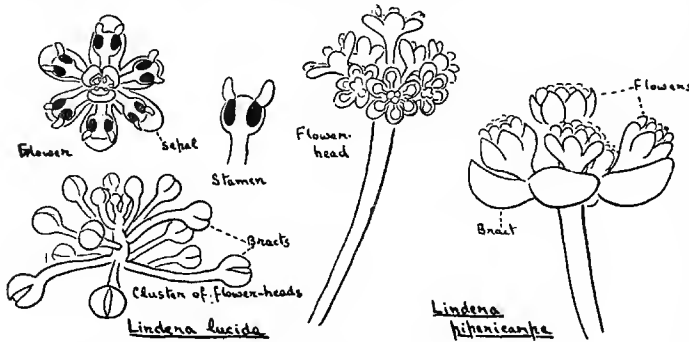
ACTINODAPHNE, LINDERA, LITSEA, NEOLITSEA

Flower-heads generally in small dense clusters in the leaf-axils, or on the twigs and branches behind the leaves, occasionally in racemes, never in panicles: each flower shortly stalked and grouped with 2-8 (or more) other flowers in a tiny stalked head surrounded (at least when young) with bracts like a perianth: flower-heads shortly stalked, singly or several together to form a flower-cluster: flowers male or female, tiny.

Fruit a small or large, round or oblong berry, generally ripening orange, red or black, seated on the small or swollen calyx-cup, the rim of the cup generally entire (that is, without sepals): fruits in shortly stalked clusters.

These genera are readily distinguished from the foregoing by the arrangement of the flowers. From each other they differ fundamentally only in minute details of the stamens. However the arrangement of the leaves is a rather useful, if imperfect, guide to the Malayan species.

In Actinodaphne the leaves appear to be arranged in whorls separated by long, leafless portions of stem so that they recall the arrangement in the Pulai-trees (Alstonia): actually they are arranged in a very compressed spiral. In most species of Litsea and Neolitsea the leaves are clearly arranged in a spiral, often crowded at the ends of the twigs but never appearing to be whorled. But a few species of Litsea agree with Lindera and have the leaves apparently alternate; actually they are in a very drawn out spiral with the leaves on the upper or lower side of the twig twisted to the right or the left.



Text-Fig. 121. Inflorescences of Lindera, $\times 3$: flower $\times 5$: stamen $\times 8$.

What seem at first sight flower-buds in these genera are really the flower-heads. When they open, the tiny bracts which cover them curl back and display the true flower-buds inside, as if they were a multiple jack-in-the-box. The groups of flower-heads in the leaf-axis or on the twigs suggest the flower-buds

of some of the wild Nutmegs (as Knema), and when the fruit takes the place of the flower, the group of oblong one-seeded fruits set on the stalks of the original flower-heads recall the fruit-clusters which develop from a single flower in the case of the *Kenanga*-family (Annonaceæ). The absence of red sap distinguishes these Laurels from the Nutmegs and the presence of a calyx-cup at the base of each fruit distinguishes them from the Annonaceæ.

The fruit of most species look like acorns in their cups (*Quercus*), or as little eggs in egg-cups, but the cups are never marked or scaly like those of the acorns and the fruits themselves have a pulpy rind. The fruit may be seated on the cup or partly or wholly immersed in it. When the fruits are clustered on the twigs, they often suggest those of a wild Fig-tree.

ACTINODAPHNE

(Gr., actis—a ray, daphne—a laurel)

Leaves more or less whorled.

Flowers with 9 fertile stamens: anthers with 4 flaps.

50 spp., E. Asia, Malaysia: 15 spp. in Malaya.

A. Maingayi

Maingay's Mountain Laurel

(A.C. Maingay, 1836-1869, doctor and botanist of the East India Co.)

A fairly large tree to 80 ft. high, *with narrow conical crown; buds covered with long narrow scales 1-2" long; twigs, leaf-stalks and undersides of the leaves velvety or woolly with long thick brown hairs.*

Leaf-blade 6-17 × 2-5", large, narrowly oblong or lanceolate, pointed, stiffly leathery, drooping, glaucous beneath, with many pairs of side-veins; stalks 1-2" long.

Fruits $\frac{3}{4}$ -1" wide, *round, rather flattened, ripening yellow then bright red, seated on a rather woody cup $\frac{1}{2}$ " wide, densely crowded on the twigs behind the leaves.*

Malaya; frequent in the mountains, rare in the plains.

From its characteristic crown and long leaves this fine tree is at once recognised. It is common at Fraser's Hill. The fruits suggest red figs but, when bruised, smell strongly of turpentine.

A. sesquipedalis

Ant Laurel

(Lat., sesqui—one half more, pes—a foot)

A small or medium-sized tree, 20-50 ft. high: *bark dull brown, smooth; buds covered by a big bunch of large green scale-leaves like under-sized foliage leaves; leaves in whorls at intervals of 6-12": twigs and young leaves silky.*

Leaf-blade 9-24 × 2-10", large, narrowly to broadly ovate, pointed, papery-tough, very glaucous beneath; stalks 1-3" long.

Flowers yellowish green, $\frac{1}{2}$ " wide, in clusters 1-1 $\frac{1}{2}$ " wide on the branches or trunk, or on the twigs.

Fruit 1" wide, large, round, orange-yellow then purple-black with yellow rind, seated on a large dull greenish grey cup $\frac{1}{2}$ " wide: seeds large, brown with watery marks.

Siam, Malaya: frequent in lowland forest.

The large leaf-like scales which cover the buds and make them look like double green flowers, are usually inhabited by ants which find them convenient places to build their nests. The large, whorled, papery leaves with glaucous undersides and the big buds distinguish this plant from all others in the Malayan flora.

LINDERA

(J. Linder, 1678-1723, a Swedish botanist)

Leaves more or less alternate on the horizontal branches, spirally arranged on the erect ones.

Flowers with 9-12 fertile stamens: anthers with 2 flaps.

60 spp., Asia, N. America: 14 spp. in Malaya.

L. lucida Text-Fig. 121
(Lat., shiny)

Shiny Laurel

A slender tree, up to 80 ft. high, with open, uneven, conical crown, limited to the upper quarter or sixth of the trunk, with few ascending and wide-spreading limbs: the trunk monopodial.

Leaf-blade $2\frac{1}{2}$ -8 × $1\frac{1}{2}$ -3", *ovate-elliptic, slightly fleshy*, tipped, the base rounded, rather dark glossy green, yellowish green beneath, the point downturned, the sides upcurled, with 5-7 pairs of side-veins: stalk $\frac{1}{2}$ -1" long.

Flower-heads small, on stalks $\frac{1}{4}$ - $\frac{3}{4}$ " long, many heads in a cluster, the 4 yellow bracts falling off when the flowers open: *flowers* .1" wide, yellowish, faintly scented, 7-10 in a head.

Fruits $\frac{1}{3}$ " long, *small*, oblong, pointed, green, seated on the tiny, not enlarged, calyx: each fruit shortly stalked, and several fruits on a common stalk, $\frac{1}{2}$ -1" long, from the leaf-axil.

W. Malaysia: common in lowland forest, open country and thickets from Perak to Singapore.

At first impression this little tree seems very unlike a Laurel and may well be mistaken for one of the *Kenanga*-family (Annonaceæ) because of its stiffly monopodial shape with spreading branches. Actually it is more likely to be confused with a species of *Canthium*, of the *Ixora*-family (Rubiaceæ), unless one remembers that *Canthium* has opposite leaves.

L. pipericarpa Text-Fig. 121
(Lat., piper-pepper; Gr., karpos-fruit)

Peppercorn Laurel
Medang Serai

A mountain tree reaching 60 ft. high, with light green, small-leaved crown and slender twigs: bark greenish grey, smooth: all parts smelling of citronella and eucalyptus when cut or bruised: glabrous.

Leaf-blade 3-5 × $\frac{3}{4}$ -1 $\frac{3}{4}$ ", *small*, narrowly elliptic, tapered to each end, rather glaucous beneath, with 7-11 pairs of side-veins: stalk $\frac{1}{2}$ - $\frac{3}{4}$ ".

Flower-heads $\frac{1}{2}$ " wide, on stalks $\frac{1}{4}$ " long, 1-several heads in a leaf-axil or clustered on the twigs behind the leaves, *the bracts and sepals whitish: flowers* .1" wide *greenish white, fragrant*: stamens green with yellow anthers: nectaries yellow.

Fruit .2" wide, *small, round, green then black*, seated on a tiny calyx-cup with a stalk .2" long.

W. Malaysia: very common in clearings in the mountains of the main range and on land-slides, occasional in the lowlands of Perak and Selangor.

This little tree, so common at Fraser's Hill and Cameron Highlands, is the mountain counterpart of the Shiny Laurel (*L. lucida*) but with smaller leaves, flowers and fruits and with a characteristic smell in all its tissues from which the Malay name is derived. In many places it forms pure stands by the roads or at the edge of the forest, and such can be recognised afar off from the pale green fine foliage: on Fraser's Hill there is scarcely a garden in which it is not to be found. It bears a superficial resemblance to the sapling of the *Tembusu* (*Fagraea fragrans*) in its leaves and crown, but the bark, flowers and smell distinguish it. It appears that there are male and female trees but we have not been able to determine this satisfactorily.

L. rufa

Dwarf Mountain Laurel

(Lat., reddish brown)

A mountain shrub or treelet to 12 ft. high, flowering at a few feet; *twigs hairy*: leaves often hairy beneath, or glabrous.

Leaf-blade 1-3 × $\frac{1}{2}$ -1 $\frac{1}{2}$ ", *small*, elliptic or rounded, pointed, rather stiff and leathery, *upright, glaucous beneath, with a pair of conspicuous side-veins reaching from the base to more than halfway along the blade making it appear 3-veined*: stalk $\frac{1}{4}$ - $\frac{1}{2}$ " long.

Flowers .1" wide, *dull ochre yellow, in tiny sessile axillary clusters*.

Fruit $\frac{1}{3}$ " long, oblong, ripening black.

Malaya: common on mountain-tops, in the heaths.

The leaves are like those of the *Tejur* (*Neolitsea*) but are smaller.

LITSEA(from the Chinese plant name *litsai*)

Leaves alternate or spirally arranged.

Flowers with 9-18 fertile stamens: anthers with 4 flaps.

200 species, tropical Asia, and Australasia: 56 species in Malaya.

L. firmaBlue Laurel
Medang

A tree to 100 ft. high, without buttresses, like *L. grandis* but:

Bark warm brown, rather scaly in large angular pieces, the new bark yellow.

Leaf-blade much smaller, 2-7 × 1-2 $\frac{1}{2}$ ", upward pointing, stiff, blunt or pointed, blue-green and rather dull and shabby above, *more or less glaucous beneath*, very variable in size, big trees having small leaves: (young leaves purplish pink): stalk $\frac{1}{4}$ - $\frac{3}{4}$ " long.

Flower-heads, .4-.5" wide, on shorter stalks $\frac{1}{4}$ - $\frac{1}{2}$ " long (mostly on the twigs behind the leaves).

Fruits smaller, .4-.5" long.

W. Malaysia: rather common in the forest and secondary jungle, especially in the south of the country.

This is a shabby tree, the leaves often galled.

L. grandis Text-Fig. 119Great Laurel
Medang

A medium-sized to big evergreen tree, 30-100 ft. high, but the crown rather narrow: *bark dull brown: twigs, leaf-stalks, buds and undersides of the leaves velvety with very short pale brownish hairs: leaves spirally arranged*, or almost alternate.

Leaf-blade 5-9 × 2 $\frac{1}{2}$ -5 $\frac{1}{2}$ ", *rather large*, elliptic to obovate, *blunt* or slightly pointed, *flat and stiff like thin cardboard, dark green or bluish green above, yellowish green beneath, strongly ribbed*: side-veins 8-14 pairs, connected by fine parallel transverse veins: leaf-stalk $\frac{1}{2}$ -1" long.

Flower-heads $\frac{1}{2}$ " wide when open, on stalks $\frac{1}{4}$ - $\frac{3}{8}$ " long, and grouped in clusters in the leaf-axils or on the twigs just behind the leaves: flowers greenish white with yellow anthers.

Fruits $\frac{1}{2}$ - $\frac{3}{8}$ " long, oblong, pointed, *half-covered by the calyx-cup, green then purple and finally blackish*: set in bunches in the leaf-axils or on the twigs behind the leaves.

Malaya Peninsula, Java frequent in lowland and mountain forest, and in open country throughout Malaya.

L. megacarpa Text-Fig. 120Elephant Laurel
Medang Keladi

(Gr., megas—great, karpós—fruit)

A large tree, up to 80 ft. high, *with dense large-leaved crown*: bark brown, smooth: glabrous: *young leaves purple or pinkish brown*.

Leaf-blade 6-18 × 2 $\frac{1}{2}$ -8", *large*, elliptic-obovate, with a small tip, leathery, *slightly glaucous beneath*, with many faint veins: stalk 1-1 $\frac{1}{2}$ " long.

LAURACEÆ

Flower-heads $\frac{3}{4}$ " wide when open, with 4 greenish white bracts, shortly stalked, set in slender light green racemes 2-6" long, from the leaf-axils and the twigs behind the leaves: flowers cream-white, 5 in a head.

Fruits $\frac{3}{4}$ -1 $\frac{1}{4}$ " wide, round, very large, turning yellow from the apex then red, seated on a broad shallow yellowish cup as wide as the fruits: the white flesh rapidly turning yellow on exposure to the air, smelling strongly of resin: generally several fruits on a woody stalk, 1-2" long, on the twigs below the leaves.

Frequent in Malaya, in lowland forest and secondary jungle.

This splendid tree resembles in shape the Sun Laurel, *Phæbe grandis*, and well deserves to be brought into cultivation. The fruits are among the biggest of our Laurel-trees. The bark and fruits have a slight amount of white latex which rapidly turns yellow on exposure to the air.

L. myristicæfolia

Nutmeg Laurel

(with leaves like *Myristica*).

A tree up to 60 ft. tall: glabrous.

Leaf-blade 4-8 × 1 $\frac{1}{2}$ -3", narrowly elliptic, pointed, leathery, with faint veins: stalk $\frac{1}{2}$ - $\frac{3}{4}$ " long.

Fruit $\frac{3}{4}$ " long, half-covered by the rather fleshy cup $\frac{1}{2}$ " wide, on a stalk $\frac{3}{4}$ " long.

Malay Peninsula: frequent in lowland forest, common on Penang Hill.

L. umbellata Text-Fig. 119

Common Laurel

Medang, Isop Nanah (Tumpat)

An evergreen bush or small tree, 10-30 ft. high, rather spreading and flopping: twigs, leaf-stalks and midribs more or less brown hairy or velvety, the undersides of the leaves often velvety also: leaves practically alternate, or very laxly spiral.

Leaf-blade 3-9 × 1 $\frac{1}{2}$ -4", rather small, elliptic, pointed, rather shiny dark green above, more or less glaucous beneath, rather thin, not stiff and leathery: stalks $\frac{1}{2}$ - $\frac{1}{2}$ " long.

Flower-heads 2-1" wide when open, small, on stalks only 1-3" long, in clusters in the leaf-axils: flowers densely hairy.

Fruit 3-4" long, oblong, pointed, green then purple and finally black, seated on a small, 4-6 toothed cup $\frac{1}{4}$ " wide.

India, W. Malaysia: common throughout Malaya in lowland jungle and open country.

This species, which is variable in the size and hairiness of the leaves, is distinguished from the Blue Laurel (*L. firma*) by its smaller, pointed and thin leaves alternately arranged, by its small flower-heads, and by the 6 teeth (persistent sepals) to the cup of the fruit.

Litsea sp. Plate 219, Text-Figs. 118, 119

Kelantan Laurel

Medang

A more or less deciduous tree very like *L. grandis* but:—

Bark light grey, becoming irregularly fissured and flaky in angular oblong pieces.

Leaf-blade thinly leathery, not stiff, generally slightly glaucous beneath, with more distant veining: leaf-stalks longer, $\frac{3}{4}$ -1 $\frac{1}{2}$ ".

Flower-heads mostly on the branches behind the leaves, on longer stalks 6-1" long, the open flower-heads 6-7" wide.

Fruits smaller, 3-4" long, seated on a smaller, shallower cup, ripening dark red then black and pulpy.

Peninsular Siam, North Malaya: Kedah, Perlis, Kelantan in rice-fields and belukar.

This is one of the commonest and, to the villagers, one of the best known trees in the neighbourhood of Kota Bahru. It can be seen in the hedges of nearly every rice-field, in the thickets of scrub, around the dwellings and along the railway line. The reason for its abundance is because its timber is used in the construction of the Malay houses and because it grows rapidly and will stand

coppicing. From a distance one may soon learn to recognize it from its stiff habit like the *Kelempayan* (*Anthocephalus*); the rather narrow, short and conical crown terminates a lanky stem and the branches, which arch up and out from the trunk, droop slightly at the ends. The big leaves, too, are characteristic: those of saplings measure as much as 17' × 10".

The trees near Kota Bahru appear to be more or less completely deciduous about March—May, after the beginning of the dry weather. The young leaves are pinkish. The flowers are said by Malays to be irritating to the skin, doubtless because of their fine chaffy hairs, and so also is the pulp of the ripe fruit, wherefore it cannot be eaten.

This is the only wild Laurel in Malaya that we have found with the standing of a cultivated plant.

NEOLITSEA

(Gr., neos—new; the genus *Litsea*)

Leaves spirally arranged.

Flowers with 6 fertile stamens: anthers with 4 flaps.

30 spp., S.E. Asia, trop. Australia: 4 spp. in Malaya.

N. zeylanica

(Lat., of Ceylon)

Shore Laurel

Tejur, *T. Pasir*, *Medang Pasir*

An evergreen bush or small bushy tree up to 50 ft. high, of *sandy and rocky coasts*; bark grey or pinkish grey, smooth or somewhat fissured: twigs slender: young leaves pale pinkish.

Leaf-blade $1\frac{1}{2}$ – $5\frac{1}{2}$ × $\frac{3}{4}$ –3", rather small, elliptic with a rather long tip, thinly leathery, generally distinctly glaucous beneath, with 3–4 pairs of side-veins, the lowest pair of veins reaching half the length of the blade; stalk $\frac{1}{4}$ – $\frac{3}{4}$ " long.

Flower-heads $\frac{1}{2}$ " wide, greenish, small, sessile, singly or a few in a cluster in the leaf-axils and on the twigs behind the leaves.

Fruits $\frac{1}{2}$ – $\frac{1}{2}$ " wide, round glossy green then reddish and finally black, pulpy, seated on a small cup, .2" wide, with a stalk $\frac{1}{4}$ – $\frac{1}{2}$ " long: the fruits singly or in groups of 2–6.

India to Australia. common on all coasts, occasional inland: abundant in the coastal villages of Pahang, Trengganu and Kelantan and often used as a hedge.

This species is figured by FOXWORTHY (7, p. 52). The name *Tejur* is also given to species of *Cinnamomum*. The fruits of this species are used by Malay boys in their bamboo "pea-shooters" (*bedil buloh* or *bedilang*).

BRAZIL-NUT FAMILY

Lecythidaceæ

(from the South American genus *Lecythis*)

Leaves simple, alternate or spirally arranged, often toothed; without oil-glands.

Flowers medium-sized to very large, often fluffy from the stamens, white, pink, red or yellow, radially or bilaterally symmetrical, arranged in spikes or racemes or in small groups; calyx with 2–6 lobes; petals 4–12, often joined at the base to the stamens: stamens very numerous, joined at the base in a narrow or broad ring or band; ovary more or less inferior.

LECYTHIDACEÆ

Fruit medium-sized to large, either pulpy and not opening, or woody and opening with a lid.

24 gen., 500 spp., throughout the tropics, mostly American; 3 gen. native to Malaya.

Beside numerous species of *Barringtonia* which are wild in Malaya, there are several noteworthy species introduced from the American tropics, namely the Brazil-Nut (*Bertholletia*), a few small garden trees or shrubs called *Gustavia*, and the Cannon-Ball Tree (*Couroupita*). The family is close to the Myrtle-family but differs in the arrangement of the leaves, the absence of oil-glands in the tissues, and the large flowers in which the stamens are joined at the base so that they fall off in one piece when the flower is over.

Allied with the Brazil-Nut is the Sapucaia-Nut (*Lecythis*), one kind of which (*L. ollaria*) is likely to become a fruit-tree in Malaya; it is described in the *M. A. H. A. Mag.*, vol. 8, 1938, p. 107.

Key to the Genera

- Leaves alternate, very large, wavy, withering red; big tree
with yellow flowers: cultivated *Bertholletia* p. 356
- Leaves spirally arranged in rosettes
- Wild plants; flowers with 4 petals and long slender stamens;
fruits in spikes, often hanging *Barringtonia*
- Garden plants; flowers with 6-12 petals and rather short
stamens
- Flowers on woody twigs from the trunk; big tree ... *Couroupita* p. 356
- Flowers singly on the stems or clustered at the ends of
the leafy twigs; shrubs or small trees *Gustavia* p. 357

BARRINGTONIA

(D. Barrington, d. 1800, an English naturalist)

Leaves generally in rosettes at the end of the twigs, rather upright, more or less toothed (excepting B. asiatica): with numerous side veins.

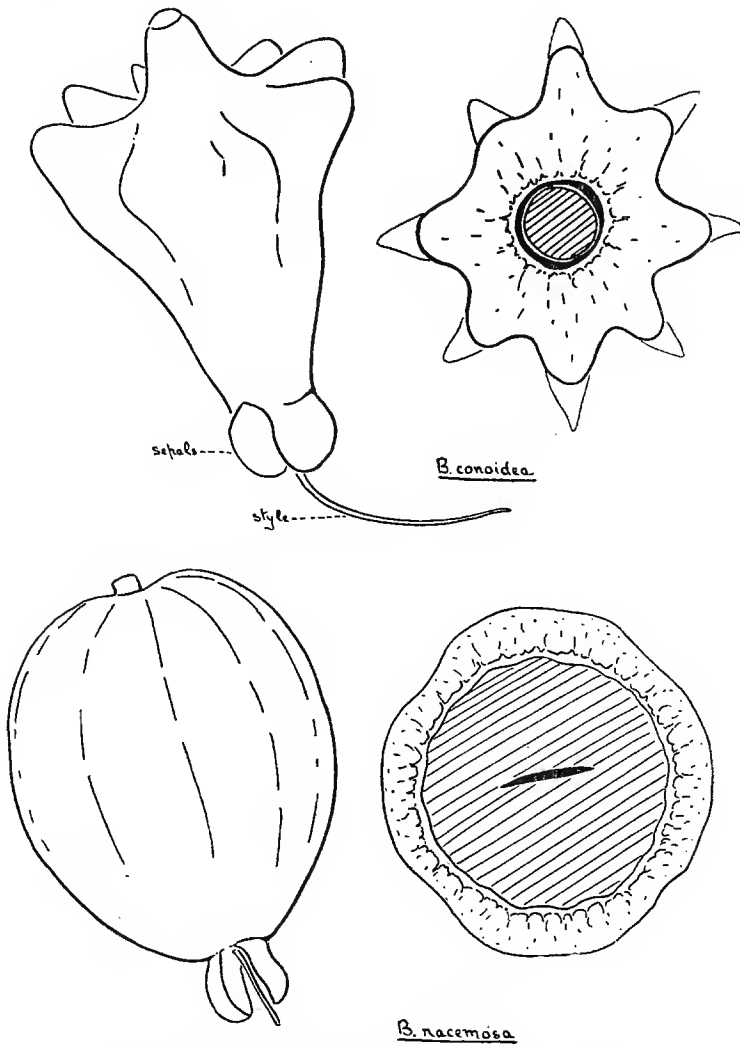
Flowers white, pink or red, often very large, heavily fragrant, very fluffy from the stamens, arranged in long, generally hanging, terminal spikes: petals 4, slightly joined to the base of the stamens: stamens joined in a ring at the base and falling off in piece: style one, long.

Fruit medium to large, round, oblong, smooth, grooved or angled, with green, brown or reddish rind and a large fibrous and leathery stone, crowned by the 2-4 persistent sepals: seeds 1-4, generally 1, massive, without a trace of seed-leaves.

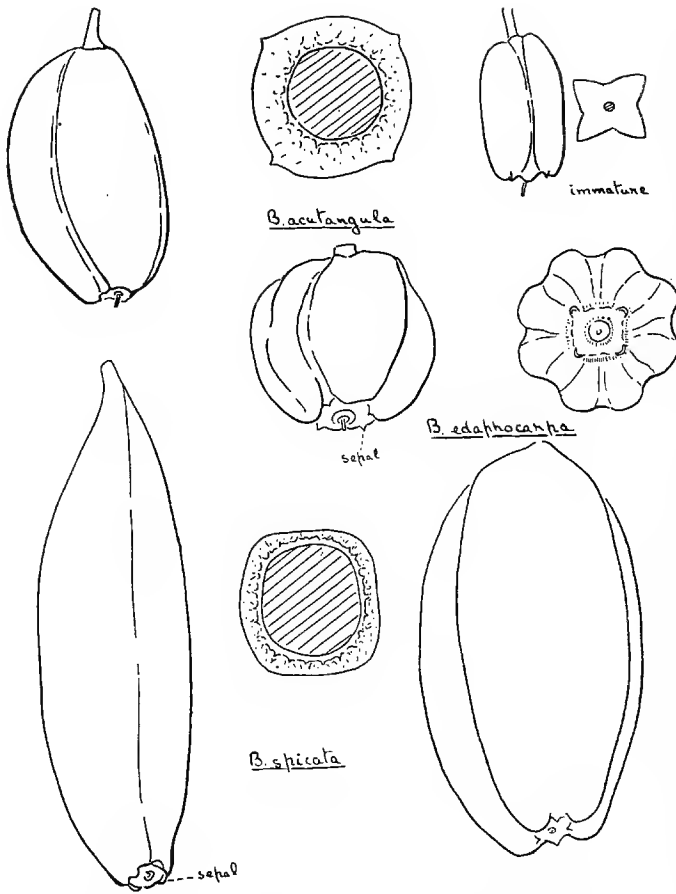
About 100 spp., trop. Africa, Asia and Australasia: about 15 spp. in Malaya in the lowlands and mountains, commonly river or stream-side.

In their large fluffy flowers and apple-like fruits, *Barringtonias* recall *Eugenia* but they do not have opposite leaves and their flowers are arranged on long spikes which, in most kinds, dangle from the twigs like strings or short pieces of cord and give to the plants a most distinct appearance, especially when laden with fruit: moreover, the flowers are strictly nocturnal. The buds begin to swell about noon but the petals and stamens do not unfold until nearly sunset when the heavy perfume becomes noticeable: about sunrise next morning the fluffy circle of stamens falls off with the petals. Each flower lasts only one night. In the daytime one sees therefore the fallen stamens and petals on the ground and only the buds and young fruits on the inflorescences. The flowers

are evidently pollinated by moths which are attracted by the scent and, in hovering in front of the flowers and probing into them with long tongues, they dust the pollen on to their bodies. As an exception, the flowers of the *Putat Ayer* (*B. conoidea*) remain open on the inflorescence till midday, or later, and it is just possible that it is day-flowering. In the big *Putat Laut* (*B. asiatica*) only one or two flowers open at a time on each inflorescence. In *B. racemosa* and *B. macrostachya*, with medium-sized flowers, several open together. In the small crimson-flowered species, *B. spicata*, *B. fusiformis*, *B. edaphocarpa* and *B. acutangula*, many flowers open on one night on the same inflorescence; and in the light of a torch, beneath their little crowns, so many dangling stars give the impression of a fairy universe. It is very unusual to find night-flowers that are red, *c.f.* *Garcinia*.



Text-Fig. 122. Fruits of *Barringtonia*; nat. size.



Text-Fig. 123. Fruits of *Barringtonia*, nat. size.

The Malayana species are evergreen and they flower apparently without season or throughout the year. None is in cultivation, but as a group of wild plants they are well-known and have the Malay name *Putat* with sundry, scarcely, distinctive epithets to indicate where they grow. *Putat Gajah* is given to any big-fruited species but may well be reserved for *B. Scortechinii*. *Putat Laut* (*B. asiatica*) is a common sea-shore tree with exceptionally large flowers and fruits. Several kinds are found in the rice-fields and in villages near the coast. With such beautiful flowers and varied fruits they make an attractive group to study, and there are several unidentified species in the country.

The fruits are eaten by monkeys, squirrels, bears and civet-cats, the fibrous stone being thrown away, but the *Putat Laut* (*B. asiatica*) and the *Putat Ayer* (*B. conoidea*) are exceptional. Their fruits are specialised for floating in the water, like those of the *Ketapang* (*Terminalia*); they are rendered buoyant through the tough, fibrous rind and are thus widely distributed by rivers and on-shore currents to be stranded as the tide turns or to be thrown up on the beach.

The leaves of most species wither yellow but in a few, such as *B. racemosa*, *B. edaphocarpa* and *B. acutangula*, they wither red.

Concerning the seeds, BURKILL remarks "Most of the species carry saponins and on that account are fish-poisons. The greatest quantity of this substance seems to be in the seeds, which are more commonly used than other parts of the tree; but the bark, either of the trunk or root, is sometimes employed". The parts to be used are pounded and thrown into water in the same way as *tuba* (Derris). Various species are employed and are called *Putat Tuba**. *B. Scortechinii*, especially, has this reputation.

* c.f. *Tuba Buah*, species of *Diospyros* (p. 214) with similar poisonous fruits.

The big fruits of some Anisophylleas (p. 122) may be mistaken for those of Barringtonia, for instance that of *A. grandis* so abundant on Penang Hill. But the fruit of Anisophyllea has a very hard stone and is not crowned by any obvious sepals, and the leaves, which have three longitudinal veins, are arranged alternately.

Key to the Species

- Sea-shore tree; leaves large, thick, shiny, sessile; fruit large, square-based *B. asiatica*
- Tufted bush standing in the water in tidal streams; leaves sessile; fruit with 8 flanges at the base ... *B. conoidea*
- Trees of different character
- Leaves sessile or with very short indistinct stalks
- Flowers 3" wide, on short thick stalks, white tinged pink; leaves large, to 7" wide; fruit oblong, round *B. racemosa*
- Flowers 2" wide or less, on slender stalks; leaves up to 3" wide; fruit narrowly oblong, 4-angled ... *B. fusiformis*
- Leaves distinctly stalked
- Leaf-stalk more than ½" long; flowers white, tinged pink
- Fruit broadly oblong, round or faintly 4-angled ... *B. macrostachya*
- Fruit narrowly oblong, banana-shaped ... *B. musiformis*
- Fruit narrowly oblong with 4 sharp angles ... *B. sumatrana*
- Fruit very large, 4—5" long, scarcely angled ... *B. Scortechinii*
- Leaf-stalk less than ½" long
- Flowers stalked, 3" wide, white tinged pink; fruit large, oblong, round; leaf-blade large, up to 7" wide *B. racemosa*
- Flowers mostly sessile, up to 2" wide, red; leaf-blade up to 3" wide *B. edaphocarpa*
- Fruits round, with 8 grooves *B. edaphocarpa*
- Fruit oblong
- Fruit brown-scurfy with 4 blunt angles; flowers almost or quite sessile; wild ... *B. spicata*
- Fruit green, glabrous, with 4 sharp angles; flowers distinctly stalked; cult. ... *B. acutangula*

B. acutangula Text-Fig. 123 Indian Putat
(from the sharply-angled fruits)

Very like *B. spicata* (distinctions in the key): flower-stalks $\frac{1}{4}$ — $\frac{1}{2}$ " long.
India to North Australia: doubtfully wild in Malaya, occasionally planted.

B. asiatica Plate 72 Sea Putat
Butong, Butun, Pertun, Putat Laut

A large sea-shore tree to 70 ft., with large-leaved, shiny crown: no buttresses: bark pinkish greyish, not scaly or ridged: inner bark thick, white with pale yellowish streaks: twigs thick: young leaves pinkish: olive with pink veins: old leaves withering yellow to pale orange.

Leaf-blade 6—18 × 3½—8", large, obovate, blunt, rather thick, leathery, shiny, sessile, though tapered to the base.

Flowers very large, 6" wide across the stamens, white, the ends of the stamens tinged pink, long-stalked; set in more or less upright (not hanging) spikes up to 12" long: petals 3" long.

LECYTHIDACEÆ

Fruit 3-4" wide, large with a broad square base tapering to the 2 rounded persistent sepals, hanging, green then brown, with a tough corky-fibrous husk.

Tropical shores of the Indian and Western Pacific Oceans: common in Malaya.

The *Putat Laut* has, perhaps, the widest flowers of any Malayan tree; they will open at dusk on twigs that have been cut in the day-time and set in water. The big fruits are commonly stranded on the beach, the brown husk having been worn away to a fibrous basket which surrounds the seed. The *Ketapang* (*Terminalia*) and the *Birah* (*Fagræa*) may both be mistaken for *Putat Laut*: the differences are contrasted under the *Ketapang* (p. 193).

In this and the two species, *B. conoidea* and *B. racemosa*, the calyx forms a complete covering round the flower-bud and is split into 2-3 parts only when the bud begins to open. In all the other species there are 4 distinct sepals.

B. conoidea Text-Fig. 122

River *Putat*
Putat Ayer

A dense bush up to 12 ft. high, in the brackish or freshwater reaches of tidal rivers, generally on submerged mud-banks, standing in the water at high tide: stems tufted, strongly thickened towards the base.

Leaf-blade as in B. racemosa but narrowly heart-shaped at the base and sessile.

Flowers 3" wide across the stamens, white, only the style pink, distinctly stalked (½"), in short scarcely hanging spikes 2-4" long from below the leaves.

Fruits 2-3" long × 1½-2" wide, conical but with 8 strong flanges round the base, tapering to the 2 (-3) blunt sepals.

Burma, Borneo, Malaya: common in its peculiar situation.

The fruits of this extraordinary species are often found on the beach as fibrous skeletons enclosing the seed. It grows with the *Rengas Ayer* (*Gluta velutina*) which has a similar appearance (see p. 43).

B. edaphocarpa Text-Fig. 123
(Gr., edaphos—the bottom, karpos—fruit)

Siamese *Putat*
Putat Sawa

Like *B. spicata* but:—

Leaf-blade 2½-7 × ¾-3"; with stalk ¼-½" long.

Flowers 1½" wide: sessile.

Fruits about ¾" long and wide, round with 8 grooves (4 deep and 4 shallow) and 8 blunt ridges, green flushed pink in the grooves, sessile.

Indo-China, Siam, Malaya: rather common by tidal streams in the forest and in rice-fields, on the East Coast from Pahang northward, on the West Coast from Prov. Wellesley northward.

B. fusiformis
(Lat., spindle-shaped)

Scurfy Putat

A small bushy tree to 40 ft., by streams in the forest and casual in the rice-fields.

Leaf-blade 3-11 × 1¼-3¾", narrowly obovate, tipped, finely toothed, narrowed to a slightly heart-shaped base, sessile or nearly so.

Flowers 1½-2" wide across the stamens, light crimson, with slender stalks ¼-1" long, in hanging, string-like spikes 12-40" long.

Fruit 2 × ¾", oblong, like a short, 4-angled banana, stalked, pale yellowish brownish scurfy.

Malaya: from Johore to Kedah and Kelantan, quite common.

The *Scurfy Putat*, the Indian *Putat*, the Siamese *Putat* and the Pahang *Putat* have small red flowers, slender string-like inflorescences and, compared with the other species, rather small leaves.

B. macrostachya

(Gr., makros—long, stachus—an ear of corn)

Red Putat
Putat Bukit*A sparingly branched, forest shrub or small tree, to 25 ft., rarely to 50 ft.**Leaf-blade 5-20 × 1½-6", oblong, distinctly tipped, thinly leathery, with 13-30 prs. of side-veins: stalk long, 1-6".**Flowers 2½" wide, across the stamens, white with red base, the stamens pinkish at the base, sessile, in hanging spikes 10-30" long: petals and calyx crimson.**Fruit 2-3½ × 1½-2½", oblong apple-shaped, rounded or with 4 faint ridges, green more or less flushed dull red, crowned by 4 small sepals.*Tenasserim, Malaya, Borneo: common in lowland forest generally on hillsides, apparently common in the mountains: *very striking with the ropes of dull red, apple-like fruits.***B. musiformis**

(shaped like a banana, Musa)

Banana Putat

Like *B. macrostachya* but the fruit banana-shaped, 4-5 × 1-1½", faintly 4-angled. Malaya: not common.**B. racemosa**

Text-Fig. 122

Common Putat
Putat Ayam*A small, straggling tree of sea-shores and tidal rivers, up to 25 ft. high: old leaves withering orange to red.**Leaf-blade 8-15 × 2½-7½", large, elliptic obovate, thinly leathery, slightly toothed, shortly tipped, sessile or narrowed to a short stalk up to ½" long: the midrib and veins in many cases yellow.**Flowers large, 3-4" wide across the stamens, pale pink with the petals white tinged pink and the stamens pink, very shortly stalked, set in long hanging spikes 12-30" long: calyx and flower-buds reddish purple.**Fruits 2½-3½ × 1½-2", oblong or rather pear-shaped, often with 4 faint grooves, green or flushed reddish, crowned by 2-3 blunt sepals.*

East Africa, Indo-Malaysia, Polynesia: common on sandy or rocky shores, on the banks of tidal rivers and creeks, and by muddy ditches in rice-fields throughout Malaya.

It seems that there are varieties of this species which have pure white flowers. The fluffy circles of stamens float on the rivers.

B. Scortechinii

(B. Scortechini, 1845-1886, the Italian missionary and botanist)

Scortechini's Putat
Putat Gajah

A forest tree, to 60 ft. high, generally by streams, with greyish-brown rather fissured or flaky bark: flowering at 15 ft.

*Leaf-blade 3½-10 × 1½-4", tapered to each end, very slightly toothed: stalk ½-1½" long.**Flowers 2" wide across the stamens, greenish white, the base of the stamens pinkish, sessile on fleshy hanging spikes 8-26" long.**Fruit 4-5½ × 2-3", very large, oblong, slightly 4-angled, green becoming yellowish or tinged pink, tipped by 4 small sepals.*

Endemic: common throughout the peninsula up to 4,000'.

B. spicata

(from the long flower-spikes)

Pahang Putat

Like *B. fusiformis* but:—

Leaf-blade narrowed to a distinct stalk about ¼" long, not heart-shaped.

Flowers sessile or very shortly stalked.

Fruits narrowly oblong and bluntly 4-angled, 3 × ¾", or broadly oblong, scarcely angled except at the ends, 2-2½ × 1½", pale yellowish brown, scurfy.

Burma to New Guinea: by rivers and streams Pahang, Perak, Malacca.

B. sumatrana

Sumatran *Putat*

Like *B. macrostachya* but:—

Leaf-blade 4-10 × 1-4", *stiffy leathery, with 7-13 prs. of side-veins.*

Stamens pink.

Fruit 2 × $\frac{3}{4}$ ", oblong with 4 sharp angles.

Sumatra, Malaya, Borneo, Celebes: on the banks of tidal rivers and creeks in Johore and Singapore.

BERTHOLLETIA

(L. C. Berthollet, the French chemist of the 19th century)

1 sp., natives of Brazil.

B. excelsa

Brazil-Nut Tree

(Lat., lofty)

A large deciduous tree, up to 80 ft. high, with round-cylindrical crown and massive trunk; *twigs* with a faint ridge on each side from the bases of the leaf-stalks; *old leaves withering red.*

Leaves 12-20 × 4-6", *alternate, large, oblong, tipped, drooping, with wavy edges, finely toothed; stalks* $\frac{1}{2}$ -1" long, with 2 narrow ridges on the upperside from the base of the blade.

Flowers 1-1½" wide, *light yellow, almost sessile, set in* sparingly branched, stout, upright, green *panicles* 8-16" long; *sepals* 2, green; *petals* 6, light yellow, white at the base, unequal; *stamens* short, *covered by a yellow bun-shaped structure* attached to one side of the flower by a stalk with crimson inner surface and set with many rich yellow teeth or plates; style short.

Fruit 4-5" wide, round, *very large and woody, brownish grey, with a plug,* containing about 14 large woody angled seeds.

As yet the Brazil-Nut tree is little known in Malaya but it has been introduced to the villages and is likely to become a common tree. It grows well and will fruit in the eighth year from seed: isolated trees seem not to fruit because they appear to be self-sterile, like the Cannon-Ball tree (*Couroupita*), and it is therefore advisable to plant the trees in clumps. The fruits take about 15 months to develop. There are two fine specimens in the grounds of Raffles College at Singapore and there are many trees in the Public Gardens at Kuala Lumpur. In general appearance, they resemble the *Binjai* (*Mangifera cæsia*, Plate 9). In the Amazon forests the trees attain more than 130 ft. in height and good specimens are said to bear more than 300 fruits in a season.

COUROUPITA

(from the S. American plant-name *couroupitoutoumou*)

19 spp. in tropical America.

C. guianensis

Cannon-Ball Tree

(from the Guianas)

A tall deciduous tree with rather narrow crown: *trunk thickly set with the long, woody inflorescences* from near the base to the upper branches.

Leaves 6-12 × 2½-4½", *arranged spirally in rosettes at the ends of the twigs, light green, thin, rather wavy, elliptic tapered to each end, the stalk and underside of the midrib rather stiffly hairy: stalks* $\frac{1}{4}$ -½" long.

Flowers 5" wide, *large, fleshy, fragrant, stalked on long inflorescences* 1-4 ft. long, not or sparingly branched: *sepals* 6: *petals* 6, *broad, yellow on the outside, pink on the inside and beautifully veined apricot yellow: staminal band white, fleshy,*

drawn out and turned up as a thick flap on the lower side of the flower, the fertile magenta stamens on the flap.

Fruits very large, round, greyish brownish, hard like cannon-balls, containing many seeds: disintegrating when ripe.

This most beautiful and remarkable tree is even less known in Malaya than the Brazil-Nut. There is a mature specimen in the Botanic Gardens of Singapore and another in the Public Gardens at Kuala Lumpur, before the Offices of the Department of Agriculture, and saplings have recently been planted out in Singapore and Penang. It grows fast and enjoys the climate so that it will probably become a common tree in parks and gardens, but the large fruits prevent its use on roadsides. Like the Brazil-Nut, too, it seems to be self-sterile so that isolated individuals will not fruit. The tissue of the flower when broken is white but quickly turns blue.

The Cannon-Ball tree in Singapore changes its leaves in March and September, having a regular leaf-period of six months: the leaves fall rapidly and the crown is bare only for a day or two. The flowering continues for many weeks.

GUSTAVIA

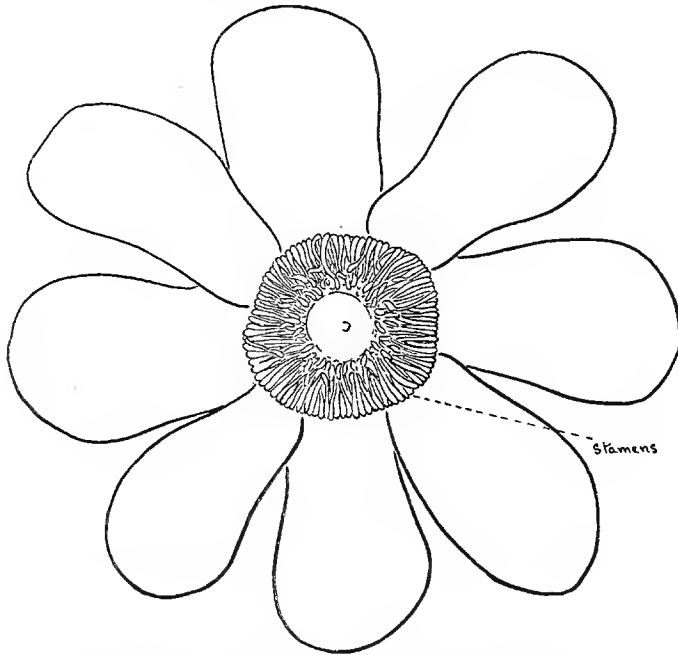
(King Gustavus III, of Sweden, 1746-1792)

Leaves arranged spirally, generally in rosettes at the ends of the twigs, toothed.

Flowers very large, white, pink or purple, fleshy, fragrant, solitary or 2-3 together, not in spikes or panicles: petals 6-12, rather unequal, the upper generally the smaller: stamens rather short, joined to a broad fleshy ring: style very short.

Fruits rather large, like flat-topped apples, fibrous or hard, containing many smooth seeds.

About 40 spp., in trop. America.



Text-Fig. 124. Flower of *Gustavia augusta*, $\times \frac{1}{2}$.

LEGUMINOSÆ

The following species have been introduced to Malaya and are to be found in some gardens. They are large woody evergreen shrubs or small trees with conspicuous fragrant flowers. The young leaves are pink. Flowering is evidently seasonal.

The Indian *Simpoh* (*Dillenia indica*) must not be mistaken for a *Gustavia*, although its large toothed leaves and large fleshy flowers with many stamens are similar: it has five petals.

Key to the Species

- Leaves long, narrow, with wavy edges, 8-18 × ¾-1 ½",
with stalks 1-1 ½" long: *petal* 6-8, deep pink,
flowers 4" wide, often on the stems below the leaves:
sparingly branched treelet *G. gracillima*
- Leaves broader: *flowers* larger, white or tinged pink,
always grouped at the ends of the leafy twigs: bushy
plants
- Leaves 12-20 × 4-7", with a stout flat stalk ¼-½"
long: *flowers* 6-7" wide, white: *petals* 8 *G. augusta*
(Text-Fig. 124)
- Leaves 6-12 × 2-4": *flowers* 5-6" wide: *petals* white,
tinged pink outside and towards the ends
- Petals 9-12, rather narrow: leaves with a distinct
stalk ¼-⅓" long, the blade curled and crisped
toward the base, with the edges curved above
the midrib at the base *G. Marcgraafiana*
- Petals 8, rather broad: *leaf* sessile, the blade tapered
gradually to the twig *G. superba*

BEAN FAMILY

Leguminosæ

(Lat., legumen—a pod)

Leaves alternate or spirally arranged, compound, once or twice pinnate or trifoliate, rarely simple.

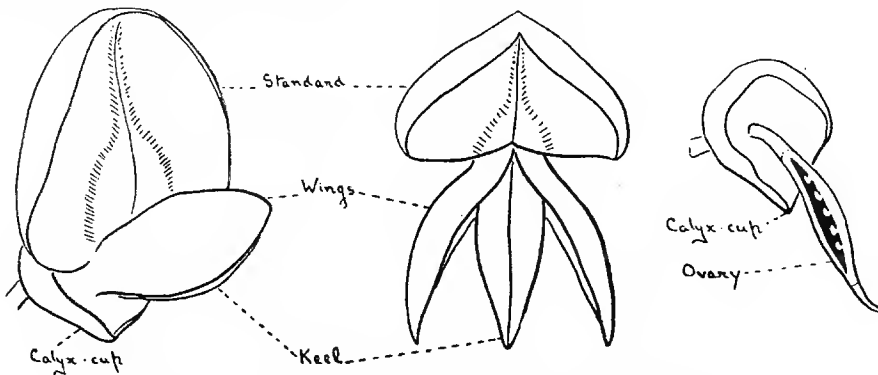
Flowers generally with 5 sepals and 5 petals: ovary superior, rather long and narrow, often stalked, with a single cavity and style.

Fruit a pod (legume) *with one cavity and one row of seeds*, very variable in shape, round or flat, thick or thin, straight or coiled, short or long, leathery or woody, splitting open or not, in some cases breaking into one-seeded joints, in a few cases with only one seed.

Over 12,000 spp., throughout the world: 67 genera, 270 spp. in Malaya, in lowland and mountain forest.

Except for the grasses and orchids, the Leguminosæ form the largest and, perhaps, the most important family of plants in Malaya. There are indeed few other families in the world with bigger numbers and such extraordinary variety. Herbs, shrubs, trees and climbers are included with great differences in leaf-form and floral structure. It would hardly be imagined, for instance, that among our common plants the Beans, the Flame of the Forest, the Angsana, the Bauhinia, the Saraca and the Mimosa belonged to the same family, yet through comparison with plants from every part of the world it has been found that one way or another they are linked together, however distant the ends of the chain may be, and all possess the same kind of ovary from which, develops the unmistakable pod. In practice, the family resolves itself, according to the structure of the flower, into three very natural sub-families, known as the Bean-, Cæsalpinia- and Mimosa-subfamilies: and under these heads the genera are arranged in this

book. The sub-families are quickly understood, being in fact no more than a verbal analysis of what becomes immediately apparent on comparing a Bean-, Cæsalpinia- and Mimosa-flower.



Text-Fig. 125. Purple Millettia (*Milletia atropurpurea*), $\times 1\frac{1}{2}$.

The importance of the family lies in the many valuable commodities that it offers. As foods, for example, there are the peas, beans, lentils and ground-nuts and such miscellaneous fruits as the *Petai* (*Parkia*), *Nam Nam* (*Cynometra*), Tamarind and *Keranji* (*Dialium*). As timbers there are several exotic kinds variously known as logwood, rosewood, blackwood and ironwood: in Malaya the chief timbers are *kempas* (*Koompassia*), *merbau* (*Iutsia*), *keranji* (*Dialium*), *sena* (*Pterocarpus*) and *sepelir* (*Sindora*). As ornamental plants, the family supplies many beautiful flowering trees and shrubs, of which the *Amherstia* is thought by some to be the loveliest in the world. Among the lesser products are such medicinal articles as senna-pods and liquorice-root, dye stuffs as indigo, cutch and hæmatoxylin, poisons at *tuba-root*, and also various gums and tan-barks. But the greatest attribute of the family lies in the power, which nearly all members possess in some degree, of fixing atmospheric nitrogen by the means of special bacteria living in little swellings (nodules) on the roots. The nitrogen from the air is thereby turned into nitrates and becomes available for the growth of the plant: and it is for this reason that leguminous plants are grown as cover-crops or as green manure.

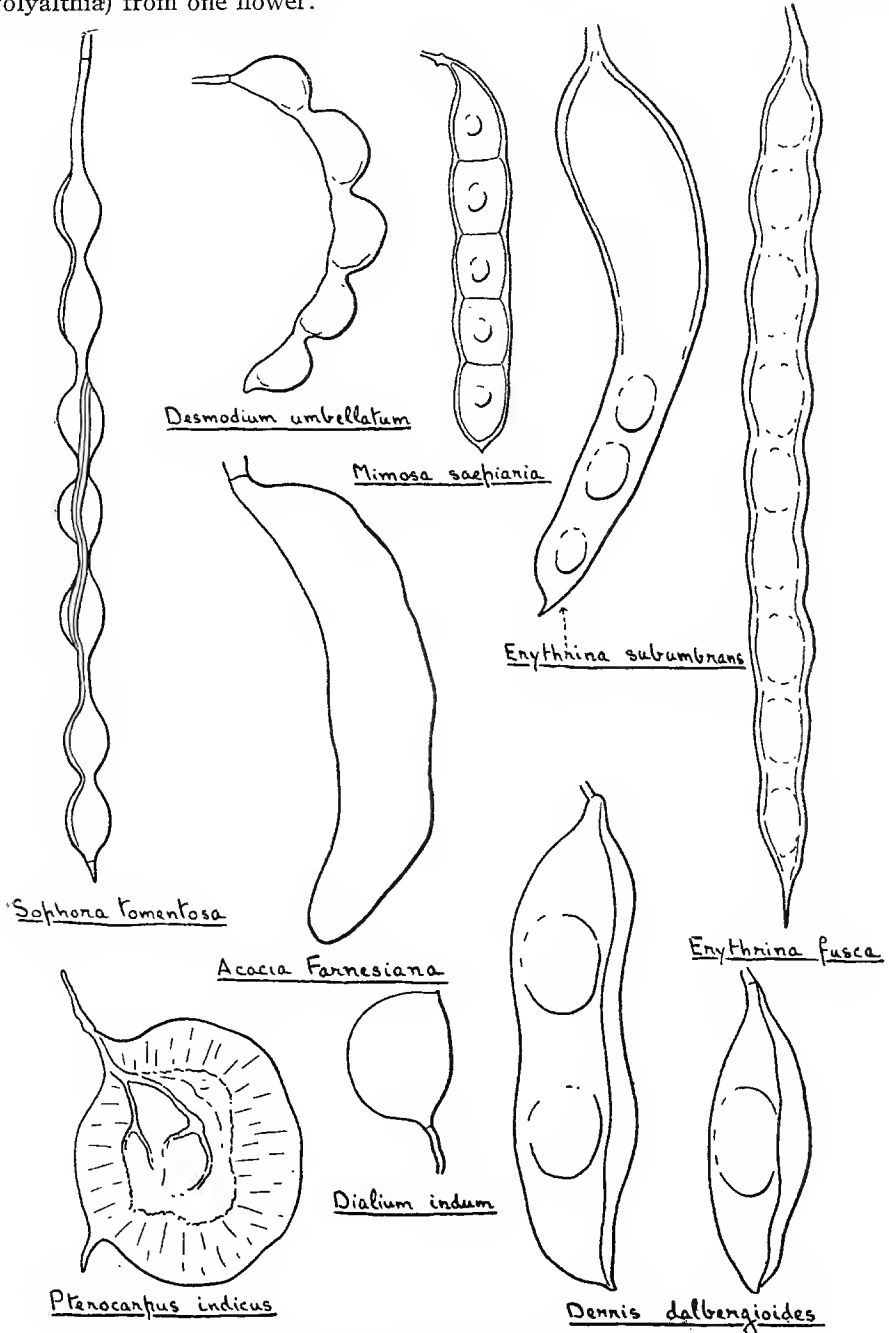
In Malaya, our leguminous trees generally have smooth pale trunks, like that of the *Tualang* (*Koompassia excelsa*) or Flame of the Forest (*Delonix*). Exceptions with rough bark are the Tamarind, the Angsana (*Pterocarpus*), the Rain Tree (*Enterolobium*), the Purple Millettia (*Milletia atropurpurea*), and *Kungkur* (*Pithecellobium splendens*).

The seeds of many leguminous trees, as the Acacias, the Albizzias and the Parkias, have exceedingly tough, hard coats which prevent them from germinating until they have been softened by slowly decaying in the soil for many years. They can be made to sprout quickly by softening them with weak acid, by putting them among the embers of a dying fire or by dropping them for few minutes into boiling water. It seems that the blanket of air between the tough coat and the embryo prevents the extreme heat from reaching the embryo. Thus it often happens that, on burning some waste land or secondary jungle in the vicinity of cultivation, a crop of Albizzia-saplings springs unexpectedly from the long-dormant seeds in the ground.

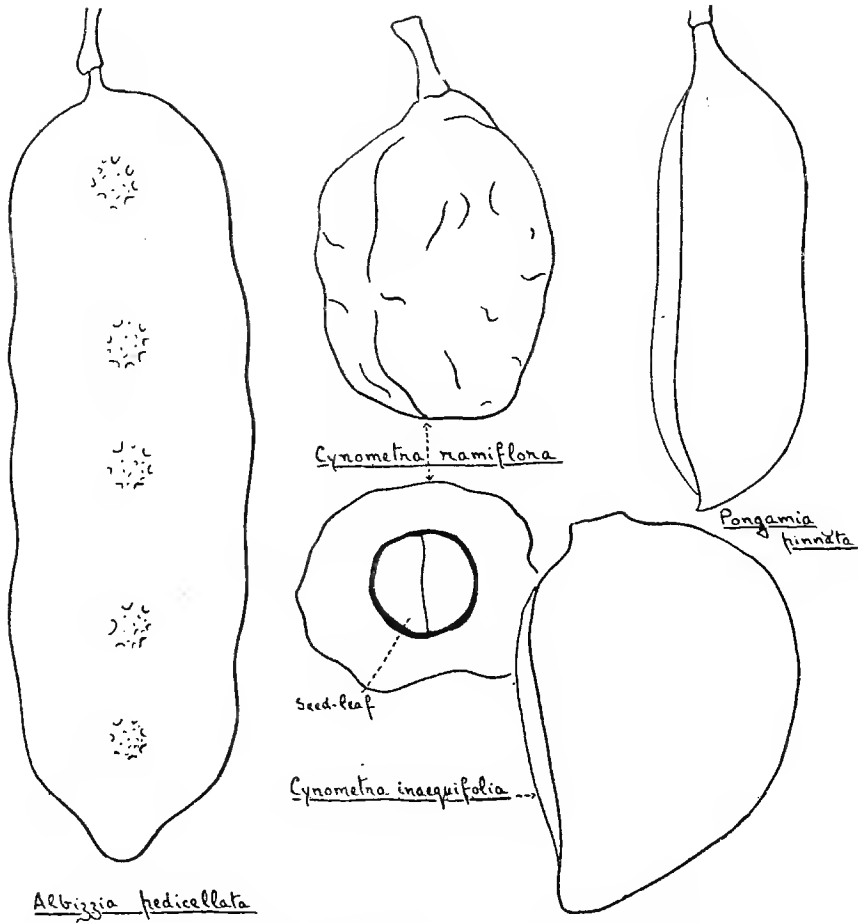
The single pods of the Leguminosæ must not be confused with the pods of the *Kenanga*-family (*Annonaceæ*), the Periwinkle-family (*Apocynaceæ*) or the

LEGUMINOSÆ

Sterculicææ, which are developed two or more from each flower. A fruit-head of a Mimosa is derived from a whole inflorescence, that of a *Mempisang* (*Polyalthia*) from one flower.



Text-Fig. 126. Pods of the Bean-family (Leguminosæ), $\times \frac{1}{2}$ -1.



Text-Fig. 127. Pods of the Bean-family (Leguminosæ), $\times \frac{1}{2}$ -1.

DESCRIPTIONS OF THE SUBFAMILIES

Bean-subfamily (Papilionaceæ) (Text-Fig. 125) p. 365

Flowers bilaterally symmetrical. *Sepals* joined to form a cup or tube with 5 teeth. *Petals* variously modified: the upper petal the largest, forming a *standard*, overlapping the others, outermost in the flower-bud: the lowest two petals joined to form a *keel* enclosing the stamens and ovary: the two side-petals forming the *wings* of the flower, overlapping the keel. *Stamens* 10, generally joined into a bundle, hidden in the keel. Herbaceous and woody plants.

Cæsalpinia-subfamily (Cæsalpiniaceæ) p. 377

Flowers bilaterally symmetrical, mostly large, showy and open. *Sepals* generally free (joined in *Bauhinia*). *Petals* not or scarcely modified, not forming wings or a keel: the uppermost petal innermost in the bud, overlapped by the others, often differently shaped or coloured and then called the *standard*. *Stamens* 10 or less, separate and not enclosed in a keel. Mostly woody plants.

LEGUMINOSÆ

Mimosa-subfamily (Mimosaceæ) p. 405

Flowers small, regular, generally grouped in heads, fluffy from the numerous stamens. *Petals* small, not modified, no standard, often joined in a tube. *Stamens* many, often joined in a tube. Seeds often with a faint 'heart-line' on each side. Mostly woody plants.

Key to the Genera

CULTIVATED TREES OF GARDENS, ROADSIDES AND VILLAGES

- Trunks or twigs spiny
 - Shrubs or small trees to 15 ft. high (leaves not trifoliolate)
 - Flowers tiny, in yellow heads: pods finger-like ... *Acacia* p. 405
 - Flowers tiny, in small white heads; pods, tiny, flat ... *Mimosa* p. 413
 - Flowers medium to large, in racemes: pods rather large, rattling ... *Cæsalpinia* p. 385
 - Trees with big trunks, or leaves trifoliolate
 - Leaves trifoliolate ... *Erythrina* p. 367
 - Leaves once pinnate with several leaflets: flowers large, pink ... *Cassia javanica* p. 389
 - Leaves with 2 pairs of tiny leaflets: flowers tiny, white ... *Pithecellobium dulce* p. 419
- Not spiny
 - Leaves 2-lobed, or split, at the apex ... *Bauhinia* p. 378
 - Leaves simple, narrow and slightly curved or bluish white: flowers yellow, tiny, in spikes or heads ... *Acacia* p. 405
 - Leaves trifoliolate ... *Erythrina* p. 367
 - Leaves with one pair of leaflets
 - Bush or small tree to 15 ft. high: flowers on the trunk ... *Cynometra cauliflora* p. 391
 - Big tree: flowers at the ends of the twigs ... *Hymenæa* p. 394
 - Leaves pinnate
 - Leaves once pinnate
 - Leaves with a terminal leaflet
 - Leaflets opposite
 - Flowers at the ends of the leafy twigs, white, pink, purple: leaflets 2-5 pairs ... *Millettia* p. 372
 - Flowers on the twigs below or behind the leaves: leaflets 6-8 pairs
 - Erect tree: flowers orange, large: leaflets large ... *Castanospermum* p. 727
 - Small sprawling tree or shrub: flowers pink: leaflets small ... *Gliricidia* p. 371
 - Leaflets alternate: big trees
 - Flowers yellow: pods like pennies: leaflets 1½" wide or more ... *Pterocarpus* p. 375
 - Leaflets small, less than 1" wide
 - Pods flat ... *Dalbergia* p. 365
 - Pods like tiny, black, velvety pears ... *Dialium* p. 393

- Leaves without a terminal leaflet
 Flowers large, bean-like, 1-3 together,
 white or red: pods pencil-like ... *Sesbania* p. 376
 Leaves white beneath: flowers large,
 pink, hanging *Amherstia* p. 377
 Not so
 Flowers yellow or pink, 1" or more
 wide, in loose clusters, panicles
 or racemes *Cassia* p. 386
 Flowers yellow or red, about ½"
 wide, in dense upturned clusters:
 pods purple *Saraca* p. 399
 Flowers red or pink in dense, down-
 turned heads *Brownea* p. 383
 Flowers small, cream-white, with
 rose-red bracts: leaflets small:
 pods thick, rather short, brownish *Tamarindus* p. 404
 Leaves twice pinnate, very feathery
 Crown distinctly umbrella-shaped and
 spreading or flat-topped
 Flowers large, red *Delonix* p. 392
 Flowers large, yellow: young shoots
 brown hairy *Peltophorum* p. 398
 Flowers in small pink clusters ... *Enterolobium* p. 412
 Lofty trees with tiny white or yellowish
 flowers
 Flowers in long-stalked, massive
 heads: pods often twisted, long,
 dangling in long-stalked bunches *Parkia* p. 414
 Not so: flowers in panicles: pods flat *Albizzia* p. 408
 Crown not distinctly umbrella-shaped
 Shrubs or small trees
 Flowers yellow or red, large *Cæsalpinia* p. 385
 Flowers white, tiny, in heads: pods
 in bunches *Leucæna* p. 413
 Trees with big trunks
 Seeds red or red and black: flowers
 pale orange, tiny, in spikes ... *Adenanthera* p. 407
 Pods coiled, purple brown: seeds
 large, foetid of garlic: leaflets
 large: flowers white, fluffy ... *Pithecellobium jiringa* p. 420
 Bark peeling, with patches of pale
 yellow new bark: leaves short,
 6" long overall *Cæsalpinia ferrea* p. 385
 Not so: leaves over 6" long
 Flowers in long-stalked, massive
 heads: pods often coiled,
 dangling in long-stalked
 bunches *Parkia* p. 414
 Not so: flowers in panicles: pods
 flat *Albizzia* p. 408

- Trunk or twigs spiny
 Leaves trifoliolate with 3 large leaflets ... *Erythrina* p. 367
 Leaves doubly pinnate with tiny leaflets ... *Mimosa* p. 413
- Not spiny
 Seeds red or red and black
 Pods straight, very short: leaves once pinnate ... *Ormosia* p. 374
 Pods curved or coiled, long: leaves twice pinnate ... *Adenanthera* p. 407
- Not so
 Big forest trees with simply pinnate leaves
 Without buttresses: no terminal leaflets: pods flat, short, often disc-like and prickly ... *Sindora* p. 403
 With large buttresses
 No terminal leaflet: *Merbau* ... *Intsia Bakeri* p. 396
 With a terminal leaflet
 Pods like small, black-velvety pears: bark generally with red gum: *KerANJI* ... *Dialium* p. 393
 Pods flat: *Kempas, Tualang* ... *Koompassia* p. 396
- Smaller trees, or trees with doubly pinnate leaves
 Leaves once pinnate
 With a terminal leaflet
 Leaflets small, very numerous: twigs rather foetid: pods small: flowers small, purple ... *Derris* p. 366
 Leaflets large, 2-5 pairs: pods large, flat or thick ... *Millettia* p. 372
 Without a terminal leaflet
 Leaflets rather small, numerous: flowers yellow or pink, not in masses ... *Cassia* p. 386
 Leaflets medium to large, 2-8 pairs: young leaves in pink tassels
 Flowers yellow, pink or red, in dense clusters: pods purple, flat, several-seeded ... *Saraca* p. 399
 Flowers white, in tiny clusters: pods short, thick, 1-seeded ... *Cynometra* p. 391
- Leaves twice pinnate
 Pods coiled up, red inside (or outside): seeds black: leaflets small or large *Pithecellobium* p. 416
 Not so: leaflets tiny
 Flowers rich yellow, fairly large: pods short, flat, few-seeded ... *Peltophorum* p. 398
 Flowers tiny, fluffy, white, cream or greenish

- Flowers in long-stalked, massive heads: pods long, often curled, dangling in long-stalked clusters *Parkia* p. 414
 Not so: flowers in panicles: pods flat *Albizzia* p. 408

SEA-SHORE AND MANGROVE TREES

- Leaves simple: pods thick, short, large, 1-seeded *Inocarpus* p. 395
 Leaves trifoliate
 Shrub *Desmodium* p. 367
 Tree, often prickly *Erythrina* p. 367
 Leaves with 1-2 pairs of leaflets: no terminal leaflet
 Small tree with brown bark: pods thick, short, knobbly, brown *Cynometra* p. 391
 Big tree with light grey bark: pods large, flat *Intsia* p. 396
 Leaves once pinnate with 2 to many pairs of leaflets
 Shrub, grey silky-hairy: flowers yellow ... *Sophora* p. 377
 Trees
 Leaflets small, many: no terminal leaflet ... *Tamarindus* p. 404
 Leaflets large, 2 pairs and a terminal leaflet *Pongamia* p. 374
 Leaves twice pinnate, with small leaflets
 Flowers yellow: young shoots brown hairy ... *Peltophorum* p. 398
 Seeds red: pods coiled: glabrous ... *Adenanthera* p. 407
 Pods straight: flowers minute, fluffy, in little heads: rare *Albizzia* p. 408

RIVERSIDE TREES

- Leaves simply pinnate without a terminal leaflet
 Flowers red, pink or yellow, in masses: pods purple, flat *Saraca* p. 399
 Flowers minute, white: pods thick, 1-seeded: leaflets asymmetric *Cynometra* p. 391
 Leaves simply pinnate with terminal leaflets
 Flowers pink: pods short, thick, 1-seeded ... *Pongamia* p. 374
 Flowers white: pods long, flat, several-seeded *Millettia* p. 372

BEAN SUBFAMILY

Papilionaceæ

(p. 361)

DALBERGIA

(N. and C. G. Dalberg, ca. 1730-1820, the Swedish botanists)

Leaves simply pinnate, with numerous small alternate leaflets and a terminal leaflet.

Flowers small, purple, pink or white, in small panicles.

Pods thin, flat, oblong, rather narrow, indehiscent, with one, less commonly 2-4, flat seeds.

About 120 species, throughout the tropics, mostly Asiatic (about 90), very few in Australia and Polynesia: about 15 spp. in Malaya.

LEGUMINOSÆ (PAPILIONACEÆ)

This genus, like *Millettia*, consists of trees and woody climbers. All the Malayan species are forest climbers except one rare little tree and one introduced species, *D. Oliveri*. Certain exotic kinds give timber of great value known as Brazilian, Honduras and Indian rose-woods and African and China blackwoods. The heart-wood of a common, thorny Malayan climber (*D. parviflora*, *Akar Laka*) is scented and used to make joss-sticks.

D. Oliveri Plate 92

Tamalan Tree

(D. Oliver, 1830-1916, the English botanist at Kew)

A tall tree with spreading crown, up to 60 ft. high: bark grey, smooth: young shoots silky hairy, soon glabrous.

Leaves 6-9" long, up to 11" on young shoots: leaflets 13-17 (19-21 on the young shoots) including the terminal leaflet, $\frac{3}{4}$ -1 $\frac{1}{4}$ × $\frac{1}{2}$ - $\frac{3}{4}$ ", the end leaflet hardly bigger than the others, rather small, blunt, minutely notched, slightly obovate, base tapered and slightly oblique, with stalks .1-2" long.

Flowers .3-4" long, lilac in the bud, fading pink then white, in small panicles, 2-3" long, in the axils of scale-leaves or deciduous rudimentary pinnate leaves on short side-twigs becoming leafy at the ends: calyx with 5 teeth, dull purple: stamens in 2 bundles of five.

Pod 2-3 $\frac{1}{2}$ × $\frac{3}{8}$ ", flat, long stalked, glabrous, with 1, occasionally 2-3 seeds.

Native of Burma and Siam: introduced to Malaya.

This tree, which at first sight suggests the Rain-Tree (*Enterolobium*), grows in abundance on Fort Canning in Singapore and has also been planted in the Public Gardens at Kuala Lumpur. It is partly deciduous in Singapore and changes its leaves by a few branches at a time, like the *Angsana* (*Pterocarpus*), but during the second half of the year. When the new twigs develop they firstly produce several small panicles of flowers in the axils of bud-scales or rudimentary foliage leaves, and then the new foliage leaves.

DERRIS

(Gr., a leathern coat)

Like *Dalbergia* but the leaflets strictly opposite.

About 50 spp., pantropical: 12 spp. in Malaya.

Most species of *Derris* are climbers like the well-known *Tuba*-plants (*Derris elliptica* and *D. malaccensis*). But a few, like the following, are *Cassia*-like trees with small vetch-like flowers and foliage.

D. dalbergioides Text-Fig. 126

(like a *Dalbergia*)

Vetch-Tree

Batai, Bētek

A small, *Cassia*-like tree up to 40 ft. high, with light feathery crown of small foliage, the trunk soon breaking up into the large limbs: bark light grey, slightly fissured: twigs, leaf-stalks and buds finely golden brown silky: young leaves pinkish: all parts of the plant giving a fetid smell like bean-pods when crushed.

Leaves 5-8" long, with 9-18 pairs of leaflets (or more in saplings) and a terminal one: leaflets $\frac{1}{2}$ -1 × .2-4", oblong, small, blunt, dark green, glaucous beneath, the stalks very short.

Flowers .3-4" long, mauve-purple, vetch-like, in short spike-like inflorescences, 2-5" long, standing up from the twigs generally behind the leaves, or from the axils of the oldest, and invisible from below: standard with a greenish-white mark at the base.

Pods 1 $\frac{1}{2}$ -3 × $\frac{1}{2}$ - $\frac{3}{4}$ ", 1-3 seeded, flat, leaf-like, pale brownish, not opening, winged along one side.

Indo-China to Java: common in secondary jungle from Malacca northwards, especially in Perak and Kedah.

The manner of growth of this tree is just like that of a Cassia and, in the north of the country, it may be mistaken for the Limestone Cassia, *C. timoriensis*: but Cassias have no terminal leaflet. The delicate foliage with glaucous undersides to the leaflets, the golden silky buds and young leaves and the foetid smell of the broken twigs distinguish the species from all other Malayan trees. It is likely to be useful for afforestation of waste land.

DESMODIUM

(Gr., desmodion—a small bond)

Leaves trifoliate.

Flowers small, in racemes: the wings more or less attached to the keel.

Pod constricted into several 1-seeded joints, not opening but the joints falling apart at maturity.

About 150 species, throughout the warmer parts of the world, chiefly in the tropics: 19 species in Malaya, mostly herbs and shrubs of villages and waste-places.

D. umbellatum Text-Fig. 126

Sea Vetch-Tree
Lemak Ketam, Petai Laut (Malacca)
Hati Hati

A straggling shrub or small tree to 20 ft. high, old plants developing a thick, stocky trunk, often prostrate toward the sea: young branches and leaves in some cases densely silky.

Leaf-stalk $\frac{3}{4}$ –2" long: end-leaflet $1\frac{1}{2}$ –4 × $1\frac{1}{4}$ –3", elliptic, rounded or narrowed to a blunt apex, thinly leathery, rather glaucous beneath with 7–11 pairs of side-veins.

Flowers $\frac{1}{2}$ " long, cream-white, in short dense axillary racemes or clusters: calyx silky with 5 long teeth.

Pod 1–2" long, curved, with 1–4 rather thick joints $\frac{1}{4}$ " wide, brown.

On sea-coasts and shores of tidal rivers round the Indian Ocean from the Mascarene Islands to Polynesia: common on both sides of Malaya, on sandy, muddy and rocky ground.

The pod is like that of Mimosa, but in Desmodium the joints separate completely because the whole pod is constricted between them whereas in Mimosa the pod itself is not constricted and the joints are detached from the peripheral framework of the pod.

CORAL-TREES

ERYTHRINA

(Gr., eruthros—red)

Soft-wooded, quick-growing trees *with short woody spines or prickles on the trunk and branches*: twigs stout, prickly.

Leaves trifoliate, spirally arranged, with large entire stalked leaflets each with a pair of green glands or knobs at the base.

Flowers large, red or purple, working upside down, crowded in whorls on slowly elongating racemes: standard large, wings short, keel generally short: *stamens generally projecting well beyond the keel*, with 1 stamen free and 9 joined together so as to give 5 long ones alternating with 4 short ones.

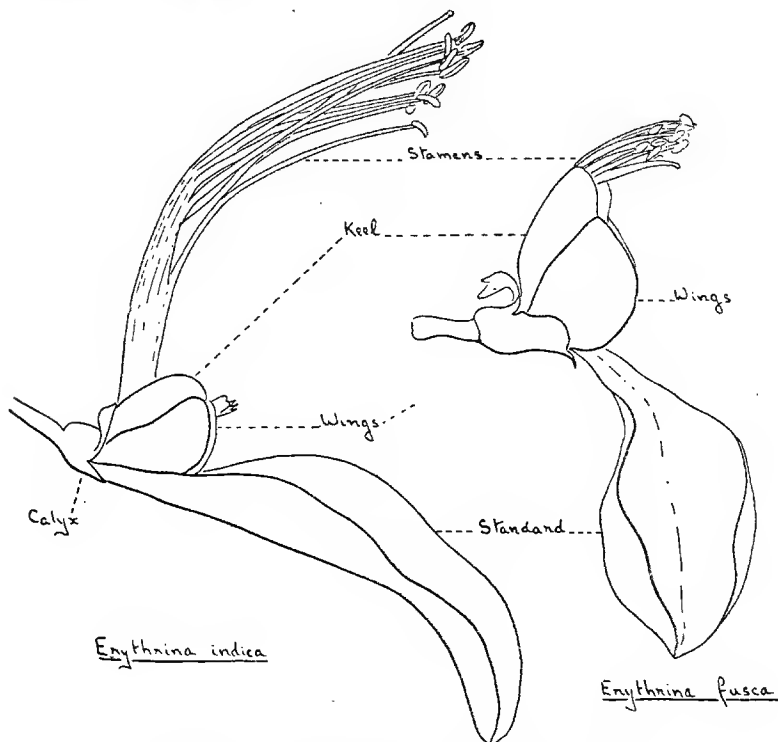
Pod long, more or less constricted between the seeds: seeds red, pink or brown.

About 30 spp., throughout the tropics: 5 spp. Malaya.

The Coral-Trees are known to Malays as *Dadap*, *Dedap* or *Derdap*. They are easily recognised from the prickly twigs and trifoliate leaves. Three species

LEGUMINOSÆ (PAPILIONACEÆ)

are often found in parts of Malaya, the Indian Coral-Tree being the most abundant. But, like the rest of the genus, they need a sandy soil and a monsoon climate in which to thrive. Inland in the Peninsula, they are usually poorly grown with irregular crowns but near the sea, particularly on the East coast, they will become stalwart shady trees. The Indian and Purple Coral-Trees are deciduous and flower on the bare branches before the new leaves develop. The December Tree (*E. subumbrans*) appears to be evergreen in Singapore or, at most, only partly deciduous.



Text-Fig. 128. Flowers of *Erythrina*, nat. size.

The Coral-Trees are pollinated by large birds, such as *Chloropsis* and crows, which visit the freshly opened flowers in the early morning to drink the sweet, if somewhat bitter, watery honey which collects round the base of the stamens. The large, bright red, firm and scentless flowers with projecting stamens are typical "bird-flowers" and the whole inflorescence is strong and elastic to enable the birds to hop about on it and poke into the flowers. The inverted position of these, which is caused by the drooping of the inflorescence, not only assists the birds by offering the gay standard as a platform, supported by the crowded buds beneath, but it prevents the copious honey from running out. All the flowers in a whorl are open on the same day. Small birds may therefore drink their fill in a single visit, but they are too light to depress the flowers and reach the style and stamens: only heavy-bodied birds are the effective pollinators. The flowers of the Indian Coral-Tree open about 4 a.m. and those of the Purple Coral Tree soon after sunrise: they remain on the inflorescence for 2-3 days after opening

but do not secrete honey after the morning of the first day. In the December-Tree, the inflorescences point obliquely upward and birds perch on the ends of them and poke into the flowers with their heads down. The pollen is carried on the bird's head. In monsoon countries such as Java, the Coral-Trees flower during the dry months, when rain-water is scarce for small creatures, and their flowers provide an important supply of drink to birds and even squirrels.

The difference in shape of Erythrina-flowers depends mainly on the relative lengths of the standard and keel and on the way the standard is held.

Key to the Species

Leaflets oblong, longer than broad			
Big lowland tree with very thorny trunk: flowers dark purple	...	...	<i>E. fusca</i>
Small mountain tree with fissured, not thorny trunk: flowers crimson	...	...	<i>E. crista-galli</i>
Leaflets as broad as long or broader			
Flowers 1-2" long			
Flowers scarlet: keel not half as long as the standard: common	...	...	<i>E. subumbrans</i>
Flowers orange-red: keel more than half as long as the standard: (scarce as yet)	...	...	<i>E. Pæpigiana</i>
Flowers 2-3½" long			
Flowers pencil-like, reddish pink: scarce	...	...	<i>E. corallodendron</i>
Not so			
Leaves not variegated: flowers dark scarlet	...	...	<i>E. indica</i>
Leaves striped yellow: flowers light orange-red	...	...	<i>E. Parcellii</i>

E. corallodendron

Pink Coral-Tree

(Gr., korallion—coral, dendron—tree)

Like *E. indica* but with differently shaped and coloured flowers.

Flowers 2½" long: calyx .6" long, cup-shaped, not split or lobed: *standard salmon-red or reddish pink, narrow, straight*, not spreading, silky: keel short: stamens nearly as long as the standard and tucked close under it.

Pods with scarlet seeds.

As yet this tree of Tropical America is little known in Malaya, but it has attractive, bizarre flowers.

E. crista-galli

Cockscomb Tree

(Lat., a cockscomb)

A shrub or small tree, to 15 ft. high, *with rugged trunk and gnarled twisted branches*, forming an irregular open crown: *bark pale greyish buff, deeply fissured: neither trunk nor twigs thorny but with a few brown or black spines on the leaf-stalks and some of the leaflets.*

Leaflets 1½-3½ × ¾-2", oblong, rather glaucous beneath.

Flowers 2" long, *in groups of three in the leaf-axils*, forming leafy panicles at the ends of the twigs: *standard dark crimson*: keel dark crimson, about ¾ as long as the standard.

Pods 4-7" long, with 2-4 seeds, rather constricted between the seeds.

Trop. America: introduced to Penang Hill and other hill-stations.

The deeply fissured bark and gnarled appearance of this charming little tree, as well as its occurrence in the mountains, will distinguish it from all our native Erythrinæ. It is called, in Louisiana, "Cry-baby Tree" from the excessive nectar which drips from the flower.

E. fusca Plate 97, Text-Figs. 126, 128
(Lat., dark)

Purple Coral-Tree
Chekring, Chenkring

A deciduous tree becoming rather large and massive, up to 80 ft. high, with rounded crown: *very thorny: trunk sharply buttressed*, light grey to *brownish*, sparsely or thickly studded with knobs tipped with spines: thorns often on the underside of the leaflets.

Leaflets rather glaucous or hoary-white beneath, the terminal leaflet about twice as long as broad, 2-6 × 1-3", blunt.

Flowers 1½-2" long, in short inflorescences, 4-6" long, at the ends of the bare twigs or with the new leaves: calyx ¾" long, shortly split on the upperside: *standard very dark crimson to purple, hooded*: wings white, with the outer half purple: keel greenish white, short: stamens greenish white, about half as long as the standard.

Pods 6-8" long, with 6-11 brown or mottled seeds.

Mascarene Islands, India, Ceylon, through Malaysia to the Pacific Isles.

This tree, which is perhaps our largest Erythrina, is found chiefly in the north of Malaya, in Penang, Kedah, Perlis and Kelantan, where it is commonly planted along roads and by streams and rivers bordering rice-fields, and it is evidently wild, at least on the coast. Occasional trees are found in the south, as in Singapore, Alor Gajah, Tampin and Seremban. It is at once distinguished by the thorny trunk, brownish bark, oblong leaflets and sombre flowers like those of the Purple Millettia (*M. atropurpurea*). Its preference for wet places is rather unusual in the genus. It flowers early in the year after the first spell of dry weather.

E. indica Plate 98, Text-Fig. 128

Indian Coral-Tree, Tiger's Claw

A deciduous tree *with greenish grey, smooth bark marked with pale longitudinal stripes*: trunk not spiny: twigs spiny.

Terminal leaflet generally broader than long, suddenly cut off, at the wide base.

Flowers 2½-3" long, the racemes up to 10" long: calyx 1-1½" long, split along the upperside: *standard 1½" wide, deep scarlet, curved back*: wings and keel crimson, short: stamens red, nearly as long as the standard.

Pods 7-11" long, with many dark carmine seeds.

India to the Pacific Isles: a seashore tree.

The tree is wild on the sandy shores of both sides of the Malay Peninsula. It grows into a large shady tree leaning over the beach like Terminalia and Barringtonia. It is commonly planted in villages and along roadsides from Malacca northward and is used to make close hedges or living palings because it grows readily from massive cuttings and its prickles ward off intruders. During the first spell of dry weather in the year, from January to February, the trees shed their leaves and flower on the bare twigs. Old trees tend to become umbrella-shaped. The timber is called Widjet-wood in India. The leaves and seeds can be eaten when cooked but the raw seeds are poisonous: it seems that all parts of the plant are slightly poisonous.

(The species is called *E. variegata* in BURKILL'S Dictionary.)

E. Parcellii

Variegated Coral-Tree

Like *E. indica* but:—

Leaflets with a broad yellow midrib and yellow stripes along the side-veins, the base of the leaflet not suddenly narrowed.

Flowers larger, 3-3½" long, in longer inflorescences: calyx 1½" long: standard paler, light orange red, rather narrow, 1¼" wide.

Cultivated in gardens, occasional: of doubtful origin.

This species does better inland in Malaya than the Indian Coral-Tree, and its paler flowers give a better show. It may be only a variety of *E. indica*.

E. Pœpigiana

Flaming Coral-Tree

(E. F. Pœpig, 1798-1868, the German botanist and explorer)

Like *E. subumbrans* but:—

Flowers $1\frac{1}{2}$ -2" long: calyx not split or lobed: *standard flame-orange*, curved back: *keel long*, two-thirds as long as the standard, flame-orange: stamens just projecting from the keel.

Trop. America: little known as yet in Malaya.

E. subumbrans Plate 99, Text-Fig. 126

December Tree

(Lat., with light shade)

Like *E. indica* but:—

Terminal leaflet as long as broad or slightly longer, rounded or broadly wedge-shaped at the base.

Flowers $1-1\frac{1}{2}$ " long: calyx .3" long, splitting into 2 lobes: *standard scarlet* with pallid white stripes near the base, *rather hooded*: keel short: stamens pinkish red, about two-thirds the length of the standard.

Pods 4-8" long, the half next the stalk flat and seedless, the distal half with 1-3 seeds.

Burma, W. Malaysia, Philippine IIs.: doubtfully wild in Malaya.

This species is not common in Malaya and seems only to be planted. It is the least thorny and it has a thornless variety called *Dadaþ Srep*. In shape it is upright rather than spreading and, in Singapore, it is distinguished among all seasonal trees by flowering during the height of the wet season from October to December, its light crown decked with red flowers offering a cheery spectacle in the Christmas drizzle. (The species used to be called *E. lithosperma*).

GLIRICIDIA

(Lat., glis—doormouse, cædere—to kill)

Leaves simply pinnate with several pairs of small opposite leaflets and a terminal one, spirally arranged.

Flowers pinkish-lilac, fairly large, *with the standard curved back and notched*.

Pods flat, rather long, without cross-partitions, opening, with 5-8 seeds.

4 spp., tropical America: 1 sp. introduced to Malaya.

G. sepium Plate 100

Mexican Lilac

(Lat., of hedges)

A deciduous shrub or small tree up to 30 ft., with straggling or flopping branches: *glabrous except for the brown silky hairy buds and young leaves*.

Leaves 5-9" long: *leaflets 6-8 pairs, gradually increasing in size to the terminal one, 2-2½ × 1-1½"*, drooping, narrowly elliptic, slightly tipped, blunt, short-stalked, with rounded base and the edges of the base incurved, *dark green above, very pale green and almost glaucous beneath*.

Flowers 1" long, pinkish lilac, not fragrant, *in racemes, 4-5" long, obliquely erect from the branches and twigs below the leaves or in the axils of the oldest leaves*: calyx cup .2" long: *standard with a yellow spot*: wings and keel narrow.

Pods 4-6" long × ½-¾", hanging, 1-2 on each inflorescence, slightly swollen by the seeds.

This little tree is frequently planted in gardens and as a shade-tree in plantations. It sheds its leaves after dry weather and then flowers as the new leaves unfold. It flowers best where there is a marked dry season, as in the north and on the east side of the Peninsula.

MILLETTIA

(C. Millett, ca. 1830, officer of the East India Company)

Leaves once pinnate with 2-5 pairs of medium to large, opposite leaflets and a terminal leaflet: without glands.

Flowers $\frac{1}{2}$ -1" long, white, pink or purple, in racemes or panicles: calyx cup-shaped with 5 minute teeth or none.

Pods splitting open, flat with several flattened seeds or thick with 1-4 massive seeds.

About 150 spp., Africa, Indo-Malaysia, China, Australia: about 15 spp. in Malaya.

The species of *Millettia* are climbers or large trees. Two are characteristic riverside trees in the middle and north of the country and one, the Purple *Millettia* (*M. atropurpurea*), is a not uncommon tree of villages and secondary jungle, which should become better known as an ornamental because it has the faculty, enjoyed also by the *Tembusu* (*Fagraea fragrans*) and the *Mengkudu* (*Morinda elliptica*), of being able to develop a full crown even on poor, hard and ill-drained soil. The genus is interesting because several species contain in their roots a poison similar to that of *tuba-root* (Derris), if not identical with it: the genus is, indeed, closely allied with Derris the pods of which have, however, only one seed and are thin and winged and do not split open. The poison is used to kill fish in the same way as *tuba*, and that of two African species is made into an arrow-poison.

Key to the Species of *Millettia* and *Pongamia*

Seashore tree: leaflets 2 pairs, rather broad ... *Pongamia pinnata* p. 375

Inland trees

Flowers dark purple: pods stout, with 1-4 large brown seeds: leaflets 3-5 pairs ... *Millettia atropurpurea*

Flowers white or pink: pods flat

Pods velvety brown: flowers white: leaflets 1-3 pairs ... *Millettia albiflora*

Not so: riverside trees

Pods short, rather thick, 1-seeded: leaflets 3 pairs: flowers pink ... *Pongamia pinnata*
var. *xerocarpa* p. 375

Pods with several seeds, flat: leaflets 3-5 pairs: flowers white or faintly pink: by *Neram-rivers* ... *Millettia Hemsleyana*

M. atropurpurea Plate 104, Text-Fig. 125
(Lat., ater-black, purpureus-purple).

Purple *Millettia*
Jenaris, Jenërek, Tulang Dain

A large, handsome, evergreen tree, up to 100 ft. tall, with dense, cylindric or dome-like, dark glossy green crown, the trunk fluted at the base: bark pink-grey to reddish brown, rather flaky: twigs white or silvery grey.

Leaves 8-18" long: leaflets $3\frac{1}{2}$ -10 x $1\frac{1}{2}$ -3 $\frac{1}{2}$ ", 3-4 pairs, narrowly ohlong with a blunt tip and round base, thinly leathery, glossy green, the sides slightly upcurled and wavy: side-veins 5-7 pairs: stalk of leaflet $\frac{1}{4}$ " long.

Flowers $\frac{3}{4}$ " wide, 1" long, smelling rather unpleasant, on short stalks, in a terminal panicle, 12-18" long, with numerous upturned branches: flower-buds sooty green with fine short black hairs: calyx deep purple: petals dark reddish purple, white at the base, the standard with a green triangular stripe: stamens and style white.

Pods 4-7 × 2-2½", *thick*, slightly flattened, *brown*, leathery, *splitting open tardily when fallen on the ground*: seeds generally 1-2 in a pod, sometimes 3-4, *massive, brown often with darker wavy stripes or dark at one end*.

Burma, Siam, W. Malaysia: frequent in villages, open country and high forest, especially in the north of Malaya, abundant round Tampin.

This fine tree so much resembles the *Senkuang* (*Dracontomelum*) in its dense crown that from a distance it is generally impossible to distinguish them: for which reason, our photograph of the *Senkuang*, Plate 5, will serve also for the Purple *Millettia*. (The *Senkuang* has, of course, many more leaflets and different flowers and fruits.)

That the Purple *Millettia* thrives on such poor soil as stony laterite can be seen from its abundance in the hinterland of Malacca between Gemas and Tampin. Saplings may take a few years to establish themselves, after which they will grow rapidly and, if left intact, will develop an umbrageous canopy of foliage from the ground. The flowers are inconspicuous against the dark leaves but, in falling, lay a purple carpet on the grass. From the fallen flowers, pods and big seeds the Purple *Millettia* can be recognised without difficulty. The marking on the seeds varies considerably in different trees. Flowering is seasonal after periods of dry weather. The development of the embryo-seedling can be made out with the naked eye in the immature pods, by cutting open the enlarging ovules.

The Malay names sound very like those of the common tree *Grewia tomentosa*, though doubtfully cognate. The name *Tulang Dain* is given to several wild trees with hard, dry wood and should be used with caution in identifying this *Millettia*.

(In BURKILL'S Dictionary, the species is called *Whitfordiodendron pubescens*).

M. albiflora

(Lat., albus—white, flos—flower)

White *Millettia*

Kayu Rindu

Like *M. atropurpurea* but:—crown thinner: *bark pale grey*, smooth: *leaflets narrower, 1½-2½" wide*, with 7-10 pairs of side-veins: *flowers white, ¾" long*, scentless, in rather shortly branched slender *axillary panicles*, the buds blackish and the standard with a greenish yellow spot at the base: *Pods 7-13 × 1½-2"*, flat, *woody, hanging, velvety brown or blackish*, with several flat seeds.

Malaya: throughout the lowlands, mostly as a riverside tree.

In fruit, this is a very striking tree.

M. Hemsleyana

(W. B. Hemsley, 1843-1924, the English botanist)

River *Millettia*

Jada

A tree up to 90 ft. high with *light grey, smooth bark* and rather open crown.

Leaves 5-8" long, with pale ashen green, upward pointing leaflets: *leaflets 3-5 pairs, 2-3½ × ¾-1½"*, narrowly elliptic or slightly obovate *with a rather long point, thin*, with 6-8 pairs of side-veins, *hairy on the underside of the midrib*.

Flowers ½" long, white or tinged pink, in short, hairy, axillary racemes 2-4" long: calyx hairy: standard glabrous.

Pods 3½-6 × ¾-1", flat, *glabrous*, green then brown, several-seeded.

Lower Siam, Malaya: on the banks of *Neram-* and *Rengas-*rivers in Pahang, Perak, Trengganu and Kelantan, common.

Care is needed to distinguish this from the River *Mempari* (*Pongamia pinnata* var. *xerocarpa*) which has longer, glabrous racemes, short, thick, 1-seeded pods that do not open and only three pairs of leaflets: the standard of the *Mempari* is hairy like the calyx. Malays frequently confuse them, giving the names *Mempari* and *Jada* to both.

ORMOSIA

(Gr., hormos—a chain or necklace)

Leaves simply pinnate, with a few pairs of opposite, shortly stalked leaflets and a terminal leaflet.

Flowers small in terminal panicles, pink or white.

Pods short and oblong to rounded and disc-like, rather thick, opening, with 1-3 rather large, shining scarlet, hard seeds (beans).

About 50, throughout the tropics: about 10 spp. in Malaya.

Most trees of this genus are rare and difficult to recognize except when we meet their scarlet seeds on the ground. The seeds resemble those of the *Saga* (*Adenanthera*) and this name is also given to *Ormosia*, but *Ormosia* is at once distinguished from *Adenanthera* by the short pods and simply pinnate leaves, and its seeds lack the 'heart-line'. In habit the trees strongly resemble the *Kempas* (*Koompassia*) but they never become so lofty and their crowns are spreading. One species, *O. parvifolia*, is frequent in the Reservoir Catchment Area, in Singapore.

O. parvifolia

Saga Utan

(Lat., with small leaf)

A tree up to 80', superficially like the *Kempas* especially in the leaves: twigs, leaf-stalks, inflorescence and underside of the leaves finely hairy.

Leaves 4-8" long: leaflets 4-6 prs., with the terminal leaflet $1\frac{1}{2}$ - $2\frac{1}{2}$ × $\frac{3}{8}$ - $1\frac{1}{2}$ ", narrowly elliptic, rather suddenly tipped, entire, with 5-8 prs. of side-veins: leaflet-stalks .1" long.

Flowers .4" long, white: panicles 4-5" long.

Pods $1-1\frac{1}{2}$ × $\frac{3}{8}$ ", oblong, embossed by the seeds, greyish black, finely downy: seeds 1-3, about $\frac{1}{8}$ " long.

Sumatra, Malaya, Borneo: chiefly in the south of Malaya.

O. gracilis

(Lat., slender)

A slender tree to 40': leaves like *O. parvifolia* but slender.

Pods round, flattened, $1-1\frac{1}{2}$ " long, hard, thick, green with bluish bloom: with one large, scarlet seed, $\frac{3}{8}$ " long, $\frac{1}{8}$ " wide, with a small black aril at the base.

Frequent in the mountains.

PONGAMIA

(from the Malabar plant name *pongam*)

Like *Millettia*, but the pods short, thick, woody, 1-seeded and not opening.

A few species from India to Fiji.

Only one species occurs in Malaya. It is a characteristic, though rather inconspicuous, sea-shore tree and it has a distinct variety extending far inland on river banks. Both the sea-shore and inland trees are well-known as *Mempari* or *Malapari*. They contain a poison in their roots which can be used like *tuba* for catching fish. Various parts of the plants are used in native medicines, chiefly for skin troubles, and an oil is extracted from the seeds; the juice of the plant and the oil have antiseptic properties.

The trees are deciduous, or partly so, and flower as the new leaves develop. The inland variety flowers about March and then its pink blossom lends a beautiful colour to the riversides. This variety would make a good ornamental, or avenue tree. The coastal form often has white or very pale pink, insipid flowers.

P. pinnata Plate 113, Text-Fig. 127Seashore *Mempari*,
Mempari, Malapari

A deciduous tree up to 70' high with fairly dense, light shining green crown: *bark* dull grey to pinkish brownish, smooth, but becoming shallowly fissured: *inner bark* with a strong smell of crushed bean-pods: *young leaves* pink.

Leaves 6-12" long, glabrous: leaflets 2 pairs, with a terminal leaflet $3\frac{1}{2}$ -7 × 2-4", broadly elliptic or ovate, shortly and bluntly tipped, thinly leathery: *leaflet-stalks* $\frac{1}{4}$ - $\frac{1}{3}$ " long.

Flowers $\frac{3}{4}$ " long, pink or white, in axillary, glabrous racemes 4-8" long: calyx cup-shaped, pinkish to dull red, finely silky: standard finely silky.

Pods $1\frac{1}{2}$ -2 $\frac{1}{2}$ × 1", oblong, glabrous, flattened but thick, *woody* with a curved point and a slender short stalk, *pale brownish drab*: seeds 1, rarely 2.

A seashore tree of S. E. Asia and the Pacific: common on sandy and rocky coasts in Malaya, rarely planted.

Var. **xerocarpa**River *Mempari*

(Gr., xeros—dry, karpos—fruit)

Leaflets 3 prs. with the terminal leaflet 2-5 × $\frac{3}{4}$ -2", much smaller and more pointed, narrowly elliptic with rather long acute tips, the midribs hairy beneath.

Flowers about $\frac{1}{2}$ " long, pink.

W. Malaysia: common on river banks in the lowlands of Malaya, chiefly in the freshwater tidal reaches: occasionally planted in town and village.

Care is needed not to mistake the River *Mempari* for the *Jada (Millettia Hemsleyana*, p. 373), under which the differences are contrasted.

PTEROCARPUS

(Gr., pteron—a wing, karpos—fruit)

Leaves simply pinnate, with rather large alternate leaflets and a terminal leaflet.

Flowers yellow, with crisped petals, in axillary racemes.

Pods flattened, disc-like, 1-several seeded, not opening.

About 15 spp., throughout the tropics: 1 sp. in Malaya.

This genus includes several valuable timber-trees, generally known as Red Sanders Wood or Red Sandal Wood, but only the *Angsana* grows in Malaya. The economic aspect of the genus is given in BURKILL'S Dictionary.

P. indicus Plates 114, 115, 116: Text-Fig. 126*Angsana, Sena*

A large deciduous tree, up to 100 ft. high, or more, with large buttresses and wide-spreading dense, dome-like crown, *the lower branches weeping: bark greyish brown, becoming shallowly longitudinally fissured*, often rather scaly, *containing a dark red gum*.

Leaves 8-20" long: leaflets mostly 7-9, 2-5 × $1\frac{1}{2}$ -3", broadly elliptic, rather suddenly tipped, thin, rounded at the base: leaflet stalks 1-2" long.

Flowers $\frac{3}{4}$ " long, *ochre yellow, very fragrant*, in axillary racemes 6-12" long.

Pods $1\frac{1}{2}$ -2" wide, with a lateral point.

Malaysia generally.

This magnificent tree is wild in a few parts of Malaya, chiefly by the sea; in the east of Johore it is not uncommon along tidal creeks and rivers. It is best known as a roadside tree, for which purpose it excels in the beauty of its vast shady crown and its fragrant yellow flowers. In mature trees the lower branches spread outward and droop so that their ends sway in the wind and may even sweep the ground: the uppermost branches are short, erect and twiggy, while the middle branches are intermediate in length: and this configuration gives the even dome-like crown. Pollarded trees, like those in front of the hospital at Penang, develop enormous ascending limbs.

Early in the year, after the break in the wet weather, the *Angsana* sheds its leaves, becomes bare for a few weeks and then develops new leaves and flowers. Throughout most of the country, from Malacca northward, where the dry season is sufficiently marked, the *Angsana* is completely deciduous but usually in Johore and Singapore, where the season is not pronounced, it changes its leaves by a branch or two at a time, working from below upwards, and then it may be several months before the crown is entirely renewed. A very dry August may induce a second leaf-change later in the year, but this is uncertain and less decided. The inflorescences develop in the axils of the young, light green foliage but the *Angsana* is peculiar because its flowering is not continuous. In any one neighbourhood, the trees which are ready to flower will burst into blossom on the same day; the petals will rain down the next morning, laying the familiar yellow carpets by the road, and then there will be an interval of several days before all such trees in the neighbourhood flower again: and so the trees continue in fitful bloom until their inflorescences are exhausted. In full flower the crowns seen painted yellow and the air pervaded with fragrance. It appears that the trees require a special stimulus to open their flowers. The incidence of dry weather causes the leaf-changes and the development of the inflorescences, but some other factor makes the flowers open: unless this factor arises, the buds remain rudimentary. It seems that the flower-buds, like those of the Pigeon Orchid, are stimulated to develop by a sudden drop in temperature, as is caused by a heavy storm, when all the trees which are ready to flower and which lie within the influence of the storm blossom together after the necessary interval for development: the interval appears to be three days for the *Angsana*. The coffee-bushes and the March-orchid (*Bromheadia*) also flower gregariously in this manner (see p. 38). The fruits take about 4 months to ripen.

Formerly there were many avenues of *Angsana*-trees throughout the country but an obscure disease attacked those in Malacca about sixty years ago and spread thence to Penang and Singapore. The symptoms of the disease resemble those of the Dutch Elm disease of Europe and the disease may be connected also with some boring or sucking insect. The leaves of affected trees wither; the branches die back, and after two or three months, the whole tree is killed. Several avenues were thus destroyed or decimated and but few persist, as at Port Dickson and Taiping where they are the admiration of visitors. The three trees by Anderson Bridge in Singapore are the remnants of the avenue which fronted the sea along the Esplanade. The disease is no longer prevalent but, in planting *Angsana*-trees, it is advisable to separate them widely among other kinds of tree, thus reducing the likelihood of an infection from spreading. (For an account of the disease, see the article by C. X. FURTADO in the Journ. Mal. Br. Roy. As. Soc., XIII, 1935, p. 163).

The wood of the *Angsana* has a rose-like odour and is said to be the best fine-furniture wood in the country. Various parts of the tree, including the red gum which oozes from wounds, are used in native medicine.

SESBANIA

(from the Arabian plant name *sesaban*)

Leaves pinnate with numerous small opposite leaflets, no terminal leaflet.

Flowers large, strongly flattened in few-flowered, short axillary racemes.

Pods very long, narrow, pencil-like, subcylindric, with cross-partitions (septa) between the numerous oblong seeds.

About 40 spp. throughout the tropics: 2 species of herb and one introduced tree in Malaya.

S. grandiflora Plate 118
(Lat., large-flowered)

Sesban, Vegetable Humming Bird
Getih, Turi, Kachang Turi

A small, evergreen tree 15–30 ft. high, with few, ascending, many-leaved branches of light feathery appearance.

Leaves 6–12" long: *leaflets* 10–30 pairs, $\frac{3}{4}$ –1 $\frac{1}{2}$ × $\frac{1}{2}$ – $\frac{3}{4}$ ", small, narrowly oblong, blunt, pale yellowish green, the uppermost and lowest leaflets smaller than the middle ones; with very short stalks: stipules 3–5" long.

Flowers 3–3 $\frac{1}{2}$ " long, cream-white or magenta-pink to red (var. *coccinea*), hanging in short, 2–4 flowered axillary racemes 1–2 $\frac{1}{2}$ " long: calyx 2-lipped, tubular, $\frac{1}{2}$ –1" long: keel slightly longer than the standard.

Pods 12–20" long × $\frac{1}{4}$ – $\frac{1}{2}$ ", hanging, with 15–50 seeds.

Native of N.E. Asia: commonly planted in villages in Malaya.

The young leaves, young pods and flowers of this well-known little tree are sold in the markets and used as vegetables especially in curry; they have a rather unpleasant smell. The flowers of the red variety are said to be better. It is fast-growing and short-lived, and is useful to plant where light shade is required. Various parts of the plant are used in native medicine.

The name *Turi* must not be confused with *Tui* (=Dolichandrone, p. 163).

SOPHORA

(from the Arabian plant-name *sofera*)

Leaves simply pinnate with numerous opposite leaflets and a terminal leaflet.

Flowers yellow, in terminal racemes; stamens separate for most of their length.

Pods long, many seeded, strongly constricted between the seeds like a row of beads.

About 25 spp. throughout the tropics and subtropics: 1 sp. in Malaya.

S. tomentosa Text-Fig. 126
(Lat., woolly)

Silver Bush

A shrub or treelet to 15 ft., with lax branches: *all parts more or less densely grey silky hairy.*

Leaves 5–12" long: *leaflets* 5–9 prs., occasionally alternate, with the terminal leaflet 1–2 × $\frac{3}{4}$ –1 $\frac{1}{2}$ " and slightly bigger than the rest, *broadly elliptic, blunt*, base rounded, with very short stalks 1" long.

Flowers $\frac{1}{2}$ – $\frac{3}{4}$ " long, in racemes 10–12" long.

Pod 3–8" long, with 2–9 black seeds, stalked between each seed and ending in a point, many on each inflorescence.

India to the Pacific Isles: a sea-shore shrub common on the East coast of Malaya and from Lumut northwards on the west coast.

CÆSALPINIA SUBFAMILY

Cæsalpiniaceæ

(p. 361)

AMHERSTIA

(Lady Sarah Amherst, d. 1838, artist and collector in India)

Buds covered by a pair of thin, flat, lanceolate, separate stipules: *new leaves developing in tassels.*

Leaves alternate, simply pinnate with opposite leaflets, no terminal leaflet.

Flowers few, large, well-spaced along hanging racemes from the bare parts of the branches: *flower-stalk* with 2 large recurved persistent bracts: *sepals* 4: *petals* 3 large,

LEGUMINOSÆ (CÆSALPINIACÆ)

2 minute (rudimentary), one as a standard: stamens 9, 5 being long and 4 very short, joined in a tube for half their length, sometimes with a short free 10th stamen.

Pods flat, several-seeded, opening.

1 sp., Burma: introduced to Malaya.

A. nobilis Plate 78

Amherstia

An evergreen tree, reaching 60 ft. high: young leaves pinkish coppery then bronze, limply hanging.

Leaves 1-2 ft. long: leaflets 4-12 × 1½-3½", 4-7 pairs, oblong, rather suddenly tipped, rounded at the base, whitish beneath: leaflet-stalks 3-4" long: stipules 1-1½" long, soon falling off.

Flowers delicate pink, in delicate pink hanging racemes 12-20" long: flower-stalks 2-4" long: sepals coiling up: petals 2" long, the standard rose-red, its stalk white with pink stripes and spots and its upper part with a large vivid yellow patch with 2 red streaks, the lateral petals deep rose-pink with a yellow patch as the standard: ovary stalk and style vivid rose-red, the ovary pale yellow.

Pods 6 × 1½", glabrous, with 4-6 seeds.

The Amherstia is a beautiful and fantastic tree but it seems to care neither for the soil nor for the climate of Malaya, where it is little known. It is said to thrive in moist low country with deep, rich, well-drained earth, but not to flourish near the sea. It can be grown in our gardens to give a fair display of blossom but it is not sturdy enough for roadsides. In appearance it much resembles a Saraca and it develops its new leaves in the same way (not as in Brownea): when sterile, the buds, the bronza young leaves and the white undersides of the leaflets distinguish it. Nothing appears to be known of the evolution or mechanism of the strange flowers; or why the species should be restricted to Burma.

BUTTERFLY TREES

BAUHINIA

(John and Caspar Bauhin, 16th century herbalists, the twin leaflets suggesting brothers)

Leaves alternate, more or less split into two lobes, with many longitudinal veins.

Flowers large, showy, in terminal, axillary or extra-axillary (leaf-opposed) racemes with 1-2 flowers open at a time, or solitary: calyx tubular, ribbed, generally splitting open along the lower side: petals 5, the standard generally distinctively coloured: stamens 1-10, large.

Pod long, flat, many-seeded, splitting open.

About 150 spp., throughout the tropics: 25 spp. in Malaya.

Our native species of Bauhinia are large climbers with white, yellow or red flowers: their vivid tresses will be familiar to all who know the forest. In our gardens there are several introduced species which are flowering shrubs or small trees: they do not blossom well in the south of the Peninsula because they require a markedly dry season to ripen their wood. None is large enough to produce timber.

The genus is easily recognised from the split leaves, though in a few climbers they are entire and in some exotic species they are completely divided into two.

B. acuminata and *B. purpurea* have been planted by roadsides in Kedah, and *B. monandra* in Singapore.

Key to the Species

- Petals wholly pale yellow (fading mauve), broad, sessile *B. tomentosa*
- Petals white
- Flowers less than 1" wide: calyx not splitting *B. malabarica*
- Flowers more than 1" wide: calyx splitting
- Petals narrow, strap-like: flower-buds like brown-velvety fingers *B. megalandra*
- Petals broad
- Stamens 10: petals sessile, not clasping the standard *B. acuminata*
- Stamens 5: petals stalked, overlapping the standard *B. variegata*
var. *candida*
- Petals pink, magenta or purple; stalked
- Stamen 1: petals pale yellow then suffused pale pink: standard splashed crimson *B. monandra*
- Stamens 3: petals narrow, not 1" wide
- Petals pale pinkish white *B. rosea*
- Petals clear pink to deep rose-pink: ovary-stalk deep pink *B. purpurea*
- Petals pinkish violet: ovary-stalk white or very pale pink *B. violacea*
- Stamens 5: petals broad, 1" wide or more, rich magenta-purple
- Petals scarcely overlapping; flower 4-5" wide: stalk of standard not grooved *B. Blakeana*
- Petals much overlapping: flower 3" wide, variegated red and yellow: stalk of standard grooved *B. variegata*

B. acuminata

White Bauhinia

(Lat., pointed)

A shrub.

Leaf-blade 3-5" wide, as broad as long, cut for a third its length into *more or less pointed lobes*, the base heart-shaped with 9-11 veins, *finely downy beneath*.

Flowers 3-4" wide, scentless, in racemes: *petals 1-1½" wide*, broadest at or below the middle, the side-petals at right angles to the scarcely distinct standard: *stamens 10*: *ovary green with a large stigma*.

Pod 4-5 × ¾".

S. E. Asia: doubtfully wild in Malaya, frequent in gardens.

This is the only species in Malaya, excepting the wild climbers, which has pointed lobes to the blade, and thus it can always be recognised when sterile or in fruit.

B. Blakeana

Blake's Bauhinia

Shrub.

Leaf-blade 3-6" wide, as broad as long, cut for a quarter to a third its length into blunt lobes, the base heart-shaped with 11-13 veins.

Flowers faintly scented, in racemes up to 8" long: *petals 1-1½" wide*, pointed, the edges wavy: *standard with darker veins and whitish on the edges near the base*: the two upper side-petals whitish near the base: *stamens pale pink*: *ovary green with pale pink stalk and white style*.

Origin unknown: cultivated.

LEGUMINOSÆ (CÆSALPINIACÆ)

This is the showiest of the shrubby Bauhinias in Malaya. It resembles *B. variegata* but it never develops a trunk, and it has large flowers with spreading petals.

B. malabarica

Malabar Bauhinia

A small bushy, evergreen tree up to 40 ft. high, with rather fissured bark: *twigs, leaf-stalks and bases of the veins of the leaf brownish pink.*

Leaf-blade $1\frac{1}{2}$ –5" wide, generally small, broader than long, cut for a quarter of its length into very blunt rounded lobes, the base scarcely heart-shaped with 9–11 veins.

Flowers less than 1" wide, small, white or cream, in short axillary racemes: *calyx with 5 teeth, not splitting open*: stamens 10.

Pod 8–12 × $\frac{3}{4}$ –1".

India.

This pretty and quick-growing little tree has been introduced to Singapore. It should prove a valuable road-side tree where tall kinds are not desired. The foliage is attractive but the flowers are inconspicuous. The small leaves, small flowers and unsplit calyx are distinctive. The young leaves are sour and may be eaten raw as a relish: "they excellently quench the thirst".

B. megalandra

West Indian Bauhinia

(Gr., megas—great, aner—a man)

Buds and young twigs finely brown hairy.

Leaf-blade 2–5" wide, longer than broad, cut for a third of its length into blunt lobes, the base heart-shaped with 7–9 veins.

Flowers solitary or a few together, the buds 5" long: *petals* 3" long, very narrow: *stamens* 10, all fertile, white.

Pod 9–10 × 1", finely brown hairy.

W. Indies: little known in Malaya, not beautiful.

B. monandra

Pink Bauhinia

(Gr., monos—one, aner—a man)

A bush or straggling small tree with a few, long, oblique or drooping branches.

Leaf-blade 3–7" wide, as long as broad, cut for a third its length into two blunt or slightly pointed, scarcely spreading lobes, the base widely and shallowly heart-shaped with 13–15 veins.

Flowers 3–4" wide, scentless, in short, few-flowered racemes: *petals* 1" wide, cream-white with fine, pale pink spots, gradually suffused pale pink: *standard* with grooved stalk, rather deep yellow with oblong crimson spots fused together towards the apex of the standard, gradually suffused pale pink: *stamen* white then pinkish: *ovary* green, the style pale pink.

Pod 6–8 × 1–1 $\frac{1}{4}$ ".

Possibly native of trop. America: frequent in gardens.

B. purpurea Text-Fig. 129

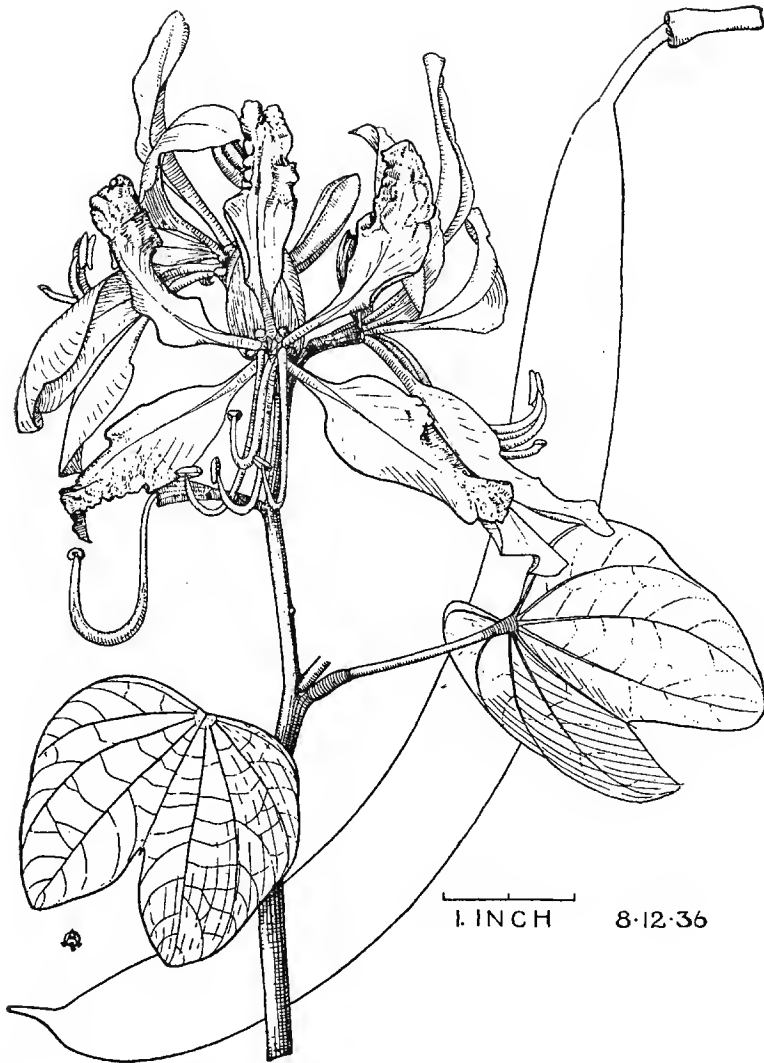
Purple Bauhinia

Like *B. variegata* but:—

Leaf-blade cut half-way or more into blunt lobes, the deeply heart-shaped base with 9–11 (–13) veins.

Flowers 3–4" wide, faintly scented: *petals* $\frac{3}{4}$ " wide, widely separate, long-stalked, lanceolate-ovate, pointed, clear pink to deep rose-pink, the standard with crimson stalk and a white splash on each side at the top of the stalk: *stamens* 3, with pink filaments: *ovary* greenish white with a deep pink stalk.

India, S. China: frequent in gardens.



Text-Fig. 129. Purple Bauhinia (*B. purpurea*): (by courtesy of G.A.C. Herklots, Hongkong University).

B. rosea

Rose Bauhinia

Like *B. purpurea* but:—

Leaf-blade very shallowly heart-shaped with 7-9 basal veins.

Flower $2\frac{1}{2}$ - $3\frac{1}{2}$ " wide: petals $\frac{1}{2}$ - $\frac{2}{3}$ " wide, strap-like, gradually widening from the stalk, pale pinkish white, deeper coloured towards the ends, the stalks white, the standard distinguished only by the stalk turning reddish pink in the open flowers: ovary with white stalk.

Origin doubtful: cultivated: perhaps only a variety of *B. purpurea*.

B. tomentosa
(Lat., woolly)

Yellow Bauhinia

A shrub.

Leaves 2-3" wide, *small*, as broad as long, cut for a third their length into blunt lobes, the base varying widely and shallowly heart-shaped to wedge-shaped with 7-9 veins, *downy beneath*.

Flowers 4" wide, scentless, solitary or in pairs, opposite the leaves, shaped as in *B. acuminata*, never opening fully: *petals* 1-1½" wide, oblong, broadest about the middle, overlapping the scarcely distinguishable standard (crimson spot at the base): *stamens* 10: *ovary* pale yellow.

Pod 4-5 × ½".

Trop. Africa, India, China: frequent in Malayan gardens.

B. variegata Text-Fig. 130

Variegated Bauhinia

A bush or small tree up to 20 ft. high, with distinct trunk and creviced bark.

Leaf-blade 3-5" wide, slightly broader than long, cut for a quarter to a third its length into blunt lobes, the base deeply heart-shaped with 11-13 veins.



Text-Fig. 130. Variegated Bauhinia (*B. variegata*): (by courtesy of G.A.C. Herklots, Hongkong University).

Flowers 3" wide, fragrant like roses, in short racemes on the bare twigs: petals 1-1½" wide, pale pink to deep magenta-pink or pinkish violet, broadest toward the blunt ends, overlapping, in some cases with crisped and wavy edges: standard with purple-red veins: both the standard and the two upper side-petals often splashed white near the base.

Pod 1-2 ft. × 1".

S.E. Asia: occasional in Malayan gardens.

Var. candida

Flowers wholly white except for the light yellow central part of the standard and, in some cases, of the other petals.

Pods 5-7 × ¾".

Frequent in Malayan gardens.

B. violacea

Violet Bauhinia

Like *B. rosea* and *B. purpurea* but:—

Leaf-blade as long as wide or longer, cut for a third to a half its length into blunt or slightly pointed lobes, the base very shallowly and widely heart-shaped.

Petals ½-¾" wide, pinkish violet or magenta, the standard with light crimson stalk and whitish at the top of the stalk: stamens pale magenta: ovary greenish white, with white or very pale pink stalk.

Trop. America.

The petals are coloured as intensely as in *B. Blakeana* but they are much narrower so that the flower is not nearly so fine. The species is probably only a variety of *B. purpurea*.

BROWNEA

(P. Browne, 1720-1790, an English naturalist of the W. Indies)

Low, sprawling, bushy evergreen trees with drooping branches: new leaves developing in tassels: terminal buds small, covered by several alternate scale-leaves.

Leaves alternate, simply pinnate, nearly sessile or shortly stalked, with few to many alternate or subopposite large leaflets with unequal bases and abrupt tips (the lowest leaflets smaller with equally heart-shaped bases): no terminal leaflet: stipules long, threadlike, soon withering.

Flowers large, pink or red, in terminal heads facing vertically down and surrounded at the base by numerous, bracts: sepals 4-5, like the petals, but only half as long: petals 5, stalked, all alike, no standard: stamens 11 (10-12), more or less joined.

Pod flat, rather short and thick, woody, velvety or glabrous, splitting and coiling up: seeds large, flat, rather irregular in outline, few in a pod, sometimes only one.

About 15 species, trop. S. America, chiefly in Venezuela: 4 spp. introduced to Malaya.

In their manner of developing new leaves Browneas resemble Saracas, but they differ in many respects such as the presence of bud-scales, the downturned heads of Rhododendron-like flowers, and their habit of growth. The species which have been introduced to Malaya, except for *B. capitella*, are bushy trees of slow growth, not reaching a height of more than 25' but spreading on all sides to form low crowns which are thick and leafy from the ground and within which one can walk about as it were in a dome of foliage. Like many leguminous trees, the branches grow obliquely upright and spread horizontally: then a few side-branches grow obliquely from them, spread horizontally and again branch obliquely upward; so the crown gradually heightens, but a main trunk is not developed. When the buds lengthen, they do not develop foliage leaves immediately, as in *Saraca*, but they form a tube of alternating scale-leaves of gradually increasing size, as in the genus *Cynometra*. This tube is curved near its base to point downward: it reaches only a few inches long in *B. coccinea* but nearly a foot in *B. grandiceps*. The pale, limp, new leaves are thrust from the end of the tube by the elongating stem and dangle for some days like bunches

LEGUMINOSÆ (CÆSALPINIACEÆ)

of seaweed before they stiffen and straighten. In each species the young leaves have a characteristic colour. The flower heads are terminal, except in *B. capitella*, and therefore the branches of mature trees are sympodial. Flowering and leafing take place about the same time of the year as in *Saraca* but the flowering period is more extended: the branches continue to develop new inflorescences in decreasing numbers after the main blossoming and there are, indeed, few weeks in the year when there are no inflorescences at all. Many of the flower-heads turn down through the canopy of foliage and can be seen only from within the crown, whence they appear like red lanterns lighting the gloom in an elfin manner such as is found in no other plant.

The flowers open from the outside toward the centre of the head and the involucre of bracts falls off, shortly after flowering has begun. Only the last flower or so sets fruit.

Unlike *Saracas*, *Brownias* grow well in the full open and cannot endure heavy shade. They are to be seen in most public gardens in the country, but because of their slow growth they are seldom planted in private grounds. Their manner of growth lends itself to the building of arbours, which their flowers will then decorate.

Key to the Species

Leaflets 12-18 pairs : young leaves mottled : flower heads 7-8" across, pink	... ..	<i>B. grandiceps</i>
Leaflets 3-9 pairs : young leaves not mottled : flowers reddish pink		
Twigs and leaf-stalks hairy at first : leaflets 6-9 pairs		<i>B. ariza</i>
Twigs and leaf-stalks glabrous from the beginning		
Leaflets 5-7 pairs : flowers 3" long, in heads 3" wide		<i>B. coccinea</i>
Leaflets 3-5 pairs : flowers 2½" long, in heads 2" wide	... ..	<i>B. capitella</i>

B. ariza The Ariza
(native W. Indian name)

Young leaves uniformly pale pinkish buff then pinkish brown: *the bud-scales of expanding buds up to 9" long, the larger ones strap-shaped, limp and pink*: stipules up to 5" long: *young twigs and leaf-stalks pale brown hairy*, soon woody and glabrous.

Leaves 8-12" long: *leaflets 4-8 × 1-2½"*, 4-9 pairs rather broadly oblong with the tip ½-1¼" long.

Flowers 3" long, 1-1½" wide, flame-pink, in heads 4-6" wide: stamens (10-11) joined for a third their length into 1, 2, or, usually, 3 bundles.

Pods velvety.

Native of Colombia.

B. capitella Lantern Brownea
(Lat., with little heads)

Very like *B. coccinea* but:—*leaflets (2-) 3-5 pairs, opposite: flowers smaller, 2½" long or less, in smaller heads 1-2" wide, mostly from the bare branches behind the leaves: stamens joined in one bundle for ½-¾ their length.*

Native of Venezuela.

This species closely resembles *B. coccinea* in its glabrous leaves with few leaflets, but it differs in the smaller size of its parts and in its habit. The branches grow upward, then droop heavily and bear the leaves bunched at the ends. For the greater part of their length the branches have no leaves and they are too few and straggling to give the tree a compact crown. The small vivid red flower-heads break out along the branches at all times of the year, but in greatest profusion after dry weather.

B. coccinea Plate 79
(Lat., carmine-red)

Scarlet Brownea

Young leaves rather purplish becoming uniformly pinkish brown: *bud-scales of expanding buds up to 4" long, pinkish*: stipules $\frac{1}{2}$ -1" long: *young twigs and leaf-stalks glabrous*.

Leaves 7-12" long, *with persistently green stalks: leaflets 3-5½ × 1-2", 5-7 pairs, rather broad, the tip about ½" long*.

Flowers as in *B. ariza*, slightly deeper coloured, in heads about 3" wide: *stamens (11-12) joined for about half their length into one bundle*.

Pods almost glabrous.

Native of Jamaica.

B. grandiceps Plate 80

Rose of the Mountain

(Lat., grandis—large, caput—head)

Young leaves mottled pale pink and greenish white, then pinkish brown and green, finally uniformly green: bud-scales of expanding buds up to 12" long, green: stipules up to 12" long: *twigs and leaf-stalks finely brown hairy, slowly glabrous*.

Leaves 18-30" long, almost sessile: *leaflets 3-6½ × ¾-1¼", 12-18 pairs, narrow, with the tips ¼-1" long: the lowest pair of leaflets overlapping the twigs, small and with heart-shaped base*.

Flowers 2-8" long, pink, in heads 7-8" wide: stamens (11) joined only at the extreme base, generally in one bundle, in some cases 2 or 3 bundles, rarely nearly free

Pods velvety.

Native of Venezuela.

CÆSALPINIA

(A. Cæsalpini, 1519-1603, the Italian physician and botanist)

Leaves twice pinnate, with few to many pairs of small, opposite, sessile leaflets. no terminal leaflet.

Flowers yellow or red, often showy, in racemes or panicles, the flower-bud covered by the enlarged lower sepal: sepals and petals 5, with a standard: stamens 10.

Pods oblong, splitting, with several hard flattened seeds.

About 100 spp., throughout the tropics: 9 spp. in Malaya, and 3 introduced.

This genus consists of shrubs, trees and woody climbers, and to the last category belong the Malayan species with the exception of *C. sappan*. The twigs and leaves are in many cases thorny. The best known member of the genus is the Peacock Flower, *C. pulcherrima*, which is a shrub grown in most Malayan gardens in both its yellow and red varieties. The Brazilian Ironwood, *C. ferrea*, has been introduced to Singapore and should be extensively planted if seed is forthcoming; it is a handsome tree with beautiful scaling bark, like that of Plane-trees (*Platanus*) in temperate climates or the *Selunchur* (*Cratoxylon ligustrinum*) of our own forests; its wood is very hard. Several exotic species, with equally hard wood, yield a deep red dye, known as brazilin. Accounts of the dying and tanning properties of the genus are given in BURKILL'S Dictionary.

Key to the Species

- | | |
|---|-----------------------|
| Tall tree with scaly bark and small leaves 3-6" long ... | <i>C. ferrea</i> |
| Shrubs or small trees with leaves over 6" long | |
| Very prickly: flowers less than 1" wide, yellow, with short woolly stamens | <i>C. sappan</i> |
| Not or slightly prickly: flowers red or yellow, over 1" wide, with long slender stamens ... | <i>C. pulcherrima</i> |

C. ferrea

Brazilian Ironwood

(Lat., of iron)

A deciduous tree, up to 60 ft. high, with fluted base and rather flat-topped crown: *bark light buff-yellow, very smooth and even like soft leather, the older bark becoming*

LEGUMINOSÆ (CÆSALPINIACÆ)

grey or brownish and scaling off in long angular scroll-like pieces, leaving the patches of pale new bark: twigs zig-zag, horizontal or drooping.

Leaves 3-6" long, with 2-4 (-5) pairs of side-stalks, often terminating in a leaflet: leaflets $\frac{1}{2}$ - $\frac{3}{4}$ × $\frac{1}{2}$ - $\frac{1}{2}$ ", 4-5 pairs, elliptic to obovate.

Flowers $\frac{3}{4}$ " wide, yellow, fragrant, in racemes 3" long, upturned and arranged in small leafy panicles: petals not stalked, the standard with red spots: stamens .4" long, hairy.

Trop. America.

C. pulcherrima Plate 81 (Lat., most beautiful)

Peacock Flower, Gold Mohur,
Pride of Barbados
Jambul Merak

A glabrous, evergreen bush or small tree up to 25 ft. high: twigs and leaf-stalks pale green with a waxy bloom, occasionally slightly prickly.

Leaves 8-14" long, with 4-9 pairs of side-stalks: leaflets $\frac{1}{2}$ - $\frac{3}{4}$ × .3-.4", 6-11 pairs, rather obovate, slightly notched at the blunt tip, very unequal at the base.

Flowers $\frac{1}{2}$ " wide, scentless, with stalks 1-2 $\frac{1}{2}$ " long, in terminal slowly elongating racemes up to 14" long: sepals orange-red: petals stalked, red with a broad golden yellow frilled and wavy border, becoming wholly crimson, the standard much smaller, projecting forward, with a reddish stalk and yellow frilled top, becoming wholly crimson: stamens 2 $\frac{1}{2}$ " long red.

Possibly native of S. America, now cultivated throughout the tropics.

Yellow Variety

Yellow Peacock Flower

Flowers 2" wide, in racemes up to 2 ft. long: sepals and petals wholly clear yellow, the standard darker yellow: stamens pale yellow.

C. sappan Plate 82 (the Malay name)

Sappan Tree

A small prickly evergreen tree up to 20 ft. high: bark pale grey, studded with pointed knobs: young twigs and buds finely brown hairy: buds covered by the stipules: spines small, strong, a pair at each leaf-base and several scattered, often in threes, on the twigs, often a few on the underside of the leaf-stalk.

Leaves 8-18" long, hairy beneath, with 9-12 pairs of side-stalks: leaflets $\frac{1}{2}$ - $\frac{3}{4}$ × .3-.4", 12-16 pairs, widest near the very unequal base, blunt: stipules $\frac{1}{2}$ - $\frac{3}{4}$ " long.

Flowers $\frac{3}{4}$ " wide, sulphur yellow, fragrant, in terminal panicles 6-12" long: petals not stalked: standard with orange-red lines: stamens $\frac{1}{2}$ " long, white woolly.

Pods 3 × 1 $\frac{1}{2}$ ", oblong, broad, hard, with strong upturned point, yellowish green then blackish brown, with a few greenish brown seeds.

Indo-Malaysia: wild on sandy riverbanks in the middle of Malaya, frequent in gardens.

A red dye is obtained from the wood. It was used by the dyers of Patani, Kelantan and Pekan, but it is giving place to the synthetic aniline dyes. "The wood has the hardness of ebony" (BURKILL). There was a row of small trees beside the main road at Ulu Bernam bridge in Perak.

CASSIA

(from the Greek name *Kassia*)

Leaves simply pinnate, with 2-many pairs of opposite leaflets: no terminal leaflet.

Flowers generally rather large, yellow or pink, in axillary racemes or terminal panicles or clusters: petals often dissimilar: stamens 10 or 7, with thick filaments and clumsy anthers opening by terminal pores, the lower stamens longer than the upper, and the upper three rudimentary or absent in some species.

Pods variable, flat or cylindrical, opening or not, many seeded, often with partitions between the seeds.

About 400 spp. throughout the tropics: 25 spp. in Malaya, introduced except 2-3.

The headquarters of this large genus is in tropical America where the species are most numerous in dry open forest. Two only are wild in Malaya, namely the Pink Cassia (*C. nodosa*) of the lowland forest of the middle of the country, and the Limestone Cassia (*C. timoriensis*) of the limestone hills. The Johar (*C. siamea*) may be wild in Kedah and Perlis, but it has been cultivated

so long that its origin is doubtful. The other species that are described below are introduced plants. Only the *Johar* and the Horse Cassia (*C. grandis*) are village trees; the *Johar* occurs throughout Malaya but the Horse Cassia is common only in the north, where it is well-known in all the villages, though strangely enough it is an introduction from the West Indies. The climate of Malayan gardens evidently suits many kinds of Cassia so that more species will doubtless be introduced in course of time. In the M.A.H.A. Magazine, Vol. V, p. 37, there is an account of all the species, herb, shrub and tree, then known in Malaya.

Cassias are often called *Sena*, but this name is also given by Malays to the *Angsana* (*Pterocarpus*). Several species from E. Africa and Asia are the source of senna-pods of western medicine and others, like the Indian *Laburnum*, the Horse Cassia and several herbaceous species, are used in native medicine. In most species the fresh tissue, especially of the bark, has a foetid smell like crushed bean-pods, and this property has given rise to the common Malay name *Busok Busok* or *Sebusok*, applied chiefly to *C. nodosa*. This smell occurs in many leguminous trees, e.g. *Pongamia*, *Derris*, *Millettia*, *Koompassia*.

Key to the Species

- Flowers pink : pods large, black
- Leaflets 12-20 pairs, oblong, almost parallel-sided
 - Shoots with brown woolly hairs : flowers in long spikes *C. grandis*
 - Shoots with soft white hairs : flowers in short clusters *C. renigera*
 - Leaflets 5-12 pairs, broadest about the middle, elliptic
 - Trunk spiny : stipules large : cult. *C. javanica*
 - Trunk not spiny : stipules tiny : wild or cult. *C. nodosa*
- Flowers yellow : pods often small, thin, flattened
- Leaflets 2 pairs : shrubs
 - Leaflets pointed, curved : flowers pale yellow, 2-2½" wide *C. fruticosa*
 - Leaflets blunt, not curved : flowers orange yellow, 3" wide *C. splendida*
 - Leaflets 3-10 pairs or, if more, then pods cylindrical
 - Pods cylindrical, long : leaflets large or many
 - Inflorescences hanging from the branches *C. fistula*
 - Infloresc. terminal : leaflets 6-15 pairs *C. spectabilis*
 - Pods flat or short : infloresc. terminal
 - Leaflets 3-6 pairs
 - Pod flat : lowlands *C. surattensis*
 - Pod cylindrical : mountains *C. lævigata*
 - Leaflets 6-12 pairs
 - Large tree : leaflets 2-3" long *C. siamea*
 - Shrub : leaflets less than 2" long *C. biflora*
 - Leaflets 10-26 pairs : pods flat or winged
 - Shrub : leaflets large, over 2" long : flowers in orange spikes *C. alata*
 - Small trees : leaflets less than 2" long, narrow
 - Shoots golden hairy : stipules large : wild and cult. *C. timoriensis*
 - Shoots not so : stipules small : cult. *C. multijuga*

Seven Golden Candlesticks
Gelenggang, Dawn Kurap

(Lat., winged)

A straggling shrub to 10': *leaves* 1-2' long, the stalk and midribs ochreous brown: *leaflets* 8-20 prs., large oblong, blunt, $2-4\frac{1}{2} \times 1-2''$.

Flowers $1-1\frac{1}{2}''$ wide, *bright yellow*, set in *erect spikes* 1-2' long, with large, swollen orange bracts concealing the flower buds.

Pods $6-8 \times .8''$, black, with 4 wings.

Trop. America: abundant in villages and waste places in Malaya.

The leaves are valued by natives as a cure for ringworm and other skin-diseases.

C. biflora

Bushy Cassia

(Lat., with two flowers)

Shrub to 12', finely hairy: *leaflets* 6-10 prs., $\frac{3}{4}-1\frac{1}{2} \times .4-.7''$, oblong-elliptic, light green, notched at the tip.

Flowers $1-1\frac{1}{2}''$ wide, *rich yellow*, in a short terminal often leafy cluster.

Pods $3-6 \times .5''$, brownish, flat.

Trop. America: common in gardens.

C. fistula Plate 83

Indian Laburnum, Golden Shower

(Lat., a pipe)

A deciduous tree up to 30' high: *leaflets* 3-8 pairs, $3\frac{1}{2}-7 \times 2-3''$, large, broadly ovate, pointed.

Flowers $1\frac{1}{2}-2''$ wide, *golden yellow* in hanging racemes up to a foot long from the old branches behind the leaves.

Pods $1-2' \times 1''$, *cylindric*, woody, blackish, often constricted.

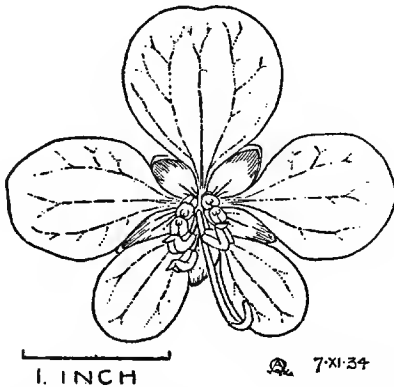
India and Ceylon: common in gardens.

This is the finest of all Cassias and is at once recognized by the sprays of yellow flowers hanging from the branches. It is a slow growing tree which in Singapore sheds its leaves at intervals of 9-10 months. The inflorescences develop with the new foliage. The mature crown is unusually heavy for a Cassia.

C. fruticosa Plate 84, Text-Fig. 131

Drooping Cassia

(Lat., shrubby)



Shrub or treelet to 15', twigs zig-zag and drooping especially in flower: *leaflets* 2 pairs, $2-4 \times 1-1\frac{3}{4}''$ (upper pair), large, curved, very unequal-sided, the lower pair smaller than the upper.

Flowers $2-2\frac{1}{2}''$ wide, *pale yellow* in loose, often leafy, terminal clusters.

Pods $8-12 \times \frac{1}{4}''$, pencil-like, black.

Trop. America: common in gardens.

Text-Fig. 131. *Cassia fruticosa*: (by courtesy of G.A.C. Herklots, Hongkong University).

C. grandisHorse Cassia
Kotek, Kotek Mamak

A deciduous tree up to 50' high; *twigs, leaf-stalks and inflorescences covered with short rusty wool, especially when young.*

Leaves 6-12" long: leaflet 10-20 prs., oblong, blunt, hairy beneath, $1-2\frac{1}{2} \times \frac{1}{2}-\frac{3}{4}$ ".

Flowers deep rose pink inclining to yellowish, in drooping lateral and terminal spikes up to 10" long.

Pods 1-3 ft. \times $1\frac{3}{4}$ ", compressed-cylindric, woody, massive, blackish.

Trop. America: occasional in gardens and villages in the south, common in villages from Kuala Kangsar northward.

The Horse Cassia is easily known among the pink-flowered species by the rusty hairiness, numerous leaflets and massive pods: it is, moreover, the only common village species with pink flowers. It is deciduous in the north of the country: the leaves fall at the end of the year, at the beginning of the dry season, and in February or March the trees are covered with the flowering spikes, which are borne on the twigs before the new leaves. In the south the tree is less certain in flowering on account of the weather.

C. javanica

Javanese Cassia

Like *C. nodosa* but with a spiny trunk, stipules $\frac{1}{2}-\frac{3}{4}$ " long, and the flowers at the ends of leafy twigs.

Java, Sumatra and Philippines: occasional in gardens in Malaya but not wild.

It seems that *C. javanica* or *C. nodosa* may hybridise under garden-conditions and that they may therefore be regarded as extremes of one species. Only the smooth-trunked *C. nodosa* is wild in Malaya.

C. laevigata

Hill Cassia

(Lat., smoothed over)

A shrub or tree to 6-30' very like *C. glauca* but with fewer (3-5 prs.) of rather long-pointed, drooping leaflets with up-curved sides: smaller flowers $1-1\frac{1}{2}$ " wide: short, thick, cylindric, dark-brown pods $2\frac{1}{4}-4$ " long.

Trop. America and W. Africa: cultivated in the mountains in Malaya.

C. multijuga Plate 86

Leafy Cassia

(Lat., multus-many, jugum-yoke)

An evergreen tree to 25' with light-green feathery foliage: leaves 5-9" long: leaflets 10-26 pairs, $\frac{1}{2}-1\frac{1}{4} \times \frac{1}{4}$ ", small, oblong.

Flowers 1-1\frac{1}{2}" wide, rich yellow, in large terminal clusters 4-10" long.

Pods 4" long, flat, brownish.

Trop. America: common in gardens in Malaya.

This is a very quick-growing, but ornamental tree which fruits rather capriciously in Malaya.

C. nodosa Plate 87

Pink Cassia

(Lat., with nodes or joints) Busok Busok, Sebusok, Bereksa, Beresah (Pah.)

A deciduous tree up to 80' high, with smooth dark greyish-brown bark, not thorny. Leaves 9-12" long: leaflets 5-12 prs., $1-2\frac{1}{2} \times \frac{1}{2}-\frac{3}{4}$ ", oblong or ovate, pointed, softly hairy becoming glabrous: stipules tiny, crescentic.

Flowers 1" wide, pink, softly hairy, sweetly scented, with 3 long stamens swollen in the middle of their stalks: set in short stiff clusters, up to 4" long, on the branches behind the leaves.

Pods 1-2 ft. \times $\frac{1}{2}-\frac{3}{4}$ ", cylindric, black.

LEGUMINOSÆ (CÆSALPINIACÆ)

S. China, Burma, W. Malaysia : common in the lowland forest in the middle of the country, especially in Pahang : occasional in gardens.

The Pink Cassia is one of our most beautiful forest trees. It is seen to greatest advantage on the roads between Kuala Pilah, Bentong, Raub, Kuala Lipis and Jerantut and from the railway between Gemas and K. Lipis. It is easily recognized either from the masses of pink flowers on the branches or from the dangling pods like large black pencils. The trees shed their leaves very gradually from November to March and flower from April to July : the pods ripen from October to December. The bark and twigs have a foetid smell like crushed bean-pods.

C. renigera Plate 88 Burmese Cassia
(Lat., ren—kidney, gerre—to bear)

A small tree to 25', like *C. nodosa* but : twigs and leaves persistently softly hairy : leaflets 13–21 pairs, oblong, blunt as in *C. grandis* : stipules large, leafy, kidney-shaped, $\frac{1}{2}$ –1" long : pods shorter and thicker, $7\text{--}10 \times 1$ ".

Burma : occasional in gardens in Malaya.

The finest specimen of *C. renigera* in Malaya occurs on Government Hill, Singapore, near the Private Secretary's House : it was planted by Lady MARRIOTT about 1915.

C. siamea Plates 89, 90 Kassod Tree,
Johar, Johor

An evergreen tree up to 60', with rounded crown becoming straggling and misshapen with upright and drooping branches.

Leaves 6–12" long : leaflets 7–10 prs., $1\frac{1}{2}$ –3 \times $\frac{1}{2}$ –1", oblong or slightly ovate, with a hairlike point.

Flowers $1\text{--}1\frac{1}{2}$ " wide, bright yellow, in long, straggling, erect or oblique, terminal inflorescences up to 16" long with few flowers open at a time.

Pods 6–9 \times $\frac{1}{2}$ – $\frac{3}{4}$ ", flat, often curved, brownish.

India and most of Malaysia : very abundant in villages, waste places and by roadsides in Malaya, possibly wild in the north.

C. splendida Orange Cassia

A glabrous shrub like *C. fruticosa* but with 2 pairs of blunt leaflets $1\text{--}4 \times \frac{3}{4}\text{--}1\frac{1}{4}$ ", (a gland between the lowest pairs) : stipules $\frac{1}{2}$ – $\frac{1}{2}$ " long, leafy.

Flowers 3" wide, rich orange-yellow with 7 fertile and 3 sterile stamens.

Tropical America : as yet little known in Malayan gardens, but with very showy flowers.

C. surattensis Plate 85 Glaucous Cassia
(Surat, near Bombay)

A shrub or treelet to 20', like *C. biflora* but :—

fewer (4–6) pairs of larger ovate leaflets $1\text{--}4 \times 1\text{--}1\frac{1}{2}$ ", often glaucous beneath : larger flowers, 2–2.5" wide ; pods $5\text{--}8 \times .5\text{--}.7$ ".

S. E. Asia, doubtfully wild in Malaya : occasional in gardens.

This species has been more generally known as *Cassia glauca*.

C. timoriensis Limestone Cassia
(from the island of Timor) Batai

Like *C. siamea* but smaller, up to 25' with smaller, more numerous leaflets, smaller richer yellow flowers and smaller pods and the twigs, young leaves and inflorescences pale golden hairy.

Leaflets 16-24 prs., $1-1\frac{1}{2} \times \frac{1}{2}-\frac{1}{2}$ ", oblong lanceolate, *yellowish silky beneath*, the stipules often large and crescentic: *flowers* $1\frac{1}{2}$ " wide, *rich yellow*: pods $5-6 \times \frac{1}{2}$ ".

S. E. Asia: wild on the limestone hills in Malaya, and planted by roadsides in Kedah.

In the absence of flowers, the Vetch-Tree, *Derris dalbergioides*, is similar to this Cassia but its leaflets are glaucous underneath. The Malay name is given to several leguminous trees, e.g. Albizzia, Peltophorum.

CYNOMETRA

(Gr., kuon-dog, metra-pudenda)

Evergreen trees with the *new leaves developing in bright pink tassels*: buds small, on opening developing numerous brown scales in two ranks.

Leaves simply pinnate, shortly stalked, with 1-3 prs. of rather large, *asymmetrical, slightly curved*, leathery leaflets slightly notched at the ends: *no terminal leaflets*

Flowers small, inconspicuous in clusters in the leaf-axils, or in short racemes from the old wood: petals 5, narrow, white, all similar, no standard: stamens mostly 10.

Pods rounded-oblong, more or less flattened, thick, tough, fleshy, more or less coarsely wrinkled, often brown-scurfy, *not opening, with one large seed*.

About 20 spp. throughout the tropics: 3 spp. in Malaya, in lowland forest, and 1 introduced.

The species of *Cynometra* superficially resemble *Saracas* and commonly grow with them by streams in the forest: they differ, however, in leaves, buds, flowers and fruits. The buds of *Cynometra* are like those of *Brownea* and, when they develop, they produce a flattened tube of two rows of bud-scales, gradually increasing in size from the base, and the new leaves are pushed out from the end of the tube. The leathery, asymmetric and slightly curved leaflets are different from those of *Saraca*. The flowers are tiny and inconspicuous and the pods are so thick and short, containing only one seed, as to be recognized as such only with difficulty. Nothing is known of the habits of these species in Malaya except that they produce new leaves periodically like *Saracas*.

Key to the Species

Flowers and fruits on the trunk: leaflets 1 pair: cult. ...	<i>C. cauliflora</i>
Flowers and fruits on the branches and twigs: wild	
Leaflets 1-2 pairs: pods wrinkled and knobbed:	
seashores	<i>C. ramiflora</i>
Leaflets 3 pairs: pods smooth, flattened: inland ...	<i>C. inæquifolia</i>

C. cauliflora Plate 91

Nam Nam

(Lat., caulis-stem, flos-flower)

A shrub or small tree up to 16' high, with rather dense crown: *young leaves bright pink*: the twigs distinctly zig-zag: bark greyish brown, closely dimpled-scaly.

Leaves with short woody stalks $\cdot 2$ " long: *leaflets* $2-4\frac{1}{2} \times \frac{3}{4}-1\frac{3}{4}$ ", 1 pair, elliptic-oblong, *very asymmetric*, blunt and notched at the end, rather yellowish-green, drooping.

Flowers $\frac{1}{2}$ " long, *dirty pinkish white*, borne in short racemes up to $4\frac{1}{2}$ " long, crowded on small woody knobs on the trunk, 1-3 flowers open at a time on each spike: sepals pinkish white, curved back, like petals: petals white: stamens pale pinkish white: ovary rose-pink.

Pod $2-2\frac{1}{2} \times 1\frac{1}{4}-1\frac{1}{2}$ ", short, flattened, *rather kidney-shaped*, hard, knobbed, brown, hanging from the trunk.

E. Malaysia, occasionally planted in Malaya.

The pods can be eaten raw or cooked. They taste like apples, and there are both sour and sweet kinds.

C. inæquifolia Text-Fig. 172
(Lat., unequal-leaf)

Belangan, Katong, Kekatong
Kankatong, Mengkatong, Merbau Katong

A small or big tree, up to 90 ft. high, with entire, pimply, greyish brownish bark, fluted at the base: twigs rough with small lenticels: *buds elongating to form a flattened, cone-like tube, 2-4" long, of finely hairy, brown scale-leaves*: young leaves pink, in long tassels.

Leaves 5-12" long: *leaflets* $1\frac{1}{2}$ -4 × $\frac{3}{4}$ -2", 3 pairs, shortly tipped and slightly notched at the tip: stipules linear, $\frac{1}{2}$ -2" long, soon falling off.

Flowers $\frac{3}{8}$ " wide, white in short, squat, cone-like spikes, 1-1 $\frac{1}{2}$ " long with persistent spirally arranged bracts, in the leaf-axils.

Pods 2 × 1 $\frac{1}{2}$ ", asymmetric, rounded-oblong, flattened but thick, rather kidney-shaped, hard, not wrinkled or knobbed, slightly brown scurf, dull greyish brownish.

Siam, W. Malaysia, Philippines: common in Malaya from Malacca northwards, chiefly with *Saraca* by streams.

There are several trees of this species in the park at Sri Menanti. It is abundant along streams by the passes over the main range and is most conspicuous when the tassels of new leaves are developing.

C. ramiflora Text-Fig. 127

(Lat., ramus—branch, flos—flower)

Katong Laut

A small or moderate-sized tree to 50 ft. high, without buttresses: bark greyish brown, rather pinkish, entire, pimply: twigs rough with lenticels: ? young leaves white.

Leaflets 1-2 pairs (generally one), 2-8 × 1-2 $\frac{1}{2}$ ", the lower pair (when present) always much smaller than the upper, pointing down, curved.

Flowers $\frac{3}{8}$ " wide, white, in small inconspicuous clusters in the leaf-axils and on the twigs between the leaves.

Pods 1 $\frac{1}{2}$ × 1", coarsely wrinkled and knobbed, brown scurfy, only slightly flattened, India, Ceylon, Malaysia: common on rocky and sandy coasts, especially at the mouths of small streams, also by tidal rivers, occasionally far inland by *Saraca*-streams,

A variety (var. *mimosoides*) in Kedah and Perlis has small leaflets. Similar mangrove-plants are the *Nyireh* (Carapa) with different bark and large fruits and the *Dungun* (Heritiera) with simple leaves.

DELONIX

(Gr., delos—clear)

Like *Cæsalpinia* but:—

Leaflets very numerous.

Flowers very large, in short, wide-spread, axillary racemes: sepals all equal in length.

Pod very large, long, woody, many-seeded, splitting open.

3 spp., Africa, Mascarene Islands and neighbouring parts of Asia.

D. regia Plate 93

(Lat., royal)

Flame of the Forest
Flamboyant, Gul Mohur

A deciduous tree, up to 60 ft. high, with umbrella-shaped crown and more or less buttressed trunk: bark grey, smooth.

Leaves 8-24" long, with 9-24 prs. of opposite side-stalks; *leaflets* .3-.5 × .15". 14-30 prs. on the middle side-stalks, oblong, sessile, with slightly oblique base and rounded tip: *stipules* $\frac{1}{2}$ -1" long, pinnate, simple or branched, with 3-6 prs. of tiny leaflets, persistent.

Flowers 4-5" wide, scarlet, faintly scented, on long stalks in short axillary racemes forming panicles on the new shoots with 1 or 2 small leaves at the base: *sepals crimson on the inside*: petals 1 $\frac{1}{2}$ " wide, with long stalks: *standard* 2" wide, white or pale pink, streaked crimson, with a broad wavy crimson border, yellowish centre and reddish stalk, fading yellow: stamens red, white at the base: ovary green.

Pod 12-20 × 1 $\frac{1}{2}$ -2", slightly curved, woody, hanging, splitting open on the tree, blackish: seeds 20-40.

Madagascar: planted throughout the warmer parts of the earth.

This tree is one of the joys of creation. It lay hidden in the island of Madagascar until 1824 when it was discovered by a French botanist. Now it is one of the most wide-spread of tropical trees, scattering its seed for all who stoop to gather. It came to Singapore about 1840 and has become the best-known garden and roadside tree. In monsoon countries, the trees shed their leaves at the end of the wet season and remain bare during the dry, or winter, months: in spring, or on the advent of wet weather, the new shoots develop and produce the flowers, so that an avenue of trees will then be red from end to end. The inflorescences grow from the axils of the earliest leaves of the new shoot and the large, but graceful, scarlet flowers thus appear on a pale green, feathery background before the crown is heavy with foliage. In Malaya the seasons are not marked enough to induce gregarious flowering, except perhaps in the north of the Peninsula, but every tree seems to follow its own rhythm shedding its leaves and then flowering periodically at intervals of 7–10 months. An avenue in Malaya therefore has trees blossoming at different times throughout the year and there is no month when some trees are not in bloom.

Though the flowers are not fully open until 9 a.m. or later, the petals begin to emerge from the calyx-bud shortly after midnight. The flowers last only two days, and the standard curls up and fades on the evening of the first day.

In poor, hard or heavy soil the saplings are stunted. In good, well-drained soil they grow fast, reaching a height of 25 feet in four years, and they develop a few long straggling branches with the leaves at the ends. Subsequently the side-shoots break out along these branches and the crown becomes bushy and flat-topped and finally umbrella-shaped as the outer branches spread wide and droop to the ground (Text-Fig. 12). Generally speaking, the higher the first straggling branches, the loftier will the umbrella-crown become; but it appears that some trees have by nature more weeping branches than usual and that others have more erect branches so they may never become truly umbrella-shaped. The trees do not grow well in the shade and this need for light is reflected also in the shape of the crown, for the leaves are borne near the surface and branching proceeds most strongly at the periphery: the side-branches thus become longer than the central ones. The leaflets fold together at dusk, but they remain spread out on twigs which are illuminated by street-lamps. The roots are strong so that trees are seldom blown down.

Whereas most trees have large deep red flowers, a few have slightly smaller, paler orange-red flowers in which the standard is not crimson round the edge: such trees are less showy, but a few make a pleasant contrast.

Saplings can be mistaken for those of the common Albizzia (*A. falcata*); the forked, pinnate stipules of the Flame of the Forest afford the best distinction, those of the Albizzia being small and soon shed.

DIALIUM

(a Greek plant-name for a kind of heliotrope)

Leaves simply pinnate with alternate leaflets and a terminal leaflet.

Flowers small, white, fragrant, in panicles: sepals 5: petals 0: stamens 2.

Pods oblong, not flattened, shaped like a pear or plum, small, thinly woody, not splitting open, more or less velvety, black or dark brown: containing one seed surrounded by sweet, rather pithy, edible pulp.

15 spp., throughout the tropics, mostly in S. E. Asia: 8 spp. in Malaya, in lowland forest.

LEGUMINOSÆ (CÆSALPINIACÆ)

This genus includes the timber-trees known as *Keranji* or *Kuran*, less commonly as *Sepau* or *Sepan*. They are described and illustrated by FOXWORTHY (7, p. 52). In their leaves, prominent buttresses and exceedingly hard wood they resemble the *Koompassias*. But their fruit is different; the crown is generally dense and rather congested; the buttresses are thin and often forked steep in some species, low and spreading in others; the bark is pale grey to pale or dark pinkish brown and finely pimply; and the inner bark contains a thick dark red sap, which oozes from cuts and abrasures. All the species appear to be deciduous. The leaves of some are golden-silky underneath. The fruits are sold in the markets for the edible sweet pulp; they look like diminutive Chinese black eggs.

In the north of Kedah and in Perlis occur a few villages which we may call the *Keranji*-kampongs because of the numerous *Keranji*-trees (*Dialium indum*) beneath which the attap-houses are clustered. Chief of these is Kodiang where our photograph, Plate 94, was taken. This species has 2-5 pairs of glabrous, medium-sized leaflets and small black velvety fruits about $\frac{3}{4}$ -1" long (Text-Fig. 126).

HYMENÆA

(Hymen—the god of marriage)

Leaves with one pair of strongly asymmetric leaflets: no terminal leaflet.

Flowers white, in small clusters at the ends of the leafy twigs: sepals 4: petals 5, no standard: stamens 10.

Pod oblong, thick, hard and woody, rough with small knobs, with 2 or more seeds embedded in thick mealy pulp, not opening.

8 spp., trop. America: 1 sp. introduced to Malaya.

H. courbaril Plate 101
(West Indian plant name)

West Indian Locust Tree

A very tall, evergreen tree, up to 100' or more high, with lofty, spreading branches and rounded crown: trunk cylindrical from the base with smooth, entire, pinkish-brown bark, often cracking at the junction of the limbs with the trunk: twigs zig-zag: buds very small, on expansion covered by the oblong, green, 1" long stipules.

Leaflets 2-4 × 1-1 $\frac{3}{4}$ ", oblong elliptic, with a short blunt tip, slightly curved, thinly leathery, pellucidly dotted with minute oil-glands: leaf stalk $\frac{1}{2}$ - $\frac{3}{4}$ " long.

Flowers $1\frac{1}{2}$ " wide, smelling of sour milk like *Durian*-flowers: petals cream white with pale glandular dots, scarcely longer than the sepals.

Pod 3-5 × 1 $\frac{1}{2}$ -2", brown, stinking when bruised.

This tall, quick-growing and shady tree with strong timber would make an excellent roadside tree were it not for its hard, heavy pods. It was introduced to Singapore in 1875 and has been planted in several gardens and in the Water Catchment Area. It will reach a height of 70 ft. in 15 years. Most trees become lofty with columnar trunks, but it seems that there is a variety in which the lower branches develop as strongly as the main stem to give a lower but very wide-spreading crown on a short massive trunk.

In Singapore, it is evergreen but it develops flowers and new leaves once a year. The bronze new leaves appear from February-April when the old yellowing leaves fall copiously, and then the flowering begins on the new twigs about June. The fruits need 10-11 months to ripen.

All parts of the tree contain a resin in the form of dot-like oil-glands in the tissues. It can be obtained in quantity by cutting the bark at the base of the trunk and it is said to give one of the finest copal-varnishes that are known,

superior even to Chinese lacquer. The unpleasant smell of the fruit, especially when bruised, arises from the oil glands in its wall. The mealy matter round the seeds is very sweet and is sometimes eaten by children, but it is equally stinking. Squirrels and monkeys may also eat out the pod before it is ripe and too hard to be attacked.

INOCARPUS

(Gr., is—fibre, karpos—fruit)

Leaves simple, alternate, entire.

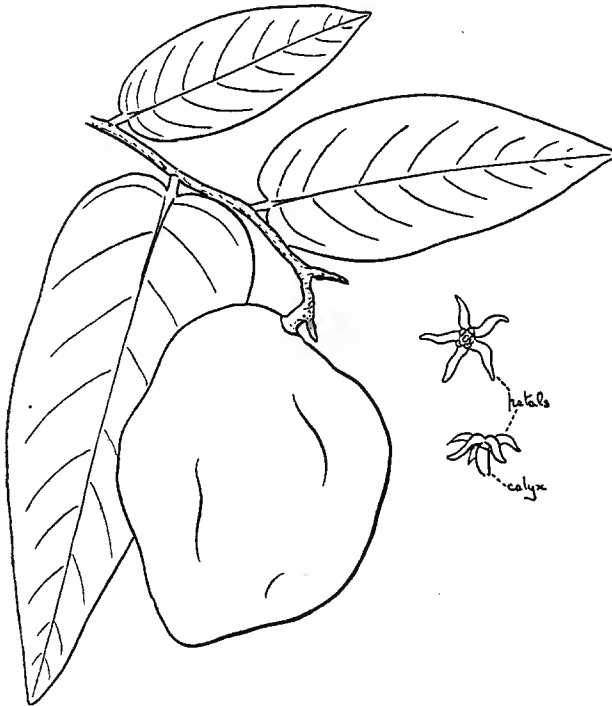
Flowers small, not papilionaceous, but with 5 narrow yellowish-white petals joined in a tube.

Pod stout, thick, leathery, with uneven, lumpy surface, with one large seed.

A few species in trop. America, Malaysia and in the Pacific Isles: 1 sp. in Malaya.

I. edulis Text-Fig. 132

Tahitian Chestnut
Kerepit, Kopit (Johore)



An evergreen bush or small tree up to 35 ft. high, often appearing tufted, straggling with drooping branches: bark giving out a red sap when cut: young leaves pink.

Leaves $3\frac{1}{2}$ -11 × $1\frac{1}{2}$ -4", oblong or ovate, tapered to the apex or blunt and notched, the base rounded, generally distinctly heart-shaped, rather leathery, yellowish green, drooping, glabrous, with 9-13 pairs of side-veins: leaf-stalk short, 2-3" long.

Flower $\frac{1}{2}$ " long or less, white fading yellow, sourly fragrant, in short axillary spikes 2-6" long, or on the twigs behind the leaves.

Pod $3-3\frac{1}{2}$ × $2-2\frac{1}{2}$ " and $1\frac{1}{4}$ " thick, slightly flattened.

Malaysia and Pacific Isles: occasionally cultivated, preferring swampy ground, wild in the brackish swamps in E. Johore.

This tree is widely cultivated in Eastern Malaysia and the Pacific Isles. The nearly ripe seeds are eaten, after boiling or roasting, and taste like chestnuts.

Text-Fig. 132. Tahitian Chestnut (*Inocarpus edulis*), $\frac{1}{2}$: flowers, nat., size.

The species is generally considered native in New Guinea and Polynesia, where it develops massive buttresses, but we find it, at least in an unbuttressed form, wild in the tidal brackish swamps by the Sedili River in East Johore, and it appears to occur naturally in similar places in Sarawak. The genus is most aberrant in leaf, flower and seed: it shows affinity with *Cynometra* (Cæsalpiniaceæ), but more closely, perhaps, with *Barklya* (Papilionaceæ), which has one species only, as a tree in Queensland. Though *I. edulis* is the current name, *I. fagiferus* is botanically correct.

INTSIA

(an Indian plant-name)

Leaves simply pinnate, with 1-4 pairs of large, blunt or bluntly tipped, *opposite leaflets, no terminal leaflet*.

Flowers rather small, in terminal panicles: petal 1: stamens 3.

Pod large, oblong, flattish, rather woody, opening, with several seeds.

12 spp. tropics of the Old World: 2 spp. in Malaya.

This small genus includes the well-known timber-tree *Merbau* (*I. Bakeri*), figured and described by FOXWORTHY (7, p. 52), and the mangrove and coastal tree *Ipil* (*I. bijuga*), figured and described by WATSON (20, p. 53). The genus is close to *Sindora* but is easily distinguished by the oblong, smooth pods like large flat bean-pods and the strongly buttressed trunks. From *Koompassia* it differs in the large opposite leaflets without terminal leaflets and the large several-seeded pods.

I. Bakeri

Malacca Teak

(J. G. Baker, 1834-1920, the English botanist)

Merbau

A very large, deciduous, strongly buttressed tree remarkably like the *Kempas* (*Koompassia*) but with larger rather fleshy leaflets, with pinkish-grey bark shallowly pocked or dimpled with small, thin roundish scaling pieces (like *Pometia*).

Leaflets 3-4 pairs. Pods 8-12 × 3-3½" with several flat seeds.

Siam, Sumatra, Malaya, Borneo and Celebes: inland lowland forest, scattered.

The trunk and shape of this tree are so like that of the *Kempas* that one must often look up to the crown to see the large leaflets in order to be certain of the identity. It is probably identical with the wide-spread *I. palembanica*.

I. bijuga*Ipil*

(Lat., bis—twice, jugum—yoke)

Bark light grey, slightly scaly in large thin roundish pieces, slightly pimply with lenticels.

Leaflets 1-2 pairs. Pods 5-10 × 2-2½".

Mascarene Islands to Polynesia: *sea-coasts, mangrove swamps and river-banks in the tidal, brackish reaches*, common.

The variety growing in mangrove-swamps has been separated as a species (*I. retusa*) because it has glabrous flower-buds.

KOOMPASSIA

(from the Malay name *Kempas*)

Leaves simply pinnate, with several rather small alternate leaflets and a terminal leaflet.

Flowers very small, in terminal panicles: sepals, petals and stamens 5 each.

Pods thin, flat, papery, with a broad wing all round, twisted near the base, not splitting open, containing one flat seed.

2 spp., Malaysia: 2 spp. in Malaya, in lowland forest.

The genus consists of lofty, strongly buttressed trees with excessively hard, heavy wood. The two Malayan species, the *Kempas* and *Tualang*, are well-known forest-trees and are described and illustrated by FOXWORTHY (7, p. 52). Big specimens of each are commonly left in clearings or at roadsides because they are too troublesome to fell. The timber was not considered of much value formerly, as it is difficult to work and not durable, but recently it has been found possible to impregnate that of *Kempas* with preservatives and it is now in demand for railway-sleepers; thus are the mighty subjugated.

The *Kempas* occurs throughout the lowland forest in swampy ground or on hillsides and it is rated by FOXWORTHY as probably our third most abundant timber-tree. The *Tualang*, by contrast, is strangely limited to certain parts of

the country from Selangor and Pahang northward, where it occurs on hillsides and in stream-valleys to an altitude of 1,000 ft. The Pink *Pelong*-tree (*Pentaspadon velutinum*) and the Pink Cassia (*Cassia nodosa*) have roughly the same distribution as the *Tualang*: the White *Pelong*-tree (*P. officinale*) is distributed as the *Kempas*.

K. excelsa Plate 102

Tualang, Sialang

Malaya, Siam (Patani), Sumatra, Borneo and Palawan.
Mature tree 150-260 ft. high.

The *Tualang* is the outstanding tree of our forests, rivalled in height only by the *Kapur* (*Dryobalanops*). It is abundant by the roads to Tras, Kuala Lipis, Jerantut and Kuantan, and again in Upper Perak on the roads to Grik and Kroh. A reserve of giant specimens was made at Temerloh.

The vast columnar trunk with smooth, greenish grey or olive bark, and the great dome-like crown with delicate, light green foliage, many twigs and gnarled branches render the *Tualang* unmistakable. Generally, in forest-felling, the trees are spared because of their hard timber, but it is highly inflammable, more so in the fresh than in the dead state, and, in time, the giants may succumb to firings of the undergrowth and even to lightning. Malays and Sakai believe the *Tualang* to be haunted. The branches often bear large combs of wild bees and supply a harvest of wild honey. The Malay name means 'the tree of swarming bees'. Climbers, it is said, ascend at night 'because the depth below the climber is invisible at that time' (de Wit, 1947).

The *Tualang* is deciduous once a year, between February and June, The vast crown works in unison and remains bare for some weeks. The flowers form after the new leaves, but it is said that flowerings occur only at intervals of 5-6 years. The Pink *Pelong* tree and the Pink Cassia change their leaves and flower, annually, at the same time.

K. malaccensis Text-Fig. 133

Kempas

Malaya, Sumatra, Borneo.
Mature trees 120-180 ft. high.



Text-Fig. 133. Fruit of *Koompassia malaccensis*, $\times \frac{1}{2}$.

The *Kempas* is not so large as the *Tualang* and has a pinkish brown bark very like that of the *Merbau* (*Intsia Bakeri*). Indeed some experience is needed to distinguish *Kempas* and *Merbau* as they grow in the forest, but the *Merbau* has the trunk distinctly dippled scaly and the leaflets are appreciably larger. The bark of the immature *Kempas*-tree is dark grey-brown and closely ridged and fissured; it is thrown off by the smooth mature bark when the tree reaches some 50-60 ft. high. The *Kempas* is deciduous about once a year, but individual trees vary and there is no such uniformity as with the *Tualang*. The flowers develop on the new twigs and the fruits spin down at the close of the year.

Kempas-trees in swampy ground have much larger buttresses than those on the hillsides or dry soil.

PELTOPHORUM

(Gr., pelte—shield, pherein—to bear)

Trees like Cæsalpinia but:—

Sepals equal, lower one not enlarged: stamens short, hairy. Pod distinctly winged all round, and not opening.

About 7 spp., throughout the tropics, absent from India: 2 spp. in Malaya.

Key to the Species

- Flowers in terminal panicles: stipules small: pods deep purple-brown: cultivated and sea-shores ... *P. pterocarpum*
- Flowers in lateral, unbranched racemes: stipules antler-like, conspicuous: pods pale brownish drab: wild, in secondary jungle *P. dasyrachis*

P. pterocarpum Plate 108
(Gr., pteron—wing, karpos—fruit)

Yellow Flame
Batai, Batai Laut

A medium-sized deciduous tree, up to 80 ft. high, with umbrella-shaped crown: bark light greyish.

Leaves 6–16" long, with 5–11 pairs of opposite side-stalks: leaflets .5–.7 × .3", 9–20 pairs (on the middle side-stalks), opposite, dark green, pale beneath, oblong, the base very unequal, apex blunt, slightly notched or with a minute point, sessile.

Flowers 1½" wide, fragrant, in erect, much branched, terminal panicles 12–18" long: flower-stalks 1–4" long: petals brilliant yellow, wavy and crinkled like tissue-paper, brown hairy towards the base on both sides: stamens .5" long, sulphur yellow with deep orange pollen: stigma bright green, broad.

Pods 2½–5½ × 1", purple-brown, the wing .1–.2" wide: with 1–5 yellowish, flattened, very hard seeds (shaped like sun-flower seeds).

Indo-China, Malaya to Australia: a common sea-shore tree on rocky or sandy coasts in Malaya.

Because of its spreading shady crown, beautiful flowers and quick growth, the Yellow Flame is becoming a favourite tree for gardens and roadsides. Saplings will flower in four years from seed, but they take many more to reach their mature shape. As in the Flame of the Forest (*Delonix*), the crown is at first bushy and flat-topped, and the umbrella-shape is acquired gradually by the lengthening of the outer branches which may ultimately droop to the ground. The Yellow Flame is strictly seasonal, in contrast with the Flame of the Forest. It sheds its leaves after a spell of dry weather, generally twice a year about January-February and July-August (average dates, 10th February, and 10th August, as for the *Ketapang*): it is bare of leaves for a week and then develops the new shoots with their terminal inflorescences. The crown becomes darkened by the young, upstanding brown flower-clusters, but is soon transformed to golden yellow when the buds open. In fruit it is equally distinguished by the abundant short, purple-brown pods which project all over it. The growth of the branches is therefore sympodial, the inflorescence terminating the growth of the main twig. In the absence of flower and fruit, the Yellow Flame can be told from the Flame of the Forest by the absence of leafy stipules, by its brown hairy twigs and buds and by its larger, less numerous leaflets. The flowering of an inflorescence continues for several weeks, proceeding gradually from base to apex with a few flowers open at a time on each branch of the panicle, and only the last flower or two on each branch sets fruit, the rest dropping off. The colour

of the flower is due to the contrast between the yellow petals and the orange pollen. The seeds take several months to germinate: they can be hastened by filing through one end of the hard coat or by softening in dilute acid or immersion in boiling water for two minutes. The bark contains a yellow-brown dye which is used in Java for the dark-brown colour of batik.

P. dasyrachis

(Gr., dasus—thickly hairy; rachis—leaf-stalk)

Yellow Batai
Batai, Jemerelang

Like *P. pterocarpum* but:—

Crown uneven, irregular, not umbrella-shaped.

Leaves with 4–9 prs. of side-stalks: *leaflets* 11–16 prs. on the middle side-stalks, .5–1 × .2–.35", longer, rather glaucous beneath: *stipules* $\frac{1}{2}$ – $\frac{3}{4}$ " long, *antler-like*, with several branches, clasping round the bud.

Flowers in axillary racemes 8–14" long: *flower-stalks* .7–1.4" long, much longer.

Pods 1–1 $\frac{1}{2}$ " wide, sharply pointed, flatter, greenish yellow then pale brownish drab, hanging down in bunches from the twigs below the leaves or in the axils of the older leaves.

Siam, Sumatra and Malaya: in inland, lowland forest or belukar, not coastal.

In habit this tree differs considerably from the Yellow Flame, although very similar in leaf. Even in the open it has a loose straggling crown, with a few upright branches giving the tree the appearance of a very large Jacaranda. It is deciduous like the Yellow Flame but it flowers as the new leaves develop. The inflorescences arise from the axils of the new leaves: they are unbranched and are never terminal. The branches of the tree therefore develop monopodially and for this reason, no doubt, the crown does not flatten and become umbrella-shaped. In habit, flower and dangling bunches of pale pods it is easily distinguished from the Yellow Flame. The distribution of the species in Malaya is uncertain. It is exceedingly abundant in belukar round Alor Gajah, Tampin and Rembau, but appears to be scarce elsewhere and is not known to the south of Malacca. It is said to be a useful tree for natural afforestation of lalang-wastes.

SARACA

(possibly derived from the Indian *asoka*)

Small to medium-sized, evergreen trees: the new leaves developing in tassels, pink or purple: buds wrapped in the long, conical, spike-like stipules.

Leaves alternate, simply pinnate, *sessile or shortly stalked*, with 1–7 pairs of large, *opposite leaflets*, no terminal leaflet: leaf-stalk rather massive, woody.

Flowers $\frac{3}{4}$ –1" wide, *yellow, orange or red*, generally with a dark eye, *fragrant*, in dense upturned clusters on the trunk or branches or on the leafy twigs, with bright pink, yellow, orange or red bracts and stalks: *calyx* tubular with 4 spreading sepals surrounding the eye: *petals absent*: *stamens* 3–8, long, slender, with tiny purple anthers: *ovary* shortly stalked, attached to one side of the top of the calyx tube.

Pod large, thin, flat, very leathery, glabrous, purple, splitting in 2 halves and coiling up: seeds large, flat, blackish brown, several in a pod.

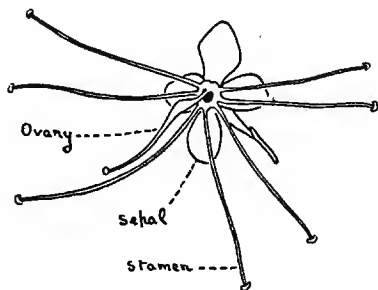
About 20 spp., India and Malaysia: 7 spp. in Malaya and 1 introduced.

Saracas are among the most beautiful of our native flowering trees and once their peculiarities are understood they are easy to recognize. Generally they are not more than 20–30 feet high, but in the forest specimens reaching 60 feet and more not infrequent. The leaves are dark green with large, drooping, pointed leaflets and they are distinguished among pinnate leaves by being nearly or quite sessile. At frequent intervals, after short spells of dry weather,

the new leaves develop: every terminal bud then breaks through the conical stipule which covers it and develops rapidly into a tassel of pink or purple, limp new leaves which dangle for several days before stiffening and straightening. At such times the trees are conspicuous from the tassels of new foliage. Then, after pronounced dry weather, generally twice a year about March and August, the flowers develop in brilliant, fragrant bunches. Finally the equally characteristic large purple pods mature. There are thus few times of the year when a Saraca cannot be recognized from its young leaves, its flowers or its pods. Monkeys and squirrels often eat the unripe seeds in the pods.

In the forest, Saracas always grow in stream-valleys, mostly at the very edge of the stream, and their dark fibrous roots, beset with nodules, trail out in bundles in the running water. Indeed, in this country, whatever river we ascend, we will find eventually that it is bordered with Saraca-trees from where it narrows and becomes a tunnel through the forest until its source, except that be in the high mountains. Saraca-streams (p. 42) are one of the characteristic features of our vegetation. They are the tributaries which descend from the low hills in the plains and they are the headwaters of all our rivers up to an altitude of 4,000 ft. In these cool, moist places, the Saraca-trees are so festooned with epiphytic ferns, mosses, liverworts and orchids, that their bark may be entirely hidden.

Most of the Malayan species are cultivated in gardens and one introduced species, *S. indica*, is seen occasionally about towns and villages. They will grow most strongly in shady places, beneath tall trees, in damp but well-drained ground. *S. thaipingensis*, *S. triandra* and *S. declinata* are the best, and the first of these is the hardiest: under suitable conditions it will become in four years a bushy tree, 12 ft. high, and ready to flower.



Text-Fig. 134. *Saraca bijuga*,
nat. size.

The flowers of Saraca are very unlike ordinary Leguminous flowers. They have no petals, but four brightly coloured sepals at the top of a tube, thus simulating *Ixora*, and a few slender projecting stamens. The flat pod and pinnate leaves, however, are typical of the family; and in other genera there is a tendency to lose the petals and develop the calyx, e.g. *Tamarind* and

Amherstia (3 petals), *Sindora* and *Intsia* (1 petal) and *Dialium* (0 petals). As in *Ixora*, too, the flowers gradually deepen in colour after opening and in *S. declinata*, *S. indica*, *S. Kunstleri* and *S. bijuga* they change from yellow to brick red: the eye does not begin to colour until some hours after the flower has opened. Most flowers in each bunch are male with a rudimentary ovary and only a few are bisexual with fully developed ovary and stamens: thus only one or a few fruits develop from each cluster of flowers.

To Malays, the Saracas are known as *Gapis* or *Golak*, with such variants as *Bergolak* and *Mergolak*, less commonly as *Talan* or *Tanglin*. Except that their roots make good handles for parangs, the trees have little use and Malays frequently do not recognize them.

Key to the Species

Flowers yellow with dark crimson eye, in masses on the trunk and branches: leaflets 5-8 pairs: stamens 4	<i>S. thaipingensis</i>
Flowers yellow to pinkish red with crimson eye and orange-pink bracts: leaflets 2-4 or 4-6 pairs: stamens 3-4	<i>S. palembanica</i>
Flowers yellow turning red, with purple or crimson eye ...	
Leaflets 1-2 pairs: stamens 7	<i>S. bijuga</i>
Leaflets 2-4 pairs: stamens 7	<i>S. Kunstleri</i>
Leaflets 4-6 pairs	
Stamens 5-6: leaflet-stalks 2-4" long: wild or cult.	<i>S. declinata</i>
Stamens 7-8: leaflet-stalks 1-2" long: cult. ...	<i>S. indica</i>

S. bijuga Text-Figs. 134, 135
(Lat., bis - twice, jugum - a yoke)

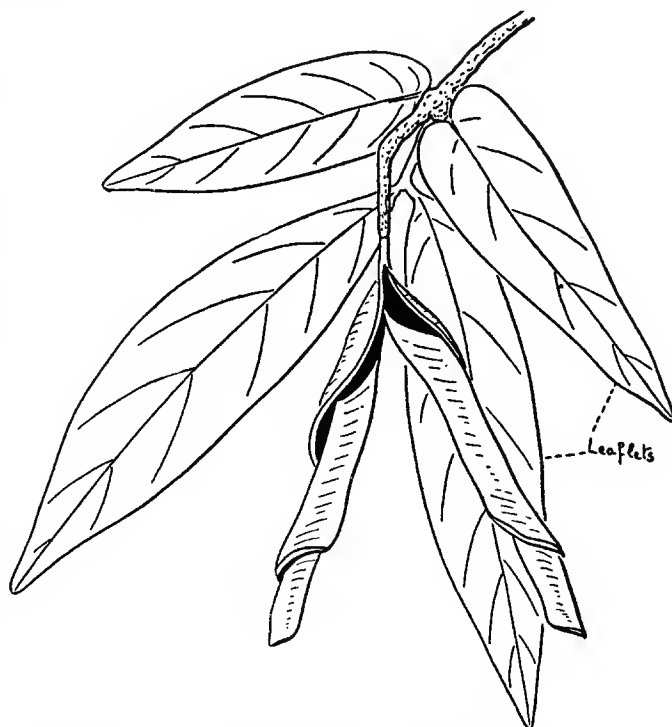
Malayan Saraca

Leaves with very short stalk $\frac{1}{4}$ - $1\frac{1}{2}$ " long: leaflets $4-12 \times \frac{3}{4}-3\frac{1}{4}$ ", the basal pair clasping the twig.

Flowers .7-.9" wide, fragrant, light apricot-yellow becoming rose-red with slightly darker purple or crimson eye, in small clusters 2-5" wide at the ends of the leafy twigs, not on the trunk: bracts on the flower-stalks small, 1-2" long, persistent, round, recurved, rose-red: stamens $1\frac{1}{4}-1\frac{1}{2}$ " long.

Pods 5-8 $\times 1\frac{1}{2}-2\frac{1}{2}$ ".
Peninsular Siam,
Malaya: common
throughout the country.

The few leaflets and rather small, terminal flower-clusters are characteristic.



Text-Fig. 135. Malayan Saraca (*S. bijuga*), with pod, $\times \frac{1}{4}$.

LEGUMINOSÆ (CÆSALPINIACÆ)

S. declinata Plate 117
(Lat., bent down)

Red Saraca

Leaves 7-20" long, with very short stalks: *leaflets* $3\frac{1}{2}$ -12 × 1-3 $\frac{1}{2}$ ", the lowest pair more or less directed to clasp the twig.

Flowers $\frac{3}{4}$ -1" wide, bright yellow turning rather dull brick-red or blood-red with dark purple eye; in clusters 3-8" wide at the ends of the leafy branches or at the ends of short, often leafy twigs from the old branches, not on the trunk: *bracts* on the flower-stalks 2-35" long, orange-scarlet, pointed, soon falling off: *stamens* $\frac{1}{2}$ -1" long, yellow at the base, purple towards the ends, with purple anthers: branches of the inflorescence green flushed purple: *flower-buds* yellow, not at all pink.

Pods 8-12 × 1 $\frac{3}{4}$ -2 $\frac{1}{2}$ ".

Siam, Malaya, Sumatra, Java: evidently common in Malaya but confused with *S. Kunstleri*.

This species is very close to the Indian Asokæ, *S. indica*, and differs in the distinct, though short, stalk to the larger leaves, the longer stalk to the leaflets, the darker eye to the flower, which is rather more deeply coloured, and in the fewer stamens. So far as we know *S. indica* is not wild in our forests.

S. indica

Asoka Tree, Sorrowless Tree

Leaves 5-12" long, almost sessile: *leaflets* 3-9 × $\frac{3}{4}$ -2", generally narrow and lanceolate, the lowest pair clasping the twig.

Flowers $\frac{3}{4}$ -1" wide, light apricot-yellow turning orange-red with purple-mauve or magenta eye, in clusters 3-6" wide, borne as in *S. declinata*: *bracts* on the flower-stalks 1-2" long, yellow, persistent: branches of the inflorescence purple: *stamens* 1-1 $\frac{1}{4}$ " long: *flower-buds* pinkish yellow.

Pods 5-10 × 1 $\frac{1}{2}$ -2".

India: introduced to Malaya, occasional in gardens and villages.

The Asoka is a sacred tree of India. It is written that Buddha was born under its shade. It is not nearly so fine a tree as our Red Saraca, *S. declinata*.

S. Kunstleri

Kunstler's Saraca

(H. H. Kunstler, the German botanical collector at Calcutta at the end of the last century)

Like *S. declinata* but:—*leaves* almost sessile: *leaflets* 2-4 pairs, the basal pair strongly clasping the twig, their stalks 1-2" long: *flower* with the eye becoming dull red: *bracts* on the flower-stalks rather persistent, blunt, 3" long, orange turning brick-red: *stamens* 7.

Malaya: apparently common in the middle of the country but often mistaken for *S. declinata*.

There is a tree of this species in the Lake Garden at Taiping near the Residency.

S. palembanica

Pink Saraca

(from Palembang)

Leaves 6-18" long, the main stalk often finely hairy: *leaflets* 4-13 × 1-6", 4-6 or 2-4 pairs, occasionally only 1-2 pairs, varying oblong lanceolate to broadly elliptic, rather suddenly tipped, with stalks 2-3" long, the lowest pair more or less clasping the twig.

Flowers $\frac{3}{4}$ " wide, slightly fragrant, light yellow becoming slightly orange-yellow and scarcely changing colour or in other cases deepening to dull red, the eye orange then crimson, in medium to large clusters 4-9" wide spread along the branches behind the leaves, not on the trunk, a few on the leafy twigs, generally with finely hairy stalks: *bracts* 2-5" long, rather large, persistent, blunt, delicate pinkish orange: *stamens* 3-4.

Pods 5-7 × 1 $\frac{1}{2}$ -2 $\frac{1}{2}$ ".

Sumatra, Borneo, Malaya: frequent throughout the country.

If *S. thaipingensis* is the showiest species and *S. declinata* has the most richly coloured flowers, *S. palembanica* is certainly the most charming. The colour of its flowers seems to vary but the general shade of the cluster is that of a sunset, because of the delicate pink bracts and flower-stalks. The species is abundant by the road from Jerantut to Kuantan, as well as in other parts of Pahang and Perak, but it is infrequent in the south. It is scarcely known in cultivation.

The trees with only 2-4 pairs of leaflets generally flower from the leafy twigs. They have been called *S. triandra* but there is no satisfactory means of distinguishing them from typical specimens of *S. palembanica*.

S. thaipingensis

(from the town of Taiping)

Yellow Saraca

Leaves 9-36" long: leaflets 8-16 × 2½-5", the lowest pair not clasping the twig, the stalks of the leaflets 4-5" long.

Flowers 6-7" wide, slightly fragrant, light apricot-yellow becoming deep yellow with the eye darkening to deep blood-red, in large clusters 6-18" wide on the trunk and main branches, not on the leafy twigs: bracts large but soon falling off: stamens 4, occasionally 5.

Pods 12-18 × 2½-4".

Throughout Malaya, but not known to be wild south of Malacca: common.

This is the showiest, hardiest and, perhaps, the commonest Malayan Saraca. It has the largest leaves, flower-clusters and pods; and it is peculiar in being strictly cauliflorous, the masses of blossom often appearing at the foot of the trunk. When out of flower it can be distinguished from *S. declinata* by the larger distinctly stalked leaves with the basal pair of leaflets not clasping the twig, the longer stalks to the leaflets and the bunches of pods on the trunk.

SINDORA

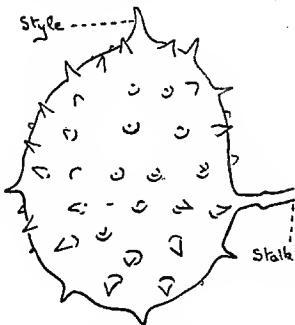
(from the Malay name *Sindor*)

Leaves simply pinnate, with a few pairs of medium to large opposite leaflets, no terminal leaflet.

Flowers in terminal panicles: sepals 4: petals 1: stamens 10.

Pods flat, broad, oblong or disc-like, often set with stout prickles, woody, blackish, splitting open, containing 1-2 seeds.

18 spp., Indo-Malaysia, 1 in Africa: 5 spp. in Malaya, in lowland forest.



Text-Fig. 136. Fruit of *Sindora intermedia*, × ½.

This genus comprises the timber-trees known as *Sepetir* or, less commonly, in Kedah and Kelantan, *Ketil* and *Meketil*. They are described and illustrated by FOXWORTHY (7, p. 52). They have columnar trunks without buttresses (like the wild *Mango*- and *Bintangor*-trees), smooth purplish grey bark and wide-spreading, often flat-topped crowns. Most species have prickly pods which decay slowly on the ground and thus enable one to identify them (Text-Fig. 136). The commonest species, *S. coriacea*, has oblong pods without

LEGUMINOSÆ (CÆSALPINIACEÆ)

prickles but there is no other tree in the country with flat pods of the same dumpy shape. Some, if not all, species are completely deciduous and remain bare for a few weeks before developing new leaves.

The tall tree at Changi in Singapore, marked on the maps and charts, is a *Sindora*; it seems to have been a landmark for nearly a century.

TAMARINDUS

(from the Arabic name *tamarhindi*)

Leaves simply pinnate with opposite leaflets, and no terminal leaflet.

Flowers in short racemes: sepals 4: petals 3: stamens 3, joined for half their length.

Pod oblong, thick, with a thin hard outer layer and fleshy, pulpy inner layer, not opening, with several seeds.

1 species.

T. indica Plates 119, 120

Tamarind

Asam, Asam Jawa, Chelagi (Kel., Treng.)

A moderately large, more or less deciduous tree to 80' high, with dense rounded crown composed of many branches and twigs: trunks of old trees often twisted and grooved, often fluted but not buttressed: *bark greyish brown, somewhat fissured and scaly*: young leaves pale green.

Leaves 3-6" long: *leaflets* .6-1 × .2-.4", 10-20 pairs, oblong, the base round and asymmetric, the apex minutely notched, thinly leathery, almost sessile, glabrous.

Flowers 1½" wide, *pale yellowish but rose-red in bud* from the bracts: racemes 2-4" long, often on leafless twigs: *bracts* 2, *rose-red*, covering the young buds but falling off before the flower opens: *petals pink-veined*, 2 spreading laterally and one as a keel in the centre: stamens green.

Pod 3-8 × 1½", *scurfy brown*, pithy green inside when unripe, becoming pulpy.

Native of trop. E. Africa and W. Asia: now widespread throughout the tropics.

The Tamarind needs a monsoon climate in which to thrive and for this reason it is not a conspicuous or generally successful tree in Malaya except in the north. It is not planted specially on roadsides, but it occurs in most towns and villages, chiefly in the neighbourhood of Indian dwellings; it does best in sandy soil near the sea but nowhere is it as fine a tree as in India or Africa. It is deciduous after the dry weather at the beginning of the year: the leaf-fall takes place gradually over the greater part of the crown at once and the new leaves develop before the crown is quite bare, but if dry weather is pronounced all the old leaves may fall before the new buds have opened. The fresh green, trailing foliage is very beautiful. The flowers are borne on the new shoots, but they are inconspicuous. The usual form of the Tamarind in Malaya is a bushy tree about 30 or 40 ft. high, with stocky trunk and, from a distance, it greatly resembles the *Mempoyan* (*Rhodammia*) on account of its round, densely twiggy crown. The Wood-Apple (*Feronia*) and the Madras Thorn (*Pithecellobium dulce*) also resemble the Tamarind from a distance, but they are thorny trees. The small, glabrous and leathery leaflets of the Tamarind are characteristic: at dusk they fold together.

The pulp of the ripe pods is edible though sour, and after preparation, by being squeezed from the pods and with the addition of salt, it is sold in native shops as a blackish brown, uninviting mass suggesting inspissated dates. It is used chiefly in curries, but it and other extracts of the tree are employed in native medicine, as described in BURKILL'S Dictionary. The acid in the pulp is tartaric. For a relish, the *Asam Gelugor* (*Garcinia atroviridis*, p. 314) is often used as a substitute in Malaya.

MIMOSA SUBFAMILY

Mimosaceæ

(p. 362).

ACACIA

(a Greek name for a thorny tree)

Like *Albizzia* but :—

The stipules often modified into a pair of thorns at the base of the leaf.

Stamens free (many).

Pods variable flat, cylindrical, straight or coiled.

About 450 species throughout the warm parts of the earth, chiefly in Australia and Africa.

Only two species of this large genus are native in Malaya and they are woody climbers. Three introduced species are common, however, in cultivation : one is a moderate-sized tree (*A. auriculiformis*) of gardens and parks : another is a small tree grown chiefly at Cameron Highlands (*A. podalyriæfolia*) : and the third is a fragrant village-bush well-known as *Bunga Siam* (*A. Farnesiana*). The genus includes the numerous Wattle-trees of Australia and they, like most of the species, are accustomed to a dry climate and do not succeed therefore in the Malay Peninsula.

Typically Acacia-leaves are twice pinnate like those of *Mimosa* and *Albizzia*, but in many Australian species, including the Wattles, the leaf is strangely modified. The pinnate-portion of the blade does not develop but the portion of the leaf-stalk near the stem is transformed into a blade through being flattened in the plane of the stem, that is at right angles to the plane of a normal blade. Such a blade is called a *phyllode*; and the two species. *A. auriculiformis* and *A. podalyriæfolia*, both have phyllodes : only the seedling in its early stages has a pinnate leaf, and gradually the pinnate portion disappears from later leaves until, in the sapling stage, there is no trace of it beyond the point or tail at the end of the phyllode. Hence the flat narrow blade of *A. auriculiformis* is very different from the feathery leaf of *A. Farnesiana*. The phyllodes are twisted, more or less, at the base to set them into the sunlight, like ordinary leaf-blades.

Many Acacias are useful and there is a general account of the economic aspect of the genus in BURKILL'S Dictionary. Several species furnish an excellent hard timber. "The Ark of the Covenant as well as the furniture of the Tabernacle, are said to have been made from timber of *A. Seyal*, which yields the Shittim wood of the Bible. Also, on account of its incorruptible wood, this species for ages was used by the Egyptians to make coffins for the burial of their kings" (L. H. BAILEY, Stand. Cyclop. of Horticulture). Other species furnish tan-barks or gums, such as gum arabic which is obtained from African species. Cutch, which is used in betel-chewing, medicine, tanning and dyeing, is obtained from the Indian *A. catechu*.

A Mexican species, *A. sphærocephala*, of which there is an old specimen in the Singapore Botanic Gardens, is an ant-plant. The spiny stipules are much enlarged and hollow, like horns, and in nature they are tenanted by a certain kind of ant which bites a hole for an entrance and an exit at the base of the thorn. These ants are said to be most ferocious and to protect the tree from the leaf-cutting ants which they vigorously repel. The relationship is similar to that in the Malayan Ant-Trees, *Macaranga* and *Drypetes*.

Key to the Species

- Thorny, feathery-leaved bush: flower-heads round,
 yellow *A. Farnesiana*
- Not so
 Twigs and leaves bluish white with a waxy bloom:
 mountains *A. podalyriæfolia*
- Not so: leaves narrow, curved: flowers in short
 spikes: lowlands *A. auriculiformis*

A. auriculiformis Plate 73 Acacia-tree
 (Lat., ear-shaped)

An evergreen tree, to 50 ft., with dull green, rather thin, rounded crown: bark light grey, somewhat fissured: twigs green, without spines.

Leaves without pinnate blades, the stalk modified into a flattened blade (phyllode): phyllodes 3-6 × ½-1", narrowly oblong, slightly curved, tapered to each end, rather leathery, dull green, with 4-5 faint longitudinal veins: stalk ¼" long.

Flowers .15" long, tiny, sessile, rich yellow, very fragrant, crowded in slightly drooping, slender spikes, 3-3½" long, in pairs in the leaf-axils: petals curved back.

Pods ½" wide, flat, curling up into a close coil when ripe, green then brown: the coiled pod 1-1½" wide (overall) and consisting of 1½-2½ coils, in some cases reversed in the middle: splitting open along both edges, the under edge wavy.

Native of Thursday Island (Torres Straits), frequent in Malayan gardens and parks.

A. Farnesiana Text-Fig. 126 Bunga Siam
 (Cardinal O. Farnese, 1578-92, horticulturist) Pokok Lasana (Malacca)

An evergreen shrub or treelet to 12 ft. with long thorny straggling branches and slender zig-zag brown twigs, developing a short thick trunk when old: spines ¼-½" long, gradually enlarging to ¾-1" long on old branches, straight.

Leaf-stalk 1-1½" long, with 3-7 prs. of side-stalks: leaflets .1-25 × .05", tiny, oblong: a tiny purple gland on the leaf-stalk midway between the base and the first pair of side-stalks.

Flower-heads ¼" wide, round, rich yellow, very fragrant, on stalks 1-1½" long, singly or in clusters in the leaf-axils.

Pods 2-3 × ½", several to a flower-head, thick, cylindric, curved, green then greyish brown, with several seeds.

Cultivated throughout the tropics, perhaps originally from America: common in towns and villages in Malaya, especially in the north.

This spiny bush is planted for its fragrant heads of flowers. It is grown for the perfume-industry in S. Europe.

A. podalyriæfolia Glauous Acacia
 (with leaves like Podalyria)

A shrub or small tree to 25 ft. with conspicuous greyish white straggling branches, erect and drooping: twigs and leaves bluish white from a waxy bloom, hoary-white hairy: no thorns.

Leaves modified into phyllodes: phyllodes 1½ × ¾", oval, sessile, with a short point, with a tiny wart about one third along the upper side and a pronounced wave on the lower side towards the apex: with a midrib and side-veins.

Flowers yellow, very fragrant, in tiny heads arranged in long racemes at the ends of the branches.

Pods 1-3 × ¾", flat.

Native of Australia: grown freely at Cameron Highlands.

ADENANTHERA

(Gr., aden—acorn; bot.—anthers)

Leaves twice pinnate, with a few pairs of side-stalks and *rather large alternate leaflets*: without glands.

Flowers minute, stalked, *in narrow spike-like racemes* from the leaf-axils: stamens 10.

Pods strap-shaped, rather narrow, *curved or coiled*, coiling up when opening: *seeds many, scarlet or scarlet and black*, hard, shiny, *heart-shaped* with a faint 'heart-line' on each side.

3 spp., in the Old World tropics: 2 spp. in Malaya.

The trees of this genus are known to Malays as *Saga*. Their scarlet seeds are eagerly gathered by children who make beads and playthings from them. The Malay name is given also to other plants with similar red seeds, particularly to the climbing bean-like *Abrus* (*Akar Saga*) and to the trees called *Ormosia* (p. 374) which may be distinguished as *Saga Utan*. The name is given, probably mistakenly, to species of *Pithecellobium* with red twisted pods, though their seeds are black, and to other plants with red fruits suggesting those of *Adenanthera*. It is better to restrict the name to this genus. The word itself has been traced to the Arabic for a goldsmith. In India and Ceylon, the seeds of *Adenanthera pavonina* and of *Abrus* have been used, so far back as history records, as units of weight for fine measures, of gold for instance. BURKILL has, indeed, suggested that the seeds of *A. pavonina* were the basis of one of the very earliest of such systems. The most fundamental of known systems of weights is the Ganda-system of India which was based on seeds of *Abrus* but it appears to have been derived from a yet earlier system with a unit twice as high. The seeds of *A. pavonina* have exactly twice the weight of those of *Abrus*. And what more delightful counters for the primitive and bloody mind than these hard, red, heart-shaped seeds?

Key to the Species

Seeds wholly red : leaflets blunt : side-stalks of the leaf 2-6 pairs	... ..	<i>A. pavonina</i>
Seeds partly black : leaflets pointed : side-stalks of the leaf 3-4 pairs	... ..	<i>A. bicolor</i>

A. pavonina Plate 74
(Lat., pavo—a peacock)

Saga, Suga

A deciduous tree up to 60 ft. tall, with rather uneven rounded crown and slightly buttressed trunk: *bark* pale pinkish grey, slightly flaky.

Leaves with the stalks 4-16" long and 2-6 pairs of side-stalks: *leaflets* $\frac{3}{4}$ -1 $\frac{1}{2}$ " \times $\frac{1}{2}$ -1", 9-15 pairs on each side-stalk, the last one apparently terminal, oblong-elliptic, the apex blunt and rounded, *the base unequal-sided*, shortly, stalked, pale and rather glaucous beneath.

Flowers .15" long, glabrous, faintly scented like orange blossom: *racemes* 3-6" long, the flowers opening gradually from below upward: *petals cream-yellow then dull orange*.

Pods 6-9 \times .6", curved but not coiled until beginning to split, green then blackish: *seeds* .3-.35" wide.

India, S.E. China and Malaysia to the Moluccas: frequent in villages and at roadsides, wild on rocky headlands and islets on the East Coast.

LEGUMINOSÆ (MIMOSACEÆ)

This is the commonest species of the genus. It has been thought to be an introduced plant in Malaya but it is undoubtedly wild on our Eastern shores where it occurs with the Sea Apple (*Eugenia grandis*) in the coastal forest. On this side of the Peninsula the climate more nearly resembles that of the monsoon countries where *A. pavonina* is known to be wild, and a number of plants preferring the monsoon-climate and not generally known in Malaya, reach down the East Coast, at least as far south as Pekan, e.g. *Sterculia fœtida* and *Kleinhovia hospita*. A form of *Saga* with rather small flowers, leaflets and seeds and with hairy flowers is sometimes distinguished as *A. microsperma*.

In Singapore, the *Saga*-trees appear to shed their leaves at intervals of 6–8 months, their leafless period being very short. They flower, like the Yellow Flame (*Peltophorum*), from the ends of the new shoots.

The similar red seeds of *Ormosia parvifolia* are oblong, without the 'heart-line'.

A. bicolor

(Lat., of two colours)

Wicked Heart
Saga

Like *A. pavonina* but :—

Leaves smaller with fewer side-stalks : leaf-stalk 2–7" long : side-stalks 3–4 pairs : leaflets distinctly narrowed to the apex and pointed, often hairy beneath, the base often symmetrical.

Pods curled in one complete coil before splitting.

Seeds .25–.3" wide, one third black.

Ceylon, Malaya : frequent in lowland forest, occasional in villages and as a roadside-tree.

ALBIZZIA

(F. del Albizzi, an eighteenth-century Italian botanist)

Leaves twice pinnate, without terminal leaflets : *mostly with numerous side-stalks and numerous small leaflets* : always with one or more glands on the main leaf-stalk : *stipules small*, soon falling off.

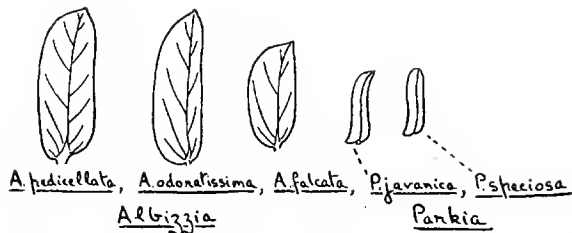
Flowers small, greenish white, pale yellow or pinkish, *mostly in small heads arranged in panicles* (not in heads in *A. falcata*) : corolla funnel-shaped : *stamens many*, much longer than the corolla, *joined into a tube below*.

Pod large, thin, flat, strap-shaped, often papery, generally splitting open : seeds numerous.

About 100 spp., chiefly in the Old World tropics : 4 spp. in Malaya, 2 introduced.

Except for the shrubby climber, *A. myriophylla*, of the north of the country, the Malayan species are tall and rather common trees. The best-known in the country, however, is the introduced *A. falcata*, which is now so abundant as to be one of the characteristic trees of the sky-line in every town. In the absence of flowers and fruits a little care is needed to distinguish *Albizzia* from the Flame of the Forest (*Delonix*) or from the *Petai* and *Kerayong* (*Parkia*) : the distinguishing features are noted under the account of *A. falcata*. All the species, native and introduced, are evergreen in Malaya but they flower seasonally after dry periods.

Certain species, notably the Indian ones, give useful timber and one of these, *A. odoratissima*, grows well in Malaya.



Text-Fig. 137. Leaflets of Albizzia and Parkia, nat. size.

Key to the Species

- Leaflets on the longer side-stalks 4-8 pairs, rather large,
 $\frac{1}{2}$ -1" wide
 Flowers in large, singly stalked heads: stamens white
 then yellow: pods with round seed-marks ... *A. lebbek*
 Flowers in small heads set in panicles: stamens pink:
 pods with faint transverse seed-marks ... *A. retusa*
- Leaflets on the longer side-stalks more than 8 pairs,
 small, less than $\frac{1}{2}$ " wide
 Pods 4-5" long, with faint transverse seed-marks:
 flowers set singly in panicles: common in towns ... *A. falcata*
 Pods larger, ribbon-like, with distinct round seed-
 marks: flowers set in heads arranged in panicles
 Pods 12-18" long: stipules as small hooks: 6-14
 pairs of side-stalks in each leaf: midrib of leaflet
 nearly central: wild ... *A. pedicellata*
 Pods 7-9" long: 2-8 pairs of side-stalks: flowers
 sessile: midrib eccentric: cultivated ... *A. odoratissima*

A. falcata Plates 75, 76, Text-Fig. 137
 (Lat., curved like a sickle)

Albizzia
 Batai

A vast tree with greyish-white, smooth massive trunk: main roots often spreading superficially: twigs and bases of leaf-stalks with many small whitish lenticels: buds and young shoots finely brownish chaffy.

Leaves with stalks 6-12" long, 8-12 pairs of side-stalks: leaflets $\frac{1}{2} \times \frac{1}{4}$ ", 15-18 pairs on the upper side-stalks, small, slightly curved, oblong, asymmetric, the midrib near the upper margin, the base very unequal, sessile: with an oblong, cushion-like yellowish-green gland shortly above the base of the leaf-stalk, a smaller gland just below the first pair of side-stalks and the last 2-4 pairs; a small gland between the last few pairs of leaflets.

Flowers small, cream-white, faintly fragrant, sessile on the branches of axillary panicles 5-9" long, singly, not in heads: stamens 6-8" long, white.

Pods 4-5 $\frac{1}{2}$ x $\frac{3}{8}$ " wide, thinly woody, pale brownish, with numerous seeds showing on the outside of the pod as faint transverse swellings: the seeds remaining attached to the split pods.

E. Malaysia: cultivated throughout Malaysia: planted and sporadically wild in Malaya.

The crown of this tree is so characteristic that it can be recognized from a great distance. In saplings the main stem grows vigorously, outstripping the branches, so that the crown is conical and open. As the tree reaches its full height, which depends on the nature of the soil and the abundance of water for

LEGUMINOSÆ (MIMOSACEÆ)

the roots, the growth of the leader slackens and the branches begin to catch up with it. The tree is light-loving, like the Flame of the Forest and the Rain-Tree, and therefore the branches develop mostly to the outside: they first spread horizontally, then begin to sag at the ends and finally the individual sprays of each branch meet together. The crown thus passes from the straggling conical shape and becomes flat-topped with several flat branch-sprays beneath and finally it becomes an even, gigantic umbrella, supported by a few almost equally large limbs (Text-Fig. 12). The leaves are arranged over the surface of this umbrella and, viewed from beneath, they appear as a marvellous lacework against the sky. At dusk the leaf-stalk droops and the leaflets close together to separate again next morning, like those of the Rain-Tree: but the Albizzia rises, perhaps, a little earlier.

This Albizzia is one of the quickest growing trees in the world. In good soil with plentiful rain, saplings reach 50 feet in height after three years, 70 feet in four years and 100 feet in 9-10 years, after which the crown begins to spread and the greatest height is probably not more than 150 feet. In consequence of this exceedingly rapid growth the wood is soft; and this inherent weakness of the trunk and limbs together with the shallow, though extensive, root-system and the vast expanse of crown renders full-grown trees very apt to be blown down or damaged by the wind. On this account, it is not used as a roadside tree and if it is planted to screen buildings it should be in company with stronger trees which will supplant it in a few years.

The soft wood is used for matches and is suitable for paper when mixed with other stronger kinds. The tree is extensively planted as a shade for coffee, tea and other crops, especially in Java.

In Singapore, the Albizzias flower between March and June and from October to December. Each tree is in flower for only one or two weeks, during which its leafy-sprays are whitened with blossom; but unless one can look down on them the flowers may not be seen, for they are turned to the upperside of the twigs.

Albizzia-saplings are easily mistaken for those of the Flame of the Forest and for those of the Parkias. One often wishes to know how to distinguish the worthless Albizzias. The Flame of the Forest has leafy, pinnate stipules. The Parkias have many more pairs of leaflets on the side-stalks (20-80 pairs) and their bark soon becomes pinkish brown. The leaflets, also, are differently shaped in the three genera, but this distinction is not so easy to describe or to recall (Text-Fig. 137).

Until recently, *A. falcata* has usually been called *A. moluccana*.

A. lebbek Plate 77

Siris Tree, Lebbek

(an Arabian plant name)

A tall tree up to 100 ft. high with rather umbrella-shaped crown: bark grey: not or scarcely buttressed.

Leaves with stalks 2-9" long, with 1-5 pairs of side-stalks: leaflets 1-2 × ½-1" 4-8 pairs, rather large, oblong, blunt, asymmetrical, with the midrib nearest the upper margin, the base very unequal, almost sessile, rather glaucous beneath: glands as in *A. falcata*.

Flowers greenish white becoming pale yellow, in tassel-like heads, 2-3" wide: each head on its own stalk, 2-4" long, the stalks arising singly or in groups of 2-4 from the leaf-axils, not in panicles: corolla ½" long, pale green: stamens white turning pale yellow, the anthers green.

Pods 4-12 × 1-2", pale straw-colour, large, very flat, thin, papery, marked with round lumps by the seeds (4-12): seeds ½" long.

N. Africa, Indo-Malaysia (monsoon-districts) to N. Australia: wild in Kedah and Perlis, occasionally planted in other parts of Malaya.

This tree is not well-suited to the general climate of Malaya but it is wild and luxuriant in the forests and bamboo-country in Perlis and the north of Kedah. Elsewhere it is sporadically planted as at Tanjong Kling in Malacca, by the Swimming Club, and there are a few trees scattered in Singapore town. It is undoubtedly a tree to be recommended for planting in sandy ground near the sea. In habit, flower-clusters and leaves it looks remarkably like the Rain-Tree (*Enterolobium*), but the crown is much less regularly umbrella-shaped, inclined to be bunched and uneven, though shady enough, and the branches are often twisted and awkward: but the colour of the flowers, which appear white from a distance, and the flat, papery, rattling pods are quite distinct. The timber is useful, when large enough.

A. odoratissima Text-Fig. 137
(from the fragrant wood)

Ceylon Rosewood

A tall tree like *A. falcata* but:—

Leaves with 2-9 pairs of side-stalks: leaflets $\frac{3}{4}$ -1 $\frac{1}{2}$ × $\frac{1}{4}$ - $\frac{1}{2}$ " dark green, distinctly curved, the midrib eccentric and close to the upper margin of the blade: a tiny green cup-shaped gland just above the base of the leaf-stalk, another below the last pair of side-stalks, and a tiny one below the last 1-2 pairs of leaflets.

Flowers small, yellowish white, fragrant, sessile, in numerous, few-flowered, stalked heads arranged in panicles 5-12" long.

Pods 7-9 × 1-1 $\frac{1}{2}$ ", thin as in *A. lebbek*, warm brown, marked with round seeds.
Ceylon, India, Siam: occasionally planted in Malaya.

This tree has strong dark heartwood, fragrant of rose-water. Its growth is slow but it makes an excellent park or roadside tree.

A. pedicellata Text-Fig. 127, 137
(from the stalked flowers)

Forest Albizzia

Petai Kerayong (Johore), *Sungga* (Malacca)

A tall, monodial tree up to 100 ft. high, like *A. falcata* but:

Crown rather narrow and conical: bark brownish grey, rather dark.

Leaflets only slightly asymmetric with the midrib central, but the base of the blade slightly asymmetric: stipules persisting as small recurved hooks on either side of the leaf-base.

Flowers stalked, in small stalked heads clustered in the upper half of long-stalked panicles 12-16" long, greenish white with green stamens.

Pods 12-18 × 2 $\frac{1}{2}$ -2 $\frac{3}{4}$ ", exactly as in *A. lebbek* but larger, pale straw-colour, not splitting open, with smaller seeds $\frac{1}{4}$ " long, the unripe pods dangling like broad green ribbons.

Malaya: frequent throughout the country in lowland forest.

Very little is known about this tree which appears to occur only in the Malay Peninsula. It is said to have hard, dark heartwood, and it is probable that it would make an excellent roadside-tree. At first sight, its feathery crown and large pods suggest the *Petai* (*Parkia*), but the conical shape (derived from the monopodial stem) and the loosely clustered pods distinguish it.

A. retusa
(Lat., blunt)

Sea Albizzia

A small tree up to 50 ft. high, like *A. lebbek* but:—

Leaflets with the midrib more or less along the centre of the blade.

Flowers in small, few-flowered, stalked heads arranged in panicles 3-6" long, white with pink stamens.

Pods 6-7 × 1", as in *A. falcata*, marked transversely by the seeds.

Nicobar Islands to the Philippines: a seashore tree of the North and East Coasts of Malaya, apparently rare.

LEGUMINOSÆ (MIMOSACEÆ)

This must look like the Rain-Tree but with different inflorescences and pods. We have not seen it but include it in our book because it seems worth discovering and bringing into cultivation.

ENTEROLOBIUM

(Gr., enteron-intestines, lobos-lobe or pod)

Leaves twice pinnate, with rather large opposite leaflets: no terminal leaflet.

Flowers in pink, tassel-like heads on long stalks: petals 5, joined in a tube: stamens many, joined in their lower parts in one bundle.

Pod long, straight or slightly curved, thick, leathery-fleshy, thickened along the edges, *not opening*, with a hard inner layer surrounding the seeds: seeds many, separated by partitions.

6 spp. tropical America: 1 sp. introduced to Malaya.

E. saman Plates 95, 96
(South American plant-name)

Rain-Tree
Pukul Lima

A lofty deciduous tree, up to 80 ft. high, with rather short, not or scarcely buttressed trunk and *wide-spread umbrella-shaped crown*: bark pale greyish or brownish, smooth, *becoming, shallowly fissured with wide, flat, slightly scaly intervals*: all parts softly downy hairy.

Leaves 8-12" long, with 3-6 pairs of side-stalks: leaflets rather large in 6-8 pairs on the end side-stalks, 3-4 pairs on the basal side-stalks, gradually increasing in size to the end of the side-stalks, the largest pairs on a leaf measuring $1\frac{1}{2}$ - $2\frac{1}{4}$ × $\frac{3}{4}$ - $1\frac{1}{4}$ ", *oblong, asymmetrical, almost rhombic* with a slight point at the tip: *leaf-stalk* with a small green cup-shaped gland on the upper side between all the side-stalks except, generally, the 2nd and 3rd pairs: side-stalk with a smaller, similar gland between all the pairs of leaflets: stipules small, falling off.

Flower-heads 2-3" wide, upturned, in clusters of 2-5, mostly 5, from the upper leaf-axils, on stalks 3" long *flowers 1½" long overall*; corolla $\frac{1}{2}$ " long, *pink* with 4-5 pale yellow lobes: *stamens pink*, white towards the base: *the central flower of each head larger than the others, and fruiting*.

Pods 6-10 × $\frac{3}{8}$ ", *thick, flattened, faintly ribbed transversely, ripening black*; seeds .6" long, brown, set in brownish pulp.

The Rain-Tree was introduced to Malaya before 1876 and has now become one of the commonest road-side trees. It grows quickly and soon develops a large, shady crown, the branches of which stretch right across the road. The largest trees in Malaya occur in Kuala Lumpur and Taiping where there are more magnificent avenues of this species than in other towns.

In most parts of the country the Rain-Tree is deciduous after the dry weather at the beginning of the year. The new leaves develop shortly after the crown has become bare and the flowers appear towards the ends of the new shoots. In the south of the Peninsula, when the dry spell is often much less marked, the trees are generally partly deciduous, developing new leaves before the old are shed, or they are deciduous by a few branches at a time.

In shape the Rain-Tree resembles the Yellow Flame (*Peltophorum*) and the Flame of the Forest (*Delonix*) but it is easily distinguished by the fissured trunk, the large and relatively few leaflets, the small pink tassels of flowers, the fruit and the habit of folding the leaflets at night. The leaflets begin to close about 1½ hrs. before sunset and do not open till the same time after sunrise: they may also close during the day when the sky is overcast. Another peculiarity of the Rain-Tree, by which it may often be recognized, is the abundance of epiphytic orchids and ferns which it supports. It seems that the shallowly grooved bark is particularly suitable for the roots of epiphytes, and the folding of the leaflets at night may permit the dew to settle on the branches

and thus allow a continual supply of moisture even in dry weather. On the front at Johore Bahru, the branches of the trees are hidden with epiphytes.

The flesh of the pods is said to be sweet and edible.

LEUCÆNA

(Gr., leukainein—to whiten)

Like Albizzia but:—

Flower heads singly on stalks, rather large: one or two flower heads from a leaf-axil: stamens 10, free (not joined in a tube).

Pods with thickened edges.

9 spp. tropical America, one in the Pacific Isles: 1 sp. introduced to Malaya.

L. glauca Plate 103

*Petai Jawa, Petai Belanda
Petai Tiga Bulan*

A bush or small evergreen tree to 30 ft., with delicate light green feathery crown, *flowering and fruiting throughout the year: all parts rather fatid, of onions, when crushed or broken: bark light grey, slightly fissured.*

Leaf-stalk 4-7" long with 4-8 pairs of side-stalks, finely downy: leaflets .5-.7 × .15", 10-17 pairs, oblong liner, distinctly unequal-sided, sessile, *pale greenish white or glaucous beneath: the leaf-stalk generally with a large pale green gland below the first pair of side-stalks, and a small gland between the last pair of leaflets on the side-stalks.*

Flower-heads 1½" wide, *cream white, fragrant*, stalks 1½-2" long: petals pale green; stamens cream-white.

Pods 5-7 × ½-¾", *flat, straight, strap-shaped, green and almost transparent against the light when young, becoming dirty brownish and rattling*, splitting along the edges, *in bunches from each flower-head: seeds numerous, small, flattened, brown, set transversely.*

Wide-spread throughout the tropics, probably native in America.

This little tree is abundant throughout Malaya in villages and waste-places, especially in the northern parts. It is of quick growth and, were it not for its unsightly bunches of old pods, of which a few are always disfiguring the crown, it would make a handsome small tree for gardens and roadsides. It could be described as *Albizzia falcata* in miniature. The young pods are eaten as a vegetable by Malays and the raw seeds are said to be tasty. The Malay names refer to its resemblance with the *Petai* (*Parkia speciosa*) and "Tiga Bulan" indicates that its pods ripen in half the time that those of the *Petai* take. To horses, the foliage is peculiarly poisonous: it causes the loss of the mane and tail and ultimately, if persistently eaten, the loss of the hooves. *L. glauca*, *L. glabrata* and *L. pulverulenta*, with hybrids between them, are grown widely in Indonesia as shade-trees for coffee.

MIMOSA

(Gr., mimos—an imitator)

Like Albizzia but:—

No glands on the leaves.

Stamens 4-10, free (not joined in a tube).

Pods small, *made up of several 1-seeded joints separating at maturity, not splitting open.*

300 spp., mostly in trop. America, a few in Asia and Africa: none native in Malaya.

Three American species of Mimosa have been introduced to Malaya and all have prickly stems. One is the Sensitive plant (*M. pudica*); another is a very thorny scrambling shrub (*M. invisa*) also with pink flowers: and the third is the white flowered giant Mimosa, *M. sepiara*, the leaves of which are not sensitive.

M. sepiaria Plate 105, Text-Fig. 126
(Lat., sepes—a hedge)

Giant Mimosa

A very thorny, evergreen shrub or small bushy tree to 30 ft., flowering throughout the year, old plants developing a massive short trunk: branches straggling and often leaning on other trees: twigs and branches set with strong flattened spines $\frac{1}{2}$ – $\frac{3}{4}$ " long, like brambles: twigs, spines and leaf-stalks reddish on the exposed sides.

Leaf-stalks 2–4" long with 6–8 pairs of side-stalks: leaflets 2–3 × .05", 18–26 pairs on the terminal side-stalks narrowly oblong, dark shiny green, sessile.

Flower-heads round, white, $\frac{3}{4}$ " wide, their stalks $\frac{1}{2}$ – $\frac{3}{4}$ " long, arranged in panicles up to 12" long, leafy in the lower part and arising in pairs from the leaf-axils: petals pale yellow: flowers smelling of smoked rubber.

Pods $1\frac{1}{2}$ –2 × 1", flat, made up of 6–8 joints, green then blackish, when ripe breaking up into the square joints and these falling out from the persistent hoop-like rim of the pod.

Common in villages and waste-places: native of tropical America.

PARKIA

(Mungo Park, 1771–1806, the Scottish explorer)

Leaves twice pinnate with many pairs of opposite side-stalks and very numerous crowded pairs of small narrow opposite sessile leaflets: a large yellowish green gland (or two) on the leaf-stalk above the base, a small gland below the end-pair of side-stalks and a minute gland between the last 1–2 pairs of leaflets: stipules small, simple, soon falling off.

Flowers small, cream-white, densely crowded in large knob-like heads on long hanging stalks: stamens 10.

Pods large, leathery, green becoming blackish, finally splitting open, dangling in clusters on long stalks from the ends of the branches: seeds numerous, large.

About 50 spp. throughout the tropics: 3 spp. in Malaya.

This genus includes the well-known *Petai* and two lesser known species of our forests. They are moderately tall trees with large feathery leaves and, if unpruned, they develop the magnificent lofty umbrella-habit of the *Albizzia* (*A. falcata*), which they very much resemble except in their peculiar clusters of flower-heads, like so many gong-sticks, and in their dangling pods. The pinkish or reddish brown bark and the prominent buttresses will also distinguish them from the *Albizzias*.

We know very little about the wild trees. Patient observation and careful enquiry from Malays will elicit much information. It has been reported, for instance, that the flowers are pollinated by small nocturnal fruit-bats which visit the inflorescences for the copious watery honey which they produce: and bat-flowers commonly smell of sour milk.

The species are very similar in general aspect and are distinguished mainly by the shape and size of the leaflets. It seems that all of them may have either straight or spirally twisted pods: certainly both kinds occur in the compass of *P. speciosa*.

Compare *Albizzia pedicellata* with conical crown and pods in loose clusters.

Key to the Species

Leaflets 2–3" wide	...	...	...	<i>P. biglandulosa</i>
Leaflets 1" wide or less				
Leaflets 20–35 pairs on each side-stalk, straight, rather blunt	...	...	...	<i>P. speciosa</i>
Leaflets 40–80 pairs on each side-stalk, curved, pointed	...	...	...	<i>P. javanica</i>

P. biglandulosa

(Lat., with two glands)

Nering, Nenering,
Neri, Neneri

Like *P. speciosa* but the leaflets much larger, $\frac{1}{2}$ -1 × 2-3", (blunt, slightly curved), the leaf-stalks often with a pair of glands placed side by side on the upper surface a short distance from the base.

Pods straight (? always).

This is a common tree in Upper Perak and it probably occurs in neighbouring States but little is known of it. The pods are not edible but Malays say that elephant and deer eat the seeds and that men can eat the sprouted seedlings in the manner of *taugeh*.

P. javanica Text-Fig. 137

Kedawong, Kerayong

Like *P. speciosa* but:—

Crown more upright, less spreading, with darker green, more profuse foliage.

Leaves larger with more parts: *leaf-stalk* 10-24" long; *side-stalks* 20-30 pairs: *leaflets* 40-80 pairs, narrowed to the pointed tip and distinctly curved forward, the *midrib* nearer the upper than the lower margin, the basal lobe blunt.

N.E. India to Java: occasional in villages and gardens, and in the forest.

In Singapore the *Kerayong* changes its leaves at a different season from the *Petai*. It flowers about October when the leaves are being shed, which is most unusual for a leguminous tree; it becomes bare about February, when the fruits ripen, and, after a fortnight, the new leaves develop. The fruits are seldom eaten, but the seeds and bark have varied uses in native medicine, as described by BURKILL, which those of the *Petai* do not fulfil. It is interesting to find such marked physiological differences between such closely related species.

The finest specimen which we have seen is that before the Bell-View Hotel at Keppel Harbour in Singapore.

P. speciosa Plates 106, 107, Text-Fig. 137

(Lat. handsome)

Petai

Nyiring (Kemaman)

A more or less umbrella-shaped tree, up to 150 ft. high, becoming rather steeply or sharply buttressed: *bark* pinkish or reddish brown, smooth or rather flaky: *twigs* reddish brown.

Leaves with stalks 6-12" long. 10-19 pairs of side-stalks swollen at their junction with the main stalk, finely hairy: *leaflets* 2-4 × .05-1", straight, scarcely narrowed to the blunt end, the *midrib* central, the base asymmetric, the basal lobe toothed.

Flowers 4" long, cream-white, smelling of milk like *Durian*-flowers, very closely set in bomb-shaped heads 2-3½" long, the heads hanging on stout green stalks 9-20" long: each flower in the axil of a tiny, silky, cream-coloured bract: the flowers opening from base to apex of the head and soon falling off, only a few end flowers setting fruit.

Pods 18-20" long (including the stalks 2-5" long), 2-2½" wide, straight or twisted, hanging in small bunches from the inflorescence-heads.

Malaysia: frequent in villages, wild in the lowland forest, abundant locally.

The chief product of the *Petai* is the fruit which is eaten with relish by Malays: the pods taste of garlic and have a strong odour which pervades the body of the eater. At the fruiting season, the bunches of coarse pods, gathered from the forest and orchard by skilful climbers, are displayed in the markets. The immature seeds, the young leaves and the fleshy part of the flower-stalk may be eaten raw and the half ripe pods are sometimes pickled in salt.

The *Petai* is one of our handsomest native trees but its growth is rather slow and, in poor dry soil, the crown is meagre. The trees are evergreen and in the south of the country they flower about May and June. The inflorescences and dangling pods are remarkable: why the pods develop only from the last few flowers which open on a head is not understood.

PITHECELLOBIUM

(Gr., pithekos—an ape, lobos—a pod)

Often with a row of several buds in each leaf-axil.

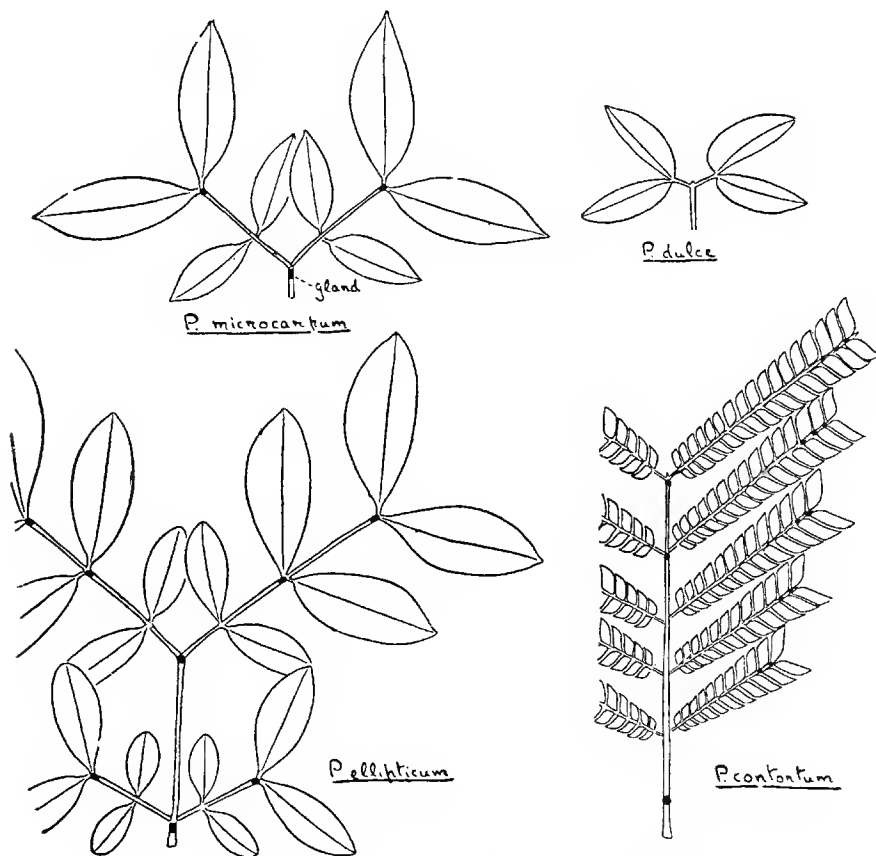
Leaves twice pinnate, without terminal leaflets: *leaflets opposite*: with glands on the stalks.

Flowers small, cream-white, in small heads arranged in panicles: stamens many, joined at the base into a tube.

Pods typically coiled, often lobed and with wavy edges in the seed-bearing part, generally thinly leathery: *seeds black* or brown, often hanging out on strings.

About 60 spp., throughout the tropics, mostly in Asia and America: 10 spp., in Malaya, 2 introduced.

This genus includes several very common, though rather insignificant or unattractive, Malayan trees. Most of them are small and they appear to be ever-green and to flower seasonally, although there are no exact observations on them. They fall roughly into three classes.



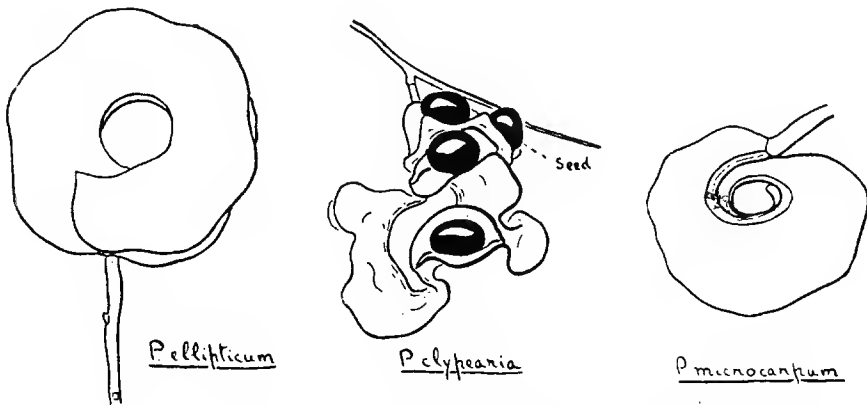
Text-Fig. 138. Leaves of *Pithecellobium*, $\times \frac{1}{2}$: the glands blackened.

The most distinct class is that of the Grasshopper Trees or *Petai Belalang*, including *P. angulatum*, *P. clypearia* and *P. contortum*. All three are abundant in secondary jungle. They are small and often shrubby and their leaves have numerous side-stalks with many rhombic-shaped leaflets, so evenly graded in size from base to apex of the leaf and packed so regularly that they might have been cut out with a die. This leaf-pattern distinguishes them from all other sorts of Malayan tree.

The second group includes medium to rather large trees with large leaves, having only one or two pairs of side-stalks and few large leaflets, and with characteristic pods. All of these have distinctive Malay names—*Kungkur* (*P. splendens*), *Jiring* (*P. jiringa*), *Saga Gajah* (*P. ellipticum*).

The third group includes small trees with one or two pairs of side-stalks to the leaves, 3-4 pairs of rather small leaflets and small coiled pods. They are generally known as *Kerēdas*, e.g. *P. affine*, *P. Kunstleri*, and *P. microcarpum*, of which only the last is common. *P. bubalinum* is a rather rare, small tree like *P. microcarpum* and is also called *Kerēdas*, but its pods are almost straight.

Besides these native species there is in cultivation the Madras Thorn (*P. dulce*) of a very different habit.



Text-Fig. 139. Pods of *Pithecellobium*, nat. size.

The species with red pods are sometimes called *Saga*, c.f. *Adenanthera*.

The pods of *P. confertum* do not open. Those of the Grasshopper Trees open only in the parts containing the seeds. In other species they split along their whole length.

The young leaves of several species, particularly of the *Jiring* (*P. jiringa*) and the *Kerēdas* (*P. microcarpum*), are intensely violet or purple and develop in limp tassels.

LEGUMINOSÆ (MIMOSACEÆ)

Key to the Species

- Leaves with more than 2 pairs of side-stalks: leaflets more or less rhombic, often small
- Twigs round or scarcely angled: leaflets 12-20 pairs on the longer side-stalks *P. contortum*
- Twigs strongly angled
- Leaflets 8-14 pairs on the longer side-stalks: glands stalked or bucket-shaped *P. clypearia*
- Leaflets 4-8 pairs: glands sessile *P. angulatum*
- Leaves with 1-2 pairs of side-stalks
- Leaves with 1 pair of side-stalks: leaflets 1-3 pairs on each side-stalk
- Twigs spiny: leaves very small: cultivated *P. dulce*
- Not so
- Pods coiled
- Pods massive, purple-brown: leaflets 2-3 pairs on a side stalk, over 5" long *P. jiringa*
- Pods small, red: leaflets 2-4 pairs on a side-stalk, less than 5" long *P. microcarpum*
- Pods straight: leaflets 1-2 pairs on a side-stalk, large
- Pods 8-12" long: bark rough: inflorescences 2" long *P. splendens*
- Pods 1½-4" long: inflorescences 4-8" long *P. bubalinum*
- Leaves with 2 pairs of side-stalks, at least on the flowerless branches: leaflets 3-4 pairs on a side-stalk
- Leaflets large, 5-9" long *P. ellipticum*
- Leaflets smaller
- Lower leaflets scarcely asymmetric: corolla .15" long *P. microcarpum*
- Lower leaflets distinctly asymmetric and rhombic
- Corolla .3" long *P. affine*
- Corolla .5" long *P. Kunstleri*

P. affine

Keredas

A small tree up to 25 ft. high.
Leaves with stalks 4-6" long, 1-2 pairs of side-stalks, *finely hairy*: leaflets 3-7 × 1½-3½", 3-4 pairs on the end side-stalks, 1-2 pairs on the basal side-stalks, *the lower leaflets more or less rhombic*: a large gland shortly above the base of the leaf-stalk and between the side-stalks, a small gland between the pairs of leaflets.
Flowers in dense heads in terminal panicles, 10-15" long: corolla .3" long.
 Pods 1½" wide, coiled, thinly leathery.
 Burma to Singapore and Borneo: apparently rare in Malaya.

P. angulatum

Grasshopper Tree
Petai Belalang

(from the angled twigs)

A small tree up to 50 ft. high, generally much less, *with angular ridged twigs* and angular lines on the branches: bark greyish brown to pinkish brown, smooth or slightly scaly with small pieces.

Leaves with angular stalks 3-12" long, 2-5 pairs of side-stalks, finely hairy: leaflets 4-10 pairs, the end leaflets of the longer side-stalks 2-6" × ¾-2", more or less

distinctly rhombic and asymmetric, with rather long tips, *the lower leaflets on each side-stalk much smaller than the end ones*: a large cup-shaped brownish gland towards the base of the leaf-stalk, small sessile brownish glands just below each pair or side-stalks and between the last few pairs of leaflets.

Panicles up to 20" long: flowers small, stalked: corolla .2" long.

Pods $\frac{1}{2}$ " wide, *loosely coiled*, lobed, 6-8" long, *orange and red*.

India to the Philippine Islands: common in secondary jungle.

P. bubalinum

Keredas

(Lat., bubalos—a buffalo)

A small tree up to 50 ft: young leaves russet-colour.

Leaves with stalks $\frac{1}{2}$ -2" long, 1 pair of side-stalks, glabrous: *leaflets* $3-7\frac{1}{2} \times 1\frac{1}{2}-3$ ", 1-2 pairs on each side-stalk, symmetric, as in the *Jiring*: a gland just below the pair of side-stalks and between the end pair of leaflets.

Inflorescences terminal and axillary, up to 8" long: flowers small: corolla .15" long.

Pods $1\frac{1}{2}-4 \times 1$ ", *straight or slightly curved*, not coiled, dull red.

Sumatra, Malaya: in secondary jungle, not common.

This little tree closely resembles *P. microcarpum* but differs in the fewer, larger leaflets, the single pair of side-stalks to each leaf and the almost straight pods. It appears to have rough bark like the *Kungkor* (*P. splendens*) and, if so, it should be readily distinguishable in the forest from both *P. microcarpum* and the *Jiring*.

P. clypearia Plate 109, Text-Fig. 139

Greater Grasshopper Tree.

(Lat., clypeus—a shield)

Petai Belalang, Chahar

Very like *P. angulatum* but:—

Leaf with 4-9 pairs of side-stalks, the main stalk 6-20" long: *leaflets* 8-14 pairs on the longer side-stalks, 3-5 pairs on the shorter, the end leaflets not so large, $1-3 \times \frac{1}{2}-1\frac{1}{2}$, very regularly rhombic and asymmetric, gradually decreasing in size from apex to base of the leaf but *the end leaflet not markedly larger than the basal*, more or less glaucous beneath: *glands* between the side-stalks and the leaflets shortly stalked or bucket-shaped.

India to the Philippine IIs.: very common in secondary jungle and open country.

P. contortum Text-Fig. 138

Lesser Grasshopper Tree

(Lat., twisted)

Petai Belalang

A small tree like *P. angulatum* but the *twigs rounded*, light brown, not at all angled: leaves and twigs hairy.

Leaves with stalks $2\frac{1}{2}-8$ " long, 3-8 (-10) pairs of side-stalks: *leaflets* 12-20 pairs on the longer side-stalks, the end leaflets $\frac{1}{2}-1\frac{1}{2} \times .15-6$ ", asymmetric, rhombic-oblong, narrow, with very unequal base, *mostly blunt*: a small green sessile, cup-shaped gland just above the base of the leaf-stalk, one between each of the last two pairs of side-stalks and the last few pairs of leaflets on the side-stalks.

Flowers sessile: corolla .15" long: *only 2-3 flowers in a head, or with the heads barely defined*.

Pods 6-8" long, .6" wide, *coiled*, dark green then *light brown velvety, red inside*.

Malaya: common in secondary jungle, especially near the sea.

This species is easily distinguished from the other Grasshopper Trees by the rounded twigs and very numerous, small and narrowly oblong leaflets. There is a form with the leaflets almost as narrow as those of the *Petai* (*Parkia speciosa*).

P. dulce Plates 110, 111, Text-Fig. 138

Madras Thorn.

(Lat., sweet)

A small to medium-sized tree up to 40 ft. high, *with dull green, bushy crown of tiny leaves and many twigs*, the ends of the twigs drooping, *generally with a few, slender, whip-like branches straggling well beyond the rest of the crown: twigs thorny* from the pairs of spine-like stipules: *young leaves pinkish brown*.

LEGUMINOSÆ (MIMOSACEÆ)

Leaves with the stalk 1" long, 1 pair of side-stalks, $\frac{1}{4}$ " long: leaflets $\frac{1}{2}$ -2 \times $\frac{1}{4}$ - $\frac{3}{4}$ ", one pair to each side-stalk (4 to a leaf), asymmetric, somewhat rhombic, rather leathery, pale beneath: stipules $\frac{1}{4}$ - $\frac{1}{2}$ " long.

Flowers $\frac{1}{2}$ " long, greenish white, in heads of 7-16 flowers, arranged in straggling, erect, terminal panicles up to 15" long: stamens white: style red.

Pods $\frac{1}{2}$ " thick, constricted between the seeds, becoming more and more coiled during development, eventually in a tight coil 2" wide with $1\frac{1}{2}$ turns, pale greenish more or less suffused rose-red: seeds 5-9, shiny black, 1" long, covered by thick white pulp and hanging from the pod on rose-red strings $\frac{1}{4}$ " long (the stalks of the ovules).

Trop. America: cultivated throughout the tropics.

The Madras Thorn is a common tree of gardens and roadsides, near habitation, in Malaya. Excepting the Wood-Apple (*Feronia*), it is so unlike any other tree in the country in general appearance that it can always be recognised from a distance. The small-leaved crown with remarkable foliage and the thorny, switch-like branches with straggling ends are characteristic. But, in the north of the country where the Wood-Apple grows, one may well hesitate to distinguish between them without seeing the fruit or examining the leaves.

The Madras Thorn makes an excellent hedge, either of large trees like that round the Polo Ground in Singapore, or as a clipped bush. Its tendency to develop leaves on dwarf-shoots lends itself to topiary.

The pulp round the seed is edible, as birds and children know.

P. ellipticum Text-Figs. 138, 139 *Saga Gajah, Jiring Tupai, Kenoah*

A tree up to 60 ft. high, like the *Jiring* (*P. jiringa*): bark silvery grey with brown swollen lenticels in transverse rows and often joined together: (young leaves pale green?).

Leaves with stalks 2-10" long, 2 pairs of side-stalks, the lower pair small and often wanting, glabrous: leaflets 5-13 \times 2-5 $\frac{1}{2}$ ", 2-4 pairs on each upper side-stalk, 1-2 pairs on the lower, large, oblong elliptic: a gland just above the base of the leaf-stalk and between the end pair of side-stalks, a small gland between each of the last 2 pairs of leaflets on the upper side-stalks and the last pair on the lower side-stalks.

Flower-heads of 2-5 flowers, very small, in elongate terminal and axillary panicles 12-20" long: corolla $\cdot 15$ " long.

Pods 1-1 $\frac{1}{2}$ " wide, becoming tightly twisted in a coil 3-3 $\frac{1}{2}$ " wide, rather thin, leathery, dull-red: seeds $\frac{3}{4}$ " long, black with a bloom, thinly pulpy, hanging out on strings.

W. Malaysia: common throughout the country, in the forest and in open country, often by the sea on rocky headlands.

This tree is nearly always full of red-ants' nests.

P. jiringa Plate 112 (from the Malay name)

Jiring

A medium-sized tree, occasionally up to 80 ft. high, with large rounded crown: bark light pinkish brown, smooth: young leaves rich purple, hanging limply.

Leaves with a stalk $\frac{1}{2}$ -3" long one pair of side-stalks, glabrous: leaflets 2 $\frac{1}{2}$ -11 \times 1 $\frac{1}{4}$ -4", 2-3 pairs on each side-stalk (4 in saplings), large, oblong-elliptic: a dull green or yellowish gland on the lower part of the leaf-stalk ($\frac{1}{4}$ - $\frac{1}{2}$ " from the base), very conspicuous in the young purple leaves, and a smaller gland between each of the last 1-2 pairs of leaflets.

Flowers greenish white to cream-white, in small heads of 3-6 flowers, arranged in panicles 4-9" long in the older leaf-axils or on the twigs behind the leaves: flower-heads $\frac{3}{4}$ " wide, very fluffy from the stamens ($\frac{1}{4}$ " long): corolla $\cdot 15$ " long.

Pods very massive, 2" wide, strongly lobed, leathery, dull drab purplish brown, coiled in 2 circles in opposite directions (reversed in the middle of the pod), constricted between the large seeds, eventually splitting open and falling to bits: seeds large, reddish brown, stinking of garlic.

W. Malaysia: very common in Malaya, in secondary jungle and in villages.

This common tree is easily recognized from the large leaflets and the massive, purple-brown, coiled pods: the fluffy flowers are also striking. The foetid seeds, like those of the *Petai* (*Parkia speciosa*) though stronger, are eaten

by Malays but, in large quantity, they are poisonous. The seeds are carried by squirrels and monkeys; and, when one has learnt to identify the purple young leaves, the saplings may often be discovered in hedges, even of the best kept gardens. As described by BURKILL, the dyers of Pekan obtain a purple dye, for silk, from the pods. The tree is variously used in native medicine.

P. Kunstleri

Keredas

(H. H. Kunstler, the German plant-collector at Calcutta, ca. 1880)

A small tree up to 30 ft. high.

Leaves with stalks 1-3" long, 1-2 pairs of side-stalks, finely hairy: leaflets 2-5 × ½-2", 3-4 pairs on each of the longer side-stalks, 1 pair on the shorter, *distinctly asymmetric with oblique bases*: a gland shortly below each pair of side-stalks and each pair of leaflets.

Flowers rather large, the corolla ½" long, in rather large heads of 4-8 flowers, arranged in finely hairy terminal panicles 6-12" long.

Pods ½-¾" broad, *tightly coiled*, thinly leathery.

Sumatra, Malaya, Borneo: common in low-lying swampy forest.

P. microcarpum Text-Figs. 138, 139

Red Pepper Tree

(Gr., mikros—small, karpus—fruit)

Keredas

A small tree, occasionally up to 60 ft. high: bark pale pinkish brown, smooth or thinly scaly in small pieces: twigs rich brown, finely hairy, the branches pale: young leaves intensely purple in limp tassels.

Leaves with stalks ½-3" long, 2 pairs of side-stalks on the leafy shoots, only 1 pair on the flowering shoots, finely hairy becoming glabrous: leaflets 2-5 × ½-2", 2-4 pairs on the longer side-stalks, scarcely asymmetric, with rather long tips, rather whitish beneath, often with wavy edges: a gland shortly below the pairs of side-stalks and between the last pair of leaflets.

Flowers cream-white, 3-7 together in heads set in terminal or axillary panicles up to 8" long: corolla ½-1" long.

Pods ½" wide, rather loosely coiled, waxy orange-scarlet.

Sumatra, Malaya, Borneo: common in secondary jungle, occasional in high forest.

This pretty little tree is most striking when beset with fruit, the vivid colour of which contrasts with the dark green foliage. "The strong-smelling pods may be put into chutnies; and the Jakuns and others are said to eat them with food as a seasoning" (BURKILL).

An unidentified species, very like this one, is common at Fraser's Hill. It has rather leathery leaflets, distinctly glaucous beneath, and larger pods forming rings about 2" across.

P. splendens

Kungkur

A rather tall tree up to 70 ft. high, occasionally 100 ft., without buttresses: bark yellowish buff to silvery or greyish brown, becoming rough with deep grey-brown rugged fissures, rather scaly on the intervening ridges.

Leaves with short stalks ½-1" long, one pair of side-stalks, glabrous: leaflets 3-6 × 1½-3", 1-2 pairs on each side-stalk, large with very wavy edges, light green: a large saucer-shaped gland on the leaf-stalk just below the side-stalks and sometimes a large gland between the bases of the end leaflets (occasionally between the other pair also).

Flower-heads ¾" wide, composed of 5-10 flowers, in small hairy panicles 2" long, terminal and axillary: corolla ½-5/8" long: calyx as a tiny cup with minute teeth.

Pods 8-12 × 1½-2", slightly twisted, massive, apparently not opening.

Sumatra, Malaya: chiefly near the sea, in high forest and secondary jungle, not common.

This species is described and illustrated by FOXWORTHY as *P. confertum* (7. p. 52). The timber is suitable for fine furniture. The pods are rather exceptional in the genus. The curious bark enables one easily to recognise the tree in the forest.

STRYCHNINE FAMILY

Loganiaceæ

(the genus *Logania*—J. Logan, 1674–1751, a Governor of Pennsylvania)

Leaves opposite, simple: often with a short or long sheath surrounding the twig just above the attachment of the leaves, but without stipules.

Flower regular: sepals 5, small: *corolla funnel-shaped* with 4–5 lobes (petals): *stamens* as many as the corolla-lobes, attached to the corolla-tube, filaments long: *ovary superior* with 2 cavities and one style.

Fruit a berry or a capsule.

30 genera, 400 spp., tropics and subtropics: 7 genera, 55 spp. in Malaya.

The Strychnine-plant (*Strychnos nux-vomica*) is a small tree native to India, Ceylon and Indo-China. Many wild species of its genus occur in Malaya but they are forest climbers bearing hooked tendrils like the climbing *Bauhinias*. Several of them contain strychnine in various parts of the plant. An account of their poison is given in BURKILL'S Dictionary.

The garden plants, *Buddleia*, also belong to the family and one species, *B. asiatica*, is a small, white-flowered shrub occasionally found in the rice-fields in the middle and north of the country.

The most important Malayan members of the family, however, are the trees of the following genus *Fagraea*.

FAGRÆA

(J. T. Fagræus, 1729–1747, a Swedish naturalist)

Trees or shrubs, often epiphytic, with *Terminalia-branching*: the buds thinly varnished with resin, and hidden between the leaf-stalks: young leaves pale green.

Flowers fragrant, nocturnal: corolla white or cream changing to deeper yellow, lasting for several days, small to very large, with 5 lobes.

Fruit a berry, small or large, with the persistent calyx at the base and containing many small seeds.

About 60 spp., tropical Asia and W. Pacific region: 20 spp. in Malaya.

The well-known *Tembusu* (*F. fragrans*) belongs to this genus. It has two close allies, the Giant *Tembusu* (*F. gigantea*), which is a lowland tree widely distributed but seldom flowering, and Wallich's *Tembusu* (*F. Wallichiana*) which is known, as yet, only from Penang Hill where it is not uncommon. Besides these, there are two common species with broad leaves and larger flowers which, at first sight, appear to have little resemblance to the *Tembusu*. One of these is the *Kopi Utan* (*F. racemosa*), which has figured prominently in rubber-forestry and is so-called from its superficial likeness to a coffee-bush, and the other is the extraordinary cabbage-leaved *Malabira* or *Bira* (*F. crenulata*) which has a thorny trunk like a *Kapok* and tiers of spreading limbs like the *Ketapang* (*Terminalia*), and which is commonly seen in the coastal areas of the west side of the Peninsula. The bark of all five species is rather deeply ridged and fissured, though not scaly, the colour and the depth and width of the fissures being characteristic of each species. They are evergreen but their flowering is strictly seasonal, the season being different in most cases: it is possible, too, especially in the *Bira* (*F. crenulata*), that the new leaves are developed seasonally, but the old leaves which turn yellow, fall throughout the year. The flowers are evidently pollinated by nocturnal moths.

Most of our shrubby species of *Fagræa* are epiphytes, common in the mountains. They have medium-sized to very large, funnel-shaped flowers of a thick, leathery consistency and they are easily recognised from their fallen corollas to which the five clumsy stamens are attached. One such species, *F. auriculata*, has flowers 6-8" wide and there is a variety of it in the Singapore Botanic Gardens (by the Tea-Kiosk) with flowers 12" across. The specimen blooms every year about June or July, its gigantic blossoms being like *Tembusu*-flowers vastly manifold. It is possible that these big-flowered epiphytes are pollinated by bats.

Species of *Fagræa* may be mistaken for members of the *Ixora*-family (*Rubiaceæ*) when not in flower because they have a kind of ring-shaped outgrowth around the twig just above the attachment of each pair of leaves. But the hidden varnished buds and the absence of obvious stipules will distinguish *Fagræa*, apart from the structure of the flower with its superior ovary.

The uses of the hard durable timber of *Fagræas* are described by BURKILL.

Key to the Species

Leaves small, less than 3" wide : stamens projecting from the flower : bark dark ...	
Leaves yellowish olive beneath : flowers 1¼" long, in threes : small tree on Penang Hill ...	<i>F. Wallichiana</i>
Not so : flowers ½" long : big trees	
Leaves flat : bark coarsely ridged : common tree	<i>F. fragrans</i>
Leaves with very wavy edges : bark finely ridged	<i>F. gigantea</i>
Leaves over 3" wide : stamens not projecting : bark pale	
Big tree with spiny trunk or branches : leaves very large, sessile	<i>F. crenulata</i>
Shrub or small tree, not spiny : leaves stalked ...	<i>F. racemosa</i>

F. crenulata Plate 121
(Lat., crena—notch)

Cabbage-Tree
Malabira, Birah, Bebirah, Berah

A big-leaved tree up to 70 ft. high, with open, flat-topped crown and stiff, spreading limbs generally arranged in alternating pairs: bark light grey to yellowish grey, darker with age, deeply and coarsely ridged and fissured: young trunks studded with short woody thorns, the old trunks becoming smooth: twigs massive, prickly.

Leaf-blade 7-14 × 5-9", large fleshy, cabbagey, obovate, abruptly narrowed at the base but without a stalk, clasping the twigs, with 5-8 pairs of side-veins.

Flowers 1¼" wide, cream-coloured turning yellowish, set in large terminal panicles 8-14" long and wide: corolla rather thick and fleshy, the tube 1" long: stamens not projecting from the tube.

Fruit ¾-1" long, oblong, green.

Malaya, Sumatra, Borneo: in swampy ground near the coast from Batu Pahat to Kangar, not reported from the East Coast.

The *Birah* grows in swampy land behind the mangrove on the west side of the Peninsula. It has also been planted in Kuala Lumpur, on the Circular Road near the Golf Course. It is scarcely a beautiful tree but a curious one from its big leaves and stiff habit, in which respects it recalls the *Ketapang* (*Terminalia catappa*): the differences between them we have contrasted under the *Ketapang*. The *Birah* flowers about March or April, perhaps again later in

the year. The flowering branches are apt to lose their leaves and so the tree may be partly deciduous. The outstretched limbs may reach an extraordinary length, as if they were unable to control their growth.

The Bira is figured and described by FOXWORTHY (7, p. 52).

F. fragrans Plates 122, 123
(from the fragrant flowers)

Common *Tembusu*
Tembusu, *Temusu*,
Temensu, *Temesu*, *Semesu*

A tall tree, reaching 100 ft. high, with light green, fine-leaved crown and dark brown, rugged bark with anastomosing ridges and deep fissures: not buttressed: twigs slender.

Leaf-blade $2-5\frac{1}{2} \times \frac{3}{4}-2\frac{1}{4}$ ", elliptic, tipped, thin: the stalk $\frac{1}{2}-\frac{3}{4}$ " long.

Flowers $\frac{3}{4}$ " wide, cream white becoming yellow, in stalked lateral clusters, 2-3" wide, from the leaf-axils: corolla-tube $\frac{1}{2}$ " long or less: stamens 1" long, projecting.

Berries $\frac{1}{4}$ " wide, round with a small point, orange then scarlet: seeds minute.

Tenasserim, Lower Siam, Malaya, Sumatra: in open and swampy lowland country throughout Malaya, commonest in the south and often planted.

If it were asked what trees were distinctive of Singapore, we would point to the *Tembusu*-trees of Tanglin for specimens as fine cannot be found on any part of the mainland. For this advantage we are indebted to the constitution of the tree which is accustomed to poorly aerated and ill-drained situations so that its roots find little fault with the heavy, yellow clay of the island. On the East Coast of Pahang, for instance, where the *Tembusu* is wild, it delights in the swampy forest which lies to the north and south of Pekan, though in Perak, by contrast, it is strangely rare. But we would point to the *Tembusu* also because it brings us the most sure evidence of the slight seasons which we have at this extremity of Asia. Each year it scents our city: and, after the ghostly flowers, come the flying foxes to gorge upon the fruits by night.

The *Tembusu* has one of the most regular flowering seasons of any tree in Malaya. In Singapore, it has two seasons, the first and foremost in May, or early June, the second and less noticeable about October or November. The May-flowering follows the dry spell which comes about January as a break in the wet weather: the October-flowering follows the less certain or less pronounced dry spell about the middle of the year. From which it will be seen that the *Tembusu* responds very slowly to the climatic stimulus, its flowers opening after an interval of nearly four months. But in all its activities the tree is leisurely. It grows slowly: it develops new leaves a pair at a time, never in flush like so many of our eager trees: its flower-buds need several weeks to open: its flowers last for several days and are not morning-glories or night-dreams like so many others: and the tiny berries require more than three months to mature. Such sluggishness is remarkable in a tropical plant, the environment of which imposes no hindrance upon its growth, but it is not unparalleled for both Mangos-teen and Nutmeg are almost, if not quite, as lethargic. The strange behaviour of the *Tembusu* has been discovered during the last ten years by R. E. HOLTUM and has been described in the Gardens' Bulletin S.S., 1935 (vol. IX, p. 73).

The flowers of the *Tembusu* open about sunset. At first they are cream-white and exhale a perfume which spreads far from the tree but as they age, for they last five or six days, they turn yellow and the fragrance a little harsh. The fallen flowers are deep yellow and have a sour, rotting smell which probably accounts for the tree's Malay name. On the first night the stamens project from the throat of the flower: they wither next day and their place is taken by the style, the stigma of which expands on the second evening. It seems that the flowers must be visited by moths, but there are no observations on their means

of pollination. The trees then relapse into another period of apparent quiescence when, some three months later, they begin to get a reddish hue and the flying foxes to assemble. This yearly event, the fruiting of the *Tembusu*-trees, which takes place in September and sometimes again in January if there has been a second flowering during the preceding year, is one of the marvels and mysteries of local natural history. The flying foxes arrive from far and wide, flapping across the evening sky from the islands to the south, from the mangrove swamps on the mainland and, even, from the coast of Sumatra, but how they know the season of the *Tembusu*-trees, whether they have scouts or by what sequence they are led to return, for at other times they are scarcely to be seen, we do not know. For two or three weeks they revel nightly in the succession of berries, squawking and fighting for position on the trees, disgorging the skins and the seeds in red splashes. And from these minute, ejected grains, the big trees slowly develop. The berries are too bitter to be relished by other animals.

The beautiful shape of a mature *Tembusu*-tree arises from a most complicated method of branching, of which we can give only the merest outline. In the mature tree we can distinguish the main, upright and perpendicular branches, their horizontal limbs with upturned ends and the countless dangling twigs with upturned rosettes of small leaves which give the crown its gauze-like effect. The sapling is conical and bushy, like a Christmas-tree. Most of its branches are built up of sets of twigs in the *Terminalia*-fashion (p. 30), but some grow normally and develop into the main, upright limbs and the branches of these become the horizontal or drooping limbs of the mature tree. The dangling twigs, which may be six or ten feet in length, develop in *Terminalia*-fashion from the twigs and hence their upturned rosettes of leaves. After they can grow no longer, they die and are cast off. If *Tembusu*-trees are left untrimmed, the lower branches develop strongly, sagging to the ground and turning up at the ends so that the crown becomes a continuous canopy from the lawn, and is furnished inside with rustic seats of arching boughs. But, as commonly happens, when the lower limbs are cut off, the upright branches shoot higher and higher and what might have been an umbrageous tree becomes a great scare-crow.

From every other planted tree in Malaya, the rugged bark and small, opposite leaves will distinguish the *Tembusu*: but remember the Lalang Tree (*Morinda elliptica*, p. 550).

F. gigantea

Giant *Tembusu*

(from the great size of forest trees)

A big, evergreen tree reaching 170 ft. high, or more, like the preceding but:—

Generally buttressed: bark with much narrower, closer and more regularly longitudinal ridges and fissures: *leaves with wavy edges*, rather darker green: (? flowers smaller, $\frac{1}{4}$ " wide, orange-yellow): (? berries yellow).

Sumatra, Malaya: Perak to Singapore, not common.

Very little is known about this magnificent tree, because it seldom flowers. A few specimens are to be found in the Tanglin district of Singapore. It is said to be common in south Perak.

F. racemosa

False Coffee-Tree

(from the inflorescence)

Kopi Utan, Kahwa Utan, Mengkudu Utan, Sepuleh, Sepulis

A shrub or small tree to 40 ft. high, monopodial with conical crown: *bark pale greyish buff*, irregularly and rather deeply fissured with broad anastomosing ridges in old trees, not prickly.

LYTHRACEÆ

Leaf-blade 6-12 × 3-6", elliptic, rather large, shortly and abruptly tipped, rather abruptly narrowed at the base or rounded, *rather thick*. fleshy or leathery, *dark green*, rather glossy: stalk $\frac{1}{2}$ - $\frac{3}{4}$ " long.

Flowers $\frac{1}{2}$ -1" wide, *cream white*, pinkish on the outside, very shortly stalked, crowded in a terminal, spike-like drooping inflorescence 3-7" long, the flowers generally bunched: corolla rather thick and fleshy: stamens not projecting.

Fruit about $\frac{1}{2}$ " long, ellipsoid.

Malaysia generally: common throughout Malaya, especially in lowlying swampy ground.

This plant is much used in native medicine and has a great many Malay names of unknown significance. It so much resembles a coffee-bush in habit leaves and fruit that *Kopi Utan* or *Kahwa Utan* is its usual designation: it must not be mistaken, however, for the Rubiaceous plants with the same name, none of which has such funnel-shaped flowers (p. 530). A variety occurs with the flowers rather loosely arranged along the inflorescence.

The False Coffee flowers generally in the middle of the year from June to September, sometimes also at the beginning of the year.

F. Wallichiana

Penang *Tembusu*

(N. Wallich, 1786-1854, the Danish botanist, Superintendent of the Calcutta Gardens)

A small tree to 50 ft. high with dense, very twiggy, narrow, conical, dingy green crown in shape like a young *Tembusu* (*F. fragrans*): bark dark grey-brown, finely and narrowly ridged and fissured.

Leaf-blade 2-4 × $\frac{1}{2}$ -1 $\frac{1}{4}$ ", elliptic, tipped, dark green above, yellowish olive beneath with ochre midrib: stalk 1-1 $\frac{1}{2}$ " long: corolla-tube 1" long, ochre: stamens projecting 1" or more.

Fruit $\frac{1}{2}$ " long, ovoid, pointed, (? colour).

Penang Hill, frequent at all altitudes.

So far as we know, this gloomy little tree occurs only in Penang though its discovery on the mainland is to be expected. It seems to flower twice a year, about January and July, like the False Coffee (*F. racemosa*).

HENNA FAMILY

Lythraceæ

(Lythrum, a temperate genus of herbs, including the Purple Loose-Strife of Europe)

Leaves simple, opposite.

Flowers regular, small to large, typically having a calyx-cup or calyx-tube with the ovary seated at the bottom and not actually inferior: calyx with 4, 6, 9 or 12 sepals or teeth: petals 4 or 6, separate, on the calyx-rim: stamens double as many as the petals or very numerous: style one: ovary with 4 or 6 cavities, half-inferior.

Fruit a small or large capsule with many small seeds, seated on or surrounded by the persistent calyx: (but a large leathery green berry in Sonneratia): seeds many, small.

About 450 species, chiefly in the American tropics: 6 genera, 11 species, in Malaya, mostly in the lowlands.

This family bears a superficial resemblance to the Rose-family (Rosaceæ), especially in the flowers of the Rose of India or *Bungor* (*Lagerstroemia*), but the opposite leaves, the number of petals (only 5 in a single-flowered Rose) and the capsular fruit distinguish it. The fruit is also the best means of

separating the family from the Melastomaceæ. But the Malayan representatives are so well-defined or have such well-known vernacular names that there is little likelihood of confusing them with other plants.

The Pomegranate or *Delima* (*Punica granatum*) is sometimes placed in this family. In its shrubby habit, slender twigs with spiky ends and small leaves it certainly resembles the Henna-tree (*Lawsonia*) but, because of its peculiar red or white flower and its large fleshy fruit, it is often placed in a family of its own called the *Punicaceæ*. The Pomegranate is fairly common in villages, particularly in the north of the country.

Key to the Genera

- Shrubs or small bushy trees: leaves small: flowers small
 Village plant: glabrous *Lawsonia* p. 428
 Sea-coast plant: silky hairy *Pemphis* p. 431
 Medium to large trees: flowers large
 Mangrove trees with thick leathery leaves ... *Sonneratia* p. 431
 Inland trees: leaves thin
 Petals white, night-flowering: leaves large, oblong,
 heart-shaped at the base: calyx large, green,
 star-like *Duabanga*
 Petals pink: leaves often withering red ... *Lagerstrœmia* p. 428

DUABANGA

(from the Indian plant-name *duya bangsa*)

Flowers very large, in terminal clusters, nocturnal, with 6 white petals and a single row of massive stamens: calyx green, fleshy, not ribbed, glabrous, widely cup-shaped, with 6 large teeth.

Fruit a large green capsule, round or oblong, surmounted by the massive style and seated on the green star-like calyx with spreading teeth: eventually turning brown and splitting with 6 (5-7) longitudinal clefts: seeds minute, many, chaffy, oblong. 2 spp., Himalayas to the Philippines: 1 sp. in Malaya.

D. sonneratioides Plates 127, 128 *Beremban Bukit, B. Darat,*
 (like *Sonneratia*, a mangrove tree) *Pedada Bukit, P. Darat, Bermah (Kroh)*

A tree reaching 100 ft. high but flowering at 20 ft., *with open conical crown, straight monopodial trunk and drooping limbs set in whorls of 2-4:* scarcely buttressed: bark pinkish brown, densely pimply with small lenticels, marked with large leaf-scars: young leaves reddish pink.

Leaf-blade 6-12 × 2½-4", large, oblong or ovate-oblong, heart-shaped at the base, glaucous beneath, with many side-veins: stalk very short, ¼" long or less.

Flowers 3" wide, in groups of 20-30; calyx green outside, white inside: petals rather crumpled and torn at the edges.

Fruit 1½" long when ripe, hanging down.

N. E. India to Malaya as far south as Negri Sembilan: common in lowland and mountain forest to an altitude of 3,000 ft.

This is one of the characteristic trees of all the passes of the main range from Gunong Angsi to Kroh. Its shape is highly distinctive and yet most confusing because it can be described only as at once upright and flopping. The main stem proceeds stiffly to the top of the crown and the limbs are set in

LYTHRACEÆ

whorls, just as in a fir-tree. But the limbs droop directly from the trunk and at their ends the big-leaved twigs dangle for several feet. Generally, at the ends of the twigs, are to be seen the clusters of a few large green flower-buds or young fruits with big style and star-like calyx, for the tree seems not only to be evergreen and to get new leaves throughout the year but also to flower more or less continuously. The unripe fruit bears a great resemblance to that of the closely allied mangrove trees *Beremban* and *Pedada* (*Sonneratia*), and this is the reason for both the Malay and botanical names. When young, the fruits are edible and acid like those of the *Beremban* but, as they ripen, they grow leathery and split open.

The flowers begin to open about 5 p.m. and are fully open at 7 p.m. with powdery anthers, the petals curled back and large drops of sweet, clear nectar round the base of the ovary. They face downward and they smell faintly of sour milk, though not so strongly as *Durian*-flowers. By sunrise next morning the petals and stamens have dropped off, leaving the calyx-star, ovary and long style. It is possible that the flowers are bat-pollinated because the stamens seem too massive for flowers that are pollinated by moths or other nocturnal insects.

Saplings of *Beremban Bukit* may be mistaken for those of *Kelumpangyan* (*Anthocephalus*) but are easily distinguished by the pink young leaves.

LAWSONIA

(I. Lawson, d. ca. 1747, a Scottish botanist)

Flowers small, in large terminal panicles: calyx-tube very short, with 4 sepals: petals 4: stamens 8: ovary superior.

Capsule small, round, splitting irregularly, with the persistent calyx at the base. 1 sp., apparently native of India, cultivated throughout tropical Asia.

L. inermis Plate 126
(Lat., unarmed)

Henna-Tree
Hinai, Inai

A straggling evergreen bush or treelet to 25 ft. high, *often thorny from the dead spiky ends of the side-twigs:* young shoots and flower-buds reddish: glabrous.

Leaves $\frac{1}{2}$ - $1\frac{1}{2}$ × $\frac{1}{4}$ - $\frac{1}{2}$ " , thin, blunt or pointed, very shortly stalked.

Flowers .3-.4" wide. *cream-white or pinkish, fragrant,* rather waxy, in *terminal sprays* up to 10" long and composed of many small lateral panicles 1-2 $\frac{1}{2}$ " long: *petals* with incurved, crinkled edges.

Fruit $\frac{1}{4}$ " wide.

Common in Malay gardens.

There is an excellent account of this plant in BURKILL's Dictionary. The wild Cocaine (*Erythroxylon*) is sometimes called *Inai Inai*, from its resemblance to the Henna: and *Kesinai* is a rather small-leaved tree (*Bridelia*) of the Euphorbiaceæ.

LAGERSTRÆMIA

(M. Lagerstrœm, 1691-1759, a Swedish patron of science)

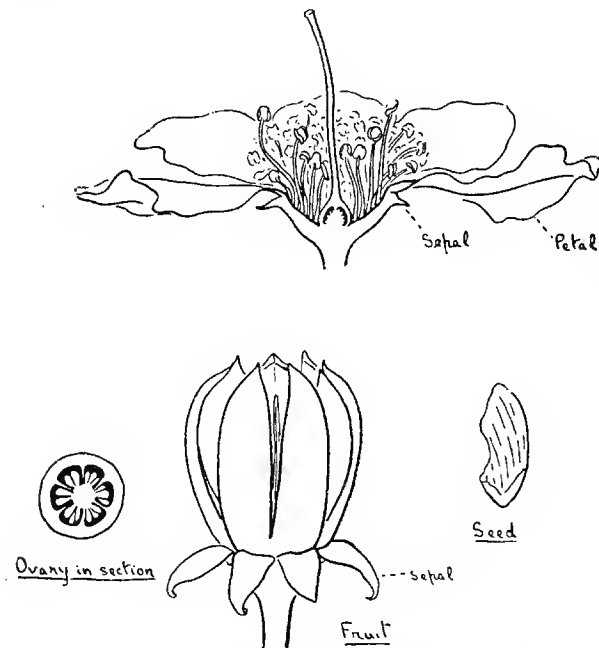
Leaves with rather large pointed buds in their axils, often withering red.

Flowers large, showy, pink or mauve (fading white), scentless, *in terminal upright panicles:* calyx-cup with 6-9 teeth: *petals* 6, *delicate, crinkled:* *stamens many,* in several rows, with slender filaments and small anthers: ovary at the bottom of the calyx-cup.

Capsule round or oblong, rather woody, seated on the persistent, woody calyx, splitting longitudinally into 6 parts.

About 20 spp., tropical and subtropical Asia, Madagascar, New Guinea and Australia: 3 spp. in Malaya, in lowland forest.

The beautiful rose-like, but scentless, flowers with six crinkled petals enable us very easily to identify the trees of this genus. To Malays they are known indiscriminately as *Bungor* although we have three quite distinct species. Two are common in open country, especially by river-banks, and the third, *L. ovalifolia*, is a big forest-tree locally abundant in the centre of the peninsula. One of the common species, *L. floribunda*, occurs only in the north from the latitude of Upper Perak, though we have not found it on the east side of the country, but *L. flos-reginæ* occurs from Negri Sembilan northwards. None is wild in Singapore and, as yet, only the forest-species, *L. ovalifolia*, has been found in Johore. *L. flos-reginæ*, the Rose of India, is being used extensively as a garden and road-side tree. The exotic bush, *L. indica*, is also grown in gardens: it has straggling erect limbs with small, blunt, nearly sessile leaves, 1-2" long, (withering red), and terminal sprays of white or pink flowers, 1" wide: the calyx is not ribbed.



Text-Fig. 140. *Bungor* (*Lagerstroemia flos-reginæ*): flower, fruit and seed, nat. size: section of ovary, $\times 2$.

thus behaves like the Flame of the Forest and the Indian Laburnum. The young leaves are pinkish olive to deep pink and the flowers are borne at the ends of the new shoots. The terminal growth of the branches is thus checked at each flowering and is resumed by the opening of lateral buds at the following leafing. For this reason the crown tends to be low and bushy, especially in the open when flowering begins at an early age of 3-4 years, and this shape is enhanced by the rapid growth of the saplings and the long weak flopping branches which they produce in the open. In the forest, by contrast, the Rose of India is a tree reaching nearly 100 ft. with tall, straight trunk: its flowering is doubtless delayed for many years until the crown has reached the light and the thick

In fruit, *Lagerstroemia* can be recognized from the woody capsule seated on the ribbed calyx with its spreading teeth. Even when sterile, the genus can be recognized from the large pointed buds in the axils of the opposite leaves, and this feature distinguishes it particularly from *Eugenia* which it much resembles in habit. There is also a peculiar feature in the bark of *Lagerstroemias*; the inner bark, next the wood, quickly turns dirty mauve or purple when exposed to the air.

The Rose of India (*L. flos-reginæ*) is deciduous. In Singapore it sheds its leaves at intervals of 6-9 months regardless, apparently, of season and

undergrowth prevents not only the development of long side-branches but over-rapid growth. The forest-species, *L. ovalifolia*, appears not to have any drooping tendency so that it may make a better tree if it can be brought into cultivation.

The inflorescences flower from base to apex with several flowers open at a time. Those of the Rose of India begin to open about 4 a.m., or even earlier, and are full open at sunrise. On the first morning they have a fresh, fluffy appearance from the projecting stamens but on the second morning they already look weary, the stamens having coiled up in the night into a brownish mass in the centre of the flower, and during the day the petals fade to pale pink or white. Most flowers fall off during their second or third day; only the later ones on the inflorescence set fruit.

Key to the Species

Flowers 1" wide, pink fading white: north of Malaya ...	<i>L. floribunda</i>
Flowers 2" wide or more, deeper coloured	
Leaves 1-2" wide: forest tree	<i>L. ovalifolia</i>
Leaves 2-4" wide: common tree, wild or cultivated ...	<i>L. flos-reginæ</i>

L. floribunda Plate 124 (Lat., full of flower)

Kedah Bungor

A tree up to 60 ft. high, with dense bushy conical or broadly cylindrical crown, the branches hidden by the foliage: trunk fluted at the base: *bark light fawn brown, flaking in large thin angular oblong pieces leaving pale patches of white or yellowish new bark: old leaves turning yellowish brown: young leaves pink.*

Leaf-blade 4-10 × 2½-4", oblong, blunt, rounded at the base, with 7-11 pairs of side-veins: stalk ½-1" long.

Flowers 1" wide, mauve pink fading white, in panicles up to 15" long: *calyx light brown scurfy*, with 12 ribs and 6 teeth.

Fruit ¾ × ¾", oblong: calyx-cup generally less than ¼" wide.

Burma, Siam, Malaya: abundant in open country and on limestone hills from Kuala Kangsar northward on the west side of the Peninsula.

The smooth, hard, peeling bark, like that of the *Selunchor* (*Cratoxylon ligustrinum*), is characteristic.

L. flos-reginæ Plate 125, Text-Fig. 140 (Lat., flos-flower, regina-a queen)

Rose of India
Crêpe Flower, Queen Flower
Bungor, B. Raya

A tree with dense, bushy, rounded crown, generally not more than 50 ft. high in the open, reaching 100 ft. in the forest: *bark buff-grey*, smooth, scarcely flaky.

Leaves as in L. floribunda but with 10-13 pairs of side-veins, withering red.

Flowers 2-2½" wide, calyx whitish downy, or flushed pink in the bud, with 12 ribs and 6 teeth.

Fruit 1 × ¾", broadly oblong or almost round: calyx-cup ¼" wide, with 6 teeth.

India to Australia: wild from Negri Sembilan northward, often massed on river-banks: commonly planted.

The flowers of wild trees are deep mauve-pink or purple-lilac but in some cultivated races they are much paler, even pure pink. The leaves are very apt to be eaten by insects. The species is called *L. speciosa* in BURKILL'S Dictionary.

L. ovalifolia (Lat., with oval leaves)

Pahang Bungor
Bungor, B. Melukut

A forest tree reaching 100 ft. high, with smooth grey bark, like *L. flos-reginæ* but:—

Leaf-blade 2-4 × 1-2", smaller, tapered to a narrow base, with 5-8 pairs of side-veins.

Calyx-cup with 8-9 ribs and 8-9 teeth.

Fruit 1 × ¾", oblong: calyx-cup 1" wide.

W. Malaysia: locally abundant in lowland forest from Johore to Perak.

PEMPHIS

(Gr., breath)

Flowers small, singly or in pairs in the leaf-axils, stalked: calyx-cup with 12 teeth: petals 6, white, small: stamens 12.

Fruit a small round capsule seated in the calyx-tube, splitting transversely with the upper half separating as a lid: seeds angular, yellowish.

1 species, from Zanzibar round the shores of the Indian and W. Pacific Oceans.

P. acidula Text-Fig. 141
(Lat., rather sour)

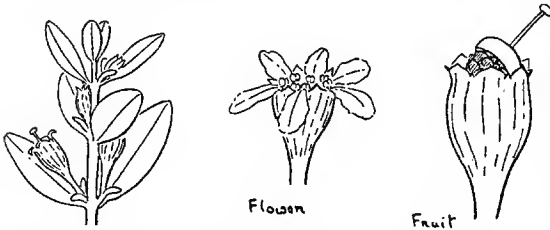
Mentigi

An evergreen sea-shore bush or small tree up to 25 ft. high, with tiny grey-silky leaves, gnarled twisted branches, and short stocky trunk: bark grey-brown, narrowly fissured, flaky.

Leaf-blade $\frac{1}{2}$ -1 \times $\frac{1}{4}$ " , narrow, pointed at each end, with a very short stalk.

Flowers $\frac{1}{2}$ " wide, not fragrant: buds reddish.

Fruit red becoming brown.



Text-Fig. 141. *Mentigi* (*Pemphis acidula*), nat. size: flower and fruit, \times 2.

The *Mentigi* is a very local tree on our rocky or sandy coasts, though it is generally abundant where it occurs, especially on the East Coast. Its fine foliage gives it an unusual and attractive appearance like the Madras Thorn (*Pithecellobium dulce*), the Wood-Apple (*Feronia*) and the Mountain Gelam (*Leptospermum*). It particularly resembles

the Mountain Gelam but differs in all details, even to the fact that its leaves wither yellow. It likes to grow on the detritus of small granite boulders and broken coral which accumulate on the shoreward side of sandy spits, or on low rocks more or less covered with sand. But it can also exist on bare, exposed rocks in the full sun, just above the tide-level and in reach of the spray, where it takes the form of a low, gnarled bush, sprawling upon the rocks, its roots penetrating into the cracks and its thick woody branches raised no more than half a foot, for all the world like *Leptospermum* on the mountain tops.

SONNERATIA

(P. Sonnerat, 1749-1814, the French botanist and explorer)

Mangrove-trees with leathery or fleshy leaves and conical, upright breathing roots projecting through the mud.

Flowers as in Duabanga but with many rows of stamens.

Fruit not opening, but as a large leathery green berry seated on the star-like calyx and with the seeds embedded in pulp.

4-5 spp., on all tropical shores of the Eastern hemisphere from E. Africa to the Pacific: 3 spp. in Malaya.

The *Beremban*, *Gedabu* and *Pedada*, so admirably described and figured by WATSON, belong to this genus. They are closely allied with the inland tree Duabanga which may be regarded as the link connecting Sonneratia with

Lagerstroemia. It is not a little remarkable that all our mangrove-trees, such as Rhizophora, Lumnitzera, Sonneratia and Avicennia, should have their inland allies to point to the kind of plant from which they have evolved.

The flowers open at dusk and give out a smell of sour milk. They are white in the sea-shore species but red in the riverside Beremban (*S. acida*). They last but one night, as those of Dunbanga.

CHEMPAKA FAMILY

Magnoliaceæ

Trees with resinous tissues (bark, pith etc.): *twigs with ring-like scars at the attachment of the leaves, caused by the falling off of the large conical stipules covering the terminal buds*: pith of twigs septate (marked with fine, close, transverse lines).

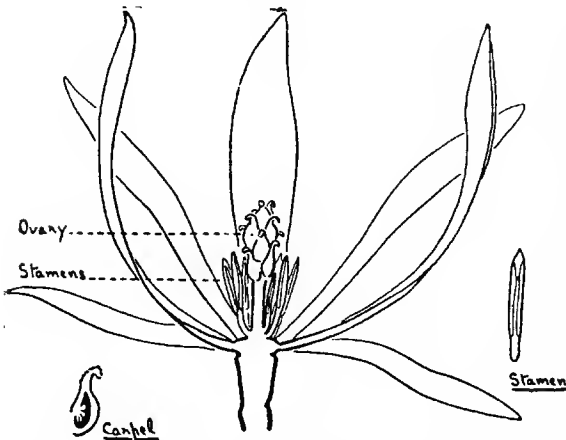
Leaves simple, arranged spirally or alternate, standing out from the twigs, not drooping.

Flowers showy, rather large, singly on short stalks on the leafy-twigs, the bud wrapped in 1 or 2 large bracts: *sepals and petals generally in circles of three*, commonly numerous and similar: *stamens* many, rather long as in the Dilleniaceæ: *ovary superior, composed of several parts* (carpels) set on a long stalk or cone from the centre of the flower.

Fruit a cluster of several parts each opening separately, or not opening, the cluster cone-like and compact or loose like a bunch of grapes.

16 genera, 100 spp., Japan, China, Himalayas, Malay Archipelago, East United States, S. E. Brazil: 6 genera, 15 spp. in Malaya.

In temperate countries this family is known from the cultivated trees and shrubs of the genus *Magnolia*. In tropical Asia, the *Chempaka* (*Michelia*) is its representative. One *Magnolia*, *M. Maingayi*, we have in Malaya but it is a small insignificant forest-tree. Indeed, apart from the *Chempaka* and its allies, all our species are forest-trees seldom to be met with, though doubtless some would repay cultivation.



Text-Fig. 142. Flower of *Michelia alba*, nat. size.

We would have begun our book with this family had we followed the style traditional to English botanists, for the unspecialised structure of the flowers and the broken distribution of the genera over the world, like the remnants of a scattered people, have led to the conclusion that "the family is probably the most ancient of living Dicotyledons". Some would take exception to the extremity of this statement, but all are agreed that it is a relic of the earliest attempts at a flowering tree and of forest such as we know it to-day. The head-quarters of the family is

now removed to the recesses of subtropical China and of N. E. India : we would not be surprised, however, if the members of our own lowland rain-forest did not turn out to be the more primitive.

In most points, the family is similar to that the *Kenanga* (Annonaceæ), but there is little likelihood of confusing them. The Magnoliaceæ are seldom monopodial trees; they hold their leaves differently and they have ring-like markings on the twig like those of Figs and Breadfruits.

MICHELIA

(P. A. Micheli, 1679-1737, the early Italian botanist)

Flowers axillary: sepals and petals similar, 9-12, in circles of 3 or 4: ovary raised on a short stalk beyond the stamens.

Fruit a grape-like bunch of several-seeded parts, each splitting open.

12 spp. Indo-Malaysia : 5 spp., in Malaya, 2 introduced.

The name *Chempaka* for species of this genus is a Hindu name for *M. champaca*, a native of India. The name seems to have been carried through Eastern Asia by Hindu culture. In this country it has acquired a wider use to indicate several trees, or shrubs, with fragrant flowers and large white or yellow petals, e.g. *Randia*, *Gardenia* *Plumeria*. Like those of the *Kenanga*, the flowers of the White and Orange *Chempaka* are often sold in the markets or in the front of Mohammedan shops : they are used for decorating the hair or are strung into garlands.

Key to the Species

Garden shrub : leaves small, up to 2 × 1" ...	...	...	<i>M. figo</i>
Trees			
Flowers yellow or orange ...	...	...	<i>M. champaca</i>
Flowers white			
Tree of cultivation ...	...	...	<i>M. alba</i>
Wild, mountain tree ...	...	...	<i>M. montana</i>

M. alba Plates 129, 130, Text-Fig. 142
(Lat., white)

White *Chempaka*
Chempaka Puteh

A medium-sized to large tree, up to 70 ft. tall, the rather cylindrical or conical crown supported by a few bold upright limbs : *bark silvery grey*, smooth.

Leaf-blade 4-10 × 1½-4", elliptic, rather long and narrow, *tapered gradually to the tip*, rather yellowish green and shiny, with 11-17 pairs of side-veins : stalk ¼-1½" long.

Flowers 2" long, white, very fragrant.

Not known in the wild state but commonly cultivated in the Malayan region.

This well-known tree is often planted by Chinese and Malays for its fragrant flowers. Its habit is characteristic, like a poplar with widely ascending branches, so that one soon learns to recognise it from its shape and yellowish green foliage. The smooth grey trunk and ring-like scars on the twigs suggest a Fig-tree, but there is no latex. In the middle and north of the country the trees are

MALVACEÆ

more or less deciduous but in the south they are commonly evergreen. They flower mainly after the new leaves have developed, but in Singapore one may find flowers on some trees at all times of year. It seldom, if ever, fruits in Malaya.

M. champaca

(the Hindu name)

Orange *Chempaka*

Chempaka Merah

Like *M. alba* but the petals yellow or orange, and commonly fruiting with greyish brown to pinkish brown hanging grape-like bunches up to 7" long (one bunch from one flower): seeds 2-5 together, hard, angular, blackish, covered with thin pink pulp and hanging out on slender white strings: generally a smaller tree.

India, Malaya: occasionally cultivated in Malaya.

This species is much less common in Malaya than the White *Chempaka*. According to Symington, it is wild in the forest at Cameron Highlands.

M. figo

(the Cochinchinese name)

Dwarf *Chempaka*

Chempaka Ambon

A dense bush or small tree with brown hairy twigs and small dark green, elliptic leaves with short stalks $\frac{3}{8}$ " long: flowers $\frac{3}{4}$ " long, at first wrapped in a brown hairy bract; the petals cream-yellow with a dull purple splash at the base, *intensely fragrant of ripe pears and bananas* (of the kind called *Pisang Ambon*).

S. China: frequent in gardens and villages in Malaya: (used by the Chinese for scenting hair-oil and perfuming tea).

M. montana

Mountain *Chempaka*

like *M. alba* but the leaves broader, obovate and rather suddenly narrowed to a small tip: *blade* but 5-9 × 3-5" with 9-12 pairs of side-veins: *flowers* white, fragrant like melon.

Java, Malaya: wild in the mountains of the northern half of Malaya; (the fresh wood smells of ginger).

MALLOW FAMILY

Malvaceæ

(Malva, the genus of European Mallows)

Leaves alternate or spirally arranged, simple, lobed or palmate with separate leaflets: stipules present.

Flowers medium to large, often showy, singly or in panicles or bunches: *sepals* 5, generally joined in a cup, (the calyx in some cases double): *petals* 5, twisted in the bud, often joined at the base: *stamens many*, joined in one tube (or column) or in 3 or 5 separate bundles, often joined to the base of the petals: *ovary superior*, with 5 cavities, *the style with 5 stigmas*.

Fruit generally a capsule, splitting into 5 parts, often large.

About 60 genera, 800 species, throughout the world: 12 genera, about 30 species in Malaya, in the lowlands.

This family of herbs, shrubs and trees includes the Mallows, Hollyhocks, Cotton-plants (*Gossypium*) Hibiscus, Durian, Kapok (*Ceiba*) and several weedy Mallow-like herbs, mostly introduced to Malaya from India and South America. The Cotton-plant, *Pokok Kapas*, is often seen in Malayan villages as a straggling shrub, but it is not successful in our moist climate.

Many plants of the family have valuable fibres in the bark and their soft tissues tend to be slimy, as in the Ladies' Fingers (*Hibiscus esculentus*). The hairs on the twigs are mostly star-shaped or transformed into disc-like scales.

Key to the Genera

- Leaves palmate, divided into 5-9 leaflets
 Trunk spiny: flowers and fruits clustered on the bare twigs: pods full of floss
 Village tree with stiff habit like a telegraph post ... *Ceiba* p. 436
 Forest tree *Salmalia* p. 443
 Not spiny: flowers hanging on very long stalks ... *Adansonia*
- Leaves simple or merely lobed
 Leaves spirally arranged
 Leaves ovate or heart-shaped, often toothed: flowers Hibiscus-like *Hibiscus* p. 440
 Leaves large, obovate: fruits large, woody, with irritant bristles, like grey *Durian*-fruits ... *Neesia* p. 443
- Leaves alternate, entire: mostly inland forest-trees
 Big, buttressed forest trees: flowers small: fruits woody, grey or black, *Durian*-like, often scarcely splitting *Cælostegia* p. 436
 Village-trees or unbuttressed forest trees: flowers *Durian*-like, white or pink, mostly on the branches or trunk: leaves coppery, brownish green or glaucous beneath: fruit *Durian*-like or red and small *Durio* p. 437

ADANSONIA

(M. Adanson, 1727-1806, the French botanist)

Leaves palmate with 5 sessile leaflets.

Flowers large, singly from the leaf-axils, and hanging on a long stalk: calyx very large and egg-like in the bud: petals 5, joined to the staminal-tube at the base: stamens many, small, on a stout column in the centre of the flower: petals and stamens falling off together.

Fruit large, oblong, woody, not splitting open, filled with the large seeds, without floss.

6 spp., Australia, Africa.

A. *digitata*

Baobab

(Lat., set with fingers)

A thornless tree with a bulky, bulbous or bottle-shaped trunk.

Leaflets dark green: leaf-stalk hairy.

Flowers 6" wide, creamy white, with a very strong smell (as of Cantaloup melon): flower-stalks 18-20" long: calyx light green and softly hairy $3\frac{1}{2} \times 3'$.

Africa.

This famous tree of Africa is little known in Malaya, but in Penang there is moderately large specimen—perhaps the only large one in the country. It is the leaning tree occupying the grass triangle at the junction of Race Course and MacAlister Roads. It flowers often, but fruits infrequently. In appearance it looks like a spineless, leafy Kapok (*Ceiba*). It seems, also, that its flowers open at night and that it may be pollinated by bats.

MALVACEÆ

In Africa the trunk swells out of all normal proportions to the crown and reaches 50 feet or more in girth, a specimen of 112 feet in girth having been recorded. Probably, the sandy east coast of Malaya would be suited to its full development. It should grow as rapidly as the Kapok, but estimates of massive old trees in Africa put their age as nearing 5,000 years.

CEIBA

(an American plant name)

Trunk and twigs thorny.

Leaves palmately divided with separately stalked leaflets.

Fruit an oblong, smooth capsule, filled with cottony hairs arising from the inner surface of the fruit and occupying the spaces between the seeds.

10 species, tropical America except the following.

C. pentandra Plate 131 Kapok Tree, P.W.D. Tree, White Silk-Cotton Tree
(with 5 bundles of stamens) Kabu Kabu, Kekabu, Kapok

A deciduous tree reaching 90 ft. high: *trunk generally wide and stout near the ground, with more or less pronounced buttresses, much narrower and neatly cylindrical upwards with regular, superposed tiers of stiff horizontal branches, generally in threes, giving a narrow, open, thin pagoda-crown, the side-branches also stiffly horizontal, a few upright: bark light grey, studded with short conical spines, at least when young.*

Leaves crowded at the ends of the twigs: leaflets 5-9, 3-7 × ½-1½", lanceolate, tipped, entire or slightly toothed, curved back and drooping, glaucous beneath: leaf-stalk 3-8" long.

Flowers 1½" wide, dirty white with a milky smell, beautifully shaped but inconspicuous, clustered on the twigs: petals joined at the base: stamens in 5 bundles.

Fruits 3-6" long, hanging in bunches like small cucumbers, green then blackish when ripe, splitting into 5 parts from base to apex: seeds brown.

Cultivated in tropical Asia and Africa, of doubtful origin: one of the commonest village-trees in Malaya, particularly in Perak.

The Kapok is grown mainly for the wool obtained from the fruits. The wool is used by Indians and Malays for stuffing cushions and pillows, and commercially for mattresses and life-belts. The tree is also grown for a hedge, because it is easily propagated by sticking branches into the ground, and, apparently, for its awkward, bizarre shape by which it is so easily recognized: it resembles a vegetable telegraph-pole. The young fruit can be eaten; the leaves and roots are medicinal: and a food-cake for cattle, like cotton-seed cake, can be made from the seed.

The Kapok prefers a monsoon-climate and does not reach its full size in the moist weather of southern Malaya. Normally it sheds its leaves and then flowers and fruits in the dry season, but in Singapore its behaviour is irregular: it seems to flower throughout the year and to shed its leaves and get new ones on one or more branches at a time, rarely over the whole crown at once. The crown is always thin, and casts little shade. The flowers open very early in the morning and close, or fall off, about noon.

Compare the Wild Kapok (*Salmalia*), p. 443.

CCELOSTEGIA

(Gr., koilos—hollow, stegē—roof)

Like *Durio* but the *trunks* always with prominent buttresses, the *leaves* with exceedingly minute scales on the underside, the *flowers* small (less than ½" wide), the *fruit* very woody and the *black seeds* with only a little pulp at one end.

4 species, Malaya, Sumatra, Borneo: 2 species in Malaya.

The Black Durian or *Punggai* (*C. Griffithiana*), described and illustrated by FOXWORTHY (7, p. 52), is a valuable timber-tree. It occurs in swampy forest and is not common but it is very conspicuous because of its vast size, its enormous buttresses and the big black *durian*-fruits hanging on the branches and lying on the ground beneath. Unripe fruits are reddish; ripe fruits are brownish or purplish black and make admirable "specimens." It is remarkable how such woody objects can split open so regularly as to cut the spines in half. The small leaves are like *Durian's* but not so scaly.

The fruits of the *Punggai* split half-way, the basal part being held together by woody, ribbed partitions. But there is a common tree in the East of Johore, called the *Krepal* or *Krepau*, the fruits of which split open like stars and are devoid of the woody partitions: they are borne, moreover, at the ends of the twigs. Although the *Krepal* is exceedingly abundant between Kota Tinggi, Mersing and Kluang, it seems to flower seldom: we found fruits in 1932 and gathered flowers for the first and only time, with the aid of a monkey, in 1940. It appears to be a *Celostegia*, in its enormous buttresses, leaves and seeds, but it has also many characters of the genus *Durio*, so that it seems to unite the two. In general appearance, the *Krepal* looks like a village *Durian*.

DURIO

(from the Malay name *Durian*)

Medium-sized to big trees, with finely scaly twigs.

Leaves alternate, rather shortly stalked, pointed, mostly with silvery or coppery scales on the underside.

Flowers in clusters, mostly on the branches or trunk, generally rather large: *calyx* in two layers, the outer covering the bud and splitting into 2 (or 3) parts, the inner splitting into 4 or 5 parts or forming a cup with four or five blunt lobes: *petals* 4 or 5, white or rose-red: *stamens* many, generally joined in 4 or 5 bundles, in some cases the bundles joined into one staminal tube (as is *Hibiscus*): style one.

Fruit a large round or oblong thorny capsule with thick walls, splitting into 5, in a few cases 2-4, parts: *seeds relatively few*, large, generally covered by white, yellow or orange pulp.

About 12 species, tropical Asia: 6 species in Malaya, in the lowland forests.

The *Durian*, *D. zibethinus*, which is the typical member of this Asiatic genus, is undoubtedly the most famous tree of the East. According to the naturalist Wallace, in his book "Malay Archipelago", it was worth a journey to the East, if only to taste of its fruit: and what visitor can boast acquaintance with these parts who has not smelt it? It appears to us an important clue to theoretical biology (*Annals of Botany*, 1949).

We have, in our Malayan forests, several species of wild *Durian*. They are called *Durian Daun* or *Durian Burong*, and they resemble the cultivated *Durian* so much that they can be recognized without difficulty from the fallen leaves, flowers or fruits: all have, for instance, that smell of sour milk in their open flowers. But we know far too little about these wild *Durians*: it seems either that they are rather variable in the size of their leaves or that there are several more species that have not yet been clearly distinguished. Especially we want more information about the kind, *D. testudinarum*, which flowers and fruits on its trunk, often at the collar of the tree, for which reason it is sometimes called *Durian Tanah*. Are its flowers always red? What do its fruits taste like? Are the flowers never on the branches?

Key to the Species

Flowers and fruits on the trunk : flowers red : wild ...	<i>D. testudinarum</i>
Flowers on the leafy twigs, small, $\frac{3}{4}$ " wide, cream white fruit small, oblong, bright red, with short prickles : wild	<i>D. Griffithii</i>
Flowers on the branches, in tufts	
Leaves glaucous and finely hairy underneath : flowers 1" wide	<i>D. Oxleyanus</i>
Leaves silvery or brownish beneath, not hairy : flowers larger.	
Leaves large, more than 7" long : calyx with 5 distinct sepals persisting in the fruit : wild ...	<i>D. oblongus</i>
Leaves 3-7" long : calyx cup-shaped with 5 short lobes, not persisting in the fruit : generally cultivated	
Flowers white, cream or yellow	<i>D. zibethinus</i>
Flowers red	var. <i>roseiflorus</i>

D. Griffithii Text-Fig. 143

(W. Griffith, 1810-1845, doctor and botanist in India and Malacca)

Squirrel's Durian

Durian Tupai

A rather small or slender tree up to 60 feet high, flowering when 15 ft. high : bark pinkish brown, becoming slightly rough and fissured.

Leaf-blade 4-7 × $1\frac{1}{2}$ -2 $\frac{1}{2}$ ", elliptic, more or less glaucous beneath, scaly only on the veins.

Flowers $\frac{3}{4}$ -1" wide, small, singly or a few together in the leaf-axils, or on the twigs just behind : petals 4, cream white : stamens not in bundles : the withered flowers persisting, yellow brown.

Fruit $1\frac{1}{2}$ -3" long, small, rather narrowly oblong, set with dense small prickles, ripening scarlet, splitting into 2, 3, or 4 parts : seeds $\frac{1}{2}$ - $\frac{3}{4}$ " long, black, with a little orange pulp at the base.

Malaya, Sumatra, Borneo : frequent in lowland forest.



Text-Fig. 143. Fruit of *Durio Griffithii*, × $\frac{1}{2}$.

At first, it seems that this tree with its little fruits and flowers should not rank in the same genus with the lordly *Durian*, but the scaly twigs, the smell of the flowers and the thorny fruits are typical, and the *Durian Burong* (*D. Oxleyanus*) helps to bridge the differences between them. Squirrels generally eat the seed from the fruit before it is ripe. There is a tree behind the Rest house at Seremban.

D. oblongus

(from the oblong leaf)

Wild Durian

Durian Daun

A tree up to 100 feet high, unbuttressed : bark entire, slightly rough, warm brown.

Leaf-blade 6-12 × 2-3 $\frac{1}{2}$ ", rather large, on the underside coppery with glittering scales.

Flowers large, white, clustered on the branches : calyx divided into 5 sepals : petals oblong, sessile : stamens joined in a tube.

Fruit 3-4" wide, round, closely set with long, stiff, rather slender, rambutan-like spines, the withered calyx remaining at the base.

Borneo, Malaya : frequent in lowland forests.

This species is illustrated by FOXWORTHY under the name of *Durio malaccensis* (7, p. 52).

(T. Oxley, d. ca. 1886, doctor of the East India Co.)

Brids' *Durian*
Durian Burong

A tree very like the common *Durian* in leaf and flower-structure, but :—
Leaves hairy and more or less glaucous on the underside, with scales only on the veins.

Flowers smaller, 1" wide; calyx with 4 short lobes : petals 4 (? white or pink) : stamens in 4 bundles.

Fruit smaller and set with narrower and more crowded spines.

Malaya, Sumatra : occasional, sometimes in villages, from Malacca northward.

The seeds are said to have a very pleasant aroma. But the species is little known.

D. testudinarum

(Lat., plated like a tortoise, testudo)

Stem-*Durian*
Durian Daun, D. Tanah

A small or moderate-sized tree.

Leaves variable in size, more or less coppery underneath : some trees with small narrow leaves, others with large leaves, others intermediate.

Flowers as in *D. oblongus* but with red or pink petals and stamens, the staminal tube long.

Fruit like that of the cultivated *Durian* but smaller, borne on the trunk generally at the base : seeds only partly covered by the pulp.

Borneo, Malaya : wide-spread but scattered in the lowland forest.

D. zibethinus

(from the Italian *zibetto* or civet, *i.e.* strong smelling)

Durian

Flowers white, cream-colour or yellow.

var. **roseiflorus**

Red-flowered *Durian*
Durian Au, D. Sepek

Petals rose-red, stamens and style pink : flower rather smaller : ? with more crowded spines on the fruit : pulp golden yellow.

The *Durian* is so widely cultivated in Malaya and neighbouring countries that its origin in the forest is doubtful. It is as likely to be truly wild in Malaya as anywhere because big trees are to be found in the forests of Pahang, Perak and Kelantan, though they may, of course, have developed from seeds discarded by jungle-folk. The odour of the fruit in season attracts wild animals from a far. The elephants, it seems, have first pick, the tiger, deer, pig, rhinoceros; seladang, tapir and monkey enjoying what is left. In those parts of Pahang where Durians are common in the forest, as in the neighbourhood of Jerantut and Mentakab, Malays and Sakai build shelters in the trees, above the reach of elephants, whence they can descend by a ladder to pick up the fruits as they drop. Tales there are of Malays who have gathered a fruit only to be gathered in turn by an elephant.

Among village-trees, the *Durian* is distinguished by its large size, overtopping all but the biggest Mango-trees, and by its sombre brownish green foliage. Young trees are conical but at maturity the crown spreads, becoming open and irregular with gnarled, crooked branches. The leaves droop, are rather small, and are silvery brownish on the underside from the minute scales. The trunk is massive and buttressed : the bark is warm brown, rough and flaky. The tree is evergreen but seasonal in flowering. There are two crops of fruit each year in Malaya, one about June and the other about January, but whether every tree flowers and fruits twice is not known. Young trees fruit at 7 years of age. The fruit takes about 3 months to develop and is not fully ripe until it has dropped from the tree : it then begins to gape into 5 pieces and, if left for only a few days, the pulp round the seeds turns sour and rancid. How the flowers are pollinated is not certainly known. They open between 2 and 3 p.m. (summer

MALVACEÆ

time), though the protrusion of the petals from the bud is evident about 10 a.m. : and the petals fall off about 2 a.m., (i.e. at opposite times to the *Simpoh*, *Wormia suffruticosa*). It has been suggested that they are self-pollinated or pollinated by bats because the milky smell is like that of bat-flowers, but bees may generally be seen at them in the afternoon. *Durian*, *Rambutan* and *Mangosteen* flower together before the *Binjai* and *Mata Kuching*.

The *Durian* has received no special selection as a fruit tree. There are many unclassified varieties differing in size, prickles and colour of the fruit and in taste, smell and colour of the pulp. The best have little or no foetid odour. It is said that the Red-flowered *Durian* (var. *roseiflorus*) has the best taste. This variety is occasionally found in villages in the northern half of the country. In Kelantan it is called *Durian Au* or *Di Au*, and in Trengganu *Durian Sepek*. It is one of the most beautiful flowering trees and deserves to be better known and cultivated, if only for ornament.

Like the *Mangosteen*, *Rambutan*, *Tampoi* and other typical Malayan fruit-trees, the *Durian* does not thrive in countries with a cold or very dry season. Its seeds, also, cannot be dried without losing their vitality.

HIBISCUS

(a Greek plant-name, perhaps the Hollyhock)

Leaves simple, spirally arranged.

Flowers large, showy, solitary or in loose clusters: calyx generally double, the inner cup with distinct sepals round the edge: stamens united in a column, joined to the base of the petals: style divided into 5 stigmas.

Fruit a capsule splitting into 5 parts.

About 150 species, throughout the tropics: about 12 species in Malaya.

Beside the Garden Hibiscus and the Rose of Sharon, which are described below, this genus includes the Ladies' Fingers or *Kachang Bendi* (*H. esculentus*) and the Musk Mallow or *Kapas Hantu* (*H. abelmoschus*). The flowers are like those of the Mallows and Hollyhocks of Europe. Those of several exotic species are pollinated by birds, and this may well be so with our tree-species *H. floccosus* and *H. macrophyllus*. The large, firm, red and scentless flower of the Garden Hibiscus, with its abundant honey and projecting stamens, is a typical bird-flower, and it is frequently visited by sunbirds and flower-peckers in Malaya.

Key to the Species of Hibiscus and Thespesia

- Cultivated shrubs or treelets: leaves distinctly toothed
 - Leaves softly downy: flowers white turning pink ... *H. mutabilis*
 - Not so
 - Flowers dangling: petals toothed and slashed ... *H. schizopetalus*
 - Not so: flowers variously coloured *H. rosa-sinensis*
- Trees, mostly wild: leaves not toothed or very slightly
 - Leaves glabrous, green beneath *T. populnea* p. 444
 - Leaves hairy, often rough or thinly white woolly beneath
 - Shoots harshly scurfy with yellowish scales, like sand-paper: flowers orange-yellow without a dark eye *H. floccosus*
 - Not so: flowers yellow with a maroon eye
 - Shoots bristly with rather prickly, long yellow hairs: leaves 5-14" wide *H. macrophyllus*
 - Shoots finely downy: leaves 3-6" wide *H. tiliaceus*

H. floccosus Text-Fig. 144
(Lat., woolly)

Orange Tree-Hibiscus
Tutok, Tutur, Kangsar, Cheong Kumai (Grik)

A deciduous tree, up to 80 ft. high, with narrow, cylindric crown appearing as a collection of leafy spires, the branches arching out and then curving up: *bark* pale grey: *young leaves* pale pink: *twigs, leaf-stalks, inflorescences and calyx* densely and harshly scurfy with yellowish scales like sand-paper.

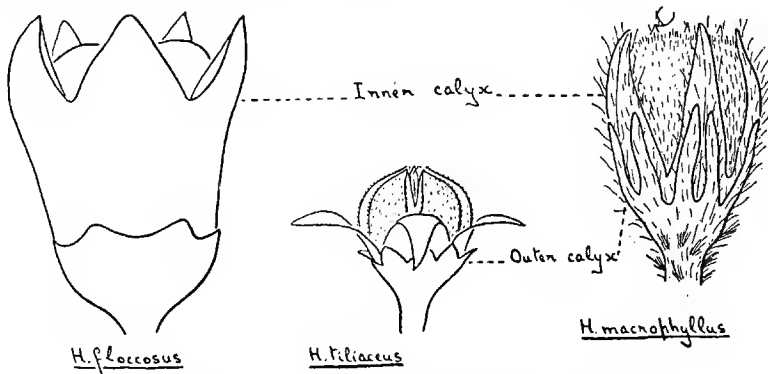
Leaf-blade 4-8" wide, heart-shaped, often shortly lobed, rather leathery, thinly and harshly hairy on both sides, rough: stalk 1-3" long.

Flowers in panicles, 4-5" wide, facing upward: *petals* 4-4½" long, 1½-2" wide, with narrow stalks, rich yellow to orange with reddish streaks, no darker eye.

Capsules 1½" wide, massive.

Malaya: in lowland forests and open country from the middle of the country northward, abundant in the north.

The shape of this tree is characteristic. The fallen flowers, though shrivelled, keep their rich colour for many days, *c.f.* the Sea Trumpet (*Cordia*).



Text-Fig. 144. Fruits of Hibiscus, nat. size.

H. macrophyllus Text-Fig. 144
(Gr., makros—long, phullon—a leaf)

Bristly Tree-Hibiscus
Baru, Tutok, Tutur, Cheong

A tree up to 80 ft. high: *crown* irregular, of few branches with very large drooping leaves: *buds* covered by enormous stipules 2-5" long: *twigs, leaf-stalks and inflorescences* finely downy with white hairs and bristly with long, tufted, pungent or prickly yellow hairs.

Leaf-blade 5-14" wide, heart-shaped, with an abrupt long tip, hairy on both sides, very slightly toothed: stalk 4-10" long.

Flowers 4" wide, clear yellow with deep maroon eye, in panicles up to 10" long.

Capsules yellow-bristly.

Indo-China, Siam, W. Malaysia: common in lowland forest and secondary jungle from Malacca northward.

This looks like the Sea Hibiscus (*H. tiliaceus*) but has much bigger leaves and bristly twigs.

H. mutabilis Plate 132
(Lat., changeable)

Rose of Sharon

A laxly branched, evergreen garden shrub or treelet with softly downy leaves and twigs.

Leaf-blade heart-shaped, with 5 short angular lobes or points, toothed.

Flowers white in the morning changing to pink in the afternoon, often double.

China: commonly cultivated in Malaya.

H. rosa-sinensis

(Lat., rose of China)

Garden Hibiscus, Shoe-Flower

Bunga Raya, B. Pepulut

This common and well-known plant of the East is grown in many varieties in our gardens. Most have been introduced from Honolulu and are propagated by cuttings: very few will fruit in Malaya. The original form of the species is certainly that with the single red flower, but it has been cultivated so long in China, Japan and the Pacific Isles that its exact origin is doubtful. If left to itself, this common form will grow into a small tree between 20 and 30 feet high. It flowers throughout the year and is evergreen.



Text-Fig. 145. Coral Hibiscus (*H. schizopetalus*): (by courtesy of G. A. C. Herklots, Hongkong University).

H. schizopetalus Text-Fig. 145

(Gr., with split petals)

Coral Hibiscus

Bunga Raya

A bush like the Garden Hibiscus but the flowers dangling on slender stalks; calyx single; petals pink or white with the edge toothed and slashed: staminal column dangling.

Native of E. Africa: occasionally cultivated in Malaya.

H. tiliaceus Plate 133, Text-Fig. 144(like the Lime-tree, *Tilia*, of Europe)

Sea Hibiscus

Baru, Baru Baru, Bebaru

A low, spreading, much branched, evergreen tree up to 40 ft. high, with downy twigs.

Leaf-blade 3-6" wide, as broad as long, heart-shaped, tipped, the edge very slightly toothed, dark green, and glabrous above, rather white or glaucous and finely downy beneath: stalk 1½-4" long.

Flowers 4" wide, bright yellow with maroon eye, fading dull pink after falling, in straggling, few-flowered terminal or axillary panicles, staminal column light-yellow: stigmas deep crimson purple.

Fruit $\frac{3}{4}$ " wide, surrounded by the calyx-cup.

On sea shores throughout the tropics: common on all sandy and rocky shores of Malaya, extending up rivers in their brackish reaches and penetrating the nibong-mangrove, often planted far inland especially by streams and ditches in rice-fields.

The Sea Hibiscus flowers throughout the year, like the common red Garden Hibiscus and the Shrubby *Simpoh* (Wormia). The flowers open one at a time on each inflorescence about 9 a.m. (long after sunrise) and close in the afternoon about 4 p.m.: the corolla falls off the tree that evening or the next morning and turns dull pink on the ground. Usually every flower sets fruit.

The fibre of the bark is used by fishermen for string and cordage in making nets and as tow for caulking boats. "It is the fibre *par excellence* throughout the Pacific for all purposes" (BURKILL).

Compare the very similar Portia Tree (*Thespesia*).

NEESIA

(T. F. L. Nees v. Esenbeck, 1787-1837, the German botanist)

Forest-trees without, or with slight, buttresses: twigs stout.

Leaves spirally arranged, large (8-30" long), elliptic-obovate, not scaly beneath.

Flowers small, clustered on the twigs behind the leaves, *Durian*-like.

Fruits large, dry, woody, bluish grey, beautifully studded with small spines like a *Durian*, splitting open half-way into 5 parts, the inside of the cavities lined with chaffy, yellow, very irritating bristles: seeds black, shiny, rather small.

6 species, W. Malaysia: 3 species in Malaya, occasional in lowland forest.

The fallen fruits of *Neesias* are occasionally met with in the forest. They are most striking and attractive, but they must be handled with the greatest caution to prevent the bristles touching the skin: if their points once penetrate it is impossible to get rid of them until the skin is naturally sloughed off.

Malays call the tree *Apa Apa* and *Ha Ha*, apparently through surprise at finding such *Durian*-like but empty and irritating fruits in the forest. There is a fine specimen on Bukit Timah in Singapore.

SALMALIA

(from the Sanskrit plant-name *salmali*)

Tree with thorny trunk and, often, thorny twigs.

Leaves palmate with 5-9 leaflets.

Flowers large, appearing before the leaves, solitary or clustered: calyx cup-shaped with 2-4 lobes: petals 5: stamens very many, slender, joined in a short tube and this tube joined at the base with the petals and sepals.

Capsule large, woody, splitting into 5 parts, the inner walls of the capsule covered with cottony down: seeds small.

11 species, tropical Africa, Asia, Australia: 2 species in Malaya, in the lowlands.

S. Valetonii

(T. Valeton, 1855-1929, the Dutch botanist of Java)

Wild Kapok
Kabu Kabu Utan,
Kekabu Utan

A moderate or big deciduous tree, up to 100 ft. high, with flat-topped crown; trunk pale brownish grey, set with large pointed, sharp, woody knobs, often in rows, becoming slightly buttressed: *glabrous*.

MALVACEÆ

Leaves with 5-9 leaflets: *leaflets* 4-8" long on big trees, 8-15" long on small trees, lanceolate, almost sessile: leaf-stalks 1-2½" long on big trees, 4-10" long on small trees.

Flowers 3-4" long: calyx green, *petals greenish white*, stamens white, style pink.

Capsule 5-9" long, *angled, large*, not thorny.

Malaysia generally: frequent in the forest and secondary jungle from Kuala Lumpur northward in Malaya, especially by forest-streams.

As its Malay name suggests, this tree greatly resembles the Kapok (*Ceiba pentandra*), from which it differs technically in the arrangement of the stamens. But it can be distinguished from the village Kapok by its larger, flat leaflets, larger flowers and its occurrence wild in the forest. The saplings have the same stiff habit as the Kapok with whorls of branches, but full-grown trees have flat and dense crowns. It is deciduous and flowers on the bare branches from November to February. The floss from the capsules can be used like that of the Kapok.

The tree is commonest, perhaps, in Perak.

In BURKILL'S Dictionary it is called *Bombax larutensis*.

THESPESIA

(Gr., divinely wondrous)

Like Hibiscus but the edge of the calyx-cup sharp and entire (without sepals), the fruit not enclosed in the calyx.

6 species, E. Africa, tropical Asia and Australia: 1 species in Malaya.

T. populnea Text-Fig. 146

(like the Poplar-tree, Populus, of Europe)

Portia Tree, Pacific Rosewood

Baru, Baru Baru, B. Laut, Bebaru

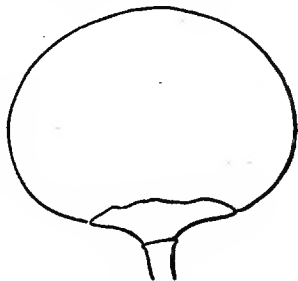
A medium-sized to rather tall, evergreen tree, up to 60 ft. high, with rather dense crown: *bark* light grey, *becoming rugged with deep fissures*: *glabrous* except the finely silvery-brown scaly young shoots.

Leaf-blade up to 7½ × 5", *longer than broad*, triangular heart-shaped, gradually narrowed to the tip, *rather fleshy and shiny*, with yellow midrib and veins like a fig-leaf.

Flowers 3" long and wide, *pale yellow with a maroon eye, fading pink on the tree and not falling off for several days*: staminal column pale yellow: *stigmas pale yellow*.

Fruit 1½" wide, *rounded-flattened*, containing a bright yellow gum, with the disc-like calyx at the base.

On sea-coasts of the Eastern Tropics: on all sandy and rocky coasts of Malaya.



Text-Fig. 146. Fruit of Thespesia, nat. size.

This tree is described and illustrated by WATSON (20, p. 53). From the similar Sea Hibiscus (*H. tiliaceus*) it differs in the glabrous shiny leaf longer than broad, the yellow stigmas of the flower, the fact that the faded flowers remain on the twigs for several days, the shape of the fruit and the rugged bark. The flowers open rather later in the morning, about 10 a.m. When sterile, it also resembles in general appearance the Sea Hearse (*Hernandia*) which, however, has a peltate leaf.

SENDUDOK FAMILY

Melastomaceæ

Leaves opposite, simple, entire, generally with 3 prominent longitudinal veins.

Flowers small to large, clustered, regular or bilaterally symmetrical: *sepals* 4 or 5, or apparently absent: *petals* 4 or 5, separate, pink, purple or blue, rarely white: *stamens* twice as many as the petals, 8 or 10, with rather thick, pink or blue stalks (rarely white) and large yellow, pink or blue anthers: *ovary inferior*.

Fruit a berry with many small seeds or with one large seed: in other cases capsular and opening, with dry or pulpy contents.

About 3,000 spp., throughout the tropics, mostly in S. America, rare in Africa and Polynesia: 25 genera, 180 spp., in Malaya, in lowlands and mountains.

This family consists mainly of herbs, shrubs and climbers. The tree-members are mostly rather small, few reaching as much as 60 ft. high. Some of the trees are among the few plants in Malaya which have blue flowers, but these are unfortunately too small to be worth cultivating though the colour is rich enough. The family is close to the Myrtles (Myrtaceæ) and differs chiefly in the absence of oil-glands, so that the tissues are not aromatic, and in the relatively few stamens with large anthers and thick stalks. The anthers, moreover, often bear "appendages" such as small horns, knobs or hairs. On the twigs one can usually find a line connecting the leaves of a pair, but there are no interpetiolar stipules as in the Mangrove- and Ixora-families (Rhizophoraceæ, Rubiaceæ).

Very little is known about the habits of the Malayan trees of this family, and the distinction of the species is in many cases far from satisfactory; e.g. *Melastoma*, *Memecylon*.

Key to the Genera

- Shrubs or treelets with 3-veined leaves withering red:
 flowers large, showy, pink to purple: petals 5
 Cultivated, chiefly in the mountains: flowers deep
 purple: leaves very silky *Tibouchina* p. 452
 Wild, lowland and mountain: flowers pink or pinkish
 purple *Melastoma*
 Trees: leaves withering yellow or brown: petals 4
 Leaves 3-veined *Pternandra* p. 451
 Leaves with a single midrib, not 3-veined *Memecylon* p. 448

MELASTOMA

(Gr., melas-black, stoma—mouth; from the berries of *M. malabathricum* blackening the tongue)

Twigs, leaf-stalks and calyx set with narrow, pointed scales, generally pressed flat, or with rather bristly hairs.

Leaves with 3 (-5) longitudinal veins, tapered to each end.

Flowers large, in terminal clusters, shortly stalked, bilaterally symmetrical through the arrangement of the stamens: *calyx with conspicuous flattened chaffy scales or more or less spreading bristles*, sepals 5, usually with an epicalyx: *petals 5, pinkish mauve, large: stamens 10, of two kinds, 5 short stamens* with yellow stalks and anthers, *5 long stamens* with a straight basal part to the stalk, a curved mauve distal part jointed to the basal and 2 short yellow horns at the joint, the anthers of the long stamens pale mauve: *style pink with green stigma*.

MELASTOMACEÆ

Fruits as berry-like capsules set with scales or bristles like the calyx, opening irregularly and disclosing a yellow, red or, commonly, purple pulpy mass with the tiny seeds embedded on it.

About 40 spp., Madagascar, Indo-Malaysia, Australia: 5 spp. in Malaya.

That very common and well-known shrub, the Singapore Rhododendron, is the chief member of this genus. All our species are so much alike, differing only in variable details, that we are tempted to consider them as merely varieties of this one species. Such is the attitude of Malays who refer to them indiscriminately as *Sendudok*, *Sedudok*, or *Kedudok*, though they may call the big-flowered kinds *Sendudok Gajah* and, occasionally, we are informed of a mysterious *Sendudok Ayer* or *Sendudok Puteh* which is alleged to have large white flowers and miraculous healing properties and to grow on river-banks: if it exists, it has yet to be made known to botanists.

Melastomas are usually shrubs of hedge-rows and waste-ground, where they are repeatedly burnt or cut back, but, if left undisturbed, they will become small trees 12-15 ft. high, occasionally even 20 ft., and such may be found in the forest at the edge of streams, on landslips or in old clearings. They are evergreen and some kinds flower throughout the year. The flowers last only one day, opening about 8 a.m. and closing in the late afternoon; the petals fall some days later. The fruits are sweet and are often eaten by children, those with purple pulp, such as the common *M. malabathricum*, staining the mouth like bilberries (*Vaccinium*). Birds, squirrels and monkeys are also fond of them and it is through their means that the Melastomas have become such common wide-spread plants, though we must add to this agency the preference of Melastomas for the poor and acid soils which generally compose waste-places.

Plants which can be mistaken for Melastomas are the *Kemunting* (*Rhodomyrtus*), which has blunt leaves and many slender stamens, and the weedy, straggling shrub known as *Clidemia hirta*, which has been introduced from South America and is now common in towns and villages. It has 3-veined, broad, hairy leaves, very small white flowers clustered in the leaf-axils and little blue-black berries: it also belongs to this family. Needless to say, the Melastomas have no more than a superficial resemblance to Rhododendrons which are allied with the heathers (*Ericaceæ*) and have trumpet-flowers.

The name Tiger-Flower is occasionally given to Melastomas.

Key to the Species

- Calyx set with spreading bristly hairs (like a *rambutan*); the seed-pulp yellow or red
 - Leaves glabrous; open places and forests ... *M. sanguineum*
 - Leaves very hairy; by forest-streams only ... *M. molle*
- Calyx with adpressed hairs, bristles or pointed chaffy scales; seed-pulp purple black
 - Leaves dull dark green, velvety on both sides:
 - flowers 2-3" wide; mountains ... *M. muticum*
 - Leaves not velvety or only on the underside, rather light green
 - Leaves ¼-2" wide, with stalks ¼-½" long; flowers 1-3" wide; very common, lowland and mountain ... *M. malabathricum*
 - Leaves 2-4" wide with stalks ¼-2" long; flowers 1-2" wide; occasional in the mountains ... *M. imbricatum*

M. imbricatumLesser Mountain *Sendudok*

(Lat., covered with tiles)

Leaf-blade 4-9 × 1½-4½", broadly elliptic, harsh to the touch on both sides: stalk ½-2" long.

Flowers 1-1½" wide, hardly stalked, set in dense clusters: calyx set with tiny scales. Occasional in the mountains: scarce in the lowlands.

M. malabathricum

Plate 158

Common *Sendudok*

(from Malabar)

Singapore Rhododendron

Twigs and flower-stalks rough with small, triangular, upward pointing scales.

Leaf-blade 1-5½ × ¼-2", narrow, slightly rough hairy on both surfaces: stalks ¼-½" long.

Flowers 2-3" wide, rarely 1-2" wide, on short stalks ¼-½" long: calyx closely set with short chaffy, silky or silvery scales.

Madagascar, India to Australia: very common throughout Malaya in the lowlands and mountains, chiefly in open places, everflowering.

This common plant is most variable. Botanists have tried to break it up into several species and varieties but without satisfaction. There are forms with large, medium-sized and small flowers, with dark purple-magenta petals, with light pink-magenta petals and, which are rare forms, with white petals: these last appear to be albino in that there is no purple even about the stems and leaves. In some the leaves are veined with purple underneath; in others the leaves are distinctly hairy underneath (var. *normale*), so that such plants may be difficult to distinguish from the Greater Mountain *Sendudok* (*M. muticum*) except by the paler colour of their leaves. A peculiar variety is that which grows in the beds or the flood-zones of rocky or sandy streams: it has small, narrow leaves, ¼-¾" wide, and small flowers, yet, on the banks more removed from the flood, every transition may be found to normal plants.

M. molleHairy *Sendudok*

(Lat., soft)

A very hairy plant, the hairs on the stem and fruit spreading: leaf-blade up to 9 × 3½", rather large, thickly and softly hairy on both sides, with stalks ½-1½" long: seeds red.

Forest streams throughout the country, not common, seldom flowering.

M. muticumGreater Mountain *Sendudok*

(Lat., curtailed)

Twigs and leafstalks set with rather long hair-like purple scales.

Leaf-blade 2-7½ × ½-3", often rather large, very dark, dull green, rather harshly velvety on both sides, especially hairy underneath and generally with purple veins beneath.

Flowers pale magenta-pink, the calyx set with rather long, silvery, hair-like scales often tinged pink: sepals ½-¾" long.

Common in the mountains, everflowering.

The dark velvety leaves abundantly distinguish this species.

M. sanguineumGreat *Sendudok*

(Lat. bloody)

Twigs, leaf-stalks, flower-stalks, calyx and fruit set with stiff, spreading, red or purple hairs: leaf-stalks flower-stalks and veins on the underside of the leaf generally red.

Leaf-blade 2-7½ × ½-3", smooth and almost glabrous: stalk ½-1" long.

Flowers 3-3½" wide: sepals about ½" long.

MELASTOMACEÆ

Fruits ripening red, with yellow or red seeds.

China, Malaysia : common in open places in the north of Malaya and on the East Coast as far south as Mersing.

This is the most distinctive of our Melastomas. The large flowers resemble those of *Tibouchina* except in their paler colour. It seems that they are produced seasonally after dry weather.

MEMECYLON

(the Greek name for the fruit of the Strawberry-tree, *Arbutus*)

Leaves with the one midrib and numerous side-veins, the veins often scarcely visible because of the thickness of the blade.

Flowers small, pink or blue or whitish, in small clusters in the leaf-axils or on the twigs behind the leaves: calyx smooth, often without a trace of sepals: petals 4: stamens 8, short, the anthers curved and with a point or horn projecting outward, often saddle-shaped.

Fruit as a round or oblong berry, crowned by the calyx-cup, with a thin, leathery or pulpy, green, pink, red, yellow, blue or black rind surrounding a thin, fairly hard shell: the shell containing one seed with large, thin, green or purple, much coiled and folded seed-leaves.

About 150 spp., throughout the tropics of the Old World : about 35 spp. in Malaya, in the lowlands and mountains.

The trees of this genus are known to Malays as *Nipis Kulit*, *Mangas* and *Delek*, though they may be called *Kelat* by mistake for *Eugenia*. The three names appear to be used indifferently. The first is the commonest and refers to the extraordinarily thin bark. This is generally grey to brownish and shallowly, closely or rather distantly fissured, though in some species finely ridged and in others rather narrowly flaky or thinly fibrous: the inner bark is pale ochre, buff or pinkish: and the whole bark is often no thicker than a piece or two of paper, yet firmly adherent to the hard, pale, dull ochre wood. Such exceedingly thin, fissured bark and hard wood is found also among Malayan trees in some wild species of *Antidesma* and *Baccaurea* (the genus to which the *Rambai* belongs) in the *Euphorbiaceæ*. One would expect the name to be *Kulit Nipis* but such is never the expression. The genus is not cursed like the succeeding.

Many of the Malayan species are common trees in the forest, making up a considerable part of the small-tree growth, but most species are very difficult to distinguish without studying minute details of the flowers and they are far from being properly understood. The fruits of all appear to be edible with a sour to sweet taste, though the rind is generally thin.

Memecylon can be mistaken for *Eugenia* because of the similarity in the leaves and fruits. *Memecylon* is distinguished by the thin bark, which is not astringent, the pink or blue flowers with short, rigid stamens (not fluffy and numerous), the thin shell inside the rind of the fruit and the thin, folded seed-leaves of the embryo. The leaves of many kinds of *Memecylon*, moreover, are so leathery that the veins are almost or quite invisible, in which case the undersides of the leaves are commonly yellowish and the uppersides dark glossy green. A faint line or ridge connecting the leaves of a pair can be seen on the twigs of *Memecylon* which is absent from *Eugenia*. The lack of latex at once distinguishes the genus from *Garcinia*.

The young leaves are variously pink, purple or deep blue.

Key to the Species

- Leaf-blade large, 4-11 × 1½-5", strongly veined :
 shortly stalked or nearly sessile
- Blade tapered to the base *M. heteropleurum*
 Blade rounded and heart-shaped at the base *M. Wallichii*
- Leaf-blade smaller, more or less leathery, the veins
 very faint and often invisible
- Blade sessile, heart-shaped at the base
- Fruit round, ½-¾" wide, green : flowers
 pinkish white : *inland tree* *M. amplexicaule*
 Fruit oblong, ½-¾" long, pink then purple
 black : flowers blue : *seashore shrub or*
treelet *M. cœruleum*
- Blade stalked, tapered to the base
- Sea-shores
- Fruit oblong : flowers blue, ¼" wide *M. cœruleum*
 Fruit round : flowers 2-3" wide
- Flowers pink, fragrant : fruits yellow then
 black : leaf-stalk up to ¼" long *M. edule*
 Flowers blue, scarcely fragrant : fruits
 yellow then red, finally black : leaf-
 stalk ¼-½" long *M. ovatum*
- Inland
- Leaf-blade 2-5½ × 1-2½" : flowers deep
 blue, in stalked clusters : fruit pink to
 purple *M. garcinioides*
 Blade 1½-3½ × 1-1½" : fruit green then
 yellowish
- Flowers in small sessile clusters, pale lilac *M. myrsinoides*
 Flowers in small stalked clusters, blue *M. acuminatum*

M. acuminatum

(Lat., pointed)

Very like *M. myrsinoides* but :—

Flowers-clusters with stalks ¼-1" long, in the leaf-axils, at the ends of the twigs or on the twigs behind the leaves : *flowers* 2" wide : *calyx* pale green, the sepal-teeth barely visible : *petals* white : *stamens* deep blue.

Malaya : common in lowland forest, ? in the mountains.

M. amplexicaule

(Lat., clasping the stem)

A tree up to 50 ft. high, with greyish brown, slightly fissured and flaky bark.

Leaf-blade 3-7 × 1-3", gradually tapered from the broad, rounded, sessile base.

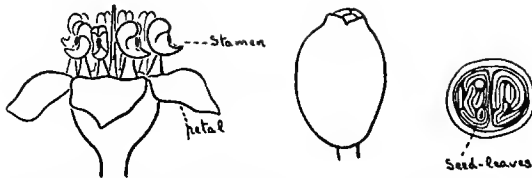
Flowers ½" wide, white or pale pinkish, in small sessile clusters on the twigs behind the leaves or in the axils of the old leaves.

India to Malaya : common throughout the country in lowland forest.

M. cœruleum Text-Fig. 147

(Lat., dark blue)

Very like *M. amplexicaule* but a smaller, sparingly branched tree or shrub with oblong fruits and different flowers, mostly clustered in the leaf-axils.



Text-Fig. 147. *Memecylon cœruleum*: flower $\times 3$: fruit, nat. size.

Flowers $\cdot 4''$ wide, scarcely fragrant: stamens deep blue: calyx-cup pink (making the buds bright pink).

Andaman IIs., Malaya: common on all rocky and sandy shores.

A variety of this species with the leaves tapered to a distinct stalk, $\frac{1}{4}''$ long, occurs commonly on the East coast.

M. edule

(Lat., edible)

A shrub or small tree to 25 ft. high, with greyish brown, closely and finely ridged and fissured bark.

Leaf-blade $1\frac{1}{2}$ –3 \times 1–1 $\frac{1}{2}''$, tapered to a rather blunt apex and to a short stalk at the base, the sides upcurled.

Flowers $\frac{1}{4}''$ wide, in small, shortly stalked clusters on the twigs behind the leaves or in the axils of the old leaves, very fragrant: calyx and petals pink: stamens with blue stalks.

Fruits pulpy when ripe, never red, round.

India, Siam, Malaya, Sumatra, Java: common on sandy and rocky shores.

M. garcinioides

(like the genus *Garcinia*)

A small tree to 30 ft. high.

Leaf-blade elliptic, tipped: stalk $\cdot 2$ – $\cdot 3''$ long.

Flowers $\frac{1}{3}''$ wide, in shortly stalked clusters on the twigs and in the leaf-axils: calyx pale pink: petals and stamens deep blue or violet.

Fruit $\cdot 4''$ wide, round or slightly oblong, pink then bluish or purple.

Sumatra, Malaya, Borneo: common in lowland forest.

M. heteropleurum

(Gr., heteros—the other, pleuron—a rib)

A shrub or small tree to 40 ft. high.

Leaves large, rather thin, with many conspicuous side-veins, elliptic, tapered to the apex, narrowed to the slightly heart-shaped base, more or less sessile.

Flowers $\cdot 4''$ wide, lilac, in small clusters on the twigs.

Fruit round, $\frac{3}{8}''$ wide, green then (?) purple.

Sumatra, Malaya, Borneo: common in lowland forest.

This must not be mistaken for *Eugenia densiflora*, p. 497.

M. myrsinoides

(like the genus *Myrsine*)

A small tree to 40 ft. high.

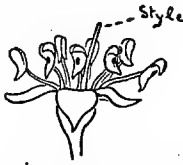
Leaf-blade elliptic, tipped, the veins more or less invisible: stalk $\cdot 1$ – $\cdot 2''$ long.

Flowers $\cdot 15''$ wide, pale lilac-pink, fragrant, in little sessile clusters on the twigs and in leaf-axils: calyx with 4 tiny teeth.

Fruit round, $\frac{1}{3}$ – $\frac{1}{2}''$ wide, grey-green then yellowish.

Malaya, Borneo, Sumatra: common in inland forest, by rivers and, occasionally, by the sea.

M. ovatum Text-Fig. 148
(from the leaf-shape)



Text-Fig. 148. *Memecylon ovatum*: flower $\times 3$: fruit, nat. size.

Very like *M. edule* but:—
A tree to 40 ft. : bark fissured and flaky, not ridged.
Leaf-blade larger, $2\frac{1}{2}$ – $4\frac{1}{2}$ \times $1\frac{1}{2}$ – $2\frac{1}{2}$ " , with a rather long, pointed tip, rather suddenly narrowed at the base into a distinct, longer stalk.
Flowers $\cdot 3$ " wide, faintly scented: calyx-cup pink: petals and stamens pale blue.
Fruit always deep red before ripening black.
Indo-Malaya: very common on rocky and sandy shores.

M. Wallichii

(N. Wallich, 1786–1854, the Danish botanist at Calcutta)

Very like *M. heteropleurum* but the base of the blade more or less widely heart-shaped: ? fruits oblong.
Malaya: common in the lowland forest.

PTERNANDRA

(Gr., pterna—heel, aner—man: from the shape of the anther)

Leaves with 3 or 5 longitudinal veins.
Flowers small or medium-size: calyx set with short blunt spines or flat warts (like miniature paving-stones): petals 4, white, blue or pale lilac: stamens 8, short.
Fruit a green or bluish berry marked like the calyx, containing many small seeds.
About 18 spp., Malaysia: 5 spp. in Malaya, chiefly in the lowlands.

These are the trees with cursed shade. Sit or work beneath them you may and, even, climb into their branches if they are living, but of their timber no Malay will make his house. So unlucky is their reputation that if they are used as beams or rafters it is believed that ill-fortune must pursue the owner for many generations. Hence the Malay name *Sial Menahun* or "Cursed Forever"; and hence the common occurrence of these trees in thickets and waste-places where, if they were less revengeful, they would certainly be cut down. Would that all of us had more reverence for trees! But here is a tale of folklore into which we need enquiry.

The Malayan species are evergreen and flower seasonally. They seldom exceed 50 ft. in height. Their young leaves are deep blue or purple-blue, especially in *P. caerulea*. The two common species, *P. caerulea* and *P. echinata*, are easily recognized from their opposite, 3-veined leaves and blue flowers, and the white-flowered *P. capitellata* is recognized from its big leathery, 3-veined leaves.

Sometimes the trees are called *Lidah Katak*.

Key to the Species

- Flowers nearly 1" wide: calyx with many soft short spines: leaves thin, narrow, ribbed beneath ... *P. echinata*
- Flowers $\frac{1}{4}$ – $\frac{1}{3}$ " wide: calyx with small, flat, pale green warts: leaves broad, leathery
- Leaves 5–10 \times $3\frac{1}{2}$ –6", very leathery: flowers white ... *P. capitellata*
- Leaves 2–7 \times 1–4", thinly leathery: flowers blue, violet or white ... *P. caerulea*

MELASTOMACEÆ

P. capitellata

(Lat., with little heads)

Cursed Shade
Sial Menahun

Leaves yellowish beneath, broadly elliptic, fleshy: stalks $\frac{1}{4}$ - $\frac{1}{2}$ ".

Flowers in small clusters in the leaf-axils or on the twigs behind the leaves.

Fruits $\frac{1}{2}$ " wide, purplish blue.

Tenasserim to Malaya: in lowland forest from Selangor northward, locally common.

P. cœrulescens

(Lat., turning blue)

Cursed Shade
Sial Menahun, Lidah Katak

Leaves rather oblong-elliptic, tipped: stalks $\frac{1}{4}$ " long.

Flowers blue except the green calyx and yellow anthers.

Fruits $\frac{1}{2}$ - $\frac{3}{4}$ " wide, blue-violet, then black.

W. Malaysia to the Moluccas: common in Malaya in lowland forest and secondary jungle.

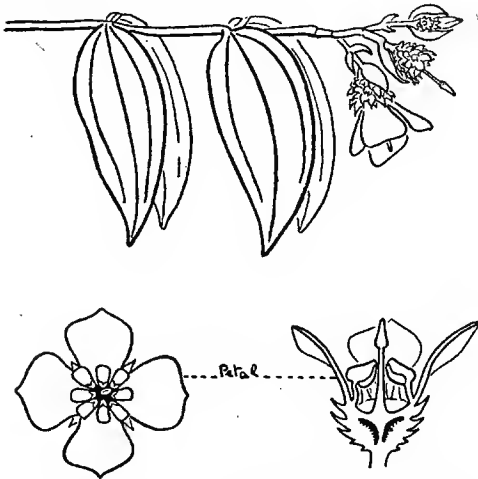
The typical form of this species has the flowers in stalked clusters, 1-3" long, at the ends of the twigs. A variety, called var. *Jackiana*, has white flowers in small clusters on the twigs behind the leaves or in the leaf-axils, smaller leaves and larger, coarsely tessellate fruits 1 cm. wide. The variety seems commoner than the typical form which has not been found south of Malacca.

P. echinata

Text-Fig. 149

(Gr., echinos— a hedgehog)

Cursed Shade
Sial Menahun



Text-Fig. 149. Cursed Shade (*Pterandra echinata*), $\times \frac{1}{2}$: flowers, nat. size.

A graceful tree with light green delicate foliage, drooping leafy twigs, grey bark and brown twigs: twigs and undersides of the leaves often hairy.

Leaf-blade 2-5 \times $\frac{3}{4}$ -1 $\frac{3}{4}$ ", narrowly oblong, long-pointed: stalks 1" long, very short.

Flowers stalked, a few together at the ends of the twigs, with a faint, rather unpleasant scent: petals rather broad, light blue turning mauve-blue in the afternoon.

Fruits $\frac{3}{4}$ " wide, green, set with soft spines or knobs.

Malaya, Borneo: very common throughout the country in lowland forest and secondary jungle.

The flowers open in the early morning and close in the late afternoon.

TIBOUCHINA

(the native name in Guiana)

Very like *Melastoma* but the fruit as a dry capsule splitting into 5 parts: stamens all joined and with 2 short knobs, or horns at the joint.

About 200 species, tropical S. America, mostly Brazil.

T. semidecandra

Brazilian Sendudok

An evergreen shrub or treelet, 5-12 ft. high, with brittle branches: like the ordinary *Sendudok* (*Melastoma*) but with large deep bluish purple flowers and velvety leaves silvery silky, and often with a golden sheen.

Flowers 3" wide, the buds covered with large rose-red bracts: *petals purple: stamens purple*, the longer ones with 2 white knobs at the joints.
Brazil: introduced to Malaya.

This beautiful shrub is common in the hill-stations of Malaya but it is little cultivated in the lowlands although it can be grown without difficulty. It seems not to fruit with us, and is propagated by young cuttings.

SENTOL FAMILY

Meliaceæ

(from the genus *Melia*)

Bark, twigs and fruits often with scant white latex.

Leaves pinnate or trifoliolate, spirally arranged: *leaflets more or less opposite*: stipules none.

Flowers small, symmetrical, mostly white, yellow or greenish, *in axillary panicles*: sepals 4-5 joined in a small cup: *petals 3-6*, narrow, curved back, separate: *stamens 5 or 10*, generally joined in a tube surrounding the ovary, with the anthers seated on the rim of the tube, in a few cases separate: *ovary superior*, with 1-5 cavities and one style.

Fruit generally large, as capsules with flat winged seeds, or fleshy with large seeds often coated with pulp.

45 genera, 1,400 species, mostly tropical: 16 genera, 100 species in Malaya, mostly in the lowland forest, very few in the mountains.

To this family belong our fruit-trees the *Sentol*, *Kechapi*, *Langsat* and *Duku* and a great many beautiful forest trees which are, however, very little known. Some of these must certainly be reckoned among the most beautiful on earth, because of their feathery foliage and magnificent fruits, and efforts should be made to bring them into cultivation. There is a large tree (*Dysoxylon*), for instance, in the forests of the middle of the country which has yellow fruits like small pumpkins: and there is another, called *Parak*, in our swampy forests which has coppery twigs and leaflets (*Amoora rubiginosa*). But the genus *Aglaia* probably offers more variety of feathery, silvery and coppery foliage than any other genus of Malayan trees.

In spite of these attractions, the family is not easy to study. The flowers differ only in minute details of construction. The fruits, however, are distinctive of the commoner species in each genus and, as they are large and more conspicuous than the flowers, we have prepared an extra key to the genera based on the fruits so that their differences may be appreciated.

In general appearance the trees of this family resemble those of other families with pinnate leaves, such as the *Burseraceæ*, *Sapindaceæ* and *Anacardiaceæ*. The staminal tube is the most distinctive feature of the *Meliaceæ*. But, in the absence of flowers, *Meliaceous* trees can generally be distinguished by their opposite and almost sessile leaflets. The *Pelong*-trees (*Pentaspadon*) and the species of *Parishia*, both of the *Anacardiaceæ*, are nevertheless very like species of *Dysoxylon* (*Meliaceæ*).

The family includes many valuable timber-trees such as the true Mahoganies (*Swietenia*) of Tropical America, the African Cedar (*Khaya*), the Satin Wood (*Chloroxylon*), the Chittagong Wood (*Chickrassia*) and the Toon Tree (*Cedrela*) of India, and the Yellow Wood (*Flindersia*) of Australia. Accounts of these will be found in BURKILL'S Dictionary. Little is known of the timber of the Malayan species.

Key to the Genera

- Leaves trifoliate: cultivated and wild trees
 Leaflets large: big trees *Sandoricum* p. 466
 Leaflets small, $\frac{1}{2}$ - $1\frac{1}{4}$ " wide: shrub or treelet *Aglaia odorata* p. 456
- Leaves pinnate
 Leaves doubly pinnate: flowers lilac:
 cultivated *Melia azedarach* p. 464
 Leaves once pinnate: flowers green, white or yellow
- Trees of cultivation
 Leaflets toothed, curved *Melia indica* p. 466
 Leaflets entire
 Leaflets 2-4 pairs and a terminal one
 Fruit pale leather colour or buff, 1-2" wide: *Langsat, Duku* ... *Lansium* p. 463
 Fruit yellow or red, $\frac{1}{2}$ -1" wide: flowers with a smell of citronella *Aglaia* p. 455
 Leaflets more numerous, the terminal one generally absent
 Leaflets small, 1 x $\frac{1}{2}$ ", 8-15 pairs ... *Chloroxylon* p. 460
 Leaflets larger
 Leaflets 3-6 pairs: foliage gloomy *Swietenia* p. 468
 Leaflets 5-13 pairs
 Leaflets 6-13 pairs: twigs with a foetid smell when broken: fallen flowers smelling of garlic *Cedrela* p. 459
 Not so: pith pink
 Leaflets large, 4-10 x 2-4", symmetrical: fruit large, round: occasional in gardens *Carapa guyanensis* p. 458
 Leaflets smaller, 1 $\frac{1}{2}$ -5 x $\frac{3}{4}$ -1 $\frac{1}{2}$ ", asymmetric: fruit oblong, small: frequent village tree, *Sentang* or *Setan* *Melia excelsa* p. 465
- Wild trees
 Mangrove and sea-shore trees with 1-3 pairs of leaflets: fruits large, round, with big angular seeds *Carapa* p. 458
 Riverside shrubs or treelets with narrow leaflets, $\frac{1}{4}$ -1" wide
 Flowers white: fruits 1-2" wide ... *Dysoxylon* p. 460
 Flowers yellow: fruits $\frac{1}{2}$ " wide ... *Aglaia* p. 455
 Not so: inland trees
 Twigs chocolate brown: leaflets 4-6 pairs, rather glaucous beneath: fruits rose-red, $\frac{1}{2}$ " wide or less, 1-seeded *Heynea* p. 462

- Not so
 Fruits round, white, red or yellow,
 large *Dysoxylon* p. 460
 Not so : *Sentang* *Melia excelsa* p. 465

Key to the Fruits of the Genera

- Fruits dry, capsular, splitting open : seeds flat,
 winged
 Fruits splitting into 3 rays : leaflets small :
 flowers without a staminal tube ... *Chloroxylon* p. 460
 Fruits splitting into 5 rays : leaflets medium
 or large
 Flowers with a staminal tube : anthers 10 :
 fruit 2-6" long *Swietenia* p. 468
 Stamens 5, separate : fruit 1-2" long ... *Cedrela* p. 459
 Fruits fleshy, the seeds bulky, not winged
 Fruit round, 2-4" wide, dry, brown, filled
 with large angular corky seeds ... *Carapa* p. 458
 Fruit more or less fleshy : seeds not so
 Fruit not opening
 Fruit round or oblong, 1-seeded, less than
 1" wide *Melia* p. 464
 Fruit round or oblong, 2-5 seeded, the
 seeds surrounded with pulp
 Leaves trifoliate : rind of fruit not easily
 separable from the pulp of the seeds *Sandoricum* p. 466
 Leaves pinnate
 Fruits with 5 seeds or pegs : fruiting
 on the branches or trunk ... *Lansium* p. 463
 Fruits with 1-3 seeds or pegs ... *Aglaia* p. 455
 Fruit opening
 Fruit ½" wide, with one seed coated with
 thin white pulp *Heynea* p. 462
 Fruit 1-4" wide, splitting into 3-4 parts,
 with 1-4 large seeds with red or
 yellow pulp *Dysoxylon* p. 460

AGLAIA

(Gr., *aglaia*—beauty)

Leaves pinnate, with a terminal leaflet, spirally arranged : leaflets opposite.
Flowers minute, round, white, pink or yellow, mostly with a citronella-scent,
 in axillary or terminal panicles : petals 5.
Fruits fleshy, not opening, rather small (up to 1" wide), with a brightly coloured,
thin rind and 1-3 cavities each filled with a large seed surrounded by transparent
white, yellow or orange pulp.
 250 species, Indo-Malaysia, Australasia : 40 species in Malaya, mostly in lowland forest.

MELIACEÆ

This genus is allied with *Dysoxylon* but differs in the flower and fruit. Most Malayan species are small trees, but a few reach 100 ft. in height. The twigs, leaves and inflorescences of many are woolly, scurfy or silvery-scaly. Our species are in general very little known, though common enough in the forest.

Kasai and *Pasak* are the names usually given to the trees by Malays: the former is also given to the orange-barked *Pometia*.

Key to the Species

Riverside bush of Neram-rivers: leaflets long and narrow, $\frac{1}{4}$ -1" wide	<i>A. salicifolia</i>
Not so: generally cultivated in gardens and villages	
Leaflets mostly 3-4 pairs	<i>A. odoratissima</i>
Leaflets 1-2 pairs	
Leaflets 1-3" long, small: throughout Malaya ...	<i>A. odorata</i>
Leaflets 3-9" long: Kota Bahru	
Leaflets narrowly elliptic: young twigs brownish scaly: fruits oblong with dull yellowish pulp: <i>Kriah, Sekriah</i> ...	<i>Aglaiia</i> sp.
Not so: fruits round, scarlet, with orange pulp: <i>Manek</i>	<i>Aglaiia</i> sp.

A. odorata Plate 174, Text-Fig. 150

Mock Lime
Chulan, Telur Belangkas

An evergreen bush or small tree, glabrous.
Leaves 2-4½" long, upright: leaflets 1½-3 × ½-1½", 1-2 (-3) pairs, dark green, flat, narrowly elliptic obovate, blunt, scarcely stalked: leaf-stalked winged narrowly throughout.



Text-Fig. 150. Mock Lime (*Aglaiia odorata*): (by courtesy of G. A. C. Herklots, Hongkong University).

Flowers .1" wide, yellow-ochre, fragrant of citronella, in small dense panicles up to 3" long.

Indo-China, S. China: common in Malayan gardens and villages.

In its bushy habit with upright leaves and small dark green leaflets, this little tree resembles a lime (*Citrus*) or the *Kemuning* (*Murraya*) from which it may readily be distinguished by the opposite, flat leaflets without gland-dots and the tiny flowers. With the Chinese it is a favourite on account of its fragrance. The flowers are used to perfume clothes and for scenting tea and the dried flowers are an 'article of trade'. It is called *Telur Belangkas* because the flowers suggest the king-crab's eggs. The plant is always propagated by marcots both in Java and Malaya and it seems that only the male plant, for there are both male and female, has been introduced: (compare the Indian Willow, *Salix* p. 581).

A. odoratissima

Kasai, Telur Belangkas Utan

A bush or small tree up to 40 ft. high: *bark* light fawn brown or greyish brown, finely dippled-scaly, with scant white latex: *twigs, leaf-stalks and inflorescences finely brown scaly*.

Leaves 5-12" long: *leaflets* 2-6 × 1-2½", 2-5 pairs, mostly 3-4, elliptic, more or less tipped, rather thin.

Flowers .05" wide, yellow, very fragrant of citronella, crowded in large panicles 6-15" long and wide.

Fruit ½" long, rather oblong, brownish yellow.

Malaya, Sumatra, Java: common in lowland forest.

This elegant small tree is much like *A. odorata* but is larger in all respects except the flowers which, individually, are much smaller.

A. salicifolia

(with leaves like a willow, Salix)

River Aglaia

Pokok Pelir Pelandok

A common riverside bush in the flood-zone under *Neram*-trees, along with *Dysoxylon angustifolium* and of very similar appearance: *leaflets* narrow, willow-like: *flowers* tiny, yellow, fragrant: *fruits* about ½" wide, oblong, ripening pinkish orange, with 2 seeds each surrounded with sweet translucent pulp.

Malaya: Kelantan, Pahang and Trengganu.

The fruits fall into the river and are eaten by fish, just as those of *Dysoxylon angustifolium* (p. 461), but they are not harmful.

Aglaia sp. Text-Fig. 151

(unidentified)

Kriah, Sekriah

A rather inconspicuous, small or medium-sized tree with greyish brownish, thinly flaky bark, with a little white latex in the tissues: *young shoots or buds finely brownish or coppery scaly*: young leaves pale green.

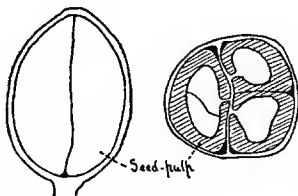
Leaves with 2 pairs of leaflets and a terminal leaflet: *leaflets* 4-9 × 1-2½", narrowly elliptic, with 14-22 pairs of side-veins.

Flowers ?

Fruits ¼-1" long, egg-shaped, smooth, dull orange-red, containing 1-2 (-3) brown seeds surrounded with yellowish-bistre, sweet, edible pulp: in small clusters on the twigs below the leaves.

A common village tree in Kota Bahru, but not yet found elsewhere.

This seems to be an undescribed species but we have not collected flowering specimens.



Text-Fig. 151. Fruit of *Sekriah* (*Aglaia* sp.), nat. size.

Aglaia sp.

(unidentified)

Manek

Like *A. odorata* but:—

Leaflets much larger, 3-8 × 1½-3", with 7-13 pairs of side-veins: *inflorescences* larger, 3-4" long: *fruits* ½-¾" long, round, dark scarlet with thin white mealy rind and translucent orange pulp.

Lower Siam, Kelantan: occasional in Kota Bahru.

This also seems to be an undescribed species, though it may be regarded as a variety of *A. odorata* with large flowers.

CARAPA

(the South American plant-name for *C. guyanensis*)

Like *Swietenia* but:—*fruit round*, with leathery rind, *splitting into 4 parts* when ripe: *seeds large, angular, corky*, closely packed together, not winged, 2-several in each fruit: flowers with 4 petals and 8 anthers.

20 spp., throughout the tropics: 3 spp. in Malaya (one introduced).

Our indigenous species of *Carapa* are common mangrove trees. They have been excellently described and figured by WATSON (20, p. 53).

Key to the Species

Inland cultivated tree: leaflets 5–8 pairs	...	<i>C. guyanensis</i>
Sea-shore, mangrove and riverside trees, wild: leaflets 1–3 pairs		
Bark smooth, peeling, pale reddish brown: fruits as big as a pomelo: leaflets very blunt, 1–2 pairs		<i>C. granatum</i>
Bark blackish brown, fissured or cracked: fruit as big as an orange: leaflets more or less pointed, 2–3 pairs	... ..	<i>C. moluccensis</i>

C. granatum

Nyireh, N. Bunga, N. Udang

(Lat., full of seeds)

A tree of tropical mangrove swamps, easily known from the smooth, peeling bark, the new bark beneath the long scroll-like flakes being greenish, and from the very large brown fruits: *leaflets withering orange red*.

Inflorescences 1–3" long.

E. Africa to the Pacific: common in all mangrove round Malaya.

This is called *C. obovatum* by WATSON.

C. guyanensis

Crabwood, Carapa

(from Guiana)

A tall evergreen tree, slightly fluted or buttressed at the base, the crown heavy but rather irregular: *bark light brown to greyish brown, rather deeply fissured, flaky* in long coarse pieces: *twigs thick, with pink pith*, no smell: *buds covered with several thick, tough, pointed, brown scales: young leaves pinkish*.

Leaves 1–2 ft. long. crowded at the ends of the twigs, rather drooping but the leaflets spread out, the stalks pale brown and woody: *leaflets 4–10 × 2–4"*, 5–8 pairs, opposite, elliptic, pointed, *symmetrical*.

Flowers ½" wide, greenish white, fragrant, in compact spike-like sprays 10–16" long, crowded at the ends of the twigs and produced before the new shoots.

Fruits 3–4" wide, brown, scurfy, like uneven apples, with 4 warted ridges.

Trop. S. America: occasionally seen in parks and gardens in Malaya.

This tree is also known as Demerara Mahogany. Its timber is valuable.

From the rather similar Broad-leafed Mahogany (*Swietenia macrophylla*) the Crabwood is told by its less dense crown with more numerous, symmetric leaflets, and by its brown bark.

C. moluccensis

(from the Moluccas)

Nyireh Batu

A tree of the upper reaches of the mangrove, often in only slightly brackish water, apparently the same species occurring also on sandy and rocky shores of islands: crown light green.

Leaflets $4-8 \times 1\frac{1}{2}-2\frac{1}{2}$ " , becoming leathery, *withering vivid yellow*.

Inflorescences 3-6" long, green: flowers .1" long, pale cream yellow.

E. Africa to the Pacific: frequent on both coasts of Malaya.

CEDRELA

(from the Latin, Cedrus—the Cedar)

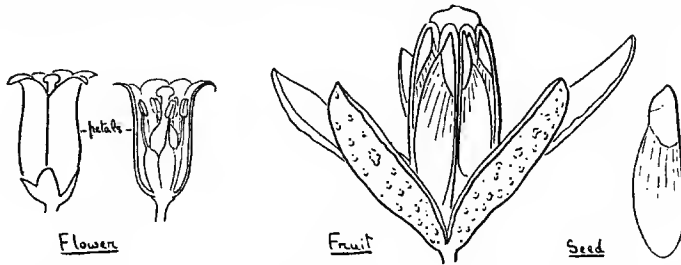
Leaves pinnate, spirally arranged, *without a terminal leaflet*.

Flowers in axillary panicles: petals 5: *stamens 5, separate*, not joined in a tube.

Fruit *an oblong, thinly woody capsule*, splitting into 5 thin parts leaving a stout woody core: *seeds flat, winged, many*.

60 species, tropical Asia and America: 3 species in Malaya.

This genus includes several valuable timber-trees, such as the Toon-Tree of India, *C. Toona*, and the Spanish Cedar of Tropical America, *C. odorata*. The Toon Tree does not grow satisfactorily in Malaya. The Spanish Cedar is grown experimentally in the Netherlands Indies, and it was intended to introduce it to Malaya but, by accident, another species *C. Glaziovii*, which is a native of Brazil, was obtained; and this species is now a common roadside-tree in Malaya. Our indigenous species appear to be rare forest-trees, known as *Surian*.



Text-Fig. 152. *Cedrela Glaziovii*: flower $\times 3$: fruit and seed, nat. size.

C. Glaziovii

Plates 134, 135, Text-Fig. 152

Stinking Mahogany

(A. F. M. Glaziou, 1828-1906, the French botanist of Rio de Janeiro)

A tall deciduous tree, up to 80 ft. high, not buttressed: *crown light green*, round, rather open, *the lower branches drooping*: *bark light grey, shallowly fissured* with broad flat intervals: *twigs thick, easily snapping, with a fulsome fœtid smell*, with large leaf-scars and conspicuous brown lenticels, *the wood of the twigs pinkish brown*: *bark, twigs, leaves and fallen flowers fœtid*.

Leaves 6-24" long, large: *leaflets $2\frac{1}{2}-4\frac{1}{2} \times \frac{3}{4}-2$ "*, 5-10 pairs, more or less opposite, lanceolate elliptic, tipped, asymmetric at the base, the middle leaflets being largest, light green, *drooping*: *leaves on the lower drooping branches much larger, 2-4 ft. long*, with 10-13 pairs of leaflets.

Flowers .2" long, white, in panicles 6-20" long, *fragrant when fresh, smelling of garlic when fallen*.

Fruits 1-2" long, oblong, blunt, dark grey or blackish, flecked with pale brown spots (lenticels): *seeds 1" long, brown, slip-like*.

Brazil: frequently planted by roads in Malaya, particularly in Perak.

A few trees of the Stinking Mahogany occur in Singapore, two being in the Cathedral Close next the Adelphi Hotel. It is planted along the main road of Raub and in several towns in Perak. The finest specimens in the country are

MELIACEÆ

undoubtedly those at Lenggong, the lower drooping branches of which sweep to the ground like those of the *Angsana* (*Pterocarpus*).

The foul smell of the twigs and leaves and the garlic smell of the fallen flowers will distinguish the Stinking Mahogany from such trees as the *Senkuang* (*Dracontomelum*), *Sentang* (*Melia excelsa*) and *Kedondong* (*Spondias*) which it closely resembles in general appearance: and all these have fleshy fruits.

In Singapore, the trees change their leaves annually about September.

CHLOROXYLON

(Gr., chloros—yellow green, xulon—wood)

Leaves simple pinnate without a terminal leaflet, the leaflets small.

Flowers in terminal panicles: petals 5: stamens 10 not joined: ovary with 3 cavities.

Fruit a small capsule splitting into 3 parts: seeds winged.

1 species introduced to Malaya.

C. swietenia

Satinwood Tree

(like *Swietenia*)

A rather small, deciduous tree (in Malaya) up to 30 feet high, like a small Nim tree (*Melia indica*) but with finer leaflets: bark light grey, slightly ridged and flaky: twigs brown with many, small, pale spots (lenticels): flowering on the bare twigs before the new leaves: glabrous.

Leaves 4–8" long, drooping, with 8–15 pairs of small, drooping, very asymmetric, dull greyish green leaflets, about $1 \times \frac{1}{2}$ ", more or less glaucous underneath.

Flowers $\frac{3}{8}$ " wide, cream-colour, in small panicles.

Capsule $\frac{3}{4}$ –1" long, oblong, splitting open on the tree.

Central India, Ceylon: occasionally seen in gardens in Malaya, but little known: two trees in the grounds of the district hospital at Kuala Kangsar.

This is a pretty little tree with delicate foliage. It may grow successfully in the dryer climate of the north of the country, like the Teak, the Litchi and the Wood Apple. The wood and bark contain a substance which may irritate the skin. In shape, the leaflets remind one of the *Garupillai* or Curry Bush (*Murraya Kœnigii*), but have no pungent smell.

DYSOXYLON

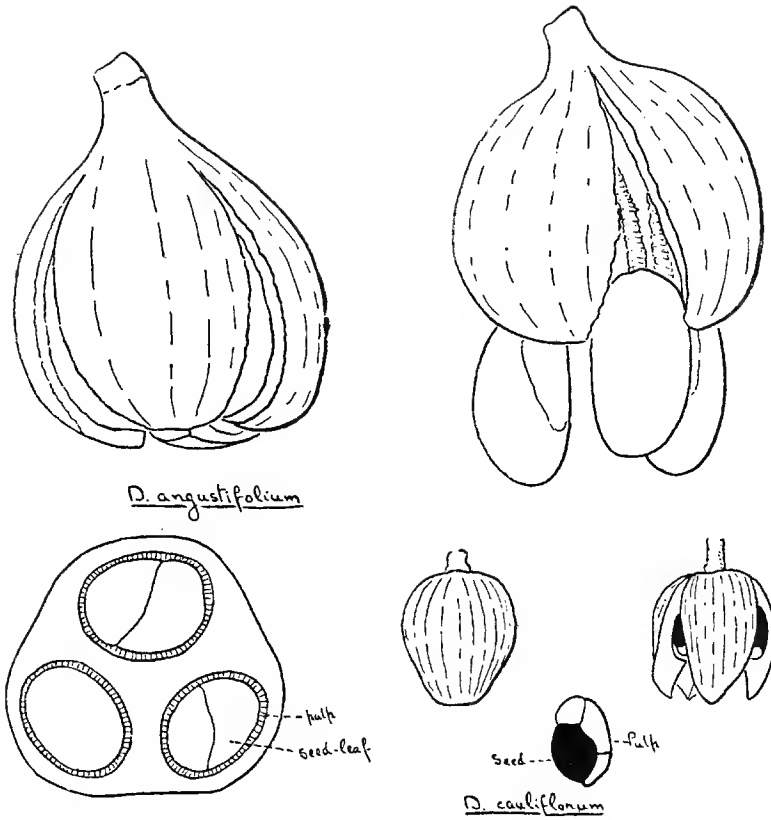
(Gr., dus—unpleasant, xulon—wood)

Leaves simply pinnate, mostly with a terminal leaflet, spirally arranged.

Fruits larger, 1–5" wide, yellow, orange, pink, red or russet-brown, round or pear-shaped, fleshy, splitting into 3–4 parts: seeds large, oblong, black or brown, more or less covered by a waxy or pulpy, opaque, yellow, orange or red layer, often dangling from the open fruits on broad, mealy, white strands.

About 100 species, Indo-Malaysia, Australasia: about 20 species in Malaya, mostly in the lowlands.

The species of this and two related genera, *Amoora* and *Chisocheton*, form a characteristic element in our virgin forests. Their large vivid fruits, often like hard tomatoes, are striking and unmistakable, yet the seeds appear to be inedible, wherefore Malays often call them *Kedondong* or *Tangisong Burong* (see p. 6). Some species have foetid tissues, smelling of garlic, and may be called *Kulim* with some such epithet as *Burong* or *Gajah* to distinguish them from the real *Kulim* (*Scorodocarpus*, see p. 728 and FOXWORTHY 7, p. 52). Usually, however, Malays are not interested in the trees and have no name for them.



Text-Fig. 153. Fruit of Dysoxylon, $\times \frac{1}{2}$.

Several exotic species of Dysoxylon give useful timber. That of two Indian species is called White Cedar and that of an Australian species Pencil Cedar : but botanically, of course, the plants have no relation with true Cedars, which are conifers.

Key to the Species

- | | | |
|--|-----|---------------------------|
| Riverside shrub or treelet with narrow leaflets | ... | <i>D. angustifolium</i> . |
| Forest tree with flowers and fruits on the trunk | ... | <i>D. cauliflorum</i> |

D. angustifolium Text-Fig. 153
(Lat., with narrow leaf)

River Dysoxylon
Langga Ayer, Maris

An evergreen shrub or small tree on the banks of *Neram*-rivers, in the flood level : leaflets narrow and willow-like: flowers 6" wide, smelling of garlic, white: fruits 1-2" wide, pear-shaped, white flushed pink, rather thin-skinned: seeds scarlet.
By *Neram*-rivers of Pahang, Trengganu and Kelantan, common.

The seeds drop into the river and are eaten by fish whose flesh they taint and render poisonous during the fruiting season. Compare *Aglaia salicifolia*, p. 457.

D. cauliflorum Plate 136, Text-Fig. 153
(Lat., caulis—stem, flos—flower)

Stem Dysoxylon

An evergreen forest tree up to 60 ft. high: *flowers and fruits clustered on burs on the trunk, almost from ground level, or along the branches and even in the axils of the old leaves: flowering sprays short, up to 3" long, the flowers white to dirty pinkish, intensely fragrant of almonds and musk, with 4 petals: fruits $1\frac{1}{2} \times 1$ ", somewhat conical, slightly 4-angled, blunt, ripening rose-red, splitting into 4 lobes, orange within: seeds shiny black, bordered on the inner face with white tissue and waxy orange pulp: latex abundant in the fruit, scant in the twigs.*

Malaya: common throughout the lowland forest.

This and another species of Dysoxylon and the *Langsat* (*Lansium*) are the only Malayan members of the family which are cauliflorous. At certain times of the year, the Reservoir Jungle in Singapore is perfumed of an evening with the heavy fragrance of the flowers which develop simultaneously on all the trees

HEYNEA

(B. Heyne, d. ca. 1820, botanist of the East India Company)

Leaves pinnate with pairs of opposite leaflets and a terminal leaflet.

Flowers small, white, in large terminal and axillary panicles: calyx as a small 5-lobed cup: petals 4-5: stamens 8-10, joined for half their length in a tube.

Fruit like a small red berry eventually splitting into two halves disclosing the one dark-brown seed enveloped in a thin white pulpy layer.

About 6 species, Indo-Malaysia: 1 species in Malaya.

H. trijuga Text-Fig. 154
(Lat., with 3 yokes)

Malay Rowan-Tree

*Mamak, Tangisong Burong,
Nessang Burong, Duak, Juak*

A small, laxly-branched tree up to 30 ft. high, but *rather bushy from the abundant pinnate leaves: bark grey or brownish, becoming rather deeply ridged and fissured, the inner bark pinkish and without latex: twigs olive brown becoming shiny chocolate or copper brown, spotted with paler lenticels: twigs and leaves glabrous: young leaves pink: no resinous smell.*

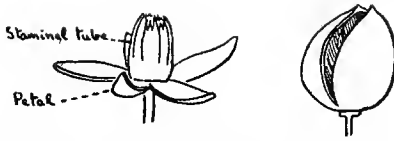
Leaves 6-15" long with 4-6 (occasionally 3) pairs of leaflets: *leaf-stalk yellowish, swollen at the pairs of leaflets: leaflets $2-6 \times \frac{3}{4}-2$ ", elliptic, widest near the asymmetric base, shortly stalked, tapered to a rather long point, thin, dark green above, more or less glaucous beneath or glancing, drooping with upcurled sides, the midrib yellowish white, with 8-13 pairs of side-veins.*

Flowers .2" wide, fragrant, white, the panicles 8-20" wide with greenish white or yellowish stalks: the anthers bright yellow at the top of the staminal cone.

Fruits .4-.5" long, round, yellow-green then vivid pink, glabrous: the branches of the panicle often flushed red in fruit.

India, S. China, Malay Peninsula, Sumatra: rather common in secondary jungle and by rice-fields in Kedah, Penang, Kelantan, Trengganu and Perak north of Ipoh: (? absent from the south of Malaya) common at Kuala Trengganu.

This beautiful little tree deserves to be much better known in cultivation, whether as a garden-tree or for planting by roadsides. It looks like a bushy Nim-tree (*Melia indica*) but with rugged bark and entire, less asymmetric leaflets. The large panicles of small white flowers cause it to resemble the *Sungkai* (*Peronema canescens*) which, however, has opposite leaves. But to the European it will recall more than any Malayan plant the Rowan-tree (*Pyrus aucuparia*), wherefore we have suggested an English name for lack of a characteristic local one.



Text-Fig. 154. *Heynea trijuga*: flower $\times 3$: fruit, nat. size.

The Malayan trees belong mostly to a variety *multijuga* of *H. trijuga*, the variety differing in having 4-6, instead of 3-4, pairs of leaflets, more numerous veins to the leaflet, larger flowers and rather smaller fruits. It should, perhaps, be regarded as a distinct species.

The smooth, chocolate-brown twigs and leaf-stalks swollen at the attachment of the leaflets will distinguish this tree even when sterile. From Burseraceous trees, which have similar leaf-stalks, it can be distinguished moreover by the lack of any resinous smell from the crushed or broken tissues as well as by the small size of the tree.

LANSIUM

(from the Malay name *langsa* or *langsat*)

A small genus differing from *Aglaia* only in the presence of a very short, thick style and 5 cavities in the fruit: leaflets alternate.

6 species, Indo-Malaysia: 3 species in Malaya.

L. domesticum

Langsat, Duku

A small or moderate-sized tree up to 50 ft. tall, the trunk rather deeply fluted: bark light reddish brown or fawn brown, slightly dippled-scaly.

Leaves 12-18" long, with 5-7 large, alternate, stalked leaflets 5-10 \times 2½-4", slightly hairy on the underside.

Flowers yellow, in hairy spikes solitary or clustered on the branches, occasionally from the trunk.

Fruit round or oblong, ¾-2" wide, ripening yellow-buff or brownish, with 5 seeds surrounded with sweet white pulp: seeds large, green.

W. Malaysia: common in Malayan villages and orchards.

This species covers the two well-known fruit-trees, the *Langsat* and the *Duku*. The *Langsat* has an oblong fruit (about 1½ \times 1") with thin, pale greyish-buff rind containing much white latex: it is also a small, meagre tree, often with poor foliage. The *Duku* is a robust tree with a larger, round fruit which has a thick, brownish buff rind easily split into 5 parts and without latex. It is said that the *Langsat* is the original, wild form of the species and the *Duku* is a cultivated race: but of this statement we have seen no proof.

Good varieties of both kinds are among the best Malayan fruits. Those without seeds are the sweetest; and, as such are smaller than fruits with seeds, only the uninitiated choose the larger. Trees grown from seed will fruit in 15 years. The fruit generally ripens between June and August; but there may also be another crop early in the year, as with mangosteens and durians.

MELIACEÆ

Like most Malayan fruit-trees, the cultivation of *Langsat* and *Duku* cannot be extended profitably into countries with a pronounced monsoon climate, for they do not like the dry season.

MELIA

(the Greek name for the Ash of Europe, *Fraxinus* : from the shape of the leaf)

Leaves pinnate, spirally arranged, with a terminal leaflet.

Flowers in axillary panicles : staminal tube with 10 blunt teeth at the top and 10 sessile anthers : petals 5.

Fruit oblong or round, fleshy with a hard stone, or leathery with a large seed, 1-seeded, not opening.

12 species, tropic of the Old World : 4 species in Malaya.

Key to the Species

Leaves once pinnate : flowers white			
Leaflets toothed, curved	...	...	<i>M. indica</i>
Leaflets entire : big tree	...	...	<i>M. excelsa</i>
Leaves twice pinnate : flowers lilac or purple		...	<i>M. azedarach</i>

M. azedarach Plate 137.
(a Persian name)

Persian Lilac
Mindi Kechil

A small, evergreen, conical tree up to 25 ft. high : buds and young shoots brownish or whitish scurfy.

Leaves 7-20" long, doubly pinnate, with 3-5 pairs of side-stalks, each with 3-5 pairs of leaflets, often 3 times pinnate in the lower part : leaflets $1\frac{1}{2}$ -3 × $\frac{1}{2}$ -1", lanceolate-elliptic, tapered, thin, light green, strongly toothed, not or only slightly asymmetric.

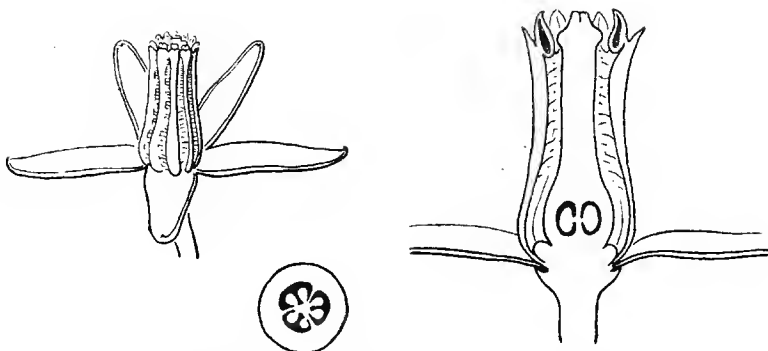
Flowers $\frac{1}{2}$ - $\frac{3}{4}$ " wide, fragrant : petals pale pink : staminal tube lilac turning deep purple.

Fruit $\frac{1}{2}$ " wide, round, green then yellowish brown.

Possibly wild in N. India, but cultivated in all warmer climates : frequent in Malayan gardens.

The Persian Lilac is a quick-growing tree with a light conical crown of delicate fern-like foliage, but it soon loses its symmetrical shape and becomes untidy. The old limbs ascend steeply from the trunk, then curve down rather abruptly and sag towards the upturned, conical leafy ends. The inflorescences are peculiar. In the axils of the large leaves are short flowering shoots, up to 8" long. They have terminal buds and small or rudimentary leaves in the axils of which the real, short panicles develop, reaching a length of only 2-3". When the fruit sets, the rudimentary leaves drop off and the whole short shoot remains as a fruiting branch on the main stem or large limbs below the foliage leaves. After the fruit has ripened, the fruiting branches drop off. A few of these flowering shoots, however, have unlimited growth and after flowering grow into normal foliage-shoots. Plants may begin to flower precociously, even from the axils of the cotyledons in the seedling-stage. Flowering continues throughout the year. There is much variation in the tothing of the leaflets.

Like the Nim Tree, the Persian Lilac has medicinal properties, as described by BURKILL, but of a different nature. The fruits are poisonous to man and some animals but not to birds : 6-8 seeds will kill a man. Fish-poison and insecticides are obtained from the plant. The leaves also are put into books to keep insects away.

Text-Fig. 155. *Melia excelsa*, × 3 and 6.

M. excelsa Plate 138, Text-Fig. 155
(Lat., lofty)

Sentang, Setan, Setang

A tall evergreen tree up to 150 ft. high, flowering at 50 ft., with rounded but rather open and uneven crown, the leaves tufted at the ends of the long slanting branches: the trunk seldom buttressed: *bark of large trees brownish or greyish-buff, fissured and with grey, fibrous, oblong flakes*, the bark of young trees pinkish or brownish grey and smooth: twigs with the buds thinly resin-coated and the *pith pink*: young leaves pale pink.

Leaves 1-2½ ft. long with 7-11 pairs of leaflets, soon glabrous: *leaflets 1½-5 × ¾-1½"*, narrowly elliptic, rather bluntly pointed, entire, asymmetric, the base very unequal, thin, with 6-11 pairs of side-veins.

Flowers ¾" wide, greenish white, fragrant, in panicles nearly as long as the leaves: petals white.

Fruit 1-1½" long, oblong, often with a constriction near one end, *green then yellow, with rather leathery rind and one large green seed giving a garlic-smell when bruised or cut*.

Malay Peninsula: frequent in villages from Malacca northward, occasional in lowland forest.

Though this is a well-known village-tree among Malays in the middle and north of the country, it appears to have escaped the attention of botanists for over a century. It was described from Penang in 1820 as *M. excelsa* but was never recognized until a year or two ago when we had the opportunity of studying the trees in Penang. There are fine specimens by the cemetery on Western Road, the great one by the entrance possibly being the original from which the species was described, and there is a specimen in the Waterfall Gardens. The big tree by the main road about a mile south of Kuala Kangsar is also a *Sentang*.

To Malays the tree is important chiefly because of its timber which is valued for house-building. The young shoots are eaten as a vegetable, though rather bitter. The old leaves are said to be intensely bitter and used only in medicine. The fruit is edible but little palatable.

In habit the *Sentang* looks like a gigantic Nim Tree with shaggy bark. It may easily be mistaken for the Stinking Mahogany (*Cedrela Glaziovii*) but its broken twigs and fallen flowers are not foetid. Care is also needed to distinguish trees of the *Senkuang* (*Dracontomelum*) from those of *Sentang* in the absence of flower and fruit: the *Sengkuang* has stouter leaf-stalks and leaflets which are often softly hairy.

M. indica Plate 139Nim Tree, Margosa Tree
Mambu, Sadu

A small or medium-sized tree with rather bushy crown: *bark* grey, becoming ridged and flaky in old trees: *twigs and leaves slightly fœtid of garlic*, when broken.

Leaves 7-13" long: *leaflets* $1\frac{1}{2}$ -4 × $\frac{1}{2}$ -1 $\frac{1}{2}$ ", 4-7 pairs generally with a terminal leaflet, *lanceolate, curved backward, toothed, very asymmetric*, light green: base of leaf-stalk with 1-2 tiny green pits on each side of the junction with the stem.

Flowers $\frac{1}{2}$ " wide, *white, fragrant, in slender lax panicles* up to 12" long, from the axils of the old leaves or on the twigs behind the leaves, a few flowers open at a time.

Fruit $\frac{1}{2}$ - $\frac{3}{4}$ " long, *rounded oblong, green then clear yellow, thinly pulpy, the outer layer like a thin shell*: seed surrounded by a thin pale shell.

Wild in India and Java, elsewhere cultivated: a frequent roadside and village tree in Malaya, especially in the north.

In India the Nim Tree is very common because it has valuable medicinal properties. "Almost every part of the tree is used": a bitter and strongly anti-septic resin pervades it. Pressed leaves are put in books to keep insects away. A medicinal toddy is made from the gummy sap. The various uses are described by BURKILL. Such preparations as soap, tooth paste, lotion and so on, incorporating the properties of the Nim Tree, are now on the market.

The Nim Tree is recognized from its delicate and curiously curved, toothed leaflets. It must not be mistaken for the Stinking Mahogany (*Cedrela Glaziovii*) which has entire leaflets and a much more fœtid smell. The trees seem not to be deciduous in Malaya.

SANDORICUM

(from the Moluccan plant-name *sandori*)

Leaves trifoliate, the leaflets entire, spirally arranged.

Flowers in panicles from the leaf-axils: stamens joined in a tube with the anthers at the top: petals 5.

Fruit large, round, fleshy, not splitting open: seeds 3-5 in a fruit, each surrounded with opaque or semi-translucent white and rather mealy pulp: the seeds with mauve-pink seed-leaves when cut across.

About 12 species, Malaysia: about 6 species in Malaya, in lowland forest.

S. koetjape Plates 140, 141, Text-Fig. 156 *Kechapi, Sentol, Setoi, Setieh*

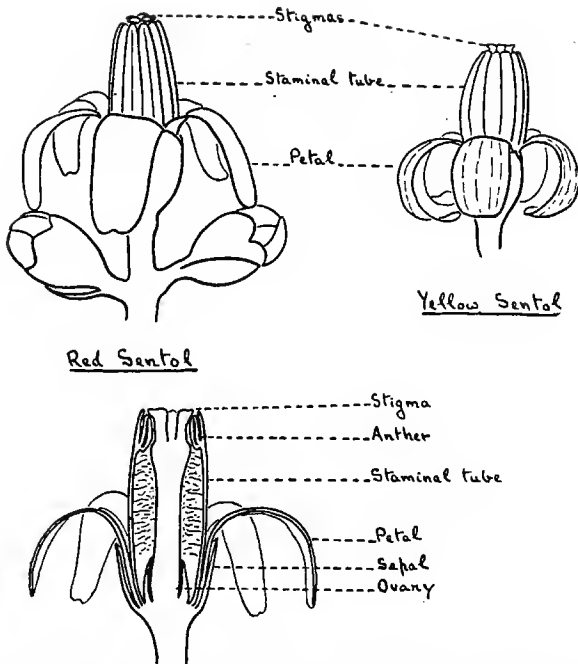
A more or less deciduous tree up to 150 ft. high, buttressed when old, generally without buttresses: *bark pinkish brownish or greyish*, mostly smooth but in a few places *peeling with round thin flakes causing faint circular raised patterns*: young leaves purplish, soon green.

Inflorescences green, axillary, drooping: flowers faintly fragrant.

Fruit 2-3" wide, rather flattened at the end, *ripening yellow, orange-ochre, brownish ochre or even slightly yellowish, thinly velvety*.

Malaysia generally: occasional in the lowland forest of Malaya, common in cultivation.

Under this species we place the two common fruit-trees, the *Sentol* and *Kechapi*, because their botanical position has not yet been sufficiently determined; whether, for instance, they are really varieties of one species as the *Langsat* and *Duku* are varieties of *Lansium domesticum*, or whether they should be regarded as two, like the Jack and the *Chempedak* (*Artocarpus*). Malays distinguish them by the fruit, whether it is thick-skinned and rather sour (*Kechapi*) or thin-skinned and sweet (*Sentol*): these names they generally apply to village-trees with the fruit of which they have been familiar from childhood and they are by no means adept at identifying the two kinds beyond their own villages.



Text-Fig. 156. Flowers of the *Sentol* (*Sandoricum kœtjape*), $\times 3$.

nevertheless, that much more information should be gathered locally before we discard the Malay names as wholly unreliable.

Both the Yellow and the Red Sentol are handsome upright trees with rather oblong crowns, resembling the Sea Apple (*Eugenia grandis*) but with more open crowns of a paler, softer green and with different bark. After the dry weather, at the beginning and middle of the year in Singapore, they shed their leaves, often so fast that the crowns become almost bare, but the new foliage develops so rapidly that within a week the tree is clothed with fresh green. The flowers are borne on the new shoots, shortly after the leaves have unfolded, and the fruits mature some 2-3 months later when the trees are hung with yellow balls. The fruits are not appetising to Europeans, though they are beautiful to look upon, for the sweet kind is too sweet and the sour excruciating. It seems that the Yellow and Red Sentol may both have sweet and sour races.

Concerning the wild species of the genus little is yet known. The Yellow Sentol we have found in the forest but not the Red; and the biggest *Sandoricum* that we have seen was a tree of the Yellow Sentol, 150 feet in height, where the road takes a bend through the forest near Lenggong on the way to Grik in Upper Perak.

RED SENTOL,

Kechapi, Sentoi

Leaflets velvety beneath, withering red, not shiny, large, 5-10" long, with 14-20 pairs of side-veins.

Flowers .5-.7" wide when fully open, green, in inflorescences 5-12" long: petals pale green, slightly recurved: staminal tube light yellow.

(Fruit sweet or sour, thick-walled, generally wrinkled or uneven, and often rotting on the tree).

(This is the Sandoricum which is so abundant in Manila).

Indeed, the application of these names is so conflicting in different parts of the country and the names themselves have so many variations that they are of little or no general use in identification. The Javanese name *Kechapi* is scarcely known out of Singapore, and in the north of Malaya the name *Sentol* is unfamiliar; but we find *Sentoi, Setul, Setoi, Setiek, Seteh, Setia* used now for the one, now for the other variety. Hence, as a result of our botanical studies, we have ventured to give the English names, the Red Sentol and the Yellow Sentol, to the two because of the characteristic colour of their withering leaves, from which they can always be distinguished from afar. It is certain,

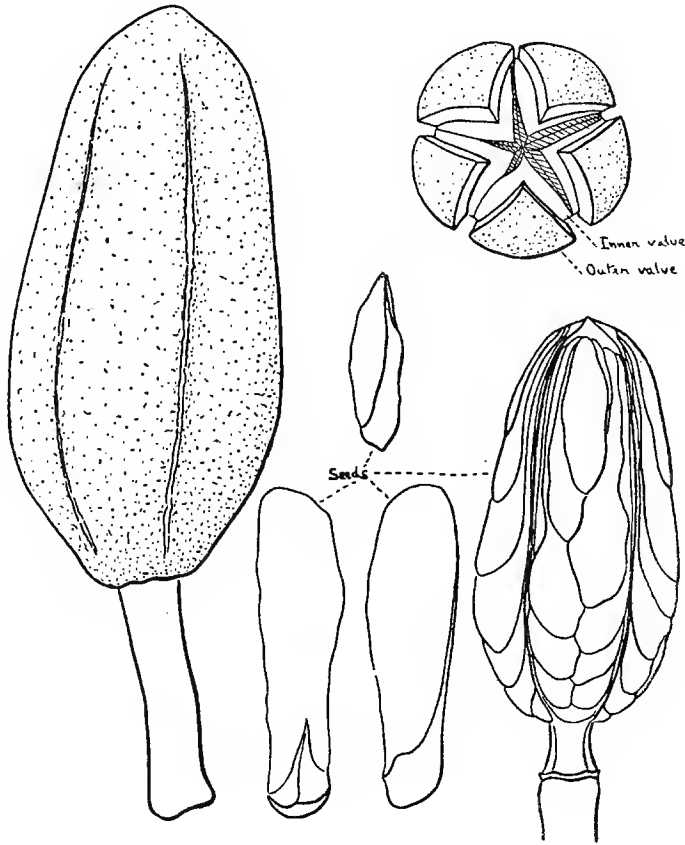
YELLOW SENTOL

Sentol, Setiek

Leaflets glabrous beneath, withering clear yellow, rather shiny, smaller and thinly leathery, up to 6" long, with 9-14 pairs of side-veins.

Flowers 3-5" wide when fully open, pinkish yellow, in inflorescences 1-6" long. calyx greenish yellow: *petals pinkish yellow* or pinkish flesh colour, strongly recurved: staminal tube deeper yellow to yellow buff.

(Fruit ? always sweet, thinner-walled, smooth and falling when ripe).



Text-Fig. 157. Fruit of *Swietenia macrophylla*, $\times \frac{1}{2}$.

SWIETENIA

(G. van Swieten, 1700-1772, a Dutch physician)

Leaves simply pinnate, without a terminal leaflet, spirally arranged.

Flowers in axillary panicles: stamens 10, united in a tube: petals 5.

Fruit a large oblong capsule, splitting into 5 parts and leaving a stout woody core bearing the numerous, flat, winged seeds at its upper end.

7 species, tropical America: 2 species introduced to Malaya.

Key to the Species

- Leaflets $\frac{3}{4}$ – $1\frac{1}{2}$ " wide, rather small *S. mahogani*
 Leaflets $1\frac{1}{2}$ –3" wide, rather large *S. macrophylla*

S. macrophylla Plate 142, Text-Fig. 157
 (Gr., makros—long, phullon—a leaf)

Broad-leafed Mahogany

A more or less deciduous tree up to 100 ft. high, with heavy, dark green, dense crown: trunk more or less buttressed, soon breaking up into several large limbs: bark dark grey, ridged and fissured with rather broad intervals, slightly scaly: twigs greyish brown, not foetid when broken: buds large, covered with numerous light brown, thick scales with recurved tips, often thinly varnished with resin: young leaves pink, soon turning green: old leaves withering orange brown to dull scarlet: glabrous.

Leaves 8–20" long: leaflets 4–7 × $1\frac{1}{2}$ –3", 3–6 pairs, mostly 5 pairs, more or less opposite, the end leaflets being the biggest, elliptic but distinctly curved, very asymmetric at the base, pointed, entire, drooping, dark glossy green with pale yellowish midrib: leaf-stalk green, dark brownish when old; the base slightly swollen but not pitted or grooved.

Flowers $\frac{1}{2}$ " wide, pale greenish yellow, in panicles, shorter than the leaves: staminal tube slightly reddish.

Capsules 6 × $2\frac{1}{2}$ ", very large, cylindrical barrel-shaped, upright, woody, greyish brown, rough, on a stout woody stalk 2" long: the body of the fruit splitting into 5 thick outer pieces (valves) and 5 thin, pale brownish white inner pieces immediately inside the outer pieces: the pieces falling off and exposing the closely packed seeds attached by the tips of their wings in 5 bundles round the top of the stout, 5-angled core: seeds 2– $3\frac{1}{2}$ " long, warm brown, with a broad thin wing and a rather corky thickened part containing the embryo.

Honduras: frequent as a roadside tree in Malayan towns.

From its heavy crown and dark fissured trunk we distinguish this gloomy tree. It was introduced to Malaya in 1876, about the same time as the Rubber-Tree. Large specimens occur in the Christian Cemetery in Penang, by several roads in the residential areas of Taiping, and near the entrance to Hindhede's Quarry at Bukit Timah in Singapore. In recent years it has been planted by many roads in Singapore such as Orchard Road, Holland Road, Eunearn Road and Nassim Hill: the trees were 20–40 ft. high in 1940 and had begun to flower. After pronounced dry weather the trees are more or less deciduous, the young shoots opening before the old leaves have all been shed. The flowers are borne on the new shoots. The large fruits are truly remarkable and it is to be hoped that they may become familiar objects in the schools. Under good conditions they are produced when the tree is seven years old.

Resembling this Mahogany are the Stinking Mahogany (*Cedrela Glaziovii*) with smaller, more numerous leaflets and foetid twigs, and the Crabwood (*Carapa guyanensis*) with more numerous leaflets and different fruits. Curiously enough, this West Indian tree was described from a specimen growing in the Calcutta Botanical Gardens by Sir GEORGE KING, who first distinguished it from the true Mahogany, *S. mahogani*.

S. mahogani

West Indian Mahogany

Like *S. macrophylla* but:—leaves smaller, 5–9" leaflets smaller, 2– $3\frac{1}{2}$ × $\frac{3}{4}$ – $1\frac{1}{4}$ ": fruits smaller.

W. Indies: occasional in Malayan gardens.

This tree was made known in Europe from the earliest days of trans-Atlantic sailing ships: the timber was used for their repair.

HORSE-RADISH TREE FAMILY

Moringaceæ

Leaves spirally arranged, 2-4 times pinnate with small, opposite, entire leaflets.

Flowers bilaterally symmetrical, set in panicles: sepals 5, joined in a cup: petals 5, free: stamens 10, 5 being sterile and spike-like and alternating with 5 fertile ones: ovary with a single cavity, the ovules arranged in 3 rows on the wall.

Fruit a long, triangular, dagger-like capsule or pod, splitting into 3 valves: seeds large, 3-winged, prismatic, arranged apparently in one row.

1 genus, 10 spp., tropical Africa, Madagascar, Arabia, India: 1 sp., in Malaya.

MORINGA

(the Indian plant-name)

M. oleifera Plate 143
(Lat., oil-bearing)

Horse-Radish Tree
Emmunggai, Gemunggai, Lemunggai, Meringgai,
Morunggai, Remunggai, Kachang Kelur

A small evergreen tree to 25 ft. high with tuberous roots, soft wood and thin crown.

Leaves 10-19" long, fern-like, with a long stalk: leaflets 3-1 x 2-5", elliptic to obovate, blunt, stalked, the base often oblique, soon glabrous, dull green, withering yellow.

Panicles 4-10" long, lax: *flowers ¾" wide, cream white, fragrant: calyx-cup green: sepals and petals cream white, the uppermost petal projecting: stamens greenish with orange anthers, hairy at the base.*

Fruit 6-16" long, at first like a long thin pale green dangling bean, then becoming 3-angled, brown, thinly woody, faintly ribbed and tapered from base to apex: seeds 1-1½" long, with a round greyish brown body and white wings.

Native of N. India, widely cultivated in Malaysia: introduced to Malaya, common in villages.

This small village-tree is at once recognised from its fern-like leaves and dagger-shaped pods. Like the members of the related family (Capparidaceæ), all parts of the plant contain a substance similar to the pungent essences of mustard and horse-radish, and the plant, accordingly, finds many uses. The leaves and young bean-like pods are eaten when cooked: an oil is obtained from the seeds and all parts are used in native medicine. The green pods are rich in Vitamin C.

GALE FAMILY

Myricaceæ

Leaves simple, spirally arranged.

Flowers minute, in catkins in the leaf-axils, male and female on different trees: male catkins bunched and generally branched: female catkins unbranched: petals and sepals none: male flowers consisting of a tiny bract and 3-6 stamens: female flowers in groups of 3, the ovary with 2 styles.

Fruit a thin pulpy berry with a large-stone: 1-seeded.

1 genus, about 60 spp., in most parts of the world: 2 spp. in Malaya.

MYRICA

(Gr., murike, an aromatic shrub)

M. Farquhariana Text-Fig. 158
(Major William Farquhar, 1770-1839, first Resident
of Singapore 1819)

Malay Gale
Telur Chichak

An evergreen tree to 40 ft. high with uneven, open, scarcely spreading crown composed of numerous, small, irregular, upright branches with short twigs: *bark* greyish buff, smooth: young twigs dull reddish brown and finely hairy: *young leaves* pale green with pink underside or pale pinkish brown.

Leaf-blade $1\frac{1}{2}$ -4 \times $\frac{1}{2}$ -1 $\frac{1}{2}$ "", narrow, oblong and blunt to lanceolate and rather pointed, generally small, thinly leathery, rather dry, dark green, with 5-11 pairs of side-veins, the fine network of veins visible on the upperside, the edge entire: *stalk* 1-2" long, very short.

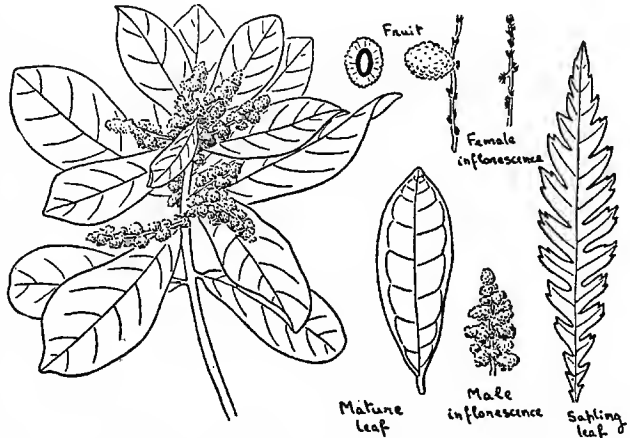
Sapling leaves up to 9 \times 2", much longer, thinner, pointed, strongly toothed (generally with small and large teeth), many pairs of veins: (a pair of conspicuous stipules at the base).

Catkins $\frac{3}{4}$ -2 $\frac{1}{2}$ " long, the male yellowish, pale orange or reddish, the female green.

Fruit $\frac{1}{2}$ " long, rather flattened, sessile, one or several to a spike, with bright rose-red then black, minutely pimply, thinly pulpy layer round the hard, pale stone.

Malay Peninsula: common especially in the middle and south of Malaya, often in sandy heaths near the sea: abundant in belukar in Singapore.

He must be an expert botanist that, coming from Europe, can recognise at once in our Malayan tree an ally of the Sweet Gale (*M. Gale*) of the bogs of his homeland. Yet when we compare the flowers and fruits of both species, only slight differences can be discovered and we learn what is nowhere more obvious than in botanical science that superficial impression is misleading. The Malayan species is a small-leaved, ragged little tree with none of the aromatic pungence of its shrubby European relative, and it has a preference for dry, well drained situations, thriving alike on the stony laterite hills of Malacca and the hot sand-dunes of the East Coast. It is inconspicuous and unattractive except when the crown is flecked with the red berries that look like tiny strawberries, though there the resemblance ends for the pulp about the stone is very thin and is said not to be eaten save by birds and squirrels. But the Malay Gale is easy to identify from the rosettes of small, dark green, upward pointing and very short-stalked leaves at the ends of its scrubby twigs and from the way in which the finest veins can be seen on the upperside of the leaf as a pale-green network: there is, indeed, no other common tree with which it can be confused. The leaves of saplings look very unlike those of the mature trees, but suggest the leaves of some



Text-Fig. 158. Malay Gale (*Myrica Farquhariana*),
 $\times \frac{1}{2}$: inflorescences, nat. size.

He must be an expert botanist that, coming from Europe, can recognise at once in our Malayan tree an ally of the Sweet Gale (*M. Gale*) of the bogs of his homeland. Yet when we compare the flowers and fruits of both species, only slight differences can be discovered and we learn what is nowhere more obvious than in botanical science that superficial impression is misleading. The Malayan species is a small-leaved, ragged little tree with none of the aromatic pungence of its shrubby European relative, and it has a preference for dry, well drained situations, thriving alike on the stony laterite hills of Malacca and the hot sand-dunes of the East Coast. It is inconspicuous and unattractive except when the crown is flecked with the red berries that look like tiny strawberries, though there the resemblance ends for the pulp about the stone is very thin and is said not to be eaten save by birds and squirrels. But the Malay Gale is easy to identify from the rosettes of small, dark green, upward pointing and very short-stalked leaves at the ends of its scrubby twigs and from the way in which the finest veins can be seen on the upperside of the leaf as a pale-green network: there is, indeed, no other common tree with which it can be confused. The leaves of saplings look very unlike those of the mature trees, but suggest the leaves of some

temperate species of oak, such as the Turkey Oak. Strangely enough, this sapling form of toothed leaf is the adult form in other species of the genus: this same divergence we find in *Artocarpus* (p. 650), *Pterospermum* (p. 615), *Ficus* (p. 666) and *Macaranga* (p. 261). The ripe male catkins emit clouds of pollen when tapped, from which we conclude that the trees must be wind-pollinated.

NUTMEG FAMILY

Myristicaceæ

(from the genus *Myristica*)

Evergreen monopodial trees, in shape, leaf, seed and resinous or aromatic tissues very like the Annonaceæ but *with watery pink or red sap in the bark and twigs: young shoots and inflorescences generally brown scurfy or woolly: twigs with septate pith.*

Leaves alternate, shortly stalked, drooping, generally long, oblong, pointed and leathery, with numerous side-veins and commonly glaucous or brown on the underside: young leaves pale green, limp.

Flowers generally very small, without petals, male and female, set in small clusters in the leaf-axils or on the branches behind the leaves, male and female on different trees: calyx cup-shaped, opening with 2 or 3 lobes, pale yellow to orange or pink, often brown scurfy: male flower containing a tiny column with the anthers set on it: female flowers containing a 1-seeded, superior ovary.

Fruit oblong, or round, small to large, with a thick or thin, fleshy, yellow, red or brown rind, splitting open and displaying the one large, hard seed (nutmeg) surrounded by a red, pink, yellow or orange, pulpy or waxy coat (mace or aril): the fruit splitting on one side only or splitting completely into two out-curling halves: seed large, the hard endosperm divided up by brown lines (i.e. ruminant, as in the Annonaceæ).

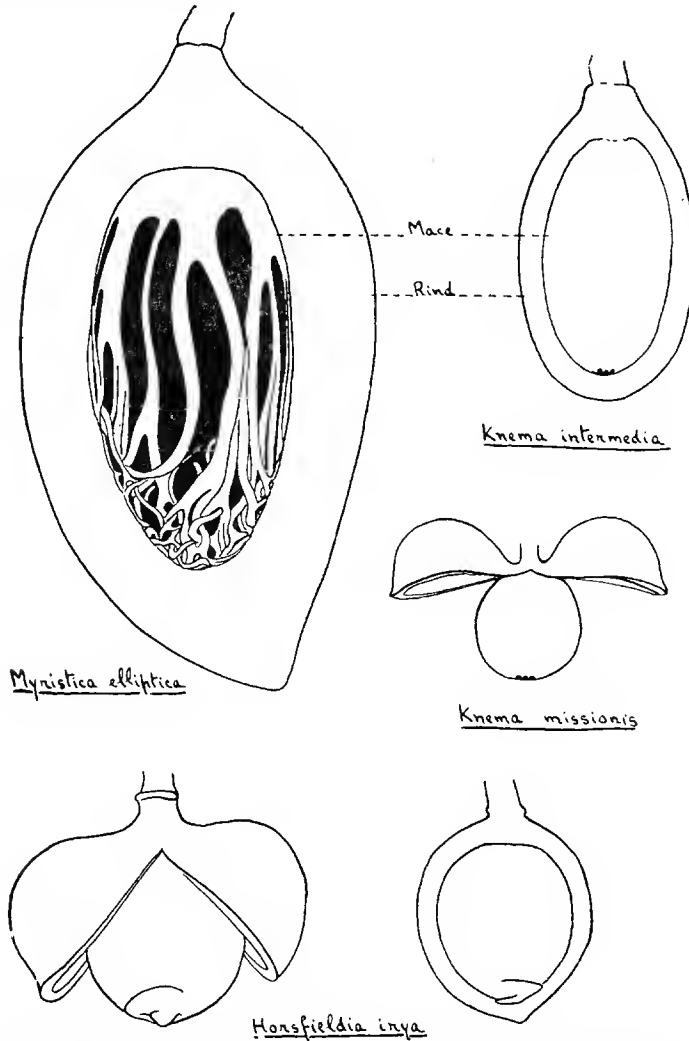
15 genera, 250 spp., throughout the tropics, mostly in Asia: 4 genera, about 50 spp. in Malaya, mostly in lowland forest, rare above 3,000 ft.

The cultivated Nutmeg-tree, *Myristica fragrans* or *Pokok Pala*, is one of a large number of wild tropical trees which are believed by botanists to be related to the *Kenanga*-family (Annonaceæ). Trees of both families are so similar that, in the absence of flowers and fruits, one must cut the bark in order to make certain to which family they belong: if a pink or red sap oozes over the wood, the tree is a wild nutmeg. The chief differences from the *Kenanga*-family lie in the flower and fruit. The Nutmeg-trees have lost the large petals so that only the small calyx remains; their stamens and ovary are very much reduced and simplified; their sexes are separated on different trees; their fruits split open, and their seeds have an edible coat. The flowers of Nutmegs are not beetle-traps and their fruits are generally sought after by birds.

In the lowland forest of Malaya there can be found roughly one-fifth of the species of wild Nutmegs in the world. Like the wild Mangosteens, the species of *Eugenia*, *Memecylon* and *Diospyros*, and the Rubiaceous and Annonaceous trees, the wild Nutmegs are one of the kinds of small tree most characteristic of the rain forest of Tropical Asia. Though they are easy to recognise as a group from their conical shape and red sap, the individual species are rather difficult to distinguish. To Malays they are known as *Pendarah*, *Pendarahan*, *Penarah*, and *Penarahan* from the word *darah* meaning blood: this red sap (or 'kino'), which issues from a cut, is often realistically gruesome like a clotted smear on the exposed wood

Some kinds are called *Pianggu*, but this name may well be restricted to *Horsfieldia irya*, a species of rice-fields, swampy streams and tidal river banks. *Pala Utan* (wild nutmeg) may also be given to some which have fruit or leaf like the cultivated nutmeg.

In general, the flowers of the Nutmegs are so small and dingy as to pass unnoticed. In the species of *Horsfieldia*, however, they appear as bunches of tiny yellow or orange grapes from the branches behind the leaves (Text-Fig. 160) : in size, shape and colour, and in their citronella-smell they are like the flowers of *Telur Belangkas* (*Aglaia odorata*). The fruits, which of course develop only on the female trees, are striking and beautiful objects whether as they hang on the tree or lie on the ground, for the inside of the split fruit, as well as the outside, has a delicate hue of pinkish yellow or reddish orange. The Swamp Nutmeg (*Myristica elliptica*) has the most beautiful fruits. (Compare *Kurrimia robusta* p. 190).

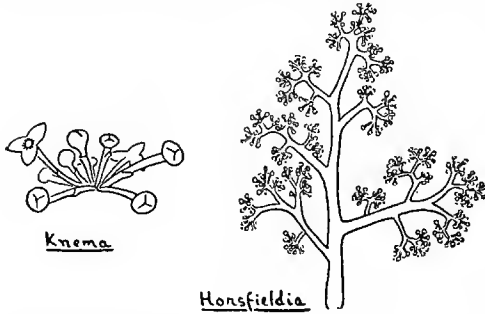


Text-Fig. 159. Fruits of Wild Nutmeg-trees (Myristicaceæ), nat. size.

The mace or pulp which surrounds the seeds is a special layer called the aril, like the pulp of the *Rambutan* and *Durian*. It has two forms. Either it is divided into a number of narrow, scarlet and waxy strips, pressed tightly into shallow grooves on the surface of the seed, as in the cultivated Nutmeg and its allies in *Myristica*: or it is a complete waxy or pulpy coat surrounding the seed and varying in colour from pale yellow to sealing-wax red, e.g. *Horsfieldia*, *Knema*. With the exception of the Cinnamon Nutmeg (*Myristica cinnamomea*), which has a spicy mace like that of the cultivated kind, that of our wild species is insipid and tasteless. Nevertheless the ripe fruits are much sought after

by birds, especially pigeons, which settle in flocks on the branches of an early morning to breakfast on the mace. Red and yellow are the colours that attract birds. Nutmeg-eaters (*Myristicivora*) is the name which zoologists give to some of these pigeons, the distribution of which in the mountains of Malaya corresponds with that of the nutmeg-trees. If our wild nutmegs are evergreen, they develop new leaves and flowers seasonally after spells of dry weather. In some, like the Great Woolly Nutmeg (*Knema Hookeriana*), the old leaves may fall so copiously as the buds begin to open that the tree is almost deciduous. The big leathery leaves of such kinds remain on the tree for two or three years. The development of the fruit appears to be slow. It takes nine months in the case of the cultivated Nutmeg, but the *Pianggu* (*H. irya*) is exceptional because its fruit ripens in two and a half months. As a rule, the wild species cannot tolerate the hard soil and hot conditions of the open country. Our knowledge of the habits of the Nutmeg trees is, however, most meagre. In Borneo a species of *Myristica* has been discovered the twigs of which are hollow and tenanted by ants like those of *Macaranga* (p. 261). In swampy ground, several of our species develop stilt-roots like mangrove-trees.

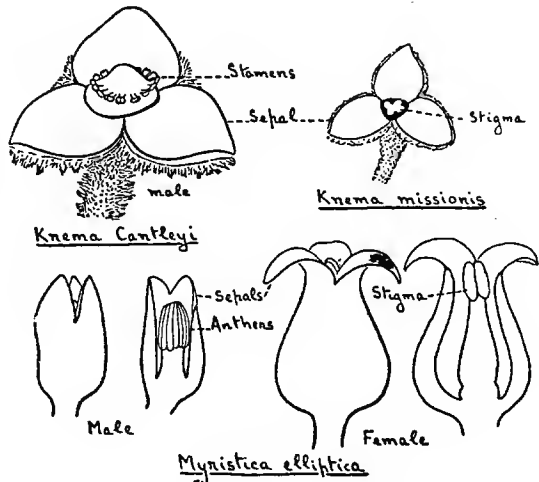
Concerning the cultivated nutmeg, *Myristica fragrans*, there are excellent accounts in BURKILL'S Dictionary and in GRIST'S Malayan Agriculture. Its leaves are unusually short, compared with other members of the family, and from its broken twigs an opalescent sap oozes. Of the plantations that were once so numerous in Malaya, there remain only those in Penang and Province Wellesley. Its nearest wild allies, botanically, occur in New Guinea.



Text-Fig. 160. Inflorescences of *Knema* and *Horsfieldia*.

A tree which may be mistaken for a nutmeg from its shape and leaves is the *Asam Gelugor* (*Garcinia atroviridis*), but its leaves are in pairs, the young ones being pink, and it has no red sap.

The genera of Nutmegs are distinguished mainly by the structure of the male-flower. This is difficult to examine and prevents one from identifying the fruiting trees which are far more conspicuous. We have therefore relied on the more obvious features of bark, leaf and fruit by which most of our common species can be recognised. Of the genus *Knema* there are several common species most difficult to distinguish which we have been obliged to omit.



Text-Fig. 161. Flowers of Wild Nutmeg-trees (*Myristicaceæ*), $\times 3$.

Key to the Common and Conspicuous Wild Nutmegs

- Leaves coppery or rusty beneath
 Leaves with bright rusty down or wool
 beneath: bark warm brown
 Blade up to $14 \times 5''$, tapered to base: fruit
 rusty woolly: seaside tree ... *Myristica guatteriiifolia* p. 478
 Blade up to $24 \times 11''$, often heart-shaped at
 base: fruit not woolly: inland tree ... *Horsfieldia superba* p. 476
 Leaves dull brownish beneath: fruit brown
 scurfy: bark blackish, fissured ... *Myristica cinnamomea* p. 477
- Leaves not coppery beneath
 Fruit glabrous, yellow to orange: twigs
 often glabrous
 Fruits small, round, $\frac{3}{4}''$ long: tidal rivers
 and swampy land ... *Horsfieldia irya* p. 476
 Fruits large, oblong, $2-3''$ long
 Fruit very pointed: bark brownish, not
 fissured ... *Myristica elliptica* p. 477
 Fruit scarcely pointed: bark coal-black,
 fissured ... *Myristica Maingayi* p. 478
- Fruits hairy, woolly or scurfy: twigs hairy,
 woolly, or at least scurfy when young
 Leaves not glaucous beneath: twigs and
 fruits brown woolly ... *Knema Cantleyi* p. 476
- Leaves glaucous beneath
 Blade $1-2'$ long or more, up to $7''$ wide,
 very leathery
 Twigs and fruit densely shaggy, brown
 woolly: fruits $2-3''$ long ... *Knema Hookeriana* p. 476
 Twigs and fruit merely scurfy velvety:
 fruit $1\frac{1}{2}''$ long ... *Knema furfuracea* p. 476
 Blade smaller, up to $1' \times 4''$, thinly leathery
 Fruit oblong, $1\frac{1}{4}-1\frac{1}{2}''$ long: bark
 brownish, pale ... *Knema intermedia* p. 477
 Fruit nearly round, $\frac{3}{4}''$ long: bark dark
 greyish brown ... *Knema missionis* p. 477

HORSFIELDIA

(T. Horsfield, 1773-1859, naturalist and doctor in the East Indies)

Fruit medium to large, glabrous, generally with juicy rind, yellowish-green to orange or pink: aril completely covering the seed, not divided into strips except at the tip in some cases, waxy or pulpy.

Flowers very small to medium, often yellow or orange and citron-fragrant, arranged in stalked much branched clusters, mostly on the branches behind the leaves (Text-Fig. 160).

Leaves not glaucous beneath, often thinly fleshy.

About 55 spp., tropical Asia and New Guinea: 19 spp., in Malaya.

MYRISTICACEÆ

H. irya Text-Fig. 159
(a plant-name from Ceylon)

Piangu, Penggu

A tall tree 40–80 ft. high with narrow crown and drooping limbs, often buttressed: bark greyish brown, somewhat flaky: *glabrous*.

Leaf-blade 4–10 × 1½–3", narrowly oblong, apex tapered, base rather suddenly rounded, drooping: stalks ¼–½" long, short.

Male flowers tiny, bright orange yellow, citron-fragrant in sprays 3–6" long from the slender branches.

Fruits ¾–1.1" long, round, rather small, in bunches, ochre yellow then bright pinkish orange, bright rose-pink internally: aril flame-red.

India and W. Malaysia: common by lowlying rivers and streams in swampy places, frequent in the rice-fields of the East Coast.

H. superba

Cabbage-leafed Nutmeg

A medium to big tree, reaching 100 ft.: bark fawn brown, more or less fissured with flat ridges: young twigs and leaves rusty woolly: twigs stout.

Leaf-blade 7–24 × 3½–11", very large, elliptic, pointed, often heart-shaped at the base, rusty woolly and strongly ribbed by the veins on the underside: stalk ½–1½", stout.

Male flowers ¼" wide, rather large, ochre yellow in sprays 3–6" long.

Fruit 2–3" long, oblong, yellow, rough.

Malaya: not infrequent throughout the country in lowland forest.

KNEMA

(Gr., knema—an internode)

Fruit like *Horsfieldia* but brown woolly, hairy or scurfy, the rind generally rather thin: aril as in *Horsfieldia*.

Flowers brown woolly or scurfy, small, singly stalked and arranged in sessile clusters, often on small woody knobs, on the branches (Text-Fig. 160).

Leaves commonly glaucous beneath, leathery or rather thin.

About 40 spp., tropical Asia to New Guinea: 14 spp. in Malaya.

K. Cantleyi Text-Fig. 161

Cantley's Nutmeg

(N. Cantley, d. 1888, Supt. of Singapore Botanic Gardens 1880–1888)

A small tree to 50 ft.: bark warm brown, rather flaky: twigs, leaf-stalks, flowers and fruits brown woolly but not shaggy.

Leaf-blade 6–14 × 1½–3", narrowly oblong, leathery, not glaucous beneath.

Fruit 1¼" long, brown velvety.

Malaya: not uncommon in lowland forest.

K. furfuracea

Scurfy Nutmeg

(Lat., furfur—bran)

A tree very like *K. Hookeriana* but:—bark dingy warm brown: twigs, leaf-stalks, flowers and fruits pale brown scurfy-velvety: leaf-blade up to 22 × 7", rather smaller: fruit 1½" long, smaller, brown scurfy-velvety, not shaggy or bearded.

Malaya, Sumatra: common in lowland woods throughout the country.

K. Hookeriana Plate 218

Great Woolly Nutmeg

(Sir W. J. Hooker, 1785–1865, the English botanist, Director of Kew Gardens 1841–1865)

A tree to 100 ft. high with narrowly conical, steep crown of large hanging leaves: bark dark grey, rather flaky, slightly fissured: twigs, leaf-stalks, flowers and fruit densely bearded with shaggy fawn brown wool: young leaves shaggy woolly, the wool soon dropping off.

MYRISTICA

Leaf-blade 10-30 × 2½-7½", very long, leathery, lanceolate, the base often narrowly heart-shaped, glaucous beneath: stalk ½-1", stout.

Fruit 2-3" long, oblong, shaggy with fawn brown wool: aril bright red.

Malaya, Borneo, Sumatra: not uncommon in lowland forest throughout the country.

K. intermedia Text-Fig. 159

Lesser Nutmeg

A small tree to 60 ft. high: bark pale pinkish brownish: twigs thinly brown scurfy when young.

Leaf-blade 3-14 × ¾-4", narrowly oblong, pointed, leathery, very glaucous beneath: stalk ½-¾".

Fruit 1½-1¾ × ¾" long, oblong, brown scurfy: aril carmine-pink, pulpy.

W. Malaysia: common in lowland forest in Malaya.

K. missionis Text-Figs. 159, 161

Small-leaved Nutmeg

A tree 30-80 ft. high: bark dark greyish brownish, slightly flaky.

Leaf-blade 3-8 × ½-2", narrowly oblong, pointed, rather small, glaucous beneath: stalk ¼-½" long.

Fruit ¾" long, nearly round, pinkish orange, thinly rusty or scurfy: aril rose-red, pulpy.

Malay Peninsula, Borneo: common in lowland forest in Malaya, often on rocky and sandy coasts.

MYRISTICA

(Gr., muron—a sweet juice distilled from plants)

Fruits generally large, 1" or more long, glabrous or finely brown scurfy: aril scarlet, waxy, divided into narrow strips with the seed showing as darker patches between them.

Flowers in stalked, or sessile, sometimes branched, clusters.

80 spp., tropical Asia, Australia and Polynesia: 11 spp. in Malaya.

M. cinnamomea

Cinnamon Nutmeg

A tree like *M. Maingayi* but the bark finely ridged.

Leaf-blade 5-10 × 1½-3" long, oblong, thinly leathery, pale brown to cinnamon brown on the underside with very fine scurf.

Fruit 2½-3½ × 1¾-2", large, egg-shaped or oblong, blunt, covered with dark rusty brown scurf.

Malay Peninsula: in lowland forest, not common.

M. elliptica Text-Figs. 159, 161 (from the leaf-shape)

Swamp Nutmeg

Tajam Penggali, Tabah (Johore)

A small or large tree 20-100 ft. high: bark pale brownish, entire but rather bumpy with lenticels: twigs generally hanging: glabrous.

Leaf-blade 4-9 × 1½-4", thinly leathery, elliptic, tapered to each end, more or less glaucous beneath: stalk ½-1".

Fruit 2½-3 × 1¾-2", large, pointed mango-shaped, beautifully apricot-orange, glabrous.

W. Malaysia: common in lowlying wet woods and by forest streams and rivers in Malaya.

MYRSINACEÆ

M. guatteriifolia

Sea-shore Nutmeg

(Guatteria, a genus of Annonaceæ: G. Guatteri, 1739-1793, an Italian botanist)

A sea-shore tree of rocky and sandy coasts, to 60 ft. high: bark warm brown to greyish brown, not fissured but rather flaky: twigs and undersides of leaves coppery or rusty with scurfy down.

Leaf-blade 5-14 × 1½-5", broadly elliptic, tapered gradually to the apex: stalk ½-1½".

Fruit 1¾-2" long, rusty with rather woolly down, oblong.

Philippines, Labuan, B. N. Borneo, East Coast of Malaya: common from Johore to Trengganu.

M. Maingayi

Maingay's Nutmeg

(A. C. Maingay, 1836-1869, doctor and botanist of the East India Company)

A big tree to 100 ft. or more high with broad conical dark green crown: bark coal black, rather closely and deeply ridged and fissured (as in Diospyros), the outer bark brittle like coal: often developing broad stilt roots in swampy ground.

Leaf-blade 5-11 × 1¼-3½", oblong, leathery, glabrous, scarcely glaucous beneath: stalk ½-1" long.

Fruits 2¼-3½ × 2-2¾", massive, rather mango-shaped, blunt, light ochraceous to apricot yellow, with very thick rind, glabrous: seed black, large.

Scattered throughout the lowland forest of Malaya, with very striking trunk and large fruit.

This species may be deciduous after pronounced dry weather, but the new leaves appear almost as soon as the old have fallen.

ARDISIA FAMILY

Myrsinaceæ

(from the genus Myrsine)

Leaves simple, spirally arranged or alternate, often dotted with tiny glands: no stipules.

Flowers very small to medium, regular, in clusters or panicles, rarely solitary: generally with 5 sepals, 5 pink or white petals joined at the base into a very short rim or tube, and 5 stamens opposite to the petals: ovary with a single cavity.

Fruit generally a small berry, 1- or several-seeded.

32 genera, about 1,000 species, mostly tropical, chiefly in Asia and S. America: 7 genera, about 100 species in Malaya, lowlands and mountains.

No cultivated or garden-plants belong to this family in Malaya, but it contains one of our characteristic genera of forest shrubs and small trees, namely *Ardisia*, and the common small tree of rubber-forestry, *Mæsa ramentacea*.

Key to the Genera

- Leaves alternate, thin, pointed *Mæsa* p. 481
- Leaves spirally arranged, generally rather leathery or blunt
 - Mangrove bush with curved fruits, fragrant white flowers *Aegiceras*
 - Fruits as small round berries
 - Flowers pink, in terminal, often stalked clusters ... *Ardisia*
 - Flowers greenish white, in small, sessile clusters in the leaf-axils or on the twigs below the leaves ... *Myrsine* p. 481

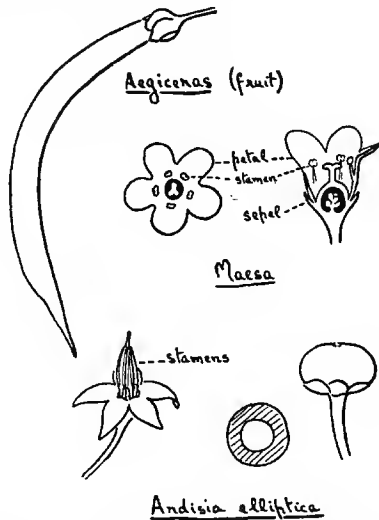
AEGICERAS

(Gr., aix—a goat, keras—a horn)

2 species, Asia, Australia, in mangrove-swamps: 1 species in Malaya.

A. corniculatum Text-Fig. 162
(Lat., with little horns)

Kachang Kachang



A shrub with blunt obovate leaves, spirally arranged: flowers and fruits in terminal clusters: fruits $1\frac{1}{2}$ –2" long, green or pinkish, curved, pointed, like miniature bananas or horns: with a cylindrical, rod-like embryo inside.

India to New Guinea: common in the mangrove round Malaya.

This species is figured, under the name *A. majus*, by WATSON (20, p. 53).

Text-Fig. 162. Ardisia-family (Myrsinaceæ): *Aegiceras*, nat. size: *Mæsa*, $\times 5$: *Andisia*, flowers and fruit, nat. size.

ARDISIA

(Gr., ardis—a point: from the projecting style)

Side-branches often swollen and flattened vertically at their junction with the trunk or stem, and commonly unbranched

Leaves spirally arranged, or alternate on the side-branches.

Flowers pink, rarely white, rather waxy, small to medium, down-pointing, stalked and set in terminal or lateral clusters on the side-branches: corolla pointed, the petals overlapping in the bud: stamens with short stalks and rather large anthers arranged in a cone round the style: ovary superior, the style often projecting from the flower-bud.

Fruit as a berry with 1 large round seed; red, black, white or brownish, seated on the persistent calyx.

About 300 spp., mostly in Asia, a small number in tropical America, very few in Africa: 60 spp., or more in Malaya, in lowland and mountain forest.

To Malays these plants are known as *Mata Pelandok*, *Mata Ayam* or *Mata Itek* from the resemblance of their small red or black berries to the eye of a mousedeer, a hen or a duck: they must not be confused with the Bulls' Eyes or *Mata Lembu* (Firmiana) and the Fish Eyes or *Mata Keli* (Gynotroches). Most of our species are shrubs, dwarf, medium or large, and not a few are small trees reaching 20–40 ft. high: all appear to be evergreen. They are very easily recognised in flower from the waxy pink petals which form a down-pointing

cone in the flower-bud, and these flowers much resemble those of the Potato-family (Solanaceæ) because of the grouping of the stamens round the style. It seems that the berries are edible in all cases, but insipid.

Ardisiæ are one of the characteristic kinds of shrub and treelet in our forests: many are yet to be added to the flora and not a few will be brought into cultivation for the beauty of their flowers and foliage.

Key to the Species

Leaves notched along the edge: shrub with red berries ...	<i>A. crispa</i>
Leaves with entire edges: berries ripening black	
Sea-shore or tidal rivers: flowers in axillary clusters ...	<i>A. elliptica</i>
Inland plants: flowers in terminal panicles	
Flowers $\frac{1}{4}$ " wide	<i>A. colorata</i>
Flowers $\frac{3}{4}$ " wide	<i>A. lanceolata</i>

A. colorata

Gouty Ardisia

(Lat., coloured)

A forest shrub or small tree to 40 ft. high: *side-branches strongly swollen into laterally compressed knobs at the junction with the main stem* and leaving big scars on falling off.

Leaf-blade 4-10 × 1-3½", rather long but very variable in width, elliptic: stalk $\frac{1}{4}$ -¾" long.

Flowers ¼" wide, pink, shortly stalked, in terminal panicles 4-12" long, 5-9" wide: sepals small, not overlapping: style projecting from the bud.

Berry ¼" wide, or less, ripening pink then red and finally black.

India, Malaya, Java: fairly common in the lowland and mountain forest.

A species with strikingly knobbed stem and beautiful panicles of flowers.

A. crispa

Village Ardisia

(from the crisped leaf-edge)

Mata Ayam

A shrub up to 10 ft. high, glabrous.

Leaf-blade 2-7 × ¾-1¾", narrowly elliptic, thinly leathery, *with the edge distinctly notched*: stalk $\frac{1}{4}$ -½" long.

Flowers ½" wide, pinkish white, *in sessile and stalked clusters at the ends of the twigs*.

Berry ¼" wide, *ripening bright red*, never black.

India, China, S. Japan, W. Malaysia to the Philippines: common in villages, open country, secondary jungle and sea-shores in Malaya.

This species has been called *A. crenata*.

A. elliptica Plate 144, Text-Fig. 162

(from the leaf-shape)

Sea-shore Ardisia

Mata Pelandok, Penah (Kel, Tr.)

Periah (Tr.)

A *seashore* bush or small tree up to 25 ft. high, glabrous: *young twigs reddish*: young leaves pink: leaves spirally arranged.

Leaf-blade 3-5 × 1-2", *elliptic*, narrowed to each end, *fleshy-leathery*: stalk ¼" long, reddish purple when young.

Flowers ½" wide, pink, *in axillary clusters* on pinkish stalks ½-1½" long, not fragrant: sepals overlapping.

Berries ¼" wide, round, distinctly flattened, *ripening reddish purple then dull black*.

India, S. China, Malaysia: common on all sandy and muddy coasts and along the banks of tidal estuaries in Malaya.

This is called *A. littoralis* in BURKILL'S Dictionary.

A. lanceolata

Great Ardisia

(from the leaf-shape)

A forest shrub or tree up to 40 ft. high: side-branches distinctly swollen at the junction with the main stem: glabrous.

Leaf-blade 4-11 × 2-4½", rather large, thinly leathery, narrowly obovate: stalks ½-1" long.

Flowers ¾" wide, or nearly 1", large, rich mauve-pink, in large terminal panicles 4-9" long, 5-7" wide: sepals rather large, blunt, overlapping.

Berries ¼" wide, green then black with crimson stalk and calyx.

W. Malaysia: frequent in lowland forest, especially on swampy ground, in Malaya.

This is the most beautiful of our tree-Ardisias in its large, richly coloured flowers.

MÆSA(from the Arabian plant-name *maas*)

Leaves alternate on the flowering twigs.

Flowers very small, in terminal or axillary panicles: ovary inferior.

Fruit a little berry with many small seeds.

Over 100 species, Old World tropics: 9 species in Malaya, as shrubs, small trees or climbers.

M. ramentacea Text-Fig. 162

Mengambir

(Lat., thin as a scraping)

Gambir Gambir, Gegambir, Kecham Utan

A bushy shrub or small tree to 35 ft. high, often with several stems, or a climber with long scrambling branches: twigs brittle: glabrous.

Leaf-blade 2½-8 × ¾-4", varying narrowly ovate and tapered to the base to rounded or heart-shaped at the base, tapered gradually to a long tip, thin, entire, with 4-9 pairs of side-veins: stalk ½-1" long.

Flowers barely ½" wide, white or greenish white, shortly stalked on the branches of the pale green lateral panicles 3-7" long: petals with wavy edge: ovary green then reddish brown.

Berry ½" wide, round, crowned by the 5 tiny sepals, white, in rows on the panicles.

India, S. China, Malaysia: common throughout Malaya in open country and the edges of forest.

The Malay name indicates the superficial resemblance of the leaves to those of the true *Gambir*, which is a Rubiaceous hook-climber (*Uncaria*). Though a common plant, it is far from understood why it should assume so many shapes because assuredly it may be a tree or a climber, and the shape of the leaves varies greatly. The inflorescences are often galled by insects and transformed into light green mossy bunches, as is also the case in some kinds of *Eugenia* (*E. longiflora*) and *Pternandra*. The Thorny Tree-Vine, *Leea angulata*, has a similar habit. The *Mengambir* figures commonly in rubber-forestry.

MYRSINE

(the Greek name for the Myrtle)

Leaves spirally arranged, small.

Flowers small, greenish white, set in small clusters in the leaf-axils or on the twigs below the leaves, not terminal, male and bisexual: sepals, corolla-lobes and stamens 5: petals toothed.

Fruits as small round berries in small clusters on the twigs below the leaves or in the leaf-axils.

About 100 species, throughout the tropics: 6 species in Malaya, lowland and mountain.

The position and arrangement of the flowers, or fruits, distinguish this genus most readily from *Ardisia*.

MYRTACEÆ

Key to the Species

Leaves mostly pointed: flower- and fruit-stalks '1" long	<i>M. Porteriana</i>
Leaves mostly blunt: flower- and fruit-stalks '3-5" long	<i>M. umbellulata</i>

M. Porteriana

Dedahruang (Kel.)

(G. Porter, 1800-1834, the English botanist at Calcutta)

A small tree up to 30 ft. high, rather conical but spindly: *bark grey*, the inner bark pinkish: *twigs* pointing up.

Leaf-blade $1\frac{1}{2}$ -3 × $\frac{1}{2}$ -1", narrowly elliptic, tapered to the short stalk, $\frac{1}{4}$ " long or less, dark green, *pointing upward* with the sides slightly curved back, the veins more or less invisible.

Flowers .2" wide, hairy at the mouth.

Berries .2" wide, pale green turning pinkish purple.

Malaya, Sumatra: frequent on the sandy and rocky parts of the East Coast, or in sandy heaths: also on mountain-tops.

M. umbellulata

Very like the preceding but often with rather larger blunt leaves which are black-dotted beneath, and with longer flower-stalks.

Malaya, Sumatra, Borneo: frequent in mangrove and on sea-shores in the south of Malaya.

MYRTLE FAMILY

Myrtaceæ

(from the genus *Myrtus*)

Buds narrow or small at the ends of the twigs, not covered by stipules or hidden in the leaf-bases.

Leaves simple, typically opposite, in some cases alternate or spirally arranged, *finely dotted with oil-glands*.

Flowers small to medium-size, regular, with 4-5 white or pink petals, *generally fluffy from the stamens*: calyx-cup with 4-5 sepals: *petals free: stamens many, with slender stalks and minute anthers: ovary more or less inferior*: style one, long.

Fruit a small woody capsule or a berry, pulpy or with leathery rind, crowned by the persistent sepals: with 1-many seeds, small or large.

About 2,700 spp., tropics and subtropics throughout the world: 9 gen., about 165 spp., in Malaya, lowland and mountain.

The Myrtle bush (*Myrtus communis*) of South Europe is the typical member of this family which consists almost entirely of trees and shrubs and is, in the main, Australian. With the exception, indeed, of *Eugenia* and possibly *Tristania*, the family appears to be specialised to the hot and rather dry climate which is found about the limits of the tropical zones and is poorly represented in the rain-forest. *Eugenia*, on the other hand, is wide-spread through the tropics and is so abundantly represented in Malaya as to be our biggest genus of flowering

plants of any category. The six other Malayan genera, in contrast, have each only one or two outlying members in this country, the bulk of their species occurring in New Guinea, Australia and the eastern half of the Malay Archipelago, so that they can be regarded as an infiltration of the Australian flora into the Malayan region. Other examples of the Australian element in our flora are the *Ru* trees (Casuarina), the Proteaceæ (to which Grevillea belongs), the Goodeniaceæ (to which the seashore *Scævola* belongs) and our indigenous conifers *Dacrydium*, *Podocarpus* and *Agathis* (see p. 40).

One of the distinctive features of the family, which it shares with the Orange-family (Rutaceæ), is the presence of tiny dot-like oil-glands throughout the soft tissues of the plant. They are generally noticeable on the underside of the leaves as darker dots or, when the leaves are held to the light, as pellucid spots and the tissues, in consequence, smell resinous or aromatic when crushed, though the smell may be very faint. Hence come the well-known essential oils of eucalyptus, cajaput (*Melaleuca*) and clove (*Eugenia*).

In Malaya the family is well known from the *Jambu*-fruits (*Eugenia*) and the *Jambu Batu* or *Guava* (*Psidium*), and from the woods called *Gelam* (*Melaleuca*) and *Kelat* (*Eugenia*). All the Malayan species are evergreen but they develop new leaves and flowers seasonally, once, twice and even three times a year, as explained under *Eugenia*: *Rhodamnia* is yet more remarkable in its frequent flowering. In general, the leaves wither pale orange or yellow buff: in *Tristania*, *Leptospermum*, *Eucalyptus* and some *Eugenias* they wither red.

Key to the Genera

- | | | | | |
|--|-----|-----|-----|----------------------------|
| Leaves needle-like, short | ... | ... | ... | <i>Bæckia</i> p. 484 |
| Leaves flat, not needle-like | | | | |
| Leaves spirally arranged (alternate in <i>Eucalyptus</i>) | | | | |
| Leaves small, $\frac{1}{2}$ -1" long: mountains | ... | ... | ... | <i>Leptospermum</i> p. 505 |
| Leaves over 2" long: bark peeling, flaking | | | | |
| Leaves like short straps, 5-7 veined: flowers in spikes | ... | ... | ... | <i>Melaleuca</i> p. 506 |
| Leaves normal, with 1 midrib: flowers in panicles: leaves withering red | | | | |
| Leaves curved, smelling strongly of <i>Eucalyptus</i> when crushed: cultivated | ... | ... | ... | <i>Eucalyptus</i> p. 485 |
| Not so: wild | ... | ... | ... | <i>Tristania</i> p. 508 |
| Leaves opposite | | | | |
| Leaves 3-veined | | | | |
| Shrub with pink flowers | ... | ... | ... | <i>Rhodomyrtus</i> p. 508 |
| Tree with white flowers: leaves silvery beneath | ... | ... | ... | <i>Rhodamnia</i> p. 507 |
| Leaves not 3-veined, with one midrib | | | | |
| Twigs and leaves glabrous | | | | |
| Leaves smelling strongly of <i>Eucalyptus</i> when crushed, glaucous: cultivated | ... | ... | ... | <i>Eucalyptus</i> p. 485 |
| Not so | ... | ... | ... | <i>Eugenia</i> p. 486 |
| Twigs and leaves hairy | | | | |
| Village tree: large, strongly veined leaves: fruits large | ... | ... | ... | <i>Psidium</i> p. 507 |
| Wild: leaves small, faintly veined: berries small | ... | ... | ... | <i>Decaspermum</i> p. 484 |

BÆCKIA

(A. Bæck, 1713-1795, the friend of linnæus)

*Leaves needle-like, opposite.**Flowers minute, singly or in pairs in the leaf-axils: petals 5: stamens 7-10: ovary half-inferior.*

Fruit a minute capsule.

About 50 spp., mostly Australian. 1 sp. reaching through Malaysia to S. China: 1 sp. in Malaya.

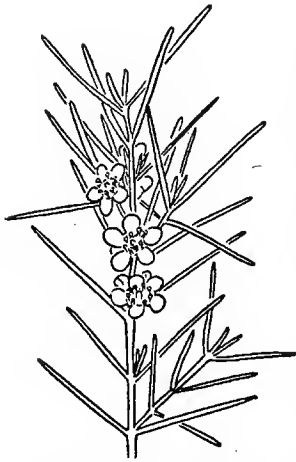
B. frutescens
(Lat., shrubby)

Plate 154, Text-Fig. 163

False Ru

*Chuchur Atap, Ujan Atap, Timor Tasek (Kem.)
China Maki, Rempah Gunong (Pah.), Da Eng (Kel.)*An evergreen shrub or small tree to 20 ft. high, *with dark greyish brown, deeply fissured, fibrous-flaky bark: branches upright, then spreading, with drooping wiry ends: leaves withering yellow, occasionally reddish.**Leaves $\frac{1}{2}$ – $\frac{3}{4}$ " long, .02" wide or less, as light green needles, pleasantly resinous-aromatic when crushed.**Flowers .2" wide, white with a pink centre.*

Australia, Malaysia, S. China: common on mountain-tops throughout Malaya, and on sandy heaths on the East Coast from Kuantan northward.

Text-Fig. 163. False Ru
(*Bæckia frutescens*), \times
 $1\frac{1}{2}$.

When it grows by the sea or in sheltered places on the mountains, the False Ru becomes a small tree with switchy twigs remarkably like a *Casuarina* except for its aromatic needle-leaves. The tips of the twigs droop almost perpendicularly and, when it rains, the drips run off their fine pointed ends just as from the frayed edges of an *atap*-roof: to this peculiarity, no doubt, the Malay names *Chuchur Atap* and *Ujan Atap* refer. But on exposed peaty soil or rocky mountain-tops, it grows as a dwarf shrub, like a heather, with gnarled woody stem, perhaps not a foot high, and branches flattened against the ground, cf. the *Mentigi* (Pemphis) and Mountain *Gelam* (*Leptospermum*).

On the coasts of Trengganu and Kelantan, the False Ru is a well-known village-plant. Its dried leaves are made into tea, there being a considerable trade in them between Malaya, Java and Sumatra.

There are fine specimens of the False Ru on Penang Hill, in the grounds of Bel Retiro.

DECASPERMUM

(Gr., with ten seeds)

Very like *Eugenia* but:—*Fruit with 6-10 small seeds.*

4 spp., Indo-Malaysia; Australasia: 2 spp. in Malaya.

EUCALYPTUS

D. fruticosum Text-Figs. 164, 165
(Lat., frutex—a shrub)

An evergreen shrub or small tree to 50 ft. high, with reddish branches and twigs: twigs, leaf-stalks, inflorescences and undersides of the leaves downy hairy or almost velvety, especially when young: new leaves purplish brown to pink.

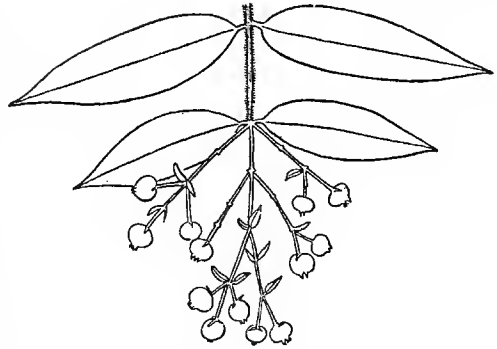
Leaf-blade $1\frac{1}{4}$ - $3\frac{1}{2}$ × $\frac{1}{2}$ - $1\frac{1}{2}$ " , small, narrowly elliptic, tapered to a rather long point, the base rounded, leathery, the veins almost invisible: stalk $\cdot 1$ - $\cdot 2$ " long, short.

Flowers $\frac{1}{4}$ - $\frac{3}{8}$ " wide, white or greenish, in short axillary panicles up to 3" long, generally near the ends of the twigs and with rather large green bracts like small leaves: petals 4: stamens pale purplish.

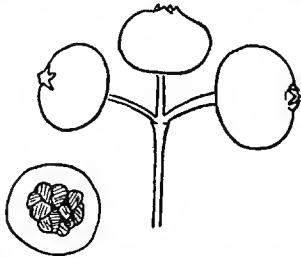
Fruit $\cdot 3$ - $\cdot 4$ " wide, round, rather flattened, pulpy, ripening purple, crowned with 4 little sepals.

Burma and S. China to Australia: very common in Malaya in secondary jungle and at the edge of the forest in the lowlands, particularly in the north.

Tailor Tree
Tuka Benang, Tukai Benai,
S'tukai Benai, Na S'tuka



Text-Fig. 164. Tailor Tree (Decaspermum), × $\frac{1}{2}$.



Text-Fig. 165. Fruits of the Tailor Tree (Decaspermum), nat. size.

This dainty little tree looks very like a Eugenia, such as *E. spicata* or *E. longiflora*, with tiny flowers and fruits and small leaves, but it can always be recognised from the reddish brown twigs and hairy shoots. It seems not to occur above 2,000 ft. altitude. The Malay names are not applied exclusively to it but are given to any similar plant with little white flowers.

EUCALYPTUS

(Gr., eu—well, kaluptos—covered)

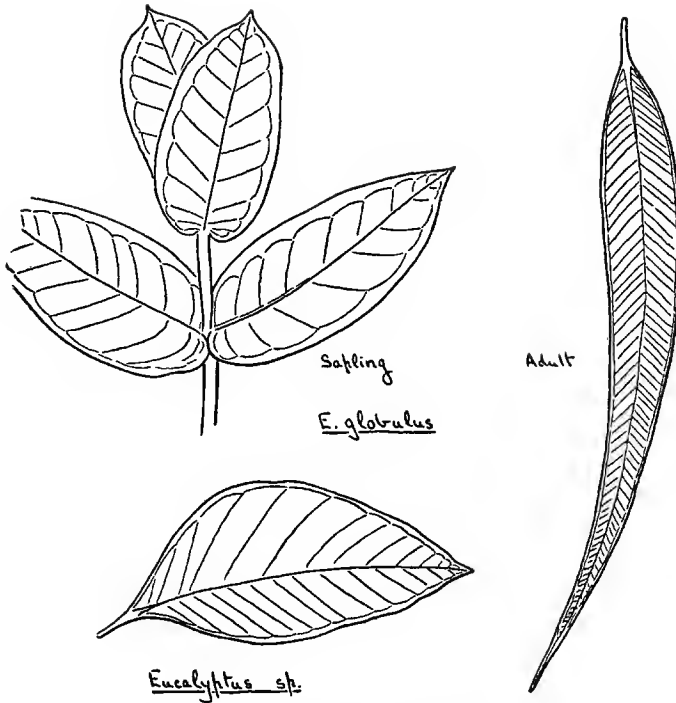
Leaves opposite, or opposite in young plants and alternate in mature plants: smelling of eucalyptus mixed with citronella, camphor or cinnamon, when crushed.

Flowers as in Eugenia but the calyx separating as a conical lid in the opening bud.

Fruit a woody capsule, crowned by the vestige of the calyx, opening by several slits: seeds numerous, small.

Over 200 species, a few in Eastern Malaysia, the rest in Australia.

This is the genus of the Gum Trees, which are the most characteristic element of the Australian flora. None is wild to the west of Celebes and Timor and comparatively few can tolerate the wet Malayan climate. Only two species seem to thrive in our lowlands, namely *E. corymbosa* which looks like a rugged-barked Eugenia, and *E. Naudiniana* which has the smooth, green, peeling bark generally associated with Eucalyptus: but neither is known outside our botanical gardens. The following two species have been planted in the mountains and are conspicuous at Fraser's Hill.



Text-Fig. 166. Leaves of Eucalyptus, $\times \frac{1}{2}$.

E. globulus Plate 146, Text-Fig. 166 Eucalyptus Tree
 Bark grey, smooth, flaky: leaves smelling of citronella and eucalyptus when crushed, withering scarlet.
 Sapling leaves opposite, sessile, heart-shaped at the base and clasping the twig, blue glaucous, $2-4 \times 1-2$ ".
 Leaves of mature trees alternate, drooping, lanceolate, slightly, curved, $4-8 \times \frac{1}{2}-\frac{3}{4}$ " with stalk $\frac{1}{2}$ " long.
 Australia.

Eucalyptus sp. Text-Fig. 166 Eucalyptus Tree
 (unidentified)
 Bark brownish, flaky: leaves smelling of eucalyptus when crushed, withering red, spirally arranged.
 Leaf-blade $2\frac{1}{2}-4\frac{1}{2} \times 1\frac{1}{2}-2$ ", drooping, often slightly curved, more or less glaucous on both sides: stalks reddish on the upper side.

We have not been able to identify this species.

EUGENIA

(Prince Eugene of Savoy, 1663-1736, a patron of science)

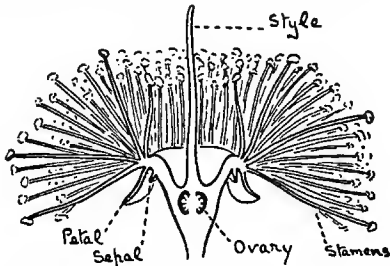
All parts glabrous (except in a very few, uncommon species).
 Leaves opposite, elliptic or oblong, generally pointed, rather shortly stalked, more or less leathery, with distinct marginal veins.
 Flowers small to large, in rather short compact bunches, generally fluffy with the stamens, green, white, red or pale yellow: calyx-cup with 4-5 sepals or teeth, or

without sepals, the cup lined with a yellow or pinkish honey-gland: *petals* 4-5, often small, in many cases tiny and falling off as a cap on the opening of the flower: *stamens* numerous (20 to several hundred), with tiny anthers on slender stalks: *ovary* inferior, the style rather long.

Fruit round or oblong, small or large, crowned by the persistent calyx-cup, with a leathery, dry, pithy or pulpy rind surrounding 1-2 (rarely more) large seeds, no stone, not splitting open: ripening green, white, pink, red, purple or black: *seeds* with 2 large, thick seed-leaves.

About 1,000 species, throughout the tropics: probably some 150 species in Malaya, in lowlands and mountains.

Eugenia is one of those big groups of tropical plants, like the *Bintangor* trees (*Calophyllum*) the Nutmegs (*Myristicaceæ*) and the *Kenanga*-family (*Annonaceæ*), to which there is no introduction in general botany and which discover themselves as a new idea in a tropical flora. In ordinary life, *Eugenia* is made known to us only through cloves, which are the dried flower-buds of a Moluccan species. Yet, *Eugenia* is not merely the largest genus of flowering plants of any description in Malaya but, in abundance of individuals and numbers of species, it is our foremost genus of trees: not even the wild figs rival it, though more spectacular. The Malayan species have recently been monographed by M. R. HENDERSON (*Gardens' Bulletin*, Singapore, vol. XII, 1949).



Text-Fig. 167. *Eugenia grandis*: flower in section, $\times 1\frac{1}{2}$.

Except the dwarfed and shrubby treelets of mountain-tops, the Malayan *Eugenias* are trees of considerable size. They occur in all parts of the country from high-tide level to the summit of Gunong Tahan. In secondary jungle many are common because their seeds are distributed by animals, very often by bats. But it seems that on the limestone hills there are few species. Unfortunately it is not possible to distinguish most kinds by a short description, though they may be recognized at a glance, for where one may seem distinctive there are always several related to it and differing only in details of flower, fruit, leaf-shape or veins of the leaf; and as there has been much error in identification it is not yet certain which are really common. Still, it is easy to recognize a *Eugenia* by its simple, opposite, leathery, shortly-stalked leaves that generally point down and have upcurled sides, from the absence of stipules (so that there is no line or scar connecting the stalks of a pair of leaves across the twig, as there is in the Mangrove- and *Ixora*-families), from the clusters of white (or pink) fluffy and sickly sweet flowers (Text-Fig. 167) and the inferior ovary which ripens into a berry with 1-2 large seeds, but has no stone. The leaves of *Eugenias* and wild *Mangosteens* are much alike, but the *Mangosteens* always have latex and concealed buds. They are more likely to be confused, in the absence of flowers, with species of *Memecylon*, the distinction from which we have given under that genus (p. 448). The *Putat*-trees (*Barringtonia*) resemble *Eugenia* in flower and fruit but they have spirally arranged leaves and their flowers and fruits are let down on strings. Compare, also, *Pygeum* (p. 528) with alternate leaves.

Malayan *Eugenias* are mostly small to medium sized trees, reaching 70 feet in height. They make up a large portion of the tree-growth below the canopy of the forest and, in general, do not take part in the canopy itself, except for a few rare or uncommon species the crowns of which may reach 150 feet. Such small trees are so numerous that a walk of half a mile in any part of the country, other than the limestone hills, will take one past at least half a dozen kinds.

But in the forest which borders the rocky coasts and sandy bays, the Sea Apple (*E. grandis*) and several other species, such as the Black Kelat (*E. cymosa*) and the Sour Kelat (*E. Cumingiana*), become so big and so abundant that a great part of the canopy may consist of their crowns and, in conjunction with the small kinds beneath them, we may truly speak of a Eugenia-forest, or a belt of Eugenia-forest, between the sea and the ordinary inland, lowland forest. In the mountains, too, where all manner of trees are smaller, the Eugenias play a more conspicuous part in the canopy, but our knowledge of the mountain species is very incomplete.

To Malays many kinds of Eugenia are familiar as fruit-trees, timber-trees or sources of tanning-material and the genus has a variety of vernacular names, the application of which is not always strictly botanical. Those with edible fruits, known as Rose Apples from the shape of the fruit and their taste of rose-water, are called *Jambu* with epithets to distinguish the kinds: the name is usually reserved for village-trees but may be given to any wild kind with big fruits or big flowers. It is the fruit of the *Jambu*-trees that is sold in the markets. *Kelat*, or *Kayu Kelat*, is the name for most wild kinds which have small or inedible fruits, and it signifies their peculiarly astringent bark: the name also has numerous epithets to indicate the colour of the flowers or fruit and the nature of the bark. Thus *Kelat Samak*, or *Samak* alone, is the name for several species the inner bark of which is intensely brown, red or purple and is used in tanning leather or toughening fishing nets and lines: the bark may be used instead of mangrove for dyeing sails and cotton fabric to brown, red or black. The word, *Ubah*, may have the same significance but, in Borneo, it is a general name for the wild species, like *Kelat* in Malaya; and on the East Coast of Pahang and Trengganu the name is given to the Sea Apple (*E. grandis*) which, however, is generally known as *Jambu Laut*. *Kelat Gelam*, *Kelat Tikus* and *Gelam Tikus* are the names for a few species the bark of which is vivid orange brown and composed of many exceedingly thin layers, like superimposed pieces of tissue-paper, which flake off in shaggy pieces: this kind of bark is useful, like that of the true *Gelam* (*Melaleuca*), for caulking boats because it swells slightly in water: it is used also as a styptic and an absorbent for wounds. *Kelat Belian* and *Kelat Betis* indicate species with good timber. A few have special names, as noted below. The name *Kelat* may be given to other trees which resemble Eugenia in having paired leaves, hard wood and astringent bark: yet it is remarkable how Malays have recognized and distinguished by one name this natural genus of trees.

The Clove-tree (*E. aromatica*), formerly abundant in the Straits Settlements, is now grown on a large scale only at Balek Pulau in Penang, where it scents the hillside and the main road. It is a very bushy, conical, small tree, reaching 25 feet, with rather small, light green, upward pointing leaves, easily recognized from their smell when broken. The cloves of commerce, known to Malays as *Chingkeh*, are the half-grown, dried flower buds: in Penang, they are picked about November to January, when the calyx has coloured red. In good soil, the trees will flower about their fifth year. They are said to live for 75–100 years and one tree of 150 years has been recorded. Though it is a native of the Moluccas and the world's supply comes mainly from Zanzibar, yet Penang-cloves are esteemed the best in the market.

Malayan Eugenias are evergreen, shedding their leaves gradually throughout the year, but new leaves and flowers they develop at seasonal intervals. Some flower once a year after pronounced dry weather; most seem to flower twice a year after each dry spell; and not a few flower three or more times. Of these

last, the Sea Apple or *Jambu Laut* (*E. grandis*) is the best example. In the south of the Peninsula where it is a common roadside tree, it flowers about the middle of March to the middle of April, from the end of July to the middle of August and about the end of December to the middle of January. Sometimes it has small flowerings, too, about the middle of June, the end of September and the end of November. As the flowering is gregarious, many trees being affected at the same time over a wide area, it must be a climatic phenomenon that is dependant, perhaps, on some alternation of dry and wet, or hot and cool, weather too subtle to be detected by ordinary meteorological methods. Some years the trees flower earlier or later than is their wont, exactly as the change of the monsoon is unpredictable, and some flowerings are poor: indeed, two good flowerings are seldom consecutive. The March flowering is the most regular and, generally, the most striking. Every tree will then flower for 10–20 days, although the height of flowering, when the crown is whitened as with snow, lasts in each case only 4–5 days or a week. The fruits take a little over 2 months to ripen, which is the same for clove-fruits. Unfortunately, we have no exact records for other species, not even for the fruit trees, but we are certain that among the other species there are very marked differences that are worth investigating. The Common *Kelat* (*E. longiflora*) seems to flower three times a year. In comparison the Grey Fig-tree (*Ficus glabella*) is deciduous three times a year, and we suspect some of the Oil-Fruits (*Elæocarpus*) of a like periodicity. But the Silver-back (*Rhodamnia*) and, perhaps, the Wild Cinnamon flower yet more often.

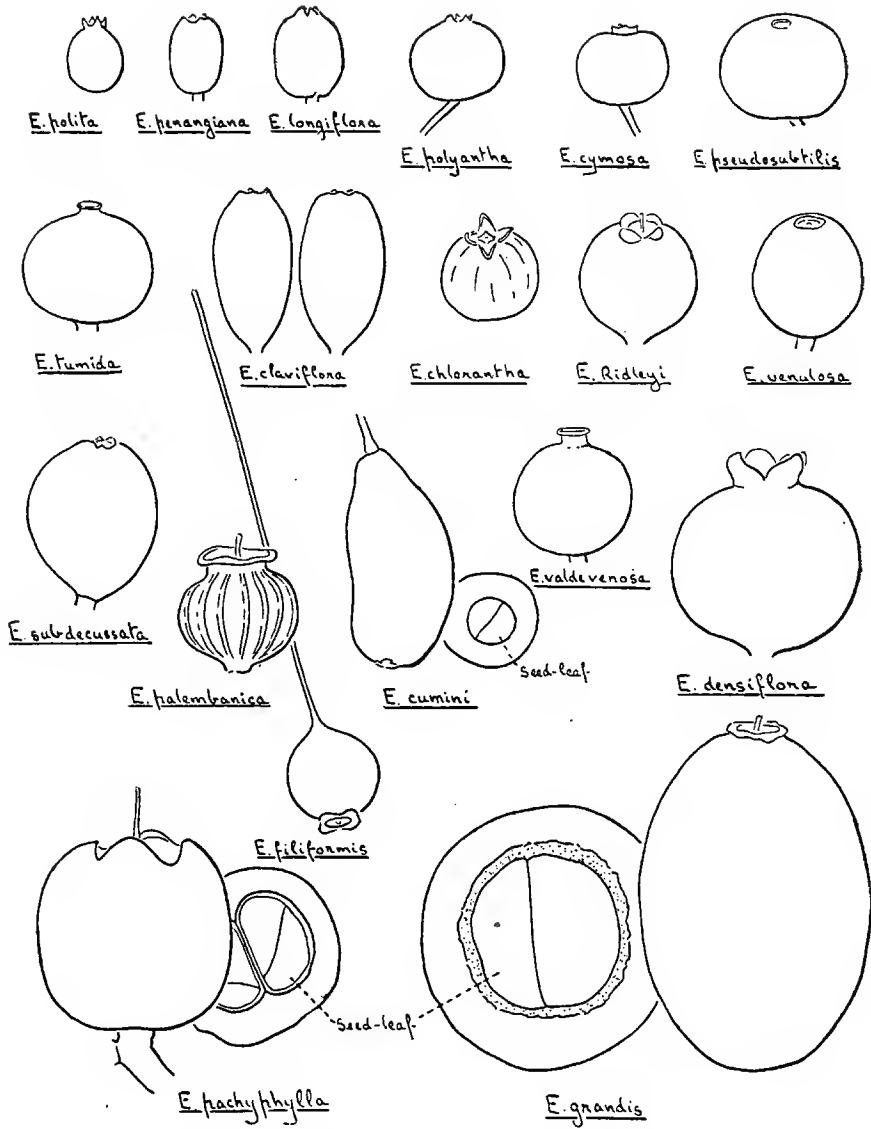
The new leaves of *Eugenia* may be pale green, as in the *Krian*, or, more commonly, pinkish as in the Clove-tree. In *E. spicata* and its close allies *E. grata*, *E. penangiana*, and *E. polita* they are purple. In a few, such as *E. Ridleyi*, they are deep blue like those of *Crypteronia* and some kinds of *Meme-cylon* and *Pternandra*. The old leaves wither yellow, pale orange yellow or rather brownish orange: in a very few cases, as *E. penangiana*, *E. claviflora*, and the wild *E. operculata*, they turn red.

The flowers are pollinated by flies, beetles and butterflies that come for the nectar in the calyx-cup and by bees that come both for nectar and pollen. Monkeys eat the flower-buds, and monkeys, squirrels, birds and, especially, small fruit-bats, eat the fruits: they bite off the rind or pulp and throw away the seed,

The genus is a most interesting one to study both for the great differences in bark, leaf and fruit and for the large number of common species that there are for comparison. One of its allies is *Eucalyptus* which differs in the dry, capsular fruit containing many small seeds and the joining of the sepals to form a conical cap over the bud so that when the flower opens the cap is pushed off like a candle-snuffer. The two genera show a remarkable difference in their distribution throughout the world. *Eugenia* is pan-tropical but, excepting a few species in New Guinea and neighbouring islands, *Eucalyptus* is limited to Australia where it has more than two hundred species. The Australian species of *Eucalyptus* are members of a dry or strongly seasonal climate: those few in N. Guinea are adapted to the more equable conditions of rain-forest and it seems that these only will thrive in Malaya.

It must be noted that, in the following descriptions, the width of the flower is taken across the fluff of stamens in the open flower, not across the petals or the calyx-cup.

If a species cannot be found in one section of the Key it should be looked for in the others, because the species are not always so confined in their habitats as the major divisions of the Key suggest.



Text-Fig. 168. Fruits of *Eugenia*, nat. size : (note the calyx at the top of the fruit).

Key to the Species

TREES OF VILLAGES, TOWNS, ROAD-SIDES AND RICE-FIELDS

- Flowers red : leaves very large : fruit massive, oblong,
splashed red *E. malaccensis* p. 499
- Flowers white, greenish or cream-colour : if pink,
then small
Leaves fairly large, 3" or more wide, at least on
some branches
Leaf-stalk $\frac{1}{2}$ " or more long
Flowers 1" wide, showy, with large petals,
clustered at the ends of the twigs : fruits
green, dry : roadside tree in the middle and
south of Malaya *E. grandis* p. 498
- Flowers $\frac{1}{2}$ " wide, petals tiny, clustered on the
twigs behind the leaves : fruit red-purple,
pulpy : village tree in the north *E. cumini* p. 496
- Leaf-stalk $\frac{1}{4}$ " long or less : fruit trees
Leaf-blade heart-shaped at the base, almost
sessile : bush or small tree *E. aquea* p. 494
- Not heart-shaped, distinctly stalked : medium-
sized tree *E. javanica* p. 499
- Leaves smaller or narrower, less than 3" wide
Flowers about 3" wide : leaf-blade 4-9" long,
narrow *E. jambos* p. 499
- Flowers about $\frac{2}{3}$ " wide : fruit red, pulpy, ribbed ;
leaf-blade 1-2" long : bush or treelet *E. Michelii* p. 499
- Flowers $\frac{1}{2}$ " wide or less : leaves 2-5" long
Flowers as little trumpets in bunches on the
twigs behind the leaves : flower-buds
 $\frac{3}{4}$ -1 $\frac{1}{4}$ " long : leaves withering red *E. claviflora* p. 495
- Not so
Leaves with 7-10 pairs of well-spaced side-
veins : stalk $\frac{1}{4}$ - $\frac{1}{2}$ " long
Twigs brown : chiefly in the middle and
south *E. polyantha* p. 501
- Twigs whitish : rice-fields : chiefly in the
north *E. pseudosubtilis* p. 502
- Leaves with more numerous, crowded side-
veins
Leaf-stalk $\frac{1}{2}$ -1" long : flowers on the twigs
behind the leaves *E. cumini* p. 496
- Stalk $\frac{1}{3}$ " long or less
Flowers $\frac{1}{2}$ " wide, at the ends of the
twigs : fruit white *E. longiflora* p. 499
- Flowers $\frac{1}{4}$ " wide, in the lower leaf-
axils : fruit red to black *E. cymosa* p. 496

MYRTACEÆ

SEA-SHORE AND MANGROVE TREES

- Bark orange-brown when fresh, papery-flaky : flowers small : fruits white or greenish : leaves small, pointed
- Single flower-bunch 2-4" long *E. grata* p. 498
- Single flower-bunch 1½" long or less
Flowers fluffy : fruit white : leaves fading yellow *E. polita* p. 501
E. spicata p. 503
- Flowers very small, rather few : fruit red : leaves fading red *E. penangiiana* p. 501
- Bark not so
- Flowers as little trumpets in bunches on the twigs behind the leaves : flower-buds ¾-1¼" long : leaves withering red *E. claviflora* p. 495
- Not so : flowers on the leafy twigs, generally at the ends
- Flowers, fruits and leaves rather large : petals and sepals conspicuous
- Leaves long and narrow, 8-14 × 2-4" : flowers in dense heads, often pinkish *E. densiflora* p. 497
- Leaves rather broad, 4-9 × 2½-5" : flowers in looser clusters
- Fruit oblong, smooth : bark greyish *E. grandis* p. 498
- Fruit urn-shaped, ribbed : bark warm brown *E. palembanica* p. 500
- Flowers ½" wide or less, with tiny petals : leaf-blade seldom more than 6 × 3"
- Twigs whitish : flowers not ¼" wide : fruit oblong, ⅓" wide, purplish *E. verecunda* p. 504
- Twigs brown or dark grey
- Leaves almost or quite sessile, the base-heart-shaped, very leathery *E. subdecussata* p. 503
- Leaves stalked, tapered to the base
- Side-veins of the leaf very fine and close : inflorescences slender
- Flowers ¼" wide, in clusters 1-2" wide : fruit red to black, pulpy *E. cymosa* p. 496
- Flowers ½" wide, in clusters 2-4" wide : fruit white, pithy *E. longiflora* p. 499
- Side-veins well spaced apart : inflorescences rather robust
- Fruit urn-shaped, ribbed : bark warm brown *E. palembanica* p. 500

TREES OF SECONDARY JUNGLE, RIVER-SIDES AND BORDERS OF FORESTS

- Bark orange brown when fresh, papery flaky
- Leaf-blade large, 8-15" long : stilted tree *E. papillosa* p. 501
- Leaves much smaller
- Leaves blunt *E. punctulata* p. 502

- Leaves tapered to a point or with a sudden long tip
- Single flower-bunches 2-4" long *E. grata* p. 498
 - Single flower-bunches 1½" long or less
 - Flowers fluffy, the stamens ⅓" long : leaves fading yellow : ripe fruits white *E. polita* p. 501
 - *E. spicata* p. 503
 - Flowers very small, the stamens 1" long : leaves fading red : ripe fruits red *E. penangiana* p. 501
- Bark not so
- Flowers like little trumpets, in bunches on the twigs behind the leaves : flower-buds ¾-1¼" long : leaves withering red *E. claviflora* p. 495
- Not so
- Leaf-blade large, over 6" long : inflorescence large : generally by streams or rivers
 - Flowers over 1" wide, in dense heads, pink or white : sepals and petals large *E. densiflora* p. 497
 - Flowers less than 1" wide, in loose panicles : petals tiny : sepals none *E. valdevenosa* p. 504
 - Leaf-blade less than 6" long on the average
 - Flowers ¾-1¼" wide : sepals and petals large
 - Leaves lanceolate : fruits round, white : river-banks of Pahang, Trengganu, Kelantan *E. densiflora*
var. *angustifolia* p. 497
 - Leaves obovate, leathery : fruits dumpy, 4-shouldered or slightly ribbed, green *E. pachyphylla* p. 500
 - Flowers smaller : sepals and petals tiny or apparently absent
 - Flowers few, at the ends of the twigs on thread-like, drooping stalks 1-3" long *E. filiformis* p. 497
 - Not so : flowers shortly stalked in denser bunches
 - Leaves almost sessile, rounded or heart-shaped at the base, leathery *E. subdecussata* p. 503
 - Leaves distinctly stalked : blade tapered to the base
 - Flowers ½-¾" wide, fluffy : fruit green, white or purplish, dry or pithy
 - Flowers rose-pink to red : fruit round, flushed purple *E. chlorantha* p. 494
 - Flowers green : fruit round, green *E. Ridleyi* p. 503
 - Flowers white
 - Leaves very leathery, blunt or scarcely pointed : fruit green, dry *E. venulosa* p. 504
 - Leaves pointed or long tipped, rather thin
 - Fruit small, white, oblong, pithy *E. longiflora* p. 499
 - Fruit rather large, round, green, then reddish brown, leathery *E. tumida* p. 504

MYRTACEÆ

- Flowers $\frac{1}{4}$ " wide or less: fruits red,
purple or black, mostly juicy
Leaves bulging between the veins:
flowers very small, in terminal
clusters: fruit red, juicy ... *E. microcalyx* p. 500
- Not so
Leaves long-tipped, rather small:
inflorescences on the leafy twigs
Side-veins of the leaf very close
and fine: flower-clusters 1-2"
wide: fruit cherry red then
black, pulpy *E. cymosa* p. 496
- Side-veins spaced apart: flower-
clusters 2-4" wide; fruit white,
pink then purple, dry ... *E. Cumingiana* p. 496
- Leaves not tipped, medium-size
Twigs brown: flowers on the twigs
behind the leaves ... *E. polyantha* p. 501
- Twigs whitish: flowers mostly on
the leafy twigs, often terminal *E. pseudosubtilis* p. 502

E. aquea

(Lat. aqueus—watery)

Water Apple
Jambu Chili, J. Ayer

A bush or small tree to 20' high: twigs angular.
Leaf-blade medium-size, up to 8 × 4", rather blunt, the base heart-shaped and clasping the stem; stalk very short, practically none.
Flowers white or pinkish, $\frac{3}{4}$ -1" wide, from the leaf-axils or the twigs just below the leaves.
Fruit $\frac{3}{4}$ -1 $\frac{1}{2}$ " wide, white or pink, top-shaped, glistening, translucent, with very juicy, crisp flesh.
Apparently native of S. India: cultivated throughout Malaysia.

Sometimes there are sold in the streets very large, pink, top-shaped fruits, 2-3" wide, that turn bright yellow when bruised: they seem to be a variety of this species. Some forms of the Java Apple are very similar and it is possible that the two species hybridise. When the Water Apple flowers or is in fruit, you must look within the crown to enjoy its fairy spangles.

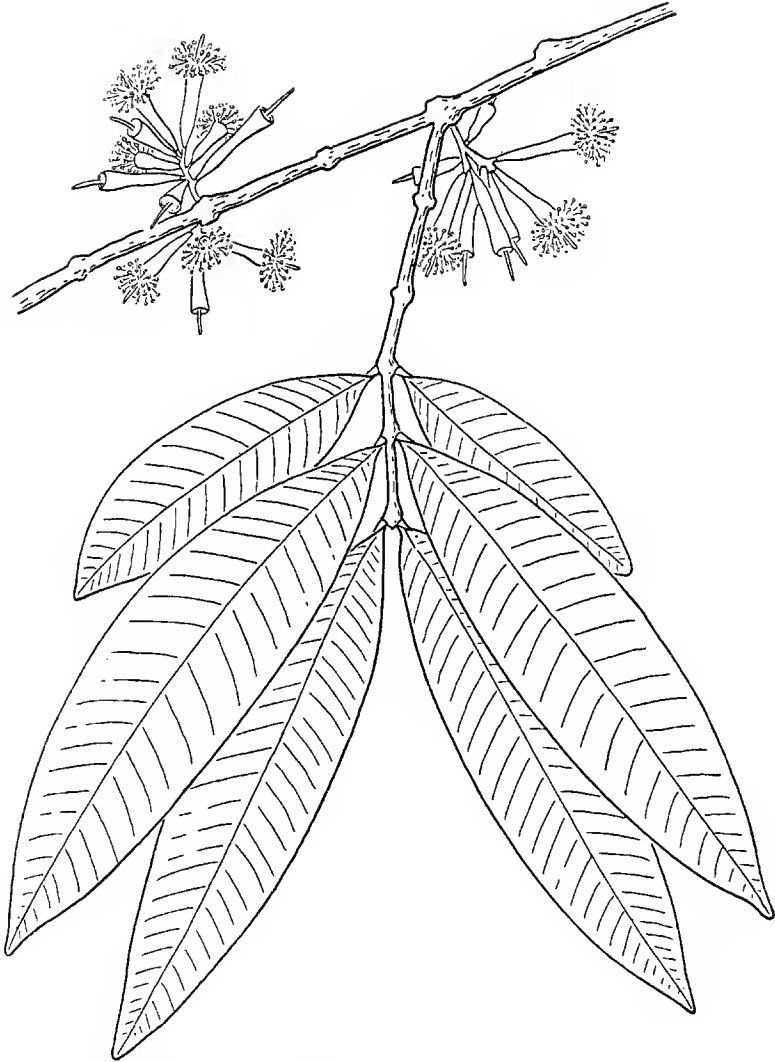
E. chlorantha

Text-Fig. 168

Crimson-flowered Kelat
Kelat Merah

(Gr., chloros—green, anthos—a flower)

A tree to 80 feet high, like *E. longiflora* in leaf and flower but:—
Bark greyish brown or dark brown.
Leaf-blade up to 7 × 3 $\frac{1}{2}$ ".
Flowers $\frac{1}{2}$ - $\frac{3}{4}$ " wide, with rose-red stamens, rather large greenish-white petals: branches of the inflorescence rather woody.
Fruit $\frac{1}{2}$ - $\frac{3}{4}$ " wide, round, green flushed rose-purple, crowned by the rather large calyx-cup, $\frac{1}{2}$ " wide: dry.
Annam, Sumatra, Malaya, Borneo: frequent in lowland forest throughout the country, often by rocky Saraca-streams; common on Penang Hill.

Text-Fig. 169. Trumpet Eugenia (*E. claviflora*), $\times \frac{1}{2}$.

E. claviflora Text-Figs. 168, 169
(Lat., clavus—a nail, flos—a flower)

Trumpet Eugenia
Jambu Arang (Kel., Tr.), Kelat Merah;
Bangkoh, Bangkeh, Rumuyu (Penang)

A spindly treelet to medium-sized tree up to 60 ft. high with grey, rather rough bark: twigs often narrowly winged: *leaves withering scarlet.*

Leaf-blade $3\frac{1}{2}$ –10 \times $1\frac{1}{2}$ –3", rather long, narrowly elliptic, oblong, tipped, thinly leathery, rather yellowish beneath, with many rather close side-veins: stalk 1–3" long.

Flowers $\frac{1}{2}$ " wide, cream-white, the rim of the calyx pink or red, like small trumpets in compact very shortly stalked bunches, 1–2" wide, on the twigs behind the leaves: flower-buds $\frac{3}{4}$ –1 $\frac{1}{4}$ " long: petals tiny, falling off in a cap.

Fruits $\frac{3}{4}$ –1" long, rather narrowly oblong, ripening pulpy and crimson, then black.

W. Malaysia from India to the Philippines: frequent in Malaya, especially on sea-coasts, abundant at K. Trengganu.

The little bunches of rather long trumpet-like flowers on the twigs and the narrowly oblong leaves distinguish this species. The name *Jambu Arang* probably refers to the very dry and hard, pale dirty brownish inner bark of the trunk which looks as if it had been scorched and killed. In Penang, the fruits are pickled in salt as *Buah Rumuyu*. A very narrow-leafed form, var. *riparia*, occurs by the Tahan River.

E. Cumingiana

(H. Cuming, 1791-1865, the English plant-collector)

Sour Kelat
Kelat Asam

A tree like the Common *Kelat* (*E. longiflora*) in leaf-shape and flower-clusters but:—

Bark becoming ridged and scaly.

Leaves with well-spaced side-veins (7-10 prs.) and short-stalks $\frac{1}{2}$ " long or less.*Flowers small*, less than $\frac{1}{4}$ " wide, white: *stamens* very short, $\cdot 1$ " long.

Fruit $\frac{3}{4}$ - $\frac{1}{2}$ " wide, round, rather flattened at the end or inclined to be 2-shouldered, waxy white turning pink then purple, blue or violet, finally blackish, with rather firm, thin white flesh: edible but sour.

Indo-Malaysia: fairly common in Malaya in lowland forest and belukar.

The Sour *Kelat* is difficult to recognize until one has found a tree in fruit and studied it. Compare the White *Kelat* (*E. verecunda*) with long-stalked leaves.

E. cumini Text-Fig. 168

(Lat., cuminum—cummin)

Jambolan,
Jiwat, Salam, Krian Duat

A small to medium-sized tree reaching 60 ft., with long-stalked leaves and oblong fruits: bark greyish white, rather scaly, pale brown internally.

Leaf-blade 2-6 × 1-3 $\frac{1}{2}$ "", small to medium-sized, tipped, with numerous close veins: stalk $\frac{1}{2}$ -1" long.

Flowers $\frac{1}{2}$ " wide, white but rose-pink after opening, in clusters, 1-4" long, mostly on the twigs behind the leaves: calyx-cup $\cdot 15$ - $\cdot 25$ " wide.

Fruit $\frac{3}{4}$ -1" long, oblong, deep purple to black, juicy: with one green seed.

Wild in India and Java: introduced to Malaya but not common.

There are two varieties of the *Jambolan*. The trees in the south of the Peninsula have small leaves (2-5 × 1-2") and small flower-clusters (1-2 $\frac{1}{2}$ " long) and in habit they recall the Common *Kelat* (*E. longiflora*) with its round, small-leafed crown. But in Penang, Kedah and Perlis, the trees have larger leaves and larger flower-clusters (2-4" long) and in habit, as well as in leaf, they suggest the Sea Apple (*E. grandis*) with its cylindrical, large-leafed crown: indeed, without flowers or fruits, it is by no means easy to distinguish them except by the rather thicker leaves with more spaced veins and the reddish inner bark of the Sea Apple. In Kedah, where there are fine trees at Alor Star, this northern variety is called *Krian Duat*.

The small-leafed form must not be confused with the Black *Kelat* (*E. cymosa*) which has shorter leaf-stalks and fruits broader than long, and which flowers on the leafy twigs.

E. cymosa Plate 147, Text-Fig. 168Black Kelat
Kelat HitamA small to fairly large tree like *E. longiflora* but:—

Crown dull, dingy green, often straggling.

Bark dark greyish brown inclining to dingy reddish brown, rather fibrous and rough.

Flowers $\frac{1}{4}$ " wide, white with reddish calyx, in slender few-flowered clusters, 1-2" long and wide, from the axils of the old leaves, rarely at the ends of twigs.

Fruit $\cdot 3$ - $\cdot 4$ " wide, round, broader than long, pulpy, dark cherry red then purple-black.

N.E. India, Malaysia: common in Malaya, in belukar inland and by the sea, especially on exposed laterite bluffs.

The Malay name refers to the black fruits but may be taken to indicate the general gloomy aspect of the tree, which feature enables one, with a little practice, to distinguish it at a glance from the Common *Kelat* (*E. longiflora*); we have grown to prefer its sombreness. Its correct botanical name is *E. syzygioides*.

The Black *Kelat* is a companion of the Sea Apple (*E. grandis*) in the Eugenia-forest that borders the sandy and rocky coasts. On the sandy flats, at a distance of a hundred yards from the sea, specimens can be found that are a hundred feet high. The biggest that we have seen was by Jason Bay on the East of Johore: it was an old tree about ninety feet high with stagheaded crown that was dying back, but its former greatness was revealed by its trunk that measured, at chest-level, 14½ ft. in circumference.

We find the Black *Kelat*, therefore, as one of the common coastal trees. It is abundant in Penang, in the vicinity of Keppel Harbour and Changi in Singapore, on the laterite hillocks of Malacca, round the bays and headlands of Lumut and Pangkor, and on the sandy heaths at Kuala Trengganu.

The *Jambolan* (*E. cumini*) with oblong fruits, long leaf-stalks and grey bark must not be mistaken for the Black *Kelat*.

E. densiflora Text-Fig. 168

Wild Rose Apple

Kelat Jambu

Generally a rather slender tree to 50 ft. high, flowering at 12 ft., but sometimes with bushy crown and massive trunk and branches: bark pinkish brown or greyish, smooth but eventually rather scaly.

Leaf-blade 8-14 × 2-4", long, rather narrow, tipped, thinly leathery, dull green: stalk ¼-½" long.

Flowers 1½-2" wide, large, white or pink, in dense heads up to 6" wide, at the ends of drooping branches: sepals or petals large: stamens 1½-1¾" long: style 1¾-2" long.

Fruit 1" thick, large, round, pinkish to purple, crowned by big sepals, edible but sour.

W. Malaysia: common in Malaya on sandy and rocky shores, often beneath *E. grandis*, and by rocky streams in the forest.

This species, with its following variety, is one of the most beautiful flowering Eugénias and it fully deserves to be brought into cultivation. Trees have been planted on the New Coast Road in Penang. There is a big tree at the top of the Waterfall Gardens. (Compare *Memecylon heteropleurum* p. 450).

var. **angustifolia**

(Lat., angustus—narrow, folium—a leaf)

River Rose Apple

Kelat Jambu Ayer

A very bushy little tree up to 30 ft. high.

Leaf-blade 3-9 × 2-2½", smaller, narrower.

Flowers smaller, white or cream: stamens 1½" long: style 1¾" long.

Fruits green then white, pithy, with green sepals.

Patani, Kelantan, Trengganu, N. Pahang, Upper Perak: very abundant on deforested banks of rivers, hanging over the water: very fragrant and whitened when in flower.

This variety must not be mistaken for *E. valdevenosa* which has bigger panicles of smaller flowers with tiny petals and without sepals.

E. filiformis Text-Fig. 168

(Lat., thread-like)

Thread Eugenia

A tree like *E. longiflora* but with dark-brown bark, slender twigs and dull, dark green, rather thin leaves with faint, distinctly spaced veins.

Flowers ½-¾" wide, ½-1" long, singly or 2-5 together on long slender thread-like stalks 1-3" long, drooping from the ends of the twigs, flower-buds long.

MYRTACEÆ

Fruit $\frac{1}{2}$ " long, oblong, green, rather dry, often with a short tube at the top, hanging on a slender stalk.

W. Malaysia: common in the lowlands, but inconspicuous.

The few long flowers on slender stalks distinguish this from all other Eugenias. It is the species figured by FOXWORTHY opposite page 98 of his book.

E. grandis Plates 148, 149, Text-Figs. 167, 168
(Lat., great)

Sea Apple
Jambu Laut, J. Ayer Laut,
J. Jembah, Jembah, Ubah

A big tree, reaching 80 ft. in the open, over 100 ft. in the coastal forest, with rather dense, tall obconic crown widest above the middle, and massive wide-spread limbs: fluted at the base, never truly buttressed: bark greyish buff, or slightly pinkish, rough, uneven, rather shallowly fissured and somewhat flaky in big trees: inner bark pale pink to dark reddish, pale yellow near the surface.

Leaf-blade 4-9 x 2½-5", large, broadly elliptic, with a distinct down-turned tip, shiny, tough, with 9-13 well-spaced pairs of veins: stalks $\frac{1}{2}$ -1" long.

Flowers 1-1½" wide, large, white, with a strong, rather sickly fragrance, arranged in fairly compact clusters, 4-6" wide, at the ends of the twigs or in the leaf-axils: sepals and petals rather large.

Fruit 1 x $\frac{1}{2}$ ", oblong, with green leathery rind when ripe, dry but edible.

Malaya, Siam, Borneo: a common tree on rocky and sandy shores; never wild inland but much planted as a roadside tree especially in the south of the Peninsula.

The Sea Apple grows rather quickly. In the open the crown soon becomes bushy and it will flower in the fourth year when 15 ft. high. The biggest specimen which we have met was that by the *kramat* at Kampong Terbak near Tumpat. It had a crown nearly 100 ft. high with a diameter of 42 yards; the trunk was 8 ft. thick a chest-level. The presence of planted trees by lanes and odd parts of Singapore dates from the time when the trees were used as fire-breaks protecting the roads from the grassy wastes bordering them: the thick bark enables the trunk to withstand *lalang*-fires. That in Dalvey Road is the only complete avenue that is left.

The Sea Apple can be mistaken for the Sea Beam or *Merbatu* (*Parinarium corymbosum*). Both are lofty, coastal trees with grey trunks, dark-green glittering crowns and clusters of fluffy white flowers. But the Sea Beam has alternate, narrower leaves and a brown fruit with a hard stone, and its lower branches droop and trail in a manner not found in the Sea Apple so that one can often distinguish the two from a distance.

Compare also *Krian Duat* (*E. cumini*), the distinction from which is given in the key.

E. grata
(Lat., pleasant)

Shore Eugenia
Kelat Gelam, K. Tikus, K. Nasi Nasi, K. Nenasi

A tree to 60 ft.: bark orange brown, rather coarsely flaky: crown dense: young leaves purple.

Leaf-blade 1½-3½ x ½-1½, small, narrow, tapered to a long point, dark glossy green, much paler beneath, rather thick and fleshy, the veins scarcely visible: stalks 1-2" long.

Flowers $\frac{1}{2}$ " wide, or less, white, bunched in rather drawn-out inflorescences 2-4" long in the leaf-axils and at the ends of the twigs: calyx not pimply: petals tiny: stamens $\frac{1}{2}$ " long.

W. Malaysia: common on rocky and sandy shores, occasional inland.

There are many trees of this species on the beach at Pangkor. It grows to a much bigger size than the allied *E. spicata*. The Malay name *Nasi Nasi* refers to the puffy white or greenish white fruits like grains of cooked rice.

E. jambos Plate 150
(from the Malay name)Rose Apple
Jambu Mawar, J. Ayer Mawar

A bush or small tree to 25 ft., with narrow pointed leaves, very large white flowers and strongly scented, rather dry, round fruits.

Leaf-blade 4-9 × $\frac{3}{4}$ -2", tapered at each end: stalk about $\frac{1}{4}$ " long.

Flowers 3" wide, fragrant, in groups of 2-8 at the ends of the twigs.

Fruit $1\frac{1}{2}$ -2" wide, dull yellow tinged pink.

Indo-Malaysia: long cultivated and of doubtful origin.

E. javanica
(Lat., of Java)Java Apple, Wax Apple
Jambu Ayer, J. Ayer Rhio

Like *E. malaccensis* but:—

Leaf-blade smaller, up to 10 × 4", rather pointed, the base rounded or narrowed: stalk very short, 1-2" long.

Flowers $1-1\frac{1}{2}$ " wide, white, from the leafy twigs.

Fruit $1-1\frac{1}{2}$ " long, $1-2\frac{1}{2}$ " wide or more, apple or pear-shaped, green or whitish, (? red), rather waxy-looking.

Andaman IIs., and W. Malaysia: occasional wild trees in the forest, especially near the coast.

E. longiflora Plate 151, Text-Fig. 168

Common Kelat

A small or medium-sized tree to 70 ft. high, with hemispherical, dense, light green crown: bark light pinkish brownish, smooth: in wet ground, developing conspicuous bunches of stilt-roots from the lower part of the trunk.

Leaf-blade $2\frac{1}{2}$ -4 × $\frac{3}{4}$ -1 $\frac{1}{2}$ ", with a distinct, long tip and numerous fine, crowded veins: stalk 2-3" long.

Flowers about $\frac{1}{2}$ - $\frac{3}{4}$ " wide, white, occasionally pale pink, with a sickly sweet scent, in dense terminal and axillary clusters 2-4" wide, the clusters with slender greenish branches.

Fruit 4" long, oblong, white, pithy.

W. Malaysia: very common in secondary jungle and by riversides throughout the country.

This shapely tree is distinguished by the small, long-tipped, finely veined leaves and small white fruits. The Black Kelat (*E. cymosa*) and the two species *E. chlorantha* and *E. tumida* closely resemble it, and it is difficult to distinguish them without flowers or fruits. The Common Kelat and the Black Kelat are, however, by far the commoner wild species of Eugenia with small, thin, pointed and finely veined leaves.

E. malaccensis
(Lat., of Malacca)Malay Apple
Jambu Bol, J. Kling, J. Merah

Tree to 60 ft. with cylindric crown, young leaves pinkish olive-buff.

Leaf-blade 8-14 × 3-7", very large, drooping: stalks $\frac{1}{2}$ " long.

Flowers 2" across, large, crimson pink, clustered on the branches behind the leaves: calyx green.

Fruit 2-3" long, large, oblong or pear-shaped, white splashed or striped with crimson-pink, or wholly pale crimson to purplish, scarcely shiny: flesh white, pithy, juicy, rather tasteless.

Origin uncertain, but from some part of Malaysia: common in gardens.

This is the most easily recognized of all Eugénias, from its big leaves, flowers and fruits. Some trees have rather narrow, pointed leaves $1\frac{1}{2}$ -3" wide.

E. Michellii
(P. A. Micheli, 1679-1737, the Italian botanist)Cayenne Cherry
Chermai Belanda

A bush or treelet to 15 ft., spreading, twiggy.

Leaf-blade 1-2 × 1", small, rounded at the base, narrowed to the blunt apex, dark green.

MYRTACEÆ

Flowers $\frac{3}{8}$ " wide, singly in the leaf-axils or 2-3 together at the ends of the twigs, white, on slender stalks $\frac{1}{4}$ -1" long.

Fruits 1" wide, cherry red, glistening, juicy, strongly ribbed, hanging: with a strong, spicy, rather resinous flavour.

Brazil: occasional in gardens in Malaya.

This little tree should be better known. Raw or cooked, the fruits are pleasant to eat and, to some palates, most agreeable. It has been called *E. uniflora*. *Chermai* is a small village fruit-tree (Cicca) of the Rubber-Tree family (Euphorbiaceæ).

E. microcalyx

Bullate Eugenia

(Gr., mikros—small, calyx—a cup)

A tree to 60 ft. high with bushy crown: bark greyish buff smooth or rather uneven. Leaf-blade 3-6 × $1\frac{1}{4}$ -3 $\frac{1}{2}$ ", elliptic to oblong, shortly tipped, variable in size, thin, glossy green, bulging between the well-spaced side-veins (9-14 pairs): stalk $\frac{1}{4}$ - $\frac{3}{8}$ " long.

Flowers $\frac{1}{16}$ " wide, tiny, cream white, in panicles 2-4" long, generally clustered together at the end of the twig.

Fruits $\frac{1}{4}$ - $\frac{1}{2}$ " wide, cherry red, juicy.

Siam, Malaya: common in lowland forest and belukar throughout the country.

We name this species from the botanical term *bullate* for describing the way in which the blade bulges between the veins. This feature is so distinctive that the species can be recognised from the leaves alone.

E. pachyphylla Text-Fig. 168

Thick-leaved Eugenia

(Gr., pachus—thick, phyllon—a leaf)

Kelat

Bark pinkish grey, pale, rather fissured-flaky: twigs white: leaves in alternating pairs.

Leaf-blade 2 $\frac{1}{2}$ -7 × $1\frac{1}{4}$ -3 $\frac{1}{4}$ ", more or less obovate, blunt or bluntly tipped, rather leathery, with 10-14 pairs of rather faint side-veins: stalks 2-4" long.

Flowers $\frac{3}{8}$ -1 $\frac{1}{4}$ " wide, rather large, white, in short axillary inflorescences 2-3 $\frac{1}{2}$ " long.

Fruit 7-9" long, almost as wide, dumpy, obscurely 4-angled, crowned with 4 shoulder-like sepals, green, in some cases slightly ribbed.

Burma, Siam, Malaya, Borneo: frequent in lowland jungle and rice-fields, generally near streams: common round Kota Bahru.

E. palembanica Text-Fig. 168

Ribbed Sea Apple

(from Palembang)

Samak, Kelat Samak

A large bush or small tree, seldom reaching 60 ft. high, in leaf and flower like *E. grandis* but:—

Bark warm-brown or rich pinkish brown, not or scarcely flaky but very finely and closely fissured: inner bark deep purple brown, very astringent.

Twigs upstanding with 4 rows of leaves.

Leaf-blade smaller, 3-7 × $1\frac{1}{4}$ -3 $\frac{1}{4}$ ", yellow green to dark shiny green, leathery, upward pointing with upcurled sides: stalk $\frac{1}{2}$ - $\frac{3}{4}$ " long.

Flowers $1\frac{1}{4}$ " wide, in compact panicles, up to 6" wide, with stout branches.

Fruit $\frac{3}{4}$ " long, urn-shaped, with round, ribbed body, short thick neck and spreading rim (the edge of the calyx-cup).

Burma, Malaya, Sumatra, Borneo: common on sandy and rocky shores and on the tops of low mountains to 2,000 ft. altitude.

The Malays of the East Coast consider the bark of this tree better than that of any other, even of *Bakau* (*Rhizophora*), for tanning, dyeing and steeping nets.

E. papillosa

(Lat., with pimples)

Stilted Eugenia

Kelat Paya, Kelat Jangkang

A tall tree of swampy forest, generally with strong, arched and flattened stilt roots from the lower part of the trunk: twigs and leaves sometimes hairy.

Leaf-blade 8-15 × 3½-7", very large, strongly ribbed, the base heart-shaped and clasping the twigs, almost or quite sessile.

Flowers ¾-1" wide, white, in terminal panicles 4-8" long.

Fruits about 1" wide, round, pale green, dry.

Malaya, Borneo: common in swampy forest from Singapore to Kedah.

The beautiful orange trunk renders this a most conspicuous and unmistakable tree at the edge of the forest.

E. penangiana

Text-Fig. 168

Penang Eugenia

Kelat Gelam

A bushy tree up to 60 ft. high, like *E. spicata* but:—

Leaf-stalks 1-2 long: leaves withering red.

Flowers much smaller, .15" wide, with very short stamens (.1" long: arranged in inconspicuous, few-flowered clusters, 1-1½" long, at the ends of the twigs: calyx-cup pink or reddish after flowering, not pimply.

Fruit larger, .3-4 long, ripening red with white pulp.

Malaya, Borneo, Java: occasional in lowland and mountain forest and on the sea-coasts, frequent, on Penang Hill.

In the lowlands this species suggests a small tree of the Black Kelat (*E. cymosa*), but it is distinguished by the orange-flaky bark, smaller flowers and different fruits. Although, by description, it is hard to distinguish from the other species with fine foliage and orange bark, it is not at all difficult in reality when one sees the tree in flower and fruit and observes the red withered leaves. In *E. grata*, *E. spicata* and *E. polita* the stamens are rather long and fluffy and the flowers are closely bunched, so that from a distance the ends of the branches, if not the whole crown, appear whitened with blossom. But in *E. penangiana* the flowers are small, few in a cluster, and have very short stamens and the inflorescences are few so that one may not be aware that the tree is flowering until close upon it. In Singapore there is a tree of the Penang Eugenia about the 13th mile on the main road to Johore, and there are a few on the coast at Labrador and in Bukit Timah Forest Reserve. Its correct botanical name is *E. attenuata*.

E. polita

Text-Fig. 168

Polished Eugenia

(Lat., polished)

Kelat Nasi Nasi, K. Nenas

Generally a bush or small tree like *E. spicata*, though up to 80 ft. high in tall forest: as *E. spicata* but:—

Small twigs sharply 4-angled.

Inflorescences very dense, with 2-4 oblong bracts (.1-2" long) at the base of each flower: calyx-cup not pimply.

Fruit ¼" wide, round or urn-shaped, crowned by 4 rather large sepals, generally, with the bracts at the base, greenish white, not pimply.

Malaya: common on rocky headlands, especially on the East Coast, and in the mountains up to 5000 ft. altitude.

E. polyantha

Plates 152, 153, Text-Fig. 168

Salam, Serah (E. Coast)

(Gr., polus—many, anthos—a flower)

A moderate-sized tree to 80 ft. high, with cylindric, rather open crown, and greyish brown twigs: bark grey, rather flaky as in *E. grandis* or *E. pseudosubtilis*.

Leaf-blade 3-5 × 1-2", rather small, not or shortly tipped, with 8-11 fairly well-spaced pairs of side-veins, dull green, thinly leathery: stalk ¼" long, short.

MYRTACEÆ

Flowers $\frac{1}{2}$ – $\frac{3}{4}$ " wide ($\frac{1}{2}$ " across the calyx-cup), tiny, faintly scented, white: the shallow, 4-angled calyx-cup cream, then pink or reddish as the flower ages: arranged in short clusters 1–2" long, mostly on the twigs behind the leaves.

Fruit .3–.4" wide, small, round or transversely oblong, often rather flattened, ripening cherry red to purple-black, pulpy.

Burma, W. Malaysia: common throughout Malaya, in the forest and belukar as well as in gardens, villages and by town-roads; but scarce in the north of the country.

In shape the Salam greatly resembles the Sea Apple (*E. grandis*) but the crown is not so dense because the leaves are smaller. It may well be mistaken for the *Krian* (*E. pseudosubtilis*) which differs chiefly in the white twigs, smaller greenish flowers, and the position of the inflorescences at, or towards, the ends of the leafy twigs.

In blossom, the *Salam* is recognized from the pinkish glow on the branches, from the clusters of reddening flowers.

E. pseudosubtilis Text-Fig. 168

(Gr., pseudos—false; *E. subtilis*)

Krian

Kriang, K. Batu

A tree reaching 80 ft. high, with small-leaved, light-green cylindrical crown: bark pale grey, often slightly pinkish or brownish, slightly scaly, rather uneven or slightly fissured: inner bark pale brown: twigs whitish: young leaves pale green, not mottled.

Leaf-blade $2\frac{1}{2}$ –6 × $1\frac{1}{4}$ – $2\frac{1}{2}$ ", apex rather blunt or slightly pointed, not tipped, with 6–9 pairs of well-spaced veins: stalk $\frac{1}{2}$ – $\frac{3}{4}$ " long, in young leaves red on the upper side.

Flowers $\frac{1}{4}$ " wide, small, yellowish green, reddish after opening, with a strange, sour fragrance, in short clusters, $1\frac{1}{2}$ –4" long, at the ends of the leafy twigs, in the leaf-axils and a few on the twigs behind the leaves.

Fruit .4–.6" wide, broader than long, often pressed together, ripening green then pink, then dark cherry red or rose-red purple finally black; thinly juicy-pulpy.

Siam, Malaya, Sumatra: very common in villages and rice-fields in Perak, Penang, Province Wellesley, Kedah, Perlis, Trengganu, Kelantan: scarce in the south, though frequent in swampy forest on the East Coast.

The *Krian*, in the wild state, is a tree of swampy forests and thus it is clearly suited to the edges of padi-fields where it is so picturesque in the north of the Peninsula. A little care is needed to distinguish it from the *Salam* (*E. polyantha*) which, however, is seldom found in the *Krian*-country. From a distance, its white twigs and pale bark suggest the *Gelam* (*Melaleuca*) or the *Mensirah* (*Ilex*) but both these have alternate leaves and the *Gelam* has a shabby grey crown. The fruits are pleasantly sweet and juicy. The seeds are generally infested by the grubs of some hymenopterous insect.

E. punctulata

(with little points)

Shaggy-barked *Eugenia*

Kelat Gelam

A tree to 80 ft. tall, with rather dense crown of small, upward pointing leaves: bark orange-brown, rather fissured and fibrous, the old flakes greyish.

Leaf-blade 2–5 × $\frac{3}{4}$ – $2\frac{1}{4}$ ", small, elliptic to obovate, blunt or slightly pointed, tapered to the base, leathery, with many fine veins: stalk .1–.4" long.

Flowers .2" wide, in terminal clusters 2–3" long: stamens very short, not fluffy.

Fruit $\frac{1}{2}$ " long, oblong, small, greenish white, rather juicy.

Malaya, Sumatra, Borneo: common in lowland forest, especially swampy ground and by rivers.

In the south of Malaya there occurs a distinct variety (*var. turbinata*) which may be another species. It has small leaves, seldom above 3" long, with very fine, close veins, and a white pithy fruit that has a thick stalk expanded at the end into a small head: it commonly grows by rivers and is known, in Johore, as *Dulang Dulang*. (The correct specific name is *E. cerina*).

Compare *E. venulosa* with different bark and fruit. Both *E. punctulata* and *E. venulosa* are unusual among Malayan Eugénias in their rather blunt, upstanding leaves which are broadest towards the apex (more or less obovate) and have recurved edges. In these respects they resemble the Clove-tree.

E. Ridleyi Text-Fig. 168

Ridley's Eugénia

(H. N. Ridley, b. 1855, Director of the Botanic Gardens, Singapore, 1888-1911)

A big tree to 100 ft. high: *bark* light brown, rather fissured and flaky: *young leaves deep blue*.

Leaf-blade 3-6 × 1-2 $\frac{1}{4}$ ", shaped as in *E. polyantha*, dull green, with 7-11 pairs of well-spaced veins: stalk $\frac{1}{2}$ - $\frac{3}{4}$ " long.

Flowers nearly $\frac{1}{2}$ " wide, *green*, in terminal clusters 2-4" long.

Fruit $\frac{1}{2}$ " wide, *round*, with *green rind*, crowned by the large calyx-cup, .2" wide, with *distinct sepals*.

Siam, Malaya: widely distributed in lowland forest: frequent in the Reservoir Jungle in Singapore and on Penang Hill.

We recognize this species from the blue young leaves and the small green, fallen flowers.

E. spicata Plate 154
(full of flower-spikes)

Spicate Eugénia

Kelat Nasi Nasi, K. Nenasi

A bush or small tree rarely as much as 30 ft., very like *E. grata* but:—

Leaf-stalks very short, .1" long or less (young leaves purple-pink).

Inflorescences very short, dense, 1-1 $\frac{1}{2}$ " long: calyx minutely pimply (from oil glands).

Fruit $\frac{1}{2}$ " long, oblong, white, pithy: in bunches, edible.

Indo-Malaysia: common by rivers, sea-shores, in secondary jungle and on the tops of low hills to 2,000 ft. altitude.

Although it is not difficult to distinguish this species from *E. grata*, one must look closely to the inflorescence and the shape of the fruit to distinguish it from *E. polita*. The finely pimply calyx at once distinguishes *E. spicata* from its allies.

The species was formerly known as *E. zeylanica*.

E. subdecussata Text-Fig. 168
(the leaves tending to be decussate)

Leather-leafed Eugénia

A tree to 80 ft. high, but dwarfed to a bush on mountain ridges: *bark* light pinkish brown: young leaves purple.

Leaf-blade 2-6 × 1-3", elliptic, blunt or shortly tipped, *very leathery*, glossy green, with close veins, *the base rounded and more or less heart-shaped*, nearly or quite *sessile* (stalk up to .1" long).

Flowers nearly $\frac{1}{2}$ " wide, *greenish yellow*, in terminal clusters 2-4" wide.

Fruit $\frac{1}{2}$ - $\frac{3}{4}$ " wide, *round or pear-shaped*, with *green rind*, with a small hollow .1" wide at the top.

Malaya, Sumatra: frequent in lowland and mountain forest: common on the East Coast on rocky shores, headlands and islands.

We recognize this species by its medium-sized, very leathery, almost sessile leaves arranged in alternating pairs (4 rows).

E. tumida Text-Fig. 168
(Lat., swollen)

Swollen Kelat

As *E. longiflora* but:—fruits larger round, $\frac{1}{2}$ – $\frac{3}{4}$ " wide, with leathery green rind, crowned by the short calyx-tube: flower-clusters 1–2 $\frac{1}{2}$ " wide, smaller: leaves often larger.

Siam, Malaya, Borneo: not so common but in similar places.

In shape, the fruits are like those of *E. valdevenosa*.

E. valdevenosa Text-Fig. 168
(Lat., with strong veins)Rib-leafed Eugenia
Kelat Jambu

A tree to 50 ft. high: bark pale greyish, smooth, internally blood-red: twigs 4-angled.

Leaf-blade 6–11 × 2–4 $\frac{1}{2}$ ", large, tipped, strongly ribbed with 12–30 pairs of well-spaced side-veins: stalk $\frac{1}{4}$ – $\frac{1}{2}$ " long.

Flowers $\frac{1}{2}$ – $\frac{3}{4}$ " wide, white, in large, loose, terminal panicles 5–9" long and wide: sepals none: petals very small, falling off in a cap.

Fruit $\frac{3}{4}$ " long and wide, rounded, pale green then whitish, surmounted by the short calyx tube 1–1 $\frac{1}{2}$ " wide: edible.

Malaya, Sumatra, Borneo: frequent in lowland and mountain woods to 4000 ft., often by streams.

This is a handsome species with large panicles and leaves recalling those of the Sea Apple (*E. grandis*), but differing in the smaller flowers with tiny petals and without sepals, and in the shape of the fruit.

E. venulosa Text-Fig. 168
(full of small veins)

Blunt-leafed Eugenia

A tree like *E. longiflora* with pale pinkish-grey or greyish-white bark, but:—

Twigs pale, whitish: leaves in alternating pairs (4 rows).

Leaf-blade blunt, or scarcely pointed, leathery, narrowed to a short stalk $\frac{1}{4}$ " long or less: veins faint.

Flowers small, $\frac{1}{2}$ – $\frac{3}{4}$ " wide: no sepals: petals tiny.

Fruit $\frac{1}{2}$ " wide, round, the green rind suffused purple on the exposed side, with a small hollow 1" wide at the top (as in *E. subdecussata*).

Malaya, Borneo: frequent in the lowland especially by rivers.

In leaf, this species recalls *E. punctulata* but its bark is different. Its correct botanical name is *E. Muelleri*.

E. verecunda
(Lat., modest)White Kelat
Kelat Puteh

A small tree to 50 ft. high with straggling or bushy crown: bark pale grey or greyish buff, smooth or slightly flaky, internally brownish or purplish brown: twigs whitish.

Leaves as in the Common Kelat (*E. longiflora*) but with longer stalks $\frac{1}{2}$ –1" long.

Flowers small, less than $\frac{1}{2}$ " wide, in clusters up to 4" wide at the ends of the twigs or in the leaf-axils.

Fruit $\frac{1}{2}$ " long, $\frac{1}{2}$ " wide, oblong, white suffused rose purple, rather dry.

Malaya, Borneo, Philippines: rather common on sea-coasts and at the back of mangrove.

This must not be mistaken for the Sour Kelat (*E. Cumingiana*) with brown twigs and bark and larger round fruits, nor for the Marsh Holly (*Ilex cymosa*) with alternate leaves. Its correct botanical name is *E. leucoxylon*.

LEPTOSPERMUM

(Gr., leptos—thin, sperma—seed)

*Leaves spirally arranged, small, narrow, sessile.**Flowers* rather small, *solitary in the leaf axils*: calyx broadly cup-shaped with 5 sepals: petals 5: stamens not very numerous: ovary half-inferior.*Fruit* a small woody capsule, opening at the top with 5 slits and seated in the persistent calyx-cup: seeds many, small.

About 30 spp., mostly Australian, a few in N. Guinea, one species reaching through Malaysia to Tenasserim: 1 sp. in Malaya.

L. flavescens Plate 220, Text-Fig. 170
(Lat., turning yellow)Mountain *Gelam*
*Gelam Bukit, China Maki*An evergreen bush or small tree to 40 ft. high, with fine-leaves, grey-green, open, scrubby crown, and *gnarled, twisted branches*: bark grey-brown, *deeply fissured, rather fibrous, flaky*: twigs distinctly angled: young leaves light green, slightly pinkish: *old leaves dull red.*Leaves $\frac{1}{2}$ - $1\frac{1}{4}$ × .1-3", flat, lanceolate, the apex blunt or slightly pointed, dull green, upturned, with 3 faint longitudinal veins visible on the upper side: *pleasantly aromatic when crushed.**Flowers* $\frac{1}{2}$ " wide, *sessile or nearly so*: sepals, petals and stamens white: calyx-cup green, *reddening with the withering of the flower*: not fragrant.

Fruit .3" wide, dark crimson, drying grey when old.

On mountain tops from Moulmein to Australia: on all mountains in Malaya, but generally above 3,000 ft.

Text-Fig. 170. Mountain *Gelam* (*Leptospermum flavescens*), nat. size.

A small twisted tree that from a distance suggests a Chinese painting of a crooked pine, that grows in bogs, on rocky cliffs or open ridges in the mountains, and that has tiny flat leaves, reddening as they wither, and white star-like flowers, can be no other than the Mountain *Gelam*. In exposed places it becomes, like the False *Ru* (*Bæckia*) and the *Mentigi* (*Pemphis*), a sprawling heather-like bush, not a foot high. The lowest level at which it has been found in Malaya is on some rapids in the upper waters of the Endau, which must be less than 1,000 ft. It grows also on the ridge of G. Panti (1,600 ft.) in East Johore, and even this low altitude is exceptional. It does not grow by the sea, although it is found in such places in other parts of the Malay Archipelago, and therefore it is readily distinguished from the *Mentigi* for which it might otherwise be mistaken. It resembles also the False *Ru* but that has needle-like, opposite leaves that wither yellow and smaller flowers.

The dried leaves of the Mountain *Gelam* are made into tea, like those of the False *Ru* and of many Australian species of *Leptospermum* called "Tea-Trees". The Malay name is derived from the resemblance of the leaves and bark to the lowland *Gelam* (*Melaleuca*). In New Zealand it is called the Red Tea Tree.

Some plants have the flowers rather less than a half-inch wide and some have them rather more.

On the ridges of Gunong Tahan, at altitudes from 3,000-5,000 ft., the Mountain *Gelam* is one of the large trees having a massive trunk, 2 ft. in thickness, and bark so rugged that one can put a finger into the cracks. Yet, on the moorland above 5,000 ft., in the bogs of pitcher-plants (*Nepenthes*), it flowers as a woody herb hardly 6" high.

MELALEUCA

(Gr., melas—black, leukos—white; from the appearance of the bark)

*Leaves narrow, spirally arranged, shortly stalked, with several longitudinal veins.**Flowers, small, sessile, in spikes: petals 5: stamens numerous: ovary half-inferior.*

Fruit a small, sessile, woody capsule, surrounded by the small calyx-cup and opening at the top with 3 slits: seeds many, tiny.

About 130 spp., chiefly Australian, 1 sp. throughout most of Malaysia: 1 sp. in Malaya.

M. leucadendron Plates 155, 156
(Gr. leukos—white, dendron—tree)Paper-bark Tree,
White Wood, Cajeput (India)
*Gelam, Kayu Puteh*A large bush, bushy coppiced tree, or tall evergreen tree to 80 ft., *with rather narrow, dense, greyish green scrubby crown* and stout, often twisted trunk: *bark whitish or light grey to greyish brownish, often tinged orange-brown, fissured and papery-flaky in coarse, elongate, shaggy pieces: young leaves and twigs silky.**Leaves 2-5 × ½-1½", lanceolate, often slightly curved, tapered to a sharp point, thinly leathery, flat, greyish green, with 5-7 longitudinal veins: stalk ¼-½" long.**Flowers finely hairy, white, fluffy from the stamens, fragrant, the body of the flower ¼" wide, arranged in spikes, 3-6" long, ending in a bud or a short leafy twig.**Fruits 15" wide, sessile, cushion-like, greyish brown, with a narrow groove round the top surrounding a small crater-like cup marked with 5 radial grooves: long persistent on the twigs.*

From Tenasserim through western Malaysia to the Moluccas, absent from the Philippines: common in Malaya, especially in swampy ground near the coasts.

The *Gelam* is planted by many of the narrow country roads through the rice-fields in Malacca and, because of the softness of the ground, the trees lean outwards trying, as it were, to widen the road. There is a fine avenue in Johore Bahru about a mile from the town on the main north road, like a row of Olive trees, but, generally, the *Gelam* is not much used for this purpose because its crown, though dense, is narrow and gives little shade. In many parts of the country, especially in Malacca, Kedah and Perlis, it is planted in woods in swampy ground where it is cut over and coppiced so frequently for firewood that the stands are very dense and the trees unable to reach much size. In the low country between Kuala Trengganu and Besut it is very abundant and clearly multiplies at the expense of other trees because of its thick bark which enables it to withstand *lalang*-fires and because of its ability to grow in water-logged soil, *cf.* the *Mengkudu* (*Morinda elliptica*).

The timber of the *Gelam* is hard and durable in contact with fresh or salt water and it is the chief firewood in several places where *bakau* or Mangrove (*Rhizophora*) is not available. The papery bark is used by Malays for caulking their boats: a layer of bark is placed over the edge of one timber before the next is fastened to it and the bark, swelling in water, seals the seam, *cf.* *Kelat Gelam* (*Eugenia*-trees).

An oil, known as Cajeput-oil, is distilled from the leaves and is used chiefly in medicine. The dried fruits are sold in the markets as *Mercha Bolong* (black pepper). (Essential oils are also obtained from several Australian species).

The *Gelam* can be mistaken for the *Acacia* (*A. auriculiformis*) but it is easily distinguished by its bark, aromatic leaves smelling rather of *Eucalyptus* when crushed, and the unusually constructed spikes of white flowers. The flowering spikes end in a bud which subsequently grows on as a leafy twig and, as the fruits remain on the twigs for a long time before tumbling off, there is often a row of fruits, like small grey knobs, toward the base of each leafy spray.

PSIDIUM

(? from the Greek name for pomegranate-peel, *sidion*)Like *Eugenia* but :—

Flowers solitary or 2-3 together on stalks in the leaf-axils.

Calyx not divided into sepals but split into 2-3 irregular pieces.

Fruit containing many small hard seeds, embedded in pulp.

About 120 spp., trop. America : 1 sp. introduced to Malaya.

P. guajava(from the Spanish *guayaba*)

Guava

Jambu Batu, J. Biji

A small rather sparingly branched tree up to 25 ft. high, with spreading or drooping limbs: *bark very smooth, orange-brown mottled greenish or pale yellowish, peeling off in very thin flakes exposing the pale new bark: twigs downy, with 4 ridges set in two pairs.*

Leaf-blade up to $6 \times 2\frac{1}{2}$ " , oblong, rounded at the base, drab green, *downcurved but the sides upcurled, the underside downy and ribbed by the veins* : stalk $\frac{1}{2}$ " long.

Flowers $\frac{3}{4}$ " wide, with white petals.*Fruit* $1\frac{1}{2}$ - $2\frac{1}{2}$ " wide, oblong or rounded, *ripening yellow and fragrant or flesh pink.*

Common in all villages throughout the country.

The bark and the peculiar set of the dull leaves enable one to recognise this little tree at a glance. It will fruit in its second year from seed, certainly by the fourth, and it lives for 30-40 years. It seems to flower and fruit continuously. There is a full account of its history and uses in BURKILL'S Dictionary.

RHODAMNIA

(Gr., rhodon—rose, amnion—the amnion : from the red unripe fruit)

Leaves opposite, with 3 main longitudinal veins.Flowers small, shortly stalked, in clusters of 3-6 in the leaf-axils: *sepals and petals 4*: stamens many: ovary inferior.*Fruit* a small berry with 3-8 seeds, crowned by the persistent sepals.

About 8 spp., S.E. Asia to Queensland: 1 sp. in Malaya.

R. trinervia Plate 157

(with 3 nerves)

Silver Back

Poyan, Mempoyan, Empoyan, Tempoyai, Mengkoyan

A small evergreen tree up to 50 ft. high: *crown dense, round, very twiggy, drab green: bark greyish brown, narrowly fissured, rather finely ridged, scarcely flaky.*

Leaf-blade $2-6 \times \frac{3}{4}-2\frac{1}{2}$ " , oblong, *tapered to the apex or with a rather sudden, long tip, generally more or less silvery or ashen white beneath, from minute silky hairs, in some cases green beneath*: stalks $\cdot 2-3$ " long.

Flowers $\cdot 4$ " wide, *white, reddish in the centre, silky, very fragrant*: stalks $\cdot 1-3$ " long.

Fruits $\cdot 3-4$ " wide, round, silky, green turning red, purple and finally black, pulpy, sweet but astringent, seeds pale yellow, angular, hard.

Tenasserim to Australia, except the Philippines common, in the forest and secondary jungle, by villages and rivers and in the mountains of Malaya.

The Silver Back, or *Mempoyan*, has perhaps a wider distribution in Malaya than any other native tree, for it occurs in every conceivable situation: it is not common, however, in the virgin forest, seeming to prefer open, well-lighted places. It is easily recognized from its characteristic, opposite, 3-veined leaves with silvery backs, though some trees are exceptional in having them green. The high mountain form has rather broad, suddenly tipped, stiff and leathery leaves. From a distance, the crown of the *Mempoyan* resembles that of the Tamarind.

MYRTACEÆ

In Singapore, the trees flower gregariously some four or five times a year, evidently in response to some climatic factor but to what we do not know: nor do we know of another tree that flowers so often yet discontinuously (*see* p. 38). At such times, the trees are enveloped in honey-sweet fragrance and a hum of bees. The fruits are edible and are sought by birds, bats, squirrels and monkeys, by whose means the seeds are distributed. The wood is very hard and is used in the construction of Malay houses: "if large pieces could be obtained it would be very valuable", (BURKILL). The branches are excellent for the cultivation of epiphytic orchids.

RHODOMYRTUS

(Gr., the rose-myrtle)

Leaves opposite, with 3 conspicuous longitudinal veins.

Flowers rather large, singly in the leaf-axils: calyx 5: petals 5: stamens many: ovary inferior.

Fruit a berry, crowned with the persistent sepals, containing many tiny seeds.

A few species in Malaysia, Australia and the Eastern Pacific: 1 sp. in Malaya.

R tomentosa . Plate 158
(Lat., woolly)

Rose Myrtle
Kemunting

An evergreen, bushy shrub up to 10 ft. tall: young parts thinly whitish woolly.

Leaf-blade 1-4 × $\frac{1}{2}$ -1 $\frac{1}{2}$ " oblong, blunt or slightly pointed, the underside thinly white woolly: stalks 1-2" long.

Flowers 1 $\frac{1}{2}$ -1 $\frac{3}{4}$ " wide, on long stalks $\frac{1}{2}$ -1" long, with a pair of bracts at the base of each flower, not fragrant: petals magenta-pink fading white: stamens pink with yellow anthers.

Berry $\frac{1}{2}$ " long, oblong, crowned with the blunt sepals, thinly woolly, green becoming purplish, the seeds in purplish pulp.

S.E. Asia, Malaysia: common in Malaya, especially in open sandy ground, on the sea-shore or sand-banks by rivers.

This pretty shrub is a favourite among children because of its sweet, edible fruits. The flowers suggest small roses. It must not be mistaken for the *Senduduk* (*Melastoma*) which has purple flowers with only a few, large stamens and pointed leaves. It delights in hot sandy places.

TRISTANIA

(Marquess de Tristan, 1776-1861, a French botanist)

Leaves arranged spirally at the ends of the twigs, generally more or less narrowly obovate, with numerous fine lateral veins: generally withering red.

Flowers small, in stalked clusters in the leaf-axils: calyx-cup with 5 teeth: petals 5: stamens yellow, set in 5 bundles of 3-5 stamens, one bundle at the base of each petal: ovary half inferior.

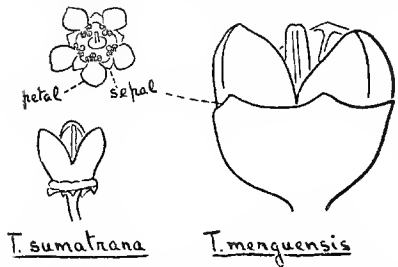
Fruit a small capsule with the calyx-cup attached round the lower half, the upper half splitting into 3 parts: seeds many, flat.

30 spp., Malaysia, Australia: 6 spp. in Malaya.

Tristania-trees can always be recognized from their beautiful, orange-brown to pinkish grey, very smooth bark which peels off in large, spiral, scroll-like pieces and accumulates round the base of the trunk. It may happen, as with some trees of *T. merguensis* on Penang Hill, that the bark of the trunk is only

drab buff without any orange, but the rich colour is always evident on the smaller branches. So striking and characteristic is this bark that there is only one other Malayan tree in which it is at all similar, that is the mangrove *Nyireh* (*Carapa granatum*) which is not likely to be mistaken for a *Tristania* because of its pinnate leaves and large fruits. Such peeling bark is found, however, in many Australian species of *Eucalyptus*.

Tristania-trees are evergreen but seasonal in flowering. They have unbuttressed trunks and dense, round crowns of small, rather upright, glossy leaves which tend to be tufted at the ends of the twigs, so as to suggest a large clove-bush. Their young leaves are pink.



Text-Fig. 171. *Tristania*: flower and fruits $\times 2$.

The Malayan species are not easy to distinguish except from the places where they grow: this character, fortunately, is sufficient.

Malay names for the genus are *Pelawan*, *Selunchor* (or *Selensor*) and *Jelujur*, the first being most usual and the second being given also to other smooth-barked trees as *Cratoxylon ligustrinum*. *Keruntum* is the Sakai name for *T. merguensis* at Cameron Highlands. *Pelawan* is indicative of the hardwood. Some exotic species supply good brown or red timber.

Key to the Species

- | | | |
|--|--------|----------------------|
| Riverside-trees; inflorescences nearly as long as, or longer than the leaves | ... .. | <i>T. sumatrana</i> |
| Not so: inflorescences much shorter than the leaves | | |
| Seashore trees: S'pore, E. coast of Johore, Port Dickson | ... .. | <i>T. obovata</i> |
| Inland tree of lowland or mountain forest | ... .. | <i>T. merguensis</i> |

T. merguensis Text-Fig. 171
(of Mergui)

Hill *Tristania*
Selunchor, *Selensor*, *Keruntum*

Leaf-blade 2-8 \times $\frac{1}{2}$ -3", leathery blunt or pointed, tapered to a very short stalk or, as in sapling and coppice-shoots, with a pointed lobe on each side of the base and encircling the twig.

Flower clusters 1-3" compact, massive: flowers yellow, $\frac{1}{2}$ " wide.

Fruit about $\frac{1}{2}$ " long and wide, half immersed in the calyx.

Tenasserim to Malaya: common in the mountains, especially on ridges, less common in lowland forest.

T. obovata
(from the leaf-shape)

Sea *Tristania*

A small tree like *T. sumatrana* but:—

Bark of young trees greyish brown, rather deeply fissured, eventually flaking off (sometimes in one large scroll) and displaying the smooth, peeling, orange-fawn bark: twigs with smooth blood red bark.

Flower clusters 1-2" long.

Fruits .2-2.5" wide, the calyx-teeth pressed against the fruit.

Malaya, neighbouring islands of the Rhio Archipelago: on rocky headlands and islands from Port Dickson southward round Singapore and along the East coast of Johore as far as Tg. Penyabong: common on St. John's Island.

NYCTAGINACEÆ

T. sumatrana Text-Fig. 171

River Tristania
Pelawan, Selunchor

A tree up to 70 ft. high with smooth orange trunk and bright glossy green crown.
Leaf-blade 3-7 x 1-2", rather distinctly tipped, tapered to a distinct stalk ¼-½" long.

Flowers .2" wide, white, with reddish calyx, in slender, stalked clusters 3-6" long.

Fruit .15" wide, the calyx-teeth pointing out or backward.

W. Malaysia: a common riverside tree from the fresh-water tidal reaches to the foot-hills, often arching out over the water.

Typically the bark of saplings is silvery grey and very smooth: it flakes off in long, spiral, grey or purple scrolls which may hang round the trunk for a long time, especially when bound up by the roots of epiphytes and climbers: then the new bark beneath is orange-yellow or orange-brown. But in some trees this first silvery bark remains so long that one doubts if it ever peels off, as happens with many of the trees on the Tahan River.

The River Tristania flowers twice a year, June-August and November-January. The crown is whitened with blossom.

BOUGAINVILLEA FAMILY

Nyctaginaceæ

(from the genus Nyctago, a synonym of Mirabilis)

Leaves spirally arranged or opposite, simple, entire: no stipules.

Flowers regular, having a tubular calyx with 3-5 lobes or sepals: petals none: stamens 1 to many: ovary superior.

Fruit enclosed in the enlarged and hardened calyx-tube.

30 gen., over 300 spp., throughout the warmer parts of the world, chiefly American: 2 gen., 4 spp. in Malaya.

Bougainvillea and the Marvel of Peru (Mirabilis) are the best known members of this family. It includes the small introduced tree, called the Lettuce tree, and its Malayan ally: they are easily recognised from their sickly yellow foliage.

PISONIA

(W. Piso, b. 1611, a Dutch physician)

Leaves generally opposite, some alternate or spirally arranged.

Flowers small, greenish white, male or female, in dense terminal clusters: stamens 6-10.

60 spp., throughout the tropics, chiefly maritime: 2 spp. wild in Malaya and 1 introduced.

Key to the Species

- A small garden tree with yellow foliage *P. alba*
- A medium-sized tree with yellow-green foliage: East Coast *P. excelsa*

P. alba Plate 159
(Lat., white)

Lettuce Tree
Kemudu, Mengkudu

A small evergreen tree up to 25 ft. high, with pale greenish yellow, or yellow, sickly looking foliage: glabrous.

Leaf-blade as in *P. excelsa*, often rounded at the base or very unequal-sided: stalk $\frac{1}{2}$ – $1\frac{1}{4}$ " long.

(Male flowers $\frac{1}{4}$ " long, with 5-toothed calyx and 8 stamens: female flowers smaller).

(Fruit $\frac{1}{2}$ – $\frac{3}{4}$ " long, on a long stalk).

Sea-coasts of Malaysia: not wild in Malaya but occasional in gardens.

The cooked leaves are eaten as a vegetable. "As the leaves of the male tree are much darker and less appetizing in appearance than those of the female tree, the male is uncommon in cultivation" (BURKILL). We have had no opportunity of proving whether such a difference in the foliage depends on the sex of the plant because it seems never to flower in Malaya. Whether the two species *P. alba* and *P. excelsa* are really different we have been unable to discover: both have identical bark, trunks, wood and foliage: possibly the flowers and fruit differ.

Malays give the Lettuce Trees the same names as they do *Morinda*, doubtless because of the resemblance between their leaves.

P. excelsa
(Lat., lofty)

Malayan Lettuce Tree
Kemudu, K. Siam, K. Selat,
Mengkudu, M. Siam, M. Selat

A medium-sized deciduous tree reaching 60 ft. high or more, with a spreading uneven crown of yellow green or yellowish leaves: bark grey or greenish grey, spotted with lenticels.

Leaf-blade 4–12 × 2–6", elliptic, thin, pointed, narrowed to the base, with 7–11 pairs of side-veins: stalk $\frac{1}{2}$ –3" long.

Flowers fragrant, in small terminal stalked clusters 2–4" wide: male flowers yellowish green, 2" wide and long, with the white stamens projecting.

Fruit 1–1½ × $\frac{1}{4}$ ", pale green, like a narrow cucumber, with 5–6 angles.

Malaysia: frequent on many of the East coast islands, abundant in the town of Kuala Trengganu.

This tree grows at its best on the small granite islands in the neighbourhood of Pulau Tioman. It sheds its leaves between April and August and flowers with the new foliage. It is doubtfully distinct from *P. alba*.

OLIVE FAMILY

Oleaceæ

(from the genus *Olea*)

Leaves opposite, simple, without stipules.

Flowers small, mostly cream-white, regular, in some cases unisexual, in small panicles: calyx small, with 4 minute teeth or none: petals 4, the edges often incurled, joined in a short tube: stamens 2: ovary superior, with 2 cavities.

Fruit a small berry or capsule.

About 18 genera, 300 spp., in temperate and tropical regions of the whole world: 5 gen., 28 spp. in Malaya.

The Ash-trees of Europe and North America (*Fraxinus*), the Olive tree of the Mediterranean (*Olea europea*), the Jasmin (*Jasminum*), the Lilac (*Syringa*),

OLEACEÆ

the Privet (*Ligustrum*) and *Forsythia* belong to this family. In Malaya it is poorly represented by several species of wild *Jasmin* and some rather inconspicuous trees one of which, *Olea brachiata*, is interesting as an ally of the Olive-tree. In gardens and villages occur also two introduced plants, the Chinese Privet and the Indian Tree of Sadness (*Nyctanthes*).

All the Malayan members of the family appear to be evergreen.

Key to the Genera

- Flowers $\frac{3}{4}$ " wide, with an orange corolla-tube: garden shrub or treelet *Nyctanthes*
 Not so: flowers much smaller, cream-white
 Straggling garden-shrub with hairy twigs and leaves: stamens longer than the petals *Ligustrum*
 Village- or wild trees: glabrous: stamens shorter than the petals
 Leaf-blade 2-5" long, often toothed near the end, the stalks up to $\frac{1}{4}$ " long: berry $\frac{1}{4}$ " long *Olea*
 Leaf-blade 4-10" long, not toothed, the stalks $\frac{1}{2}$ -1" long: berry $\frac{3}{4}$ " long *Linociera*

LIGUSTRUM

(a Latin plant-name)

Flowers in terminal panicles: corolla with a distinct tube and 4 lobes: stamens longer than the petals and with distinct stalks.

Berry with 1-3 seeds.

About 25 spp., Asia to Australia, mostly in China: 1 sp. introduced to Malaya.

L. sinense Text-Fig. 172
 (from China)

Chinese Privet



Text-Fig. 172. *Ligustrum sinense*: flower and fruit, nat. size.

A straggling shrub up to 12 ft. high, with hairy twigs and undersides to the leaves.

Leaf-blade 1-3 x $\frac{1}{2}$ -1 $\frac{1}{2}$ ", elliptic, tipped: stalk .1-.2" long.

Flowers $\frac{1}{4}$ " wide, white, very fragrant, in panicles .2-.4" long.

Berry $\frac{1}{8}$ " long, green then black, oblong.

S. China: occasional in gardens in Malaya, common as a hedge on Fraser's Hill.

LINOCIERA

(G. Linocier, a French physician of the 16th century)

Flowers in axillary panicles: petals joined together only at the extreme base, almost separate, their edges incurved: stamens shorter than the petals, with tiny stalks.

Berry thinly pulpy, with one large seed.

About 40 spp., throughout the tropics: 7 spp. in Malaya.

L. pauciflora Plate 160
(Lat., paucus—few, flos—a flower)

Malay Olive

An evergreen tree up to 60 ft. high, with *pale grey, rather smooth bark and pale grey or whitish twigs: young leaves pale green*: crown like that of a *Eugenia* with ascending limbs drooping at the ends.

Leaf-blade 4–10 × 1½–3½", elliptic, pointed, gradually narrowed to the base, rather thin, *dark green, with the midrib yellowish white underneath*: stalk ½–1" long.

Flowers ¼" wide, *cream-white, very fragrant* (or scentless in some cases), in panicles 3–6" long in the axils of the older leaves or on the twigs behind the leaves.

Berry ¾" long, oblong, *blue-black*.

Malaya: common in the lowlands, in swampy forest or on the sea-coast, also in the mountains to an altitude of 4,000 ft.

The tree is easily known from the rather large, opposite leaves on the pale twigs, and the lateral panicles of tiny, white, fragrant flowers with 4 petals. Both it and the Sea Olive (*Olea*, p. 514) greatly resemble the Marsh Holly or *Mensirah* (*Ilex cymosa*, p. 328). All three have greyish white bark and twigs, similarly shaped leaves, small flowers in axillary clusters and similar berries but the Marsh Holly has alternate leaves and differently constructed flowers. Malays, intentionally perhaps or in error, may also give the name *Mensirah* to both the Malay Olive and the Sea Olive, but it should be retained for the Marsh Holly.

NYCTANTHES

(Gr., nux—the night, anthos—a flower)

Flowers in terminal panicles: corolla with a distinct tube and 4–8 petals: anthers 2, sessile inside the corolla-tube near the top.

Fruit a small capsule.

1 sp., native of India.

N. arbor-tristis Plate 161
(Lat., arbor—a tree, tristis—sad)

Tree of Sadness
Seri Gading

A shrub or small tree up to 15 ft. high, with *4-angled twigs, rough on the angles*.

Leaf-blade 2–3 × 1–1½", ovate, tapered to the point, *edge often toothed*, thin, *rough*: stalk .1" long, short.

Flowers ¾" wide, *sweetly scented*, arranged in groups of 4–5 surrounded by 4 bracts: calyx cup-shaped, without lobes: *corolla with 5–7, mostly 6, white petals and a deep orange tube ¼" long*, giving the flower an orange eye.

Cultivated in Malaya, in gardens and villages, especially near Hindu temples.

This is one of the holy trees of India. The fallen corollas are swept up during the holy days and are preserved for future use. It is night-flowering and the corollas fall off in the morning. The vivid orange-colour of the corolla-tube can be used as a dye but it is not permanent.

OLEA

(Lat., the Olive tree)

Like *Linociera* but the petals joined into a distinct tube with 4 small lobes. About 40 spp., in the Old World: 4 spp. in Malaya.

OPILIACEÆ

O. brachiata Plate 70
(Lat., cross-armed)

Sea Olive
Kelek, Sekelek

A very twiggy evergreen shrub or small tree up to 25 ft. high, like *Linociera pauciflora* but:—

Leaf-blade 2-5 × ¾-2¼", smaller, narrowly elliptic, often toothed toward the end, rather leathery, yellowish green beneath, purplish pink when young: stalks up to ¼" long.

Flowers .1" wide, smaller, in smaller panicles ¾-2" long, at the base of the new shoots below the current leaves.

Berry ¼" long, rounded-oblong, green then black.

Malay Peninsula: common on sandy and rocky shores and headlands in Malaya, also in the East coast towns and villages.

A form, known as *O. penangiana*, occurs in Penang: it has the flowers in terminal panicles 3-6" long on short side-shoots: it appears to be a tree, but little is known about it.

See the remarks under the Malay Olive (*Linociera*).

The Sea Olive is called *Olea maritima* in BURKILL'S Dictionary.

CHEMPERAI FAMILY

Opiliaceæ

(from the genus *Opilia*)

Leaves alternate, simple, entire, with very short stalks.

Flowers very small, in simple or branched racemes, in some cases male or female, regular: calyx with a short tube and 4-5 lobes: petals none: stamens 4-5 opposite the sepals: ovary superior, with one ovule.

Fruit with a thinly fleshy or pulpy rind and one large seed, not opening.

About 20 spp., Asia: 3 gen., 4 spp. in Malaya.

This little family of shrubs, small trees and climbers is considered by some to be allied with the *Petaling*-family (*Olcaceæ*, p. 728) and by others with the *Sandalwood* family (*Santalaceæ*), neither of which is mentioned in this book: it shares with the last the curious yellowish or ochre look of the leaves and flowers. It includes the *Chemperei* or *Chepri* which is a common shrub or small tree of open country and thickets and has edible fruits and leaves which can be used as a vegetable. Very like the *Chemperei* is another forest shrub or treelet (*Lepionurus*) and the two are easy to confuse. They must not be mistaken for the *Pink Beam* (*Parastemon*) of the *Rose*-family which has similarly shaped leaves and bunches of pink fruits.

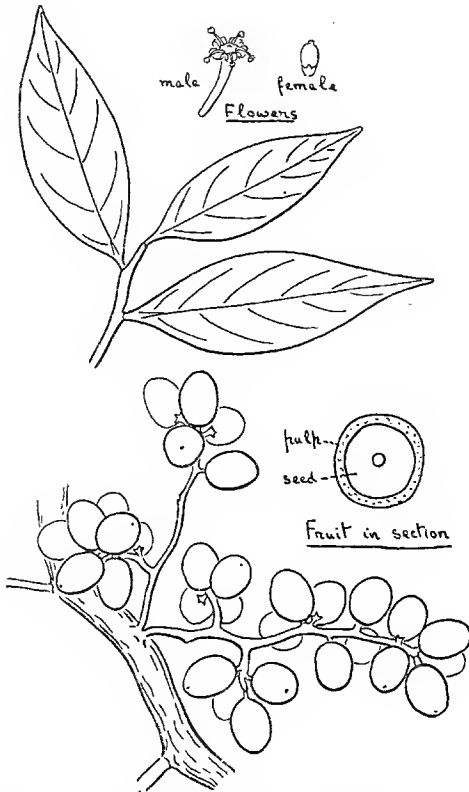
Key to the Genera

Flowers in slender branched racemes, generally on the branches or trunk: sepals 5; stamens 5	...	...	...	<i>Chempereia</i>
Flowers in short unbranched racemes, generally from the leaf-axils: sepals 4; stamens 4	...	...	...	<i>Lepionurus</i>

CHAMPEREIA

(from the Malay name)

2-3 spp., S. E. Asia to the Philippines: 1 sp. in Malaya.

C. manillana Text-Fig. 173
(of Manila)Text-Fig. 173. False Olive (Champeria): leaf and in fruit-spray $\times \frac{1}{2}$: flowers $\times 2$: section of fruit, nat. size.This is called *C. Griffithii* in BURKILL'S Dictionary.**LEPIONURUS**

(Gr., lepión—scurf, oura—a tail)

2 spp., W. Malaysia: both spp. in Malaya.

L. sylvestris
(Lat., of the wood)Cat-berry
Kuching Kuching

Very like *Champeria* but generally a shrub, flowering even at 2 ft. high. *Flowers cream-colour*, arranged in short unbranched racemes 1-2½" long, at first set with rather large pale green bracts, 1-9 racemes from a leaf-axil.

Fruit set in a small cluster on an unbranched stalk up to 2½" long.

Common in lowland woods and open country, also in the mountains.

False Olive
Chemperai, Chepri

An evergreen shrub or small tree to 15 ft. high, with a curious yellow look from the yellowish bark, yellowish olive to yellowish green leaves and orange (immature) berries: glabrous: often infested with mistletoes: twigs rather conspicuously zig-zag.

Leaf-blade 2-8 \times ½-2¾", narrowly elliptic, pointed at each end, often with a long tip, leathery, with rather few side-veins: stalk 1-3" long

Flowers 1" wide, dull ochre-yellow, in slender branched inflorescences 2-6" long, from the leaf-axils or on the branches and trunk: flower-stalks curved, the flowers facing down: male-flowers stalked, the female sessile.

Berries ½" long, oblong, smooth, bright opaque orange-ochre then dark cherry red, glabrous, thinly pulpy, in bunches.

W. Malaysia to the Philippines: common in secondary jungle throughout the country.

BELIMBING FAMILY

Oxalidaceæ

(from the Wood Sorrel, Oxalis, of Europe)

Like the Cocaine-family (Erythroxyllacæ) but with compound (pinnate or palmate) leaves.

8 genera, 900 spp., throughout the world: 5 genera, 18 spp. in Malaya, only 3 genera and 11 spp. being wild.

The common Malayan members of this family are the yellow- and pink-flowered herbaceous Sorrels (*Oxalis*), the fleshy-leafed herb *Biophytum* so abundant in coastal villages and the fruit-trees *Belimbing* and *Carambola* (*Averrhoa*). None of these is native to the country though in many places they have escaped from cultivation and become wild. The sap of most members of the family is sour from the presence of oxalic acid or its potassium-salt.

AVERRHOA

(Averhoes, 1126-1198, the Arab philosopher)

Shrubs or small trees of cultivation, evergreen.

Leaves spirally arranged, pinnate, with several pairs of shortly stalked alternate or opposite, drooping leaflets and with a terminal leaflet, the leaflets increasing in size from the base to the apex of the leaf-stalk.

Flowers rather small, symmetrical, pink or red: sepals 5: petals 5, pink or red: stamens 10: ovary with 5 styles and 5 cavities.

Fruit a large juicy berry.

2 spp., of Malayan origin but cultivated throughout the tropics.

Key to the Species

Leaflets 5-17 pairs: fruit 2-3" long, cylindrical, slightly angled	...	...	...	...	...	<i>A. bilimbi</i>
Leaflets 3-5 pairs: fruit 3-4" long, with 5 pronounced angles	...	...	...	...	...	<i>A. carambola</i>

A. bilimbi

Belimbing, B. Buloh

(the Indian plant-name)

A rather sparingly branched shrub or tree to 20 ft. high: the leaves tufted at the ends of the fragile twigs; the crown open and irregular.

Leaflets light green, hairy.

Flowers mostly on the trunk and thick branches.

Fruit like small cucumbers, green, very acid.

Native, apparently, of the monsoon regions of Malaysia.

This rather untidy little tree may well be mistaken for the *Chermai* (*Cicca*) of the Rubber-Tree family (Euphorbiaceæ) unless one carefully notices the flowers and fruits. In shape both are very similar, especially in the sapling-state with its few upright, wide-spread branches bearing rosettes of leaves or, in the case of the *Chermai*, leafy sprays. Eventually, however, the *Chermai* develops a much thicker crown (see p. 278).

The fruits of the *Belimbing* are too sour to be eaten raw but are cooked with sugar. The juice may be used for taking stains from linen.

A. carambola

Carambola

(the Spanish plant-name)

Belimbing Manis, B. Sagi

A small, rather profusely branched tree to 30 ft. high, developing a shady crown with drooping lower branches.

Leaflets more or less glaucous beneath, appearing glabrous but very finely hairy, the end-leaflets rather large 1½-3 × ¾-1¼".

Flowers on the leafy twigs or just behind the leaves.

Fruits ripening yellow, star-shaped in cross-section, sour on some trees, sweet on others.

Native of Java and to the eastward.

The fruits of the sweet variety are very juicy and refreshing with a pleasant, scented taste.

SPLAY-BERRY FAMILY

Pittosporaceæ

Leaves simple, spirally arranged, often condensed into false whorls.

Flowers in terminal clusters, rather small, regular: sepals 5, free: petals 5, free: stamens 5: ovary superior, the ovules in 2-5 rows on the wall (parietal placentas), the single style with 2-5 lobes at the top.

9 genera, 200 spp., Australasian excepting Pittosporum: 1 genus in Malaya.

PITTOSPORUM

(Gr., pitta—resin, spora—seed)

Fruit a capsule splitting into 2 parts; the seeds attached in two rows, embedded in red pulp and becoming detached as a pulpy mass on the opening of the capsule.

60 spp., mostly in Australia, New Zealand and the South Pacific Isles, a few in tropical Africa and Asia: 3 spp., in Malaya, lowlands and mountains.

P. ferrugineum Text-Fig. 174
(Lat., ferrugo—iron rust)

Splay-Berry Tree
Belalang Puak

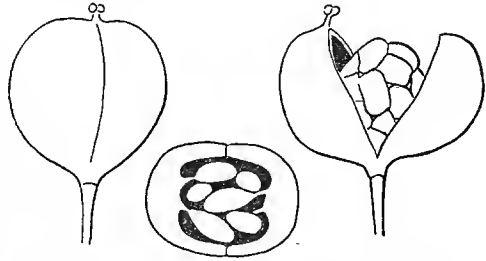
A shrub or small tree, seldom exceeding 30 ft., with light crown, evergreen: bark greyish brownish, rather silvery, rather warted: twigs, leaf-stalks, young leaves and shoots rusty brown scurfy or hairy: twigs slender, often in 3's and 4's, the leaves tending to be in clusters along them: young leaves pale green, old ones withering yellow.

Leaf-blade 2-5 × ¾-1¼", narrowly elliptic, tapered to each end with rather a long point, the edge very wavy, with 5-9 pairs of side-veins: stalk ½-¾" long, slender, the blade gradually tapered into it.

Flowers ¾" wide, in clusters 1½-3" wide, faintly honey-sweet: petals yellowish white: ovary set with brown hairs.

Fruits ¼" wide, in compact clusters of 4-12 at the ends of the twigs, ripening orange ochre and tipped with the pin-like style, then gaping in two and showing the scarlet mass of pulpy seeds: seeds pale yellow, hard, with thin red sticky pulp.

Burma to Australia: common on rocky and sandy shores and in sandy scrub in Malaya, also behind the mangrove, in some places far inland as at Kuala Krai and on Penang Hill.



Text-Fig. 174. *Pittosporum ferrugineum*: fruit × 2.

This is an insignificant little tree unless its branches are weighted with fruit. It is, nevertheless, easy to distinguish by its narrow leaves with wavy edges and by the brown hairiness of the young parts. The English name we give to it from its characteristic fruits.

Like the *Ru* (Casuarina) and *Merambong* (Scævola), it is coastal migrant from the Australian flora.

Diplospora malaccensis (Rubiaceæ) is another small coastal tree with rather narrow leaves with wavy edges but its leaves are strictly opposite in pairs and its shoots are glabrous.

SILKY OAK FAMILY

Proteaceæ

(from the genus *Protea*)

Leaves spirally arranged, often toothed or *pinnately divided*, without stipules.

Flowers rather small, in spikes or heads, often male and female: sepals 4: petals none: stamens 4, opposite to the sepals: ovary superior with one cavity and style.

Fruit various.

About 50 genera and 1,000 species, mostly Australian, a few reaching tropical Asia, S. America and S. Africa: 1 genus, 10 species in Malaya, and 1 introduced genus.

This Australian family of plants has great interest for students of the history of life on the earth, because its present distribution indicates that there must have been a former Antarctic continent or land-connection between the present continents in the Southern hemisphere and Australia from which the family has clearly been dispersed. We have only one outlying genus of forest trees or shrubs, *Helicia*, in Malaya, no species of which are common. But in the mountains and, occasionally, in the plains the Australian Silky Oaks, *Grevillea robusta* and *G. Banksii*, has been planted. They are easy to recognize from the feathery leaves with narrow segments silky white on the underside.

GREVILLEA

(C. F. Greville, 1747-1809, a founder of the Royal Horticultural Society of London)

About 170 species, Australian: 2 introduced to Malaya.

G. robusta

Australian Silky Oak

An evergreen tree with dark greyish brown, rugged, fissured bark.

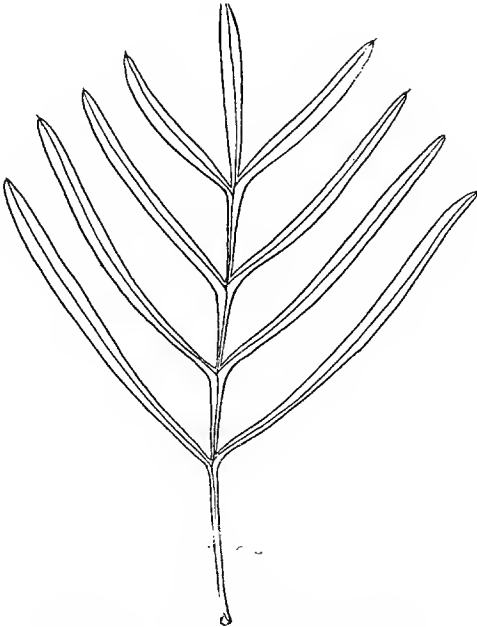
Leaves 4-12" long, spirally arranged, *divided into 5-11 pairs of toothed or lobed segments*, dull green above, *silky white beneath*.

Flowers orange, $\frac{3}{8}$ " long, stalked, *set along spike-like inflorescences*, often branched, generally from the axils of the lower leaves or on short twigs behind the leaves.

Fruits $\frac{3}{4}$ " long, boat-shaped, with a point $\frac{3}{4}$ -1" long, splitting open, containing several flat winged seeds.

This tree is commonly planted in the mountains at Cameron Highlands and Fraser's Hill. In the lowlands it appears to grow poorly and is seldom met with, but there is a fine specimen on the Residency Hill in Malacca.

G. Banksii has fewer, undivided leaf-segments and red flowers. It has been planted occasionally.



Text-Fig. 175. *Grevillea Banksii* $\times \frac{1}{2}$.

JUJUBE FAMILY

Rhamnaceæ

(Rhamnus—the Buckthorn trees of Europe)

Leaves alternate, simple.

Flowers small, in small axillary clusters, regular: calyx with 4-5 lobes: petals 4-5, small: stamens 4-5, standing opposite to the petals and generally embraced by them.

40 genera, 600 species, throughout the world: 7 genera, 23 species in Malaya, lowland and mountain.

The small flowers with their peculiarly placed stamens distinguish this family which includes only a few familiar plants such as the Buckthorns of Europe and the Cascara Sagrada of North America (Rhamnus), and the Indian Jujube (Zizyphus). Most Malayan species are climbers, many being set with sharp thorns and known as Eagles' Talons or *Kuku Lang*.

ZIZYPHUS

(from the Persian plant-name *zizafun*)

Twigs thorny: leaves with 3 longitudinal veins, (one on each side of the midrib), often asymmetric.

Flowers with the parts in fives: ovary sunk in the honey-gland.

Fruit pulpy with a large, woody stone.

About 100 species, tropics and subtropics generally: about 10 species in Malaya, mostly thorny climbers of the lowlands.

Key to the Species

Small spreading tree with blunt leaves, white or brown beneath	<i>Z. jujuba</i>
Sprawling shrub with pointed leaves, green beneath	... <i>Z. ænoplia</i>

Z. jujuba Plate 162, Text-Fig. 176
(from the French *jujube*)

Indian Jujube, Chinese Date
Bedara, B. China

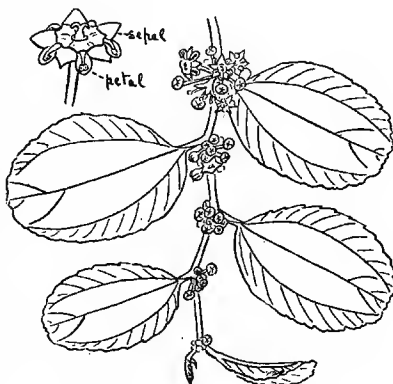
A small, thorny evergreen tree, 10-40 feet high, with a spreading, drooping umbrella-shaped crown, becoming rather open in old trees: trunk brownish grey, deeply fissured, thick and stocky, (up to 3½ ft. thick), soon breaking up into several large, spreading limbs: twigs dangling, hairy, with thorns singly or in pairs at the leaf-bases: young leaves hoary whitish.

Leaves 1-2½ × ½-1¼", elliptic, finely toothed, generally more or less asymmetric at the base, blunt, dark green, the underside hoary or finely velvety and dirty white to brownish or pale orange brown: stalks ¼-½" long.

Flowers ¼" wide, in clusters ½-1" wide, hairy, green, the tiny petals white, faintly fragrant.

Fruit ¾-1¼" wide, round or oblong, green ripening yellow, orange or brownish, often apple-shaped and tasting like a sour-sweet apple.

India to S. China: occasional in villages and gardens in Malaya, commoner in the north, especially Kedah and Perlis, not wild.



Text-Fig. 176. Indian Jujube (*Zizyphus jujuba*), × ½: flower × 2.

RHIZOPHORACEÆ

This is a pretty little tree with umbrella-crown and drooping twigs, which deserves to be better known in Malaya, for it seems to grow readily, if slowly, in all parts. In China it is said to be cultivated in greatest abundance, where more than 300 races have been enumerated. The fruits of the different races vary from sour to sweet, and the better kinds, which appear not to have been introduced to Malaya, are a favourite fruit with the Chinese. There is also a trade in dried fruits from China. In Malaya the fresh fruits are popular mainly with children to whom they are known as *Bedara*. Compare Ximenes (p. 728).

Z. œnoplia

(Gr., oinos—wine, pleios—full)

Squirrels' Jujube

Duri Sakah, Kuku Lang

A sprawling, very thorny bush 3–15 feet high: leaves very asymmetric, hairy beneath but not white or brown, the stalks less than $\frac{1}{4}$ " long.

Flowers yellowish green, in clusters $\frac{1}{4}$ – $\frac{1}{2}$ " wide.

Fruits $\frac{1}{4}$ " wide, round, glabrous, *black*.

Africa, trop. Asia, trop. Australia: common in belukar in the northern half of Malaya.

MANGROVE FAMILY

Rhizophoraceæ

(from the mangroves, Rhizophora)

Leaves opposite, simple, with large interpetiolar stipules covering the conical, spike-like buds at the ends of the twigs, the stipules in many cases twisted round the buds.

Flowers small to medium-sized, in clusters in the leaf-axils, greenish, whitish or reddish: calyx cup-shaped with 4–14 sepals round the rim: petals as many as the sepals, free, the stamens twice as many: ovary more or less sunk in the base of the calyx, with one style.

Fruit variable, not splitting open, the calyx persistent.

17 genera, 80 spp., throughout the tropics: 7 genera, 18 spp. in Malaya.

According to the habit of the trees and the manner of sprouting of their seeds, so this family is divided by some botanists into two, but in their vegetative characters and the structure of their flowers the members of both groups are so similar that they are better regarded as sub-families like the three sub-families of the Leguminosæ.

The more important sub-family, called the Rhizophoreæ, includes the well-known mangrove-trees *Bakau* (Rhizophora), *Mata Buaya*, *Tumu*, *Berus* and *Lenggadi* (species of Bruguiera), *Tengar* (Ceriops) and *Berus Berus* (Kandelia). They are littoral trees growing in the tidal waters of quiet muddy coasts and in the saline waters of estuaries. They have strange breathing-roots, shaped like pegs or hoops, which project into the air at low-tide and serve to ventilate the feeding-roots buried in the black slime (*see* p. 11, 43). But their chief characteristic is in the seeds which start to germinate long before the fruit is ripe. One seed is developed from each flower and its root gradually projects out of the fruit like a green finger, a green cigar or a rapier: in some species of Bruguiera it is only a few inches long, but in one species of *Bakau* it is 3 ft., the ultimate size being typical of the species. When the fruit is ripe, the seedling drops into the mud

and begins to sprout immediately. The seedlings that have fallen into the water at high tide are commonly washed up on the shore. These mangrove-trees have been described and illustrated fully by WATSON (Malayan Forest Records, No. 6.) : Symington has revised the species of *Bruguiera* (Malayan Forester, 1940).

The other sub-family, the Legnotideæ, comprises a few common, but not very conspicuous, kinds of inland tree belonging to three genera. They often grow by streams and rivers or in swampy ground above the brackish reaches so that one imagines that they occupy the habitat of the ancestor of the mangroves, just as the tree *Duabanga* is the inland representative of those other kinds of mangroves called *Perepat*, *Berembang* and *Pedada* (*Sonneratia*, p. 431). In their opposite leaves and small flowers the three genera greatly resemble the wild Mangosteens (*Garcinia*), the *Jambu* and *Kelat* (*Eugenia*) and the *Delek* or *Nipis Kulit* (*Memecylon*) but they are at once distinguished by their large spike-like buds covered by the interpetiolar stipules. Their twigs, also, are typically swollen at the nodes and in two genera, *Pellacalyx* and *Gynotroches*, they are hollow. The only other family of plants with such interpetiolar stipules is the *Ixora*-family (*Rubiaceæ*) which is distinguished at once by its tubular or trumpet-like corolla. The seeds of these three genera germinate in the ordinary way, not being specialised like those of the true mangroves.

The Malayan members of both sub-families are evergreen and, in most cases, develop new leaves and flowers throughout the year or at frequent intervals.

Key to the Genera

- Mangrove trees *Rhizophora*, *Bruguiera*,
Ceriops, *Kandelia* (see
Mal. Forest Records
No. 6)
- Inland trees
- Twigs solid : flowers in stalked clusters *Carallia*
- Twigs hollow : flowers separately stalked in sessile
clusters
- Flowers few in a cluster, or solitary : leaf often
strongly ribbed by the veins underneath :
berries $\frac{3}{8}$ – $\frac{3}{4}$ " wide, brownish or greenish
yellow *Pellacalyx* p. 523
- Flowers many in a cluster : leaves faintly ribbed
or not at all : berries smaller, red then black *Gynotroches* p. 522

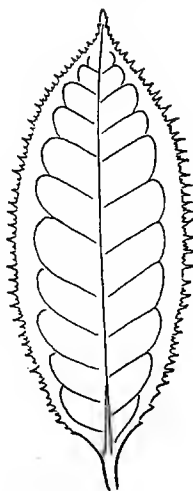
CARALLIA

(*karalli*—the Indian plant-name)

- Twigs solid.
- Flowers in small stalked clusters : petals 5–8 : stamens 10–16 : ovary more or less
inferior.
- Fruit pulpy with 1 (or 2) small curved seeds.*
- 20 spp., Madagascar, tropical Asia and Australia : 7 spp. in Malaya.

C. lucida Text-Fig. 178(Lat., shining, from the lustrous wood) *Meransi, Mesinga, Kesinga, Siseh Puyoh*

False Kelat

Text-Fig. 177. *Carallia* sp., $\times \frac{1}{2}$.

teeth, Text-Fig. 177. Such leaves are very striking and are called by Malays *Daun Sisek Puyoh*. It seems that they are typical of some species but are merely the sapling leaves of others, perhaps even of some states of *C. lucida*. We are greatly in need of more information concerning them.

(*C. lucida* is called *C. brachiata* in BURKILL'S Dictionary).

An evergreen tree to 70 ft. high, remarkably like a *Eugenia* (e.g. *E. punctulata*, *E. longiflora*): bark warm brown, uneven and roughened by the lenticels: buds thinly coated with resin.

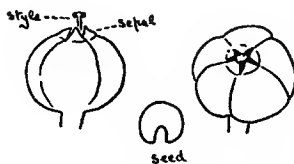
Leaf-blade $2-6 \times 1\frac{1}{2}-3$ " , elliptic or obovate, rather suddenly tipped, with the edges entire and curved back at the base, leathery, dark green above, yellowish green beneath with fine brown dots, the numerous pairs of side-veins very faint: stalk $\frac{1}{4}$ " long.

Flowers $\frac{1}{4}$ " wide, pale greenish: the stalks of the flower-clusters 1" long.

Fruit $\frac{1}{2}$ " wide, round, slightly grooved, translucent pink, pulpy, the sepals persistent at the top, like a tiny *Eugenia*-fruit.

India, S. China, Malaysia, Australia: common in the lowlands of Malaya, chiefly in damp places.

Besides this species, there are several others in Malaya some of which have oblong leaves beautifully fringed with fine, short, hair-like

Text-Fig. 178. *Carallia lucida*: fruits and seed, $\times 2$.**GYNOTROCHES**

(Gr., gune—woman, trochos—wheel; from the shape of the stigma)

Twigs hollow.

Flowers tiny, singly on short stalks, crowded in sessile clusters in the leaf-axils or on the twigs behind the leaves: petals 4: stamens 8: ovary superior.

Fruits a berry with several small seeds.

2 spp., Siam and Malaysia: 1 sp. in Malaya.

C axillaris Text-Fig. 179
(from the axillary flowers)Fish Eyes
Mata Keli

An evergreen tree reaching 80 ft. high, commonly rather small and occasionally shrubby: the horizontal branches drooping at the ends: bark grey to blackish, becoming rather cracked or closely fissured: young leaves pale green.

Leaf-blade $2\frac{1}{2}-8 \times 1-3\frac{1}{2}$ " , elliptic, tapered to each end, blunt, scarcely tipped, thinly leathery, rather dark green above, pale beneath, with 9-12 pairs of conspicuous

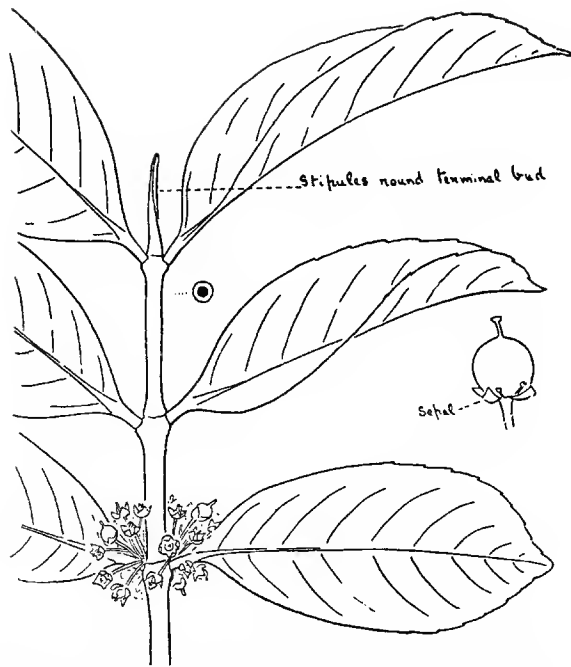
veins (though not as strong ribs), glabrous stalk $\frac{1}{4}$ " long.

Flowers $\frac{1}{4}$ " wide, greenish white, their stalks .1-15" long, some flowers male; petals white, with hairy ends: nectary greenish yellow: ovary green.

Fruit .15" wide, tiny, ripening red then shiny black, pulpy, seated on the green calyx.

Throughout Malaysia: very common in belukar and by riversides, lowlands to moderate altitudes.

This common little tree is easily recognised from its sessile clusters of tiny flowers which develop into little red, then shining black berries, from its opposite glabrous leaves, long pointed buds and hollow twigs with swollen nodes.



Text-Fig. 179. Fish Eyes (*Gynotroches axillaris*), $\times \frac{1}{2}$: fruit $\times 1\frac{1}{2}$.

PELLACALYX

(Gr., pella—hide: from the hairy calyx)

Twigs hollow.

Flowers singly on stalks, 1-4 flowers in each leaf-axil: calyx-tube rather large: petals 4-6: stamens 8 to 12: ovary half-inferior, with twice as many cavities as the number of petals.

Fruit fleshy, with many small brown seeds, (.5" long).

A few species, Indo-China, W. Malaysia to the Philippines: 2 spp. in Malaya.

Key to the Species

Leaves brown-scurfy or hairy beneath	...	...	<i>P. axillaris</i>
Leaves and fruits glabrous	...	...	<i>P. Saccardianus</i>

P. axillaris Text-Fig. 18c
(from the axillary flowers)

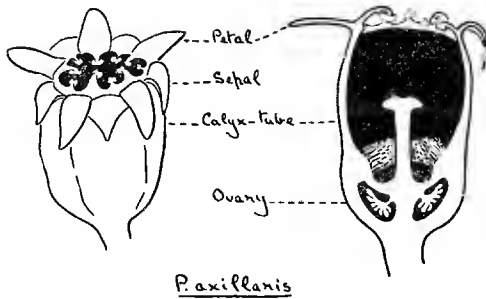
*Membuloh, Bebuloh,
Buloh Buloh, Buloh*

A small evergreen tree to 50 ft. high, *monopodial with straight rather slender trunk, stiffly horizontal branches and drooping leaves*: bark pale brown or pinkish buff, rather finely cracked: *twigs, buds and undersides of leaves brown scurfy-hairy*: young leaves pale green.

Leaf-blade 4-9 \times 1 $\frac{1}{4}$ -2 $\frac{1}{2}$ ", oblong, tipped, dingy, with 11-13 pairs of side-veins very prominent underneath: stalk $\frac{1}{4}$ " long.

Flowers $\frac{1}{2}$ " wide, on brown scurfy stalks $\frac{1}{4}$ " long, *greenish*: sepals recurved: petals 5, soon falling off, small: stamens 5 long, 5 short, bent in round the rim of the calyx-tube: in some cases with 6 petals and 12 stamens.

ROSACEÆ

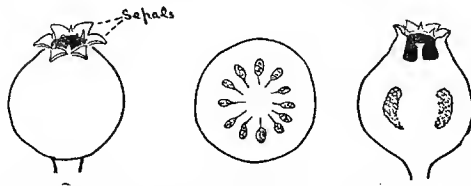


Paxillaris

Fruits $\frac{1}{2}$ " long, $\frac{3}{8}$ " wide, oblong or rounded, singly or in pairs in the leaf-axils, on short stalks $\frac{1}{2}$ " long, crowned by the 4-6 small tooth-like sepals and with the style persisting in the calyx-cup, green and more or less brown scurfy, pulpy, with numerous small brown seeds.

Malaya, Sumatra, Borneo: common in damp lowland woods, especially by streams, chiefly in secondary jungle, often on old mining land.

This little tree is easily recognised from its shape, which recalls that of the *Kelumpai* (*Anthocephalus*) in its stiff limbs and drooping leaves, but it is distinguished further by the dingy and brownish undersides of the leaves. The wood is soft and, like that of *Carallia*, has wide medullary rays. In swampy ground it develops small loop-like breathing roots like those of some mangrove-trees. The Malay names refer to the hollow twigs like slender bamboos.



Text-Fig. 180. *Pellacalyx axillaris*: flowers $\times 3$: fruit, nat. size.

P. Saccardianus Text-Fig. 181

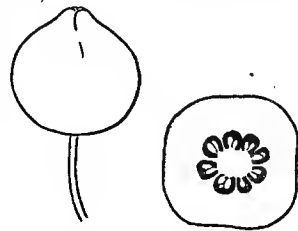
(P. A. Saccardo, 1845-1920, the Italian botanist of Padua)

Like the preceding and known by the same names, but with *glabrous leaves and fruits* (ripening greenish yellowish, 4-shouldered, with stalks $\frac{1}{2}$ " long), *the leaves with fewer veins* (7-9 pairs), *the flowers smaller and with 4 petals: fruits with 4 sepals*: bark brown or greyish, becoming very rough and cracked into many small pieces: twigs with a narrow hollow.

Malaya, Borneo: common as the preceding species: very abundant on Bukit Timah in Singapore.

The leaves of this species are occasionally in whorls of three instead of in pairs.

Membuloh, etc.



Text-Fig. 181. *Pellacalyx Saccardianus*: fruit, nat. size.

ROSE FAMILY

Rosaceæ

(Rosa, the genus of the rose)

Leaves simple, alternate or spirally arranged (compound in many exotic genera).

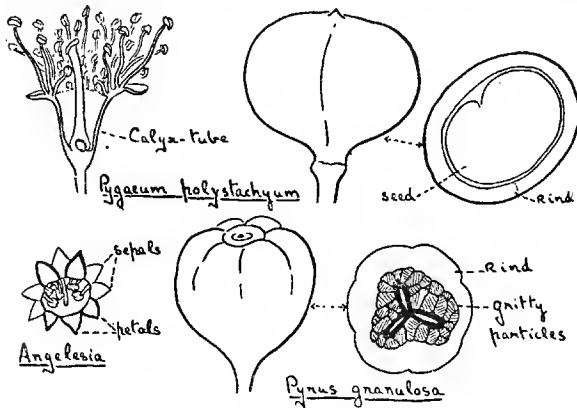
Flowers small, generally with numerous stamens, regular or bilaterally symmetrical: *calyx in the form of a cup, tube or funnel on the edge of which the sepals, petals and stamens are attached: petals free, small, absent in some cases*: ovary superior and attached to the edge of the calyx-tube on one side, or at the base of the tube, or inferior (as in pears and apples).

Fruit very variable, round or oblong with a thinly leathery or pulpy rind enclosing (in Malayan species) 1-2 stones or 1-3 seeds, not splitting open.

About 2,000 spp., throughout the world, chiefly in temperate regions: 9 genera, 40 spp. in Malaya, in lowland and mountain forest.

This family, so well-known in temperate countries, is represented in Malaya only by some gloomy-looking trees whose nature it would be impossible to discover without carefully dissecting the flowers and fruits, and a few insipid brambles and raspberries. But to it belong the roses, the cherries, plums, peaches, nectarines, apricots and almonds (*Prunus*), the apples and pears (*Pyrus*), the hawthorns

(*Cratægus*), the medlars (*Mespilus*), the loquat (*Eriobotrya*), the strawberry (*Fragaria*) and the blackberries and raspberries (*Rubus*) of cooler climates, few of which can be grown in our gardens even in the mountains.



Text-Fig. 182. Flowers and fruits of Rosaceæ: *Pygeum*, flower $\times 2$, fruit, nat. size: *Angelesia*, flower $\times 2$: *Pyrus*, fruit, nat. size.

the withered calyx persists and at the end of which there is no trace of a style, either its withered remains or a scar such as usually occur, *c.f.* the *Belimbing* (*Averrhoa*) and the *Tiup Tiup* (*Adinandra*), because the style is attached curiously to the base of the ovary on one side and there its remains may be seen in the fruit if carefully looked for. The genus *Pygeum* has a common species, known as the Bat's Laurel, which is easily recognised from its leaves and, with a knowledge of its flowers and fruit, one can distinguish the related species in the forest. In these four genera, also, there are characteristic glands at the base of the blade, as mentioned in their descriptions.

In Malaya there occur also a wild cherry, two wild loquats and a wild pear. The wild cherry, *Prunus martabanica*, occurs rather rarely in Perak and on Penang Hill: it is a small tree with white flowers and very pointed, scarcely pulpy fruit. One of the wild loquats, *Eriobotrya bengalensis*, is found but rarely in the forest in the middle and north of the country and is said to reach a fair size: the other is an unidentified species found only near the summit of Gunung Tahan. The wild pear, *Pyrus granulosa*, is a remarkable plant which we describe below.

Key to the Genera

- Leaves spirally arranged, toothed: mountains *Pyrus* p. 529
- Leaves alternate, entire, shortly stalked
 - Fruits broader than long, 2-shouldered: leaves with stalks
 - $\frac{1}{4}$ – $\frac{1}{2}$ " long, strongly veined *Pygeum* p. 528
 - Fruits longer than broad: leaves faintly ribbed or not at all, the stalks $\frac{1}{4}$ " long or less
 - Big tree with brownish fruits: flowers $\frac{1}{2}$ " wide, in flat-topped clusters: bark pale grey *Parinarium*
 - Small trees: flowers very small, in spikes: bark greyish brown p. 527
 - Fruits red: leaves rather broad *Angelesia* p. 526
 - Fruit pink: leaves rather narrow *Parastemon* p. 526

ANGELESIA

(of unknown derivation)

Like Parinarium but:—

Flowers asymmetric, tiny, with 5 small petals and 7–10 stamens.

Fruit small, pulpy, red, with one stone.

Few species, throughout Malaysia: 1 sp. Malaya.

A. splendens Text-Fig. 182

Red Beam
Merbatu Kechil

An evergreen tree up to 50 ft. high (? 100 ft. in the forest), with *dark glossy green foliage and dense round crown*: bark greyish brown, becoming rather cracked and flaky in small pieces: *young leaves pale green and silvery silky*.

Leaf-blade 2–5 × $\frac{3}{4}$ –3", broadly elliptic, shortly tipped, with a tiny gland at the edge of the blade on each side of the base where narrowed to the stalk: *stalk* 1–2" long, narrowly winged almost to the base.

Flowers 2" wide, greenish white, hairy, clustered on small stalks set on elongate slender hairy racemes up to 4" long, from the leaf-axils and terminal: with a broad horse-shoe shaped yellow nectary.

Fruit $\frac{1}{2}$ " long, pear-shaped, with the tiny hairy calyx at the base, bright red.

Sumatra, Banca, Borneo, Malaya, Philippines: common in lowland forest and secondary jungle.

The timber of this tree is said to be exceedingly durable. It is a difficult tree to recognise except in fruit or when developing new leaves, for the new twigs, projecting stiffly, are clad with pale silvery green foliage like those of the *Mempoyan* (*Rhodamnia*). The fruits are edible.

PARASTEMON

(Gr. para—alongside, stemon—a thread)

Like Parinarium but:—

Flowers very small, with only 2 fertile stamens (several small and sterile): *fruit* small, oblong, with a thin leathery bright pink rind, without a stone: seed one, large.

2 spp., Borneo, Malaya, Sumatra: 1 sp. in Malaya.

P. urophyllum Plate 163

(Gr., oura—a tail, phullon—a leaf)

Pink Beam
Kelat Puteh, Nyalas

A small tree much like *Angelesia*: young twigs and *leaf-stalks* thinly waxy-resinous: bark brownish, slightly cracked and fissured.

Leaf-blade 2–4 × $\frac{3}{4}$ –1 $\frac{3}{4}$ ", lanceolate or narrowly elliptic, tapered to each end and with a long tip, dark shining green, with a tiny brown speck-like gland on the underside on each side of the base of the midrib: *stalk* $\frac{1}{4}$ – $\frac{1}{2}$ " long.

Flowers 1" wide, white, glabrous, singly on short stalks on a long glabrous raceme generally with 1–3 branches near the base.

Fruit $\frac{1}{2}$ – $\frac{3}{4}$ × $\frac{1}{4}$ ", cream-white turning pink, glabrous, with the tiny glabrous calyx at the base.

Malaya, Sumatra, Anamba IIs: common on riverbanks, sea-shores and in secondary jungle throughout Malaya.

PARINARIUM

(from the Brazilian plant-name *parinari*)

Leaves alternate, shortly stalked.

Flowers rather irregular, inclined to be lop-sided, *medium-size*: petals minute or absent: *stamens numerous*, often partly joined together: ovary attached to one side of the calyx-tube: style attached to the base of the ovary.

Fruit rather large, round or oblong, often flattened, with a dry, leathery, hardly pulpy, often scurfy rind and 1-2 large woody stones not opening.

About 50 spp., throughout the tropics: 12 spp. in Malaya, chiefly in the lowland forest.

The trees of this genus are difficult to recognise unless by their fallen fruits and, except for the one described below, they are not common. To Malays they are known as *Batu*, *Membatu* or *Merbatu*, and they must not be confused with the *Merbau* (*Azelia*) even though in trunk and wood they resemble it. They are rather lofty, scarcely buttressed, and have dark green or greyish, dense and apparently evergreen crowns: the bark is light grey to greyish brown, rather flaky and uneven: the inner bark is pink-, orange- or red-brown (thus differing from *Merbau*): the wood is hard and heavy and is used chiefly as houseposts. *P. oblongifolium*, which is figured by FOXWORTHY (7, p. 52), has large leaves, silvery beneath, and large yellowish grey scurfy fruits. *P. rubiginosum*, also described by FOXWORTHY, is not uncommon at Fraser's Hill where it is one of the few valuable timber-trees: it has small leaves, brownish beneath and shaped as those of *P. corymbosum*.

P. corymbosum Plates 164, 165
(from the flower-clusters)

Sea Beam

Batu, Membatu, Merbatu, M. Laut

A big evergreen tree up to 100 ft. high or more, with heavy dark green crown, the lower branches drooping with long hanging ends like the *Angsana* (*Pterocarpus*): bark pale grey, rather coarsely flaky, becoming smooth in old trees: twigs dark brown, with pale spot-like lenticels.

Leaf-blade 3-6 × 1-2½", rather narrowly elliptic with a long tip, narrowed at the base, leathery, shiny, with 7-11 pairs of side-veins: stalk ¼-½" long, with 2 small yellowish brown glands at the top on the upperside.

Flowers ½" wide, greenish white, smelling of milk and seaweed, in terminal and axillary flat-topped clusters (corymbs) 3-5" wide: ovary very hairy.

Fruit 1½ × ¾", oblong, green then brownish, thinly hairy, slightly fleshy, with two large stones, the calyx persistent at the base.

Throughout Malaysia: common in Malaya, chiefly on rocky or sandy coasts and on hills by the sea, less common inland.

This tree must not be mistaken for the *Jambu Laut* or Sea Apple (*Eugenia grandis*) which is to be found in similar places and which it resembles superficially in all respects. The Sea Apple has broader, opposite leaves: its calyx persists at the top of the fruit: and its branches are never so drooping. The Sea Beam is abundant on Fort Canning in Singapore and it has been planted by several roads in Malacca and Negri Sembilan. It is a finer tree but it does not flower so often. It seems that it flowers twice a year after both of the spells of dry weather, at the beginning and at the end of the year, but it is possible that it really flowers three times a year like the Sea Apple.

PYGEUM

(Gr., pyge—the buttocks; from the shape of the fruit)

Like Parinarium but:—

Flowers regular: petals very small or absent: *ovary at the base of the calyx-tube*: style from the top of the ovary.

Fruit rather globose, generally broader than long and rather flattened, *more or less 2-shouldered*, with a thin fleshy rind and *no stone but a large seed*.

About 30 spp., W. Africa through trop. Asia to N. Australia: 15 sp. in Malaya, lowland and mountain.

Key to the Species

- Flowers borne on the new green shoots: fruits $\frac{1}{2}$ – $\frac{3}{4}$ " wide, green: leaves with 9–14 pairs of side-veins ... *P. polystachyum*
- Flowers in small clusters on the old woody twigs or branches: fruits smaller, red: leaves with 5–9 pairs of side-veins *P. parviflorum*

P. parviflorum

Currant Laurel

(Lat., parvus—small, flos—a flower)

Medang

An evergreen medium to large tree with dense conical crown of dark glossy foliage: *young twigs and leaves rusty scurfy*.

Leaf-blade 2–7 × 1–3½", elliptic, pointed, tapered to the base or even more or less heart-shaped, with 5–9 pairs of side-veins, the pair of glands at the base of the leaf small: stalk $\frac{1}{4}$ – $\frac{1}{2}$ " long.

Flowers $\frac{1}{4}$ " wide, yellowish white, in spikes 1–2½" long, *clustered on the twigs and branches behind the leaves*.

Fruits $\frac{1}{2}$ – $\frac{3}{4}$ " wide, ripening pink then red and thinly pulpy.

W. Malaysia: frequent in secondary jungle and lowland forest in Malaya.

P. polystachyum Plate 166, Text-Fig. 182

Bat's Laurel

(Gr., polu—many, stachus—an ear of corn)

Medang Kelawar

A fairly large deciduous tree, up to 90 ft. high, with coarse-leaved conical or round crown with large, wide-spreading, often horizontal limbs: *bark greyish brown, rather uneven: young leaves pale green*.

Leaf-blade 5–10 × 2½–4½", large, broadly elliptic or oblong, slightly tipped, flat, thinly leathery, light green, *with a large gland at the base on each side of the midrib and showing as a thick knob on the upperside*, with 9–14 pairs of side-veins: stalk $\frac{1}{4}$ – $\frac{1}{2}$ " long.

Flowers $\frac{1}{4}$ " wide, yellowish white, honey-sweet scented, shortly stalked, in racemes up to 3½" long, *produced at the base of the new shoots*: calyx-tube rich yellow inside: stamens fluffy white.

Fruit $\frac{3}{4}$ " wide, obscurely 2-lobed, green.

Apparently endemic to Malaya: common in forest and secondary jungle.

This tree is easily recognised from the large leaves with the pair of knob-like glands at the base of the blade. It must not be mistaken for a *Jambu* (*Eugenia*) which it resembles superficially in its flowers, but it has alternate, not opposite, leaves and a superior ovary.

In Singapore the leaves are shed twice a year, about April—May and October—November, and in some trees the shedding occurs by a few branches at a time from above downwards. The new shoots develop when most of the old leaves have fallen. The inflorescences are developed from tiny scale-leaves at the beginning of the new shoots and in the axils of the first few leaves. Flowering thus occurs with the young foliage and is often completed before the new leaves are full grown. At such times the tree scents the air around and attracts crowds of hover-flies and small beetles which suck the sweet nectar and pollinate the flowers. Most of the flowers are male (with abortive ovary); only a few at the ends of the latest developed flower-sprays have fertile ovaries, and thus the fruits are set 1-2 at the end of a stalk, which is the stalk of the raceme.

Several other species occur in the forest, both in the lowlands and in the mountains. They resemble *P. parviflorum* more than this species in the way in which the flowers are borne and in their fruits, but most have the characteristic pair of glands at the base of the blade: in some the leaves are brown hairy.

PYRUS

(Lat., the pear)

Leaves spirally arranged.

Flowers with inferior ovary and many stamens.

Fruit more or less pear-like.

About 70 spp., north temperate, a few tropical: 1 sp. in Malaya.

The pear (*P. communis*) and the apple (*P. malus*) typify this genus. In Malaya we are often puzzled, also, by the Chinese pear (*P. Lindleyi*) the fruits of which are imported from China: they have the shape of apples but the taste and gritty substance of pears. There is said to be a tree of the Chinese Pear, which fruits continuously, on Taiping Hill. But our only wild species of *Pyrus* has such small, insignificant fruits that one can hardly believe them to be 'pears' until their structure has been examined in detail, though they are probably like those of the ancestors of the cultivated species. This wild pear, which is quite common in the mountains, frequently shows a curious manner of growth from which we suggest for it the name of Fig Pear. It seems that, as often as not, the seed sprouts on the branch of a tree where it has been dropped by a bird or animal, and the seedling grows into an epiphytic bush that sends long, whitish, snake-like roots round the branches and trunk of the supporting tree and eventually down to the ground. An epiphytic tree, at heights up to 60 ft., thus develops with its wide-spread limbs pervading the crown of its support and its roots grasping the trunk like the stems of climbers, just as in the manner of a strangling fig (Text-Fig. 250): but we have never observed that the roots of the Pear can form a basket-work round the host and kill it like the figs most commonly do. Several of these epiphytic Fig Pears can be seen by the walks on Fraser's Hill. The same habit is described from Indo-China.

P. granulosa Text-Fig. 180
(Lat., full of grains)

Fig Pear

A small terrestrial tree or bush, or a wide-limbed epiphyte with descending fig-like roots: deciduous (Sept.—Oct., at Fraser's Hill), leaves withering reddish ochre.

Leaf-blade 2-4½ × 1½-3", rather broadly elliptic, blunt or pointed, dark green, with 7-9 pairs of side-veins, *the edge toothed and wavy*: stalks ½-1" long.

Flowers white, fragrant, in small terminal clusters.

Fruits ¾ × ½", round, rather dry and woody, green with brown spots, with large gritty particles round the core: 1-6 fruits in a cluster.

N. E. India to Malaya and Sumatra: common in the mountains.

IXORA FAMILY

Rubiaceæ

(Rubia—the madder-plant)

Leaves simple, opposite: stipules always present, *interpeltolar*, covering the buds, free or joined in a sheath.

Flowers very variously arranged, *regular*: sepals 4–5, generally small or minute, often joined in a calyx-tube: *corolla with a long or short tube, with 4–6*, and even 12, *petals*: stamens as many as the petals, attached to the corolla-tube, generally with very short filaments or none at all: *ovary inferior with a rather long style* often forked at the end.

Fruit various, crowned by the calyx or by a circular scar as the remains of the calyx.

Over 5,000 spp., throughout the world, mostly tropical: 70 genera, 450 spp. in Malaya.

All manner of plants—trees, shrubs, herbs, climbers and epiphytes—belong to this huge family. Though their diversity in the size and structure of the inflorescence, flower and fruit is great, yet the family is closely circumscribed by the opposite leaves with interpeltolar stipules, the corolla-tube with regularly arranged petals and the inferior ovary. In some cases the stipules fall off soon after the leaves have unfolded but their linear scars can always be seen on the twigs connecting the two leaves of a pair.

In spite of its numbers, the family is poorly represented in cultivation. *Ixora* is our only native ornamental shrub though such exotics as *Randia*, *Pentas* and *Mussaenda* from Africa, *Rondeletia* from Tropical America and *Gardenia* from China are common in Malayan gardens. The only Malayan fruit-trees are the *Mengkudu* (*Morinda*) and *Randa* (*Gardenia carinata*) and they barely deserve such qualification. No Malayan kinds are exploited as timber-trees though several might be valuable if they gave a greater quantity of timber. And as useful plants there are the Quinine-tree (*Cinchona*, from S. America), Coffee (*Coffea*, from Africa and Asia), *Ipecacuanha* (*Psychotria*, from S. America), Gambier (*Uncaria*, from Asia), and the dye-plants *Mengkudu* (*Morinda*, from Asia) and Madder (*Rubia*, from Europe and Asia): all these are described in BURKILL'S Dictionary. Nevertheless many of our wild plants especially among the shrubs, climbers and herbs, are decorative and would repay cultivation. In Europe the family is represented by the rather aberrant Bedstraws (*Galium*), Madders (*Rubia*) and their allies.

The best introduction to the family is through the garden *Ixoras*, the Coffee-bushes and the *Mengkudu* (*Morinda*) of villages and hedgerows. In the forest there occur, as a characteristic element of the lower stories of the vegetation, many Rubiaceous shrubs and treelets which often flower when small, though ultimately reaching a height of 15–30 ft., and for this reason several which are easily recognised are described in this book. Some of these forest-plants so much resemble Coffee-bushes that they are called Wild Coffee, *Kopi Utan* or *Kahwa Utan* (see *Canthium* and *Randia*). Perhaps the most noteworthy trees of the family in Malaya are the forest-trees called *Meraga* (*Adina*) whose lofty trunks are perforated with slits, thus simulating the root-trunks of the glant strangling figs.

The botanical classification of the family is most intricate, depending chiefly on the minute structure of the ovary, stamens and seeds. In the following account we have modified the descriptions of the genera so as to bring out the obvious differences between the common Malayan species.

It is worth noting that the leaves wither red in the genera *Neonauclea*, *Jackia* and *Wendlandia* and, occasionally, *Greenea*, pink in *Scyphiphora*, and yellow in the others.

Key to the Genera

Seashore or mangrove trees or shrubs

Shrub or small tree with blunt leathery leaves : flowers
pink or white *Scyphiphora* p. 559Leaves large, heart-shaped at the base : flowers white,
 $1\frac{1}{2}$ -2" long : fruits 1" wide, hard *Guettarda* p. 541

Not so

Leaves pointed, thin, wavy : flowers $\frac{1}{4}$ " wide or less ... *see Canthium* p. 534Leaves leathery, blunt : flowers $\frac{1}{4}$ - $\frac{1}{2}$ " wide, cream ... *Timonius* p. 562Leaves large, pointed : flowers and fruits in heads ... *Morinda* p. 549

Inland plants

Thorny

Flowers $\frac{1}{2}$ -1" wide, white turning yellow : fruits 1-2"
long, with many seeds *Randia* p. 553Flowers smaller, green : fruits smaller, with 3-5 seeds
Vangueria p. 564

Not thorny

Twigs very foetid when broken : shrub or treelet, forest
Saprosma p. 558

Twigs not foetid

Flowers in dense oblong or round heads, often fleshy
or bur-likeBig forest trees with latticed trunks *Adina* p. 532

Not so

Heads lilac or violet, small, set in terminal
spikes : forest shrub or treelet *Rennellia* p. 558Heads oblong, fleshy, lateral on the twigs, with
white flowers *Morinda* p. 549Heads like stalked round burs at the ends of the
twigsCommon stiff tree of secondary jungle : leaves
heart-shaped or broad at the base *Anthocephalus*Riverside trees with the leaves narrowed to the
base p. 533Flower-heads at first covered by large
bracts : rocky hillside streams *Neonauclea* p. 551Not so : trees or shrubs of lowland streams
or rivers *Nauclea* p. 550Flowers not in heads, though often in compact
clustersFlowers small, white or pinkish, crowded along the
upperside of the stiff branches of long panicles

Lowland : leaves often withering red

Shrub or treelet with terminal, erect panicles
Greenea p. 541Tree with lateral hanging panicles : stipules
large, sheathing, with several long teeth ... *Jackia* p. 547Mountain tree : panicles terminal : flowers white :
leaves withering red *Wendlandia* p. 565

Not so

Flowers in *Ixora*-like bunches or panicles at the
ends of the twigs (lateral, also, in *Pavetta*
and *Prismatomeris*, with white flowers)

RUBIACEÆ

- Corolla-tube curved, white or pinkish : petals
 tiny : berries black, on white fleshy stalks :
 shrub *Chasalia* p. 536
- Corolla-tube straight, narrow, long or short
 Petals 4
 Flowers white : style projecting $\frac{1}{2}$ -1" :
 leaves thin, often hairy *Pavetta* p. 552
 Flowers white or variously coloured :
 style projecting $\frac{1}{4}$ " or less : leaves
 seldom hairy *Ixora* p. 542
- Petals 5
 Flower-clusters often stalked, generally
 with many flowers : flowers green or
 white, often yellowing *Tarenna* p. 559
 Flower-clusters sessile (or shortly stalked),
 with few white, stalked flowers ... *Prismatomeris*
 p. 553
- Flowers in axillary clusters, or lateral on the
 uppersides of the twigs, or the flowers very
 large and solitary
- Flowers small, green or yellowish, with 4 or 5
 petals and very short corolla-tube, in small
 clusters *Canthium* p. 534
- Flowers small, tubular, yellow, with 4 petals ... *Timonius* p. 562
- Flowers small or large, white or yellow, with
 5-12 petals
 Coffee-bushes, cultivated, with red or purple
 berries containing 1-2 large seeds :
 flowers white, very fragrant, with 5 or
 6-8 petals *Coffea* p. 536
- Not so : fruits with many small seeds :
 flowers often turning yellow or cream
 Petals 5, white, often turning cream *Randia* p. 553
 Petals 6-12, white, often turning rich
 yellow : or with double flowers ... *Gardenia* p. 538

ADINA

(Gr., adinos—crowded)

Big forest trees with the trunk more or less slotted or scalloped and becoming pierced with oblong holes or slits so as to appear like a basket-work or the trunk of a strangling-fig : bark grey-brown.

Otherwise as *Naucllea*, except for the rather numerous, small flower-heads, about $\frac{1}{2}$ " wide, set in small or large panicles.

10 species, tropical and subtropical Africa and Asia : 2 or 3 species in Malaya in lowland forest.

We mention these forest trees, which are nowhere very abundant, because of their peculiar trunks which recall the latticed trunk of basket-roots of the strangling figs, though the absence of latex and the paired leaves at once distinguish them. Their Malay name is *Merombong*, *Berombong*, *Berubong* or *Meraga*. How they develop is not fully understood. The trunk of a sapling soon becomes pitted vertically with oblong slots because along these places it does not

thicken. As it swells, the slots deepen and, when, as in old trees, the core of wood disappears and the trunk becomes hollow, then it appears like a narrow wooden tower, or cylindrical shell, fitted with archers' windows. "A curious tree of large size at Tapah was a hollow cylinder of lattice-work about 80 ft. tall, and large enough to contain more than one person. The perforations were only large enough to admit the hand" (RIDLEY).

The genus is described and illustrated by FOXWORTHY (7, p. 52).

ANTHOCEPHALUS

(Gr., anthos—flower, kephale—a head)

Flowers small, cylindrical, sessile, set in stalked, round bur-like heads, but each flower separate from the others: corolla with a long slender tube and 5 narrow lobes: style projecting well beyond the corolla.

Fruit a tiny capsule splitting into 4 parts, with minute seeds: the numerous capsules substituting the flowers on the heads: the fruiting head rather fleshy.

2 species, Indo-Malaysia: 1 species in Malaya.

A. cadamba Plate 167 (an Indian plant-name)

Common Bur-Flower Tree, Kaddam
Kelempayan, Kelampai

A deciduous, monopodial tree reaching 80–100 ft. high, *with stiff, outstanding limbs*, drooping slightly at the ends, slightly buttressed: *bark grey*, becoming fissured and somewhat ridged, often cracked and rather coarsely flaky: young leaves green.

Leaves 5–12 × 2½–6", large (larger in saplings), more or less ovate, shortly tipped, *more or less heart-shaped at the base*, thinly leathery, drooping, with 12–15 pairs of side-veins: *stalk 1–1½" long: stipules oblong, large*, covering the buds, soon falling off.

Flower-heads 1½–2" wide, with stalks 1–2" long, singly at the ends of the short side-twigs: flowers yellowish white.

Fruiting-heads 1½–2" wide, green then brownish.

Indo-Malaysia: *very common* in Malaya, mostly in *secondary jungle* and on river-banks, also in the lowland forest, from Johore northwards.

This is one of our commonest wild trees and it enjoys much variety in local names. To the more usual ones, which we have cited above, may be added *Kelempayan, Kelampayan, Kempoyan, Kepayang Kayu, Lempayang* and *Lempoyan*. Often Malays confuse these with the names of *Sterculia—Kelumpai*—and of the Stem-Figs (*Ficus*)—*Kelempong*.

A glance at our photograph will show how to recognize the tree. The stiff pale trunk, the rather slender outstretched limbs sagging only near the ends and the drooping leaves give it an awkward shape like that of the Kapok (*Ceiba*). The branches are set in alternating pairs on the main-trunk, like those of the Mangosteen, but they are crowded towards the top because the earlier ones are regularly pruned off by the sapling in its vigorous growth. The hanging leaves, like those of the *Kenanga* (*Canarium*), cast little shade. But if the saplings are ungainly, the mature trees, which are curiously uncommon, are indeed handsome. The crown becomes cylindrical and narrowly flat-topped, and much bushier through the vigorous branching of the twigs which eventually obscure the trunk. The result is a tree reminiscent of a very full *Pulai* (*Alstonia*), which one hesitates at first to identify with the sapling. Such a tree once dominated the village of Ayer Bembeng in Johore. It is said that the saplings quickly reach a height of 20–30 ft. in some four years, after which their rate of growth declines. It seems, however,

that such slowing down is more apparent than real and that it affects only the main stem which begins to give way, as it were, to the limbs so soon as these are established and no longer pruned off: the crown becomes fuller instead of lankier. The seeds are minute, less than a millimeter wide, and one marvels how a big tree can spring from them.

The leaves are shed during the early part of the year after the first spell of dry weather. The flowerheads develop at the ends of the new shoots and the fruits ripen about June to August. Whether in the same year there is a second flowering and leafing is not known. It appears that the seeds are distributed as much by rains, floods and rivers as by wind, for the saplings commonly form pure stands on flood-damaged river-banks, e.g. the tributaries of the Pahang, Trengganu and Kelantan rivers.

From the point of view of tree-form it is interesting to compare the Common Bur-Flower tree with the *Kundangan* (*Bouea macrophylla*), for both have opposite, drooping leaves. But the leaves of the former can withstand little shade so that they are borne only near the ends of the twigs and the crown is open, while those of the *Kundangan* can endure their own shade and, as they remain on the twigs for a long way from the tip, the crown is correspondingly dense.

It is possible that saplings of *Beremban Bukit* (Duabanga) may be mistaken for those of the Common Bur-Flower tree, but they have pink young leaves.

For the other Bur-Flower trees, see *Nauclea* and *Neonauclea*. A yellow dye can be obtained from the bark of the roots of several species of these three genera.

CANTHIUM

(from the Malabar plant-name *kanti*)

Flowers small, green or yellowish, in sessile or shortly stalked, axillary clusters: corolla-tube very short, with 5 petals, generally hairy in the throat.

Fruit like coffee-berries, oblong with a thin rind and 1-2 large angular stones: crowned by the 5 small sepals.

About 100 spp., Old World tropics: 10 spp. in Malaya.

The trees of this genus and of the allied *Diplospora* have inconspicuous flowers and are not easy to recognise except in their likeness to big coffee-bushes, for which reason they are often called *Kahwa Utan* or *Kopi Utan* (wild coffee). They tend to develop stiff monopodial trunks with outstretched limbs like the *Kelempayan* (*Anthocephalus*) or a Mangosteen, and this habit is most striking in *C. dicoccum* and the big-fruited *C. glabrum*. Care is needed to distinguish these Green Coffees from such plants as *Memecylon* and *Eugenia*, which have also opposite leaves but which lack stipules.

Many kinds of Rubiaceous shrubs or treelets with small flowers similar to those of *Canthium* occur in the forest, notably:—

Urophyllum

(Gr., *oura*—a tail, *phullon*—a leaf): with stalked or sessile, axillary clusters of green or yellowish flowers, $\frac{1}{4}$ " wide or less, and *yellow or orange berries with many small seeds*.

Psychotria

(Gr., *psuche*—breath, *trophe*—food): with terminal clusters of green or white flowers and red, white or black *berries with 2 seeds which are generally grooved*.

Lasianthus

(Gr., *lasios*—woolly, *anthos*—a flower): *with hairy leaves, often foetid, big stipules, sessile axillary clusters of white or pink flowers, and blue, pink or purple (rarely white or black) berries with 3-9 seeds which have three angles*.

Key to the Species

- Flowers in shortly stalked, or much-branched and many-flowered, clusters
 Leaf with 6-9 pairs of side-veins, rather thin: fruit 1" long *C. glabrum*
 Leaf with 4-5 pairs of side-veins, leathery: fruit ½" long *C. dicoccum*
- Flowers in small, sessile, few-flowered clusters
 Leaves rather thin, with wavy edge and 4-7 pairs of side-veins: petals 4 *Diplospora* p. 537
 Leaves leathery, downcurved, with 3-4 pairs of side-veins: petals 5 *C. confertum*

C. confertum

(Lat., crowded)

Green Coffee

Kahwa Utan, Kopi Utan

- Like *C. glabrum* but:—
 Leaf-blade 2-6 × 1-2", elliptic, tipped, leathery, with 3-4 pairs of side-veins (often almost invisible): stalk ¼" long.
 Flowers in tiny, few-flowered, sessile clusters not 1" wide.
 Fruit ¼" long, oblong, ripening apricot-yellow (? then red), few in a cluster.
 W. Malaysia: common throughout the country, inland, by tidal streams and near the sea.

C. dicoccum

(Gr., di—double, kokkos—fruit)

Green Coffee

Kahwa Utan, Kopi Utan

- Very like *C. confertum* but:—
 Leaves 1½-4" wide, narrowly or broadly elliptic, dull dark green, with 4-5 pairs of side-veins: stalk ¼-½" long.
 Flowers ½" wide, in shortly stalked, much-branched, many-flowered clusters 1-2" wide, greenish white then yellowish, the style projecting, faintly fragrant.
 Fruits many in a cluster.
 S. E. Asia, Malaysia: common throughout Malaya, often in mangrove.

This may develop into a fairly tall tree, up to 80 feet high, with pale or dark grey bark. Its inflorescences, like those of the *Kelat* (*Eugenia longiflora*) and *Mengambir* (*Mæsa*), are often transformed by minute gall-insects into mossy bunches. In general appearance the trees resemble the Shiny Laurel (*Lindera lucida*) very closely, having the trunk tapering to the apex of the crown and the stiff spreading limbs. But, whereas the limbs on the trunk are borne in pairs, they bear their branches alternately because only one twig (of a pair) develops at a node and the position of this twig alternates from side to side of the branch from node to node. Thus the resemblance to Shiny Laurel is increased, but the opposite leaves are distinctive.

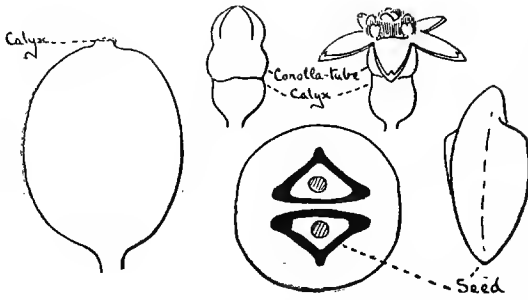
C. glabrum Text-Fig. 183

Green Coffee

Kahwa Utan, Kopi Utan

- An evergreen, monopodial tree to 40 ft. high, glabrous: bark dull brown, rather dark, exuding a pale pink or reddish, watery gum when cut.
 Leaf-blade 5-7 × 2-3", ovate, broadest near the base, tapered to the apex, with 6-9 pairs of side-veins: stalk ¼" long.
 Flowers ¼" wide, in small distinctly stalked clusters: corolla-tube ¼" long.

RUBIACEÆ



Text-Fig. 183. *Canthium glabrum*: flowers $\times 2$: fruit, nat. size.

Fruit $1-1\frac{1}{2} \times \frac{3}{4}-1$ " , oblong, green then greyish, few in a cluster or solitary, rather large, turned to the upperside of the branch: seed $\frac{3}{4}-1$ " long, brownish, flattened on one side, keeled on the other, like the breast-bone of a chicken.

W. Malaysia: common throughout Malaya.

In shape and branching this tree resembles *C. dicoccum*. It must not be mistaken for the Shiny Laurel (*Lindera lucida*) with alternate leaves or for the Randa (*Randia densiflora*) with different flower and fruit.

CHASALIA

(Chasal, a French naturalist of the 18th century)

Like *Ixora* but the corolla-tube relatively thicker, curved and with smaller petals scarcely spreading and nor overlapping in the bud.

10 spp., Old World tropics: 4 spp. in Malaya.

C. chartacea Text-Fig. 184
(Lat., paper-like)

Grains of Rice
Beras Beras, Beberas, Beras Hitam



Text-Fig. 184. *Chasalia chartacea*: fruits, nat. size.

A glabrous *Ixora*-like shrub, 3-10 ft., high.

Leaf-blade $3-9 \times 1-3\frac{1}{2}$ " elliptic, pointed, thin: stalk $\frac{1}{2}-1\frac{1}{2}$ ".

Flowers $\frac{1}{2}-\frac{3}{4}$ " long, $\frac{1}{4}$ " wide, in small terminal clusters 1-2" wide, with white, pink or purple branches: corolla-tube white, the petals yellow inside and sometimes pink outside.

Berries $\frac{1}{4}-\frac{1}{2}$ " wide, round, purple-black, seated on the swollen, white branches of the inflorescence.

India, Malaysia: common in the lowland and mountain forest, and in villages in Malaya.

COFFEA

(from the Arabian word *kahwa*)

Flowers white or green, fragrant, clustered in the leaf-axils, sessile or very shortly stalked: corolla with 5-8 petals: stamens attached inside the corolla-tube.

Berries ripening red or purple, finally black, ellipsoid, with 2 large horny seeds.

About 40 species, tropical Africa and Asia: 3 wild species in Malaya.

This genus includes all the plants which give genuine coffee. The more important are the three which we describe below. They are grown in villages and also on estates, the biggest acreages being in Johore and Selangor. They are

known to Malays as *Kahwa* or *Kopi*. In BURKILL'S Dictionary there will be found an excellent description of the history and commercial development of the coffee-trade in all its aspects; and in GRIST'S Malayan Agriculture, the cultivation of the coffee-bush is described. We wish to refer in detail only to the curious botanical phenomenon of gregarious flowering which coffee-bushes have in common with many of our wild orchids, notably the Pigeon-Orchid (*Dendrobium crumenatum*), and with the *Angsana* (*Petrocarpus*), the Angels' Trumpets (*Randia macrantha*), the *Nyatoh* and Gutta-Percha trees (*Palaquium*) and the Yellow Bells (*Stenolobium*). On certain days of the year a shabby coffee-bush is transfigured into fragrant whiteness through the sudden development of the flowers. All coffee-bushes of one species will flower together in the same district on the same days, different species generally flowering gregariously on different days. The reason is that the flower-buds need the stimulus of certain peculiar weather-conditions to make them open. The buds develop to a certain size and then remain dormant until the necessary weather-stimulus awakens them so that in a set number of days from the stimulus they will open simultaneously. Either the nature of the stimulus or the interval between the stimulus and the opening of the flower varies in the different species and hence their different days of flowering. The biological result of such gregarious flowering is that many flowers are open for pollination at the same time. As with the Pigeon-Orchid, the stimulus to flowering appears to be a sudden marked drop in temperature such as accompanies a storm in hot weather (*see p. 38*).

Key to the Species

- Flowers with 5 petals: berry $\frac{1}{2}$ " long: cult. in the mountains *Arabian Coffee*
(*C. arabica*)
- Flowers with 6-8, mostly 7, petals: leaves more or less strongly
ribbed and wrinkled: lowlands and mountains
- A strong, but small tree: berries $\frac{3}{4}$ -1" long ... *Liberian coffee*
(*C. liberica*)
- A small tree, up to 10 ft., with long drooping limbs: berries
 $\frac{1}{2}$ " long or less ... *Coffea robusta*

DIPLOSPORA

(Gr., diploous—double, spora—a seed)

Like *Canthium* but:—

Flowers with 4 petals, stamens and sepals.

Fruit a berry with several small seeds, and crowned by the 4 sepals.

About 20 spp., Indo-Malaysia and Australia: 8 spp. in Malaya.

D *malaccensis* (from Malacca)

Green Coffee
Kayu Baki (Johore)

A small evergreen tree up to 30 ft. high, glabrous: *bark light greyish yellow*, often fissured, thin and slightly flaky.

Leaf-blade 2-7 × 1-3", *elliptic*, tipped, *rather thin*, generally *wavy along the edge*, with 4-7 pairs of side-veins: stalk $\frac{1}{4}$ " long or less.

Flowers $\cdot 15$ " wide, greenish white, in tiny sessile clusters.

RUBIACEÆ

Fruit $\frac{1}{2}$ " long, broadly oblong or pear-shaped, ripening orange then red, in small clusters.

Malay Peninsula: common throughout Malaya, especially on rocky and sandy coasts.

GARDENIA

(A. Garden, d. 1791, an English naturalist)

Buds, young twigs and young flowers often varnished with resin: not thorny.

Flowers generally large and solitary, in the leaf-axils: calyx tubular, in some cases split on one side: corolla white or cream-white changing to pale yellow or intense orange-yellow, with 6-12 petals: ovary with one cavity.

Fruit generally splitting open, with a green or yellow rind a thick woody wall enclosing the numerous seeds: crowned by the tubular calyx.

About 70 spp., Old World tropics: about 10 spp. in Malaya, in the lowlands.

The horticultural representative of this genus is the well-known, small-leaved shrub, the White Gardenia or *Bunga China* (*G. augusta*), which is a native of China: it often has double flowers which do not show their proper structure. But in the forests are several species which are trees with larger, more richly coloured and more fragrant flowers, and, though they are worthy to be placed among the most beautiful flowering trees, they are scarcely known in cultivation. One, *G. carinata*, occurs sparingly in villages from Malacca northwards and it is abundant in the vicinity of Alor Star, where it is called *Randa* and its fruits are a delight to children who crack them in their teeth and suck the sweet pulpy mass of seeds. From their exceeding fragrance, these Gardenias are also called *Chempaka*, usually with the designation *Utari* to distinguish them from the *Michelia* and *Frangipanni* (*Plumiera*) which are found only in cultivation. Both *G. tubifera* and *G. carinata* have been planted recently along some of the roads in Singapore: they flower when 3-4 years old and 15-20 ft. high.

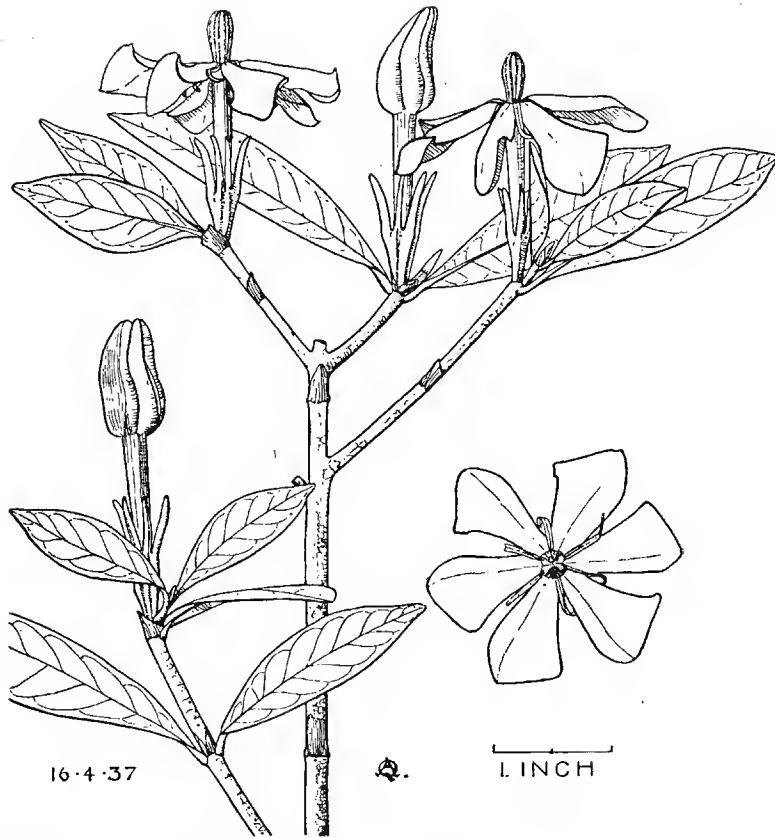
A peculiarity of some tree-Gardenias is the splitting of their fruits. When nearly ripe the fruit is round or oblong, green to yellowish and surmounted by the calyx-tube. The thick, bony, inner wall of the fruit then splits into five to eight parts, and these press outward: the rind is torn into as many ragged pieces and the wall of the fruit turns inside out exposing its orange scarlet interior and the equally vivid mass of seeds, like some strange bedraggled flower. Birds, squirrels and musang, attracted by the gay colour, eat the seeds and disperse them. While the fruits are developing the chimney-like calyces are usually tenanted by ants.

As with the tree-Randias (p. 554), the leaves on the uppersides of the twigs may be more or less reduced, but they are never entirely suppressed.

The Malayan Gardenias appear to be evergreen and to flower seasonally. It seems, too, that they are night-flowers pollinated by moths.

Key to the Species

Garden bush with white flowers, often double	<i>G. augusta</i>
Trees or bushes with the flowers turning yellow	
Calyx-tube with 5-6 flanges: twigs hairy, not resinous ...	<i>G. carinata</i>
Calyx-tube without flanges: twigs varnished with resin, glabrous	
Calyx-tube $\frac{1}{2}$ " long or less: petals 6-10, mostly 8-9: leaf stalked	<i>G. tubifera</i>
Calyx-tube 2-3" long: petals 8-12: leaf almost sessile	<i>G. Griffithii</i>



Text-Fig. 185. White Gardenia (*G. augusta*): (by courtesy of G. A. C. Herklots, Hongkong University).

G. augusta Text-Fig. 185

White Gardenia
Bunga China

A garden shrub very like the East Indian Rosebay or *Susun Kelapa* (*Tabernaemontana divaricata*) but without latex: native of China.

G. carinata Text-Fig. 186
(Lat., keeled)

Kedah Gardenia
Randa, Chempaka Utan

A small tree up to 40 ft. high, rather spreading in the open: *twigs, calyx and undersides of the leaves finely hairy: not resinous or very slightly.*

Leaf-blade 5-13 × 2½-5½", ovate, shortly tipped, gradually tapered to the base, thin, with many veins, often glossy green: *stalk very short or none.*

Flowers 2-4" wide, pale cream-yellow deepening to rich egg-yellow: *calyx-tube* ¼" long, with 5-6 flanges, some larger than others: *corolla-tube* 1¼-2" long: petals 6-9.

Fruit 1-1½" long, broadly oblong, with 6-7 ridges and surmounted by the calyx-tube with its flanges (mostly 3 large and 3 small): green ripening yellow: not opening.

Malaya: throughout the mainland but commonest in Kedah, in the forest and in the villages.

RUBIACEÆ

G. Griffithii

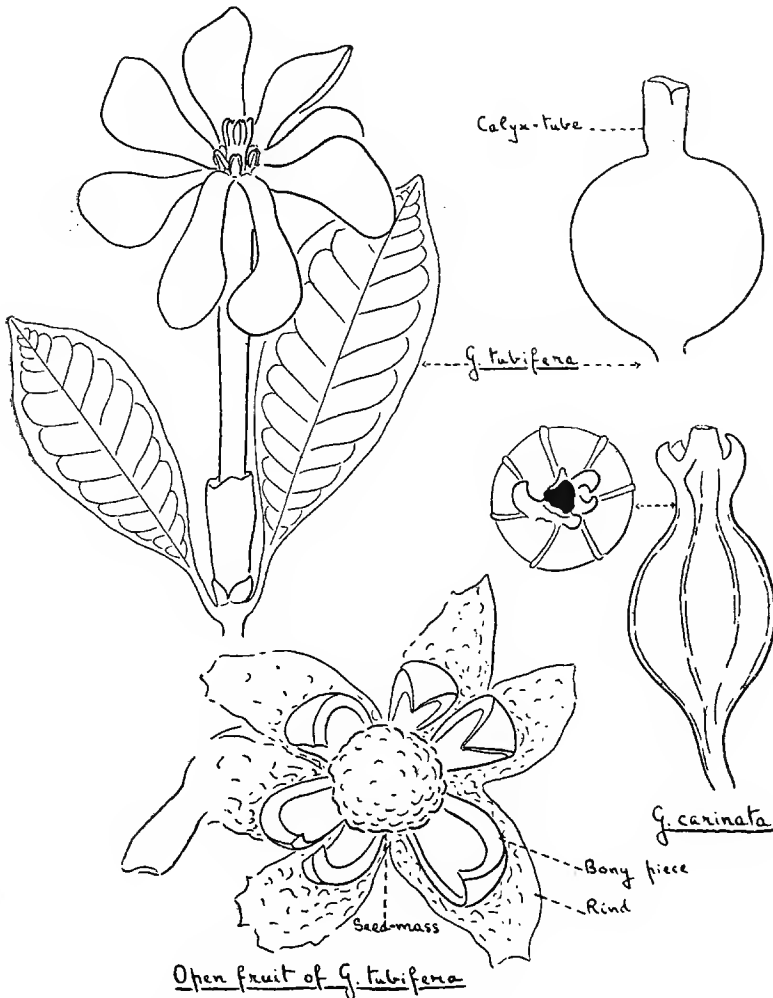
(W. Griffith, 1810-1845, doctor
and botanist of the East India Co.)

Great Gardenia
Chempaka Utan

Like *G. tubifera* but:—the leaves more or less sessile, the blade gradually tapered to the base of the short stalk: corolla 3½-4" wide: corolla-tube 4-5" long, very long, with 8-12 petals: calyx-tube 2-3" long, sheathing the corolla-tube to the middle like a boot: fruit crowned by this large calyx-tube.

Malaya: known only from the southern half of the country, in lowland forest, not common.

This has the largest flowers of any Malayan Gardenia.



Text-Fig. 186. Water Gardenia (*G. tubifera*), Kedah Gardenia (*G. carinata*): $\times \frac{1}{2}$.

G. tubifera Text-Fig. 186
(tube-bearing)Water Gardenia
Chempaka Utan, Pekan Heran (Johore)

A shrub or a tree up to 60 ft. high (? 100 ft. in the forest) with a tendency to Terminalia-branching: bark pale grey, smooth or finely cracked: buds and twigs varnished with pale yellow resin: glabrous.

Leaf-blade $2\frac{1}{2}$ -10 × $1\frac{1}{2}$ -4", very variable in size, slightly obovate, shortly tipped, rather light green, strongly ribbed, drooping with upcurled sides: stalk $\frac{1}{2}$ -1 $\frac{1}{2}$ " long.

Flowers $1\frac{1}{2}$ -3 $\frac{1}{2}$ " wide, variable in size on different plants, cream white then turning orange-yellow, fragrant like *Chempaka* but not strong: calyx-tube $\frac{1}{2}$ -1" long, smooth or slightly ribbed, often shortly split: corolla-tube $1\frac{1}{2}$ -4" long: petals 6-10, the edges recurved.

Fruit 1-2" wide, nearly round, pale apple green, crowned with the calyx-tube, splitting open, with orange-red interior, gaping widely; the inside of the fruit mealy, orange-yellow, with 6-8 very bony shells round the tomato-red seed-mass.

Malaya, Sumatra, Borneo: frequent on river-banks especially of tidal reaches, in the lowland forest and in rice-fields, throughout the country.

The flowers of this superb tree open at dusk and last for three nights. They are cream-white on the first night, chrome-buff the next day, and intensely orange on the third day when they fall off.

GREENEA

(B. D. Greene, 1793-1862, an American botanist)

Leaves large.

Flowers small, densely arranged on the uppersides of the stiff, outcurved branches of upright, terminal panicles: sepals as 4 minute teeth: corolla-tube with 4 small lobes.

Fruit a tiny capsule crowned by the minute sepals, splitting into 4 parts: seeds many, tiny.

About 6 spp., Burma, W. Malaysia to the Philippines: 1 sp. in Malaya.

G. corymbosa*Tinjau Belukar, Ulai Ulai*

A shrub or small tree to 20 ft., flowering at 2 ft.: bark dark brown, rather rough: twigs hairy: stipules large but not sheathing: leaves often withering red.

Leaf-blade 6-16 × 2-5", large, long, with many side-veins, narrowly obovate, tipped, gradually tapered to the base, thin, hairy beneath or nearly glabrous, rather yellowish green: stalk $\frac{1}{2}$ -2" long.

Inflorescences 3-9" long, 5-12" wide, hairy: flowers 4" long, the corolla-tube pinkish white, the lobes cream-white.

Fruits 1" wide.

Tenasserim to Malaya, but not south of Malacca: common especially in open country on hill-sides or on rocky screes, very abundant on Penang Hill.

This plant can be mistaken for the Wild Randa (*Randia anisophylla*) in the absence of flowers or fruits. The *Greenea* always has equal pairs of leaves on the side-shoots and its leaves often wither red.

GUETTARDA

(J. E. Guettard, 1715-1780, a French botanist)

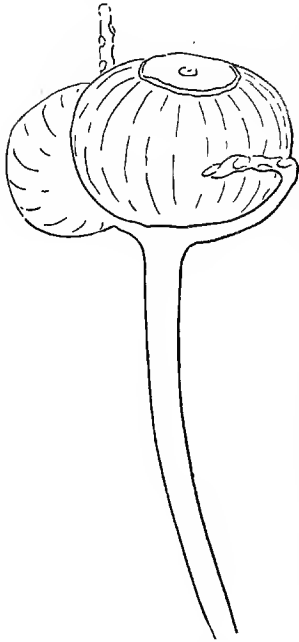
Inflorescences axillary, with a long stalk, forked once or twice, the flowers sessile on the upper side of the branches: calyx-tube short without sepals: corolla-tube long with 6-8 petals: stamens inside the corolla-tube.

Fruit round but rather flattened, with a thin rind and very hard grooved stone with 4-6 cavities, each cavity with one seed.

About 50 species, nearly all in the American tropics: 1 species in Malaya.

G. speciosa Text-Fig. 187
(Lat., handsome)

Sea Randa
Selar Makan



Text-Fig. 187. *Guettarda speciosa*: fruit, nat. size.

An evergreen seashore tree 15-30' high, with rounded sprawling crown: bark chocolate brown, smooth: twigs thick, with large leaf scars: stipules large, yellowish green.

Leaf-blade 4-10 × 3-7", large, more or less obovate, with a small tip, the base heart-shaped, glabrous or hairy beneath, yellowish green: stalk $\frac{1}{2}$ -2" long.

Inflorescence $1\frac{1}{2}$ -4 $\frac{1}{2}$ " long: flower $1\frac{1}{4}$ " wide, white, fragrant, with the corolla-tube $1\frac{1}{2}$ -2" long and yellowish.

Fruit 1-1 $\frac{1}{4}$ " wide, sessile on the inflorescence-branches, green then whitish or pinkish, faintly and closely ribbed especially when dried, the calyx-cup soon falling off and leaving a circular scar, finally splitting at the top.

East Africa, tropical Asia and Polynesia: common on all sandy and rocky shores in Malaya.

The large leaves recall those of the other seashore trees, the *Putat* (*Barringtonia*) and the *Ketapang* (*Terminalia*), but in their shape, long stalks and arrangement they are readily distinguished. The tree flowers throughout the year. The flowers open about one hour after sunset and the corollas fall off next morning: they are typical moth-flowers, like those of *Randia*, being fragrant and having a long corolla-tube and a white colour. The fruits are common objects of the drift, where they appear as pale brownish, small woody stones, with 4-6 grooves and surrounded by numerous fibres which are the remains of the rind after being rotted in the sea and pounded on the shore.

There is no Malay name in general use for this plant.

IXORA

(from the Sanskrit *Icvara*)

Leaves elliptic, thinly leathery: stipules rather small.

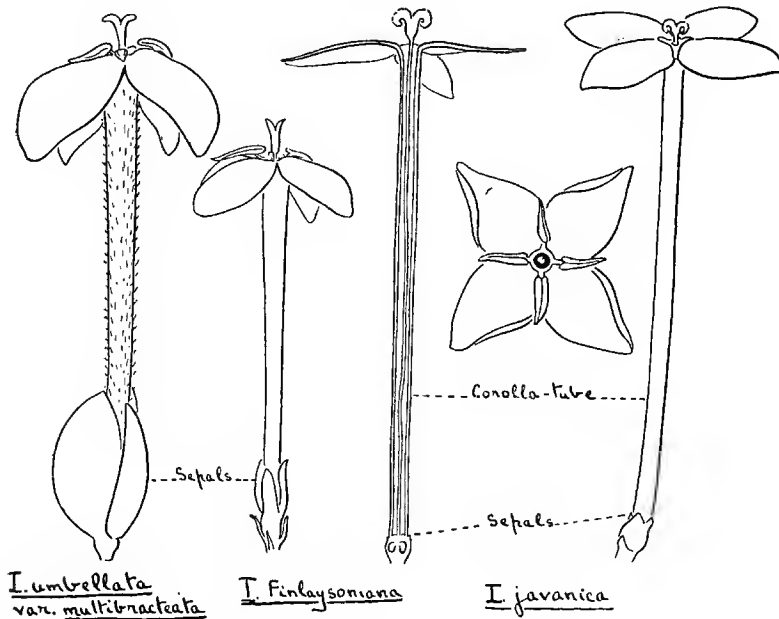
Flowers white, pink, yellow or red, in dense, generally flattened clusters at the ends of the branches: sepals 4, often minute or apparently absent: corolla-tube glabrous outside, slender, generally long, with 4 spreading petals twisted round each other in the bud: stamens 4, attached by very short stalks to the mouth of the corolla, anthers narrow: style projecting shortly, up to $\frac{1}{4}$ ", from the corolla-tube, forked at the tip.

Fruit a small, thinly pulpy berry, ripening red then purple or black, with 1-2 large seeds.

About 120 spp., throughout the tropics, mainly Asiatic: 20 spp. in Malaya, in the lowlands and mountains.

The numerous garden-varieties of *Ixora* provide an easy introduction to this genus which is typical of a rather large section of the family. Most species are shrubs, at least when planted in the open, but in the forest many of them develop into small trees, 15-20 ft. high, and one or two, such as the magnificent *I. grandifolia*, have trunks of considerable size. Very few of our wild species are in cultivation though there is not one that does not deserve trial, notably the large-flowered forms of *I. congesta* and *I. Lobbii* from Kelantan and Johore,

I. pendula with its charming candelabras of pink flowers, the fragrant forms of *I. grandifolia* and the mountain *I. micrantha*. It is not always easy to distinguish the species, particularly those with orange-red flowers, because they are most variable: the genus appears to be one which is in the process of evolution so that the limits of the species are ill-defined and may be blurred even more by hybridisation with its consequent intermediate forms. Thus there have been both confusion and superfluity in the botanical names. The classification which we offer is the simplest.



Text-Fig. 188. Flowers of *Ixora*, $\times 2$.

The Malayan species are evergreen and, in general seasonal in flowering, though the garden-varieties will bloom throughout the year. The flowers are pollinated by butterflies which hover on the petals and probe their long tongues into the corolla-tubes for the nectar at the base.

Various Malay names are given to *Ixoras*, such as these:—

Pechah Periok, *Pechah Piring*, *Pechah Passu*, *Tedok Priok*, *Todong Priok*: these are given to the red-flowered species because the 4 petals suggest a broken earthenware pot: the name *Siantan* is also given to these kinds.

Jarum Jarum, *Jenjarum*, *Menjarum*, *Nyarum Nyarum*, *Nyarong* are given to the species with white or pale flowers, as well as to those of *Pavetta* and *Tarenna*, because the unopened flower-buds and the projecting styles of the open flowers look like bunches of needles: the white-flowered species may also be called *Gading Gading* (ivories).

None of these names is specific.

Key to the Species

- Flowers white, fragrant
 Corolla-tube $\frac{1}{2}$ - $\frac{2}{3}$ " long or less, sepals and bracts minute: scarcely fragrant *I. nigricans*
 Corolla-tube 1-1½" long: sepals and bracts green, leafy or slender: very fragrant
 Leaf 4-12" long, rather large, pointed: sepals and bracts $\frac{1}{4}$ - $\frac{1}{2}$ " long *I. umbellata*
 Leaf 3-6 × 1-2½", rather small, blunt: sepals and bracts 1" long *I. Finlaysoniana*
 (Hairy: leaf oblong, cordate: sepals slender: north Malaya *I. Brunonis*)
- Flowers with pink or red tube and white or pink petals: *wild*
 Inflorescence upside down, long-stalked *I. pendula*
 Inflorescence upright: leaves large *I. grandifolia*
- Flowers generally yellow or orange turning red, in some cases always yellow, red or pink: *often cultivated*
 Flowers fragrant, yellow becoming red: corolla-tube $\frac{1}{4}$ - $\frac{1}{2}$ " long: *wild*
 Lowland tree with slender flower-clusters 1-2" wide *I. concinna*
 Mountain shrub with big flower-clusters 4-8" wide *I. micrantha*
- Flowers not fragrant, longer
 Leaves sessile, with heart-shaped clasping base
 Leaves stalked, tapered to the base
 Leaf-stalk very short, $\frac{1}{4}$ " long or less: petals blunt: cultivated *I. chinensis*
 Leaf-stalk $\frac{1}{4}$ - $\frac{3}{4}$ " long or, if shorter, then wild plants
 Leaves large 2-6" wide: petals generally blunt: wild *I. congesta*
 Leaves up to 3½" wide; if wider then the petals pointed
 Leaves gradually tapered to the apex, with 6-11 pairs of side-veins: often cultivated *I. javanica*
 Leaves suddenly tipped, with 12-26 pairs of side-veins (riverside forms with long, narrow, pointed leaves): generally wild *I. Lobbii*

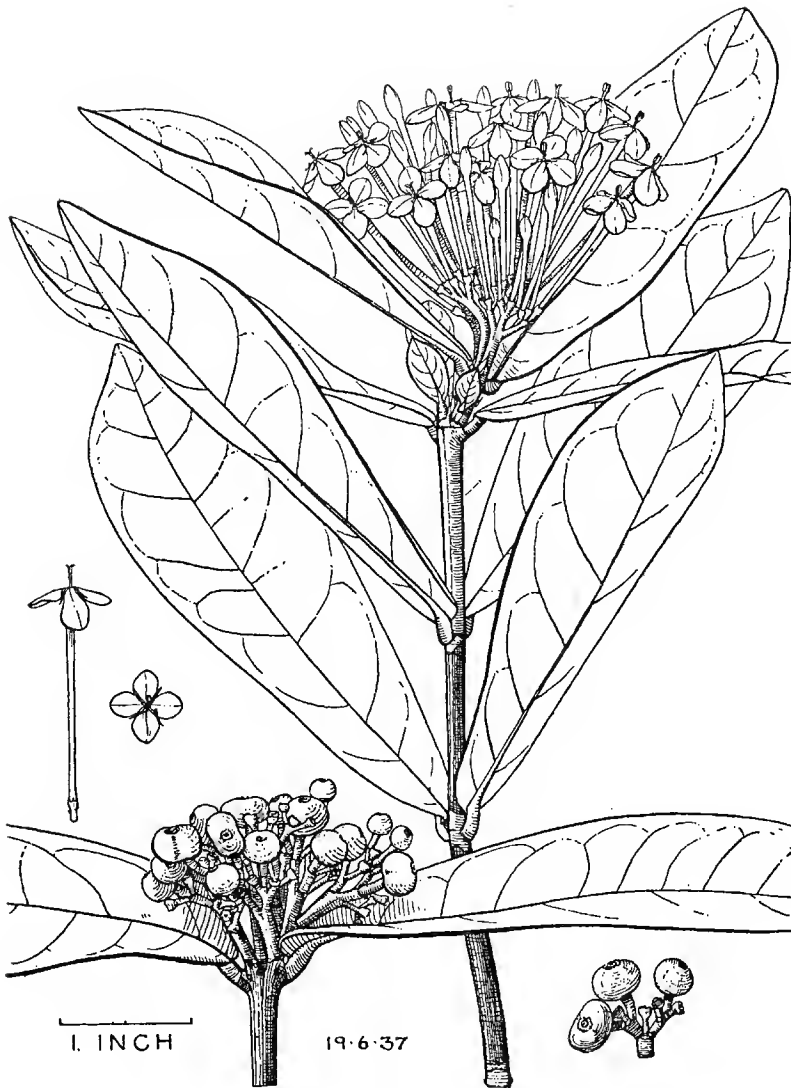
I. chinensis Text-Fig. 189Chinese *Ixora*

A garden shrub with rather small, rather blunt and almost sessile, light yellowish green leaves.

Flowers in dense clusters, 2-4" wide, with crimson branches: petals apricot yellow then red, very blunt and full.

S. China, Burma, Indo-China, Siam: frequent in Malayan gardens.

I. Dixiana is a dwarf variety with smaller flowers.



Text-Fig. 189. Chinese Ixora (*I. chinensis*): (by courtesy of G. A. Herklots Hongkong University).

I. coccinea

(Lat., scarlet)

Indian Ixora

A garden shrub with rather small, generally pointed, dark green, sessile, heart-shaped leaves, clasping the stem.

Flowers with pointed petals, typically red but pale yellow (= **Yellow Coccinea**, or *I. lutea*) or pink (= **Pink Coccinea**) in some varieties: the branches of the flower-clusters green.

India: common in Malayan gardens.

RUBIACEÆ

I. concinna

Trogon Ixora

(Lat., well-made)

A wild tree up to 60 ft. high: leaf-blade $2\frac{1}{2}$ -7 × $\frac{3}{4}$ -2 $\frac{3}{4}$ "", tapered to each end, the stalk 1-5" long.

Flowers 3-4" wide, the tube pink, the pointed petals yellow or pinkish, becoming red.

Malaya, Sumatra, Borneo: frequent in lowland forest.

I. congesta

Malayan Ixora

(from the dense flower-clusters)

A shrub or treelet, reaching 20 ft. in the forest: leaves 5-12" long, with 13-20 pairs of side-veins: flower-clusters 4-8" wide, the branches red, the petals brilliant yellow turning orange red or pink.

W. Malaysia: common in the forest.

This is the most conspicuous of our wild Ixoras. The flowers are produced seasonally unlike those of the cultivated forms of *I. javanica*: they vary much in size. A magnificent variety, which occurs in Kemaman and the north of Pahang, has flowers 1-1 $\frac{1}{2}$ " wide.

I. Finlaysoniana

Text-Fig. 188

Siamese White Ixora

(G. Finlayson, 1790-1823, a Scottish naturalist)

A shrub or small tree with stout, gnarled trunk, like *I. umbellata* but with smaller blunt leaves with few veins (6-9 pairs), much smaller bracts and sepals, and flowers only $\frac{1}{2}$ " wide.

India, Siam, Indo-China: rather frequently cultivated in Malaya.

I. grandifolia

Pink River Ixora

(with large leaf)

A rather bushy tree up to 60 ft. high, very variable in size and shape of leaf and in size of flower.

Leaf-blade 5-15 × 2-7", rather leathery, blunt or pointed, with stalks $\frac{1}{2}$ -1 $\frac{1}{2}$ " long. Flowers small, in panicles 5-12" wide, in some plants fragrant, in others scentless: *the panicles falling off in one piece* after fruiting.

Malaysia generally: common in lowlying swamp forest, chiefly by rivers, occasional in rice-fields.

I. javanica

Plate 168, Text-Fig. 188

Javanese Ixora

A shrub or, in the forest, a treelet reaching 20 ft. high: leaves 4-10 × 2-3 $\frac{1}{2}$ " with stalks $\frac{1}{2}$ - $\frac{3}{4}$ " long.

Flowers generally with rather bluntly pointed petals, in some cases blunt, very variable in size and colour, *typically yellow changing to red but clear pink (Pink Javanica) in some varieties, yellow ochre in others (Yellow Javanica)*.

Malaysia: wild and cultivated in Malaya, often by the sea: very abundant in Kelantan-villages.

This is our commonest species whether in the forest, in villages or in gardens. The best known variety is the ordinary red Ixora-bush of gardens known as the "Giant Ixora" or the "Common Red Ixora", which flowers all the year round: (it has been called *I. macrothyrsa*, in error). The pink and yellow varieties can always be distinguished from those of *I. coccinea* by the shape of the leaf. (*I. javanica* is called *I. stricta* in BURKILL'S Dictionary).

I. Lobbii

Glossy Ixora

(T. Lobb, d. 1894, plant-collector for Veitch & Sons)

Like *I. javanica* but with suddenly tipped, dark glossy green leaves with more numerous veins: petals pointed, yellow or orange turning red.

W. Malaysia: common in the forest, occasional in villages.

This species has a characteristic riverside variety with small, very narrow, pointed leaves and rather large brilliant flowers: it is known as var. *stenophylla* and it grows by all our rocky streams. In East Johore, there is a beautiful form of this riverside variety with flowers 1" wide.

I. micrantha

Mountain Ixora.

(Gr., mikros—small, anthos—a flower)

A mountain species like *I. concinna* but generally shrubby and with much larger flower-clusters.

Malaya: frequent in the mountains of the main range, but very little known.

I. nigricans

White Needles:

(Lat., blackening)

A shrub with slender twigs up to 10 ft. high: *leaves* 2-7 × 1-2½", tipped, the stalk ½" long: *flowers* ½" wide, with narrow pointed petals, faintly fragrant, in lax clusters 2-5" wide, generally with dull red branches.

India, Siam, Malaya: frequent from Malacca northward and on the East coast, occasional in villages: the tissues blacken on drying.

I. pendula

Pink Needles:

(Lat., hanging)

A shrub or small tree up to 25 ft. high with long-stalked, hanging, candelabra-like clusters, 3-9" wide, of pale pink, scentless flowers: *leaves* 5-13 × 1½-5", very variable, the stalks ½-¾": *fruit* red.

Siam, Sumatra, Malaya: common in lowland forest, seldom flowering.

I. umbellata Text-Fig. 188

Malayan White Ixora.

(from the umbels of flowers)

A shrub with fragrant white flowers (¾" wide) in clusters 3-7" wide, appearing pale green and leafy from the large bracts and sepals (¼-½" long): *blade* 5-10 × 1½-3½", dark glossy green with wavy edge, with 10-16 pairs of side-veins: *fruit* green then black.

Lower Siam, Malaya, Borneo, Sumatra: frequent in villages and secondary jungle in the north of Malaya.

This plant, with large bracts, is what we call the variety *multibracteata*. The typical state of *I. umbellata*, which occurs in the forest throughout the country, has the bracts and sepals only half as large (¼" long at most).

JACKIA

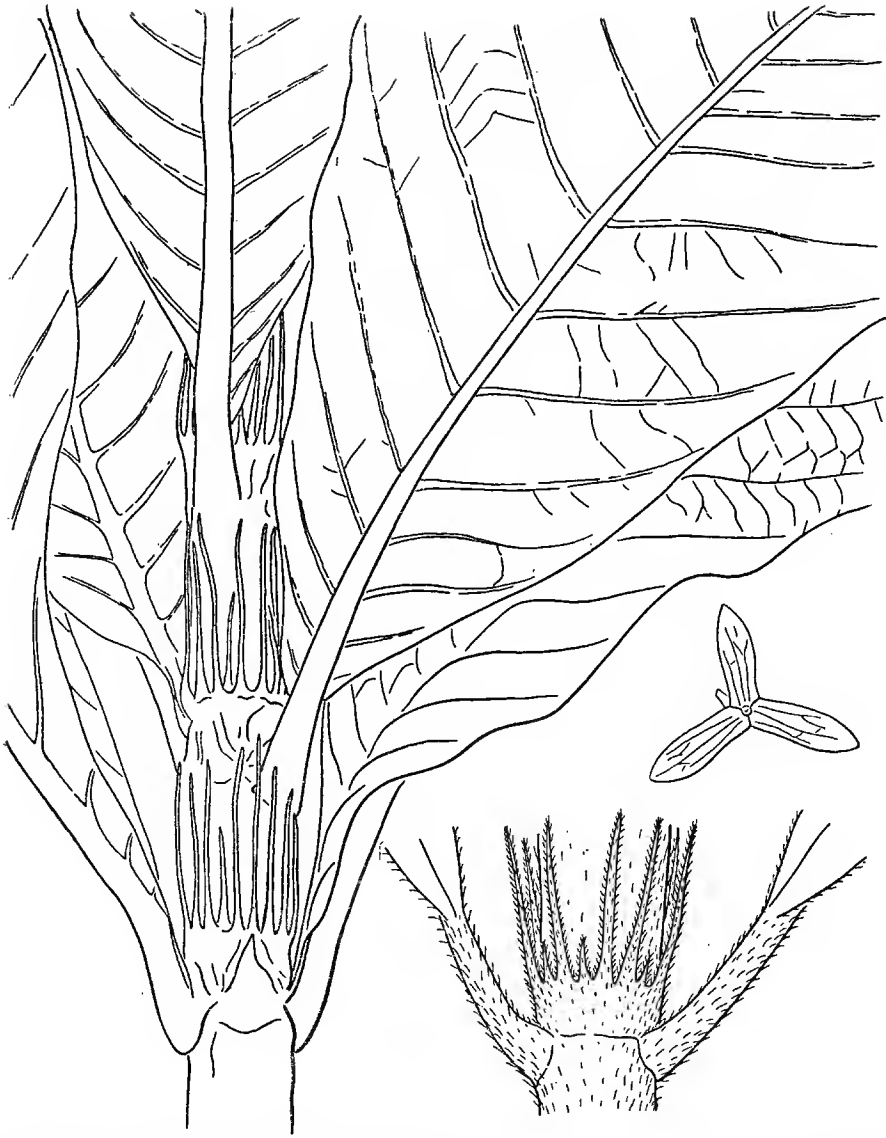
(W. Jack, 1795-1822, doctor and botanist of the East India Co.: companion of Raffles)

Leaves large: *stipules* large, sheathing, set with several long hair-like teeth or supple bristles round the edge.

Flowers small, arranged in two rows on one side of the stiff spreading branches of long-stalked, hanging, axillary panicles: sepals 3 (two others being very small): petals 5: style shortly projecting.

Fruit a tiny one-seeded nut seated at the base of the three enlarged sepals.

1 sp., Malaya, Sumatra, Borneo.



Text-Fig. 190. *Selumar* (*Jackia ornata*), $\times \frac{1}{2}$: fruit, nat. size: (from a painting by R. Hill, Cambridge University).

J. ornata Text-Fig. 190
(Lat., elaborately dressed)

Merbuloh Merah, Selumar, Selimbar

An evergreen tree up to 80 ft. high, rather slender, narrowly buttressed, flowering at 20 ft.: *bark* brownish, finely fissured and rather fibrous-flaky, thin: *twigs stout*: *stipules* $\frac{1}{2}$ -1" high, the bristles $\frac{1}{2}$ -2" long.

Leaf-blade 6-16 \times 2-8", obovate, gradually tapered to the base with a short stalk, hairy beneath, *withering red or reddish brown*.

Inflorescence dangling, 6–15" long, 4–8" wide, with a golden brown sheen: bracts green: *sepals* dull pink: *corolla-tube* $\frac{1}{2}$ " long, $\frac{1}{4}$ " wide, pale yellowish white with the lobes pink on the outside: *style* projecting $\frac{1}{4}$ " : *flowers* fragrant.

Fruit surrounded by the three enlarged, reddish pink, oblong, pointed *sepals* $\frac{1}{2}$ " long, like wings.

In swampy ground from Larut to Singapore, locally common.

The big stipule-like sheaths at once distinguish this tree. It is most conspicuous when the inflorescences are set with fruit, like roseate candelabras, and then it is as beautiful and strange a sight as one may wish. It seems, unfortunately, to flower but seldom.

Compare *Camptosperma macrophylla*, p. 104.

MORINDA

(Lat., morus—a mulberry, indus—of India)

Flowers in stalked, fleshy heads formed by the joining of the calyx-tubes: *corolla-tube* white, projecting, with 5 lobes and a hairy throat.

Fruit oblong, fleshy, formed by the coalescence of all the fruits from the heads of flowers.

About 50 spp., throughout the tropics: 7 spp. in Malaya.

Five of our species are climbers, but both climbers and trees are called by the Malay name *Mengkudu*, which may be altered locally to *Bengkudu* and even *Kemudu* (in Upper Perak, Kelantan and Trengganu). Their fruits are edible but have, when ripe, a very unsavoury and, often, rancid smell. The genus is well-known through the dye which is obtained from the root-bark. It is called morindin and is similar to that of the European Madder (*Rubia tinctorum*). Formerly this dye was used extensively for native cloths, particularly in the Batik-industry of Java, to give the red, purple madder brown and pink shades: and several species of *Morinda* were cultivated in India and Java for this purpose, the chief being *M. tinctoria* which is not found in Malaya. But, with the advent of cheap synthetic dyes, the natural product is rapidly giving place to alizarin: to distinguish between the two in the well-finished article requires the test of an expert. The root-bark of all our species is yellow to deep orange, and the small tree *M. elliptica* appears to be the richest in the dye. In BURKILL'S Dictionary there is an account of the dye and its extraction.

In both our species of tree, the flower-heads are produced only on the upper sides of the lateral branches and they appear to be "leaf-opposed" because the leaves, from the axils of which they arise, are undeveloped. And, since the leaves are arranged in alternating pairs on the branches it is only every other pair which is vertical and has a leaf on the upperside of the branch: so the flower-heads occur at every other node. Both species are evergreen and flower continuously throughout the year. They have deep tap-roots.

Key to the Species

Leaves broad: flowers scarcely fragrant: fruit whitish, large, juicy	...	...	...	...	<i>M. citrifolia</i>
Leaves narrow: flowers fragrant: fruits black, small, rather dry	...	...	...	...	<i>M. elliptica</i>

RUBIACEÆ

M. citrifolia Plate 170
(with Citrus-like leaves)

Great Morinda
Mengkudu Besar

A small evergreen tree to 25 ft. high, with small conical crown: bark pale grey brown, shallowly fissured: glabrous.

Leaf-blade up to $12 \times 6\frac{1}{2}$ " , broadly elliptic, with large stipules.

Flower-heads $\frac{1}{2}$ - $\frac{3}{4}$ " wide (excluding the corolla-tubes), solitary on stalks $\frac{1}{4}$ -1" long: corolla-tube .3-.4" long.

Fruits 2-3 \times $1\frac{1}{2}$ -2" , ripening greyish white with a very rank, rancid smell.

Cultivated throughout Indo-Malaysia, possibly wild on the rocky coasts: common in all villages in Malaya, frequent on the sea-coasts.

M. elliptica Plates 169, 170
(from the leaf-shape)

Lalang Tree, Black Morinda
Mengkudu Kechil, M. Jantan

A tree up to 60 ft. high, generally not more than 40 ft., flowering even as a bush: crown dense, spreading, conical though straggling when old: bark greyish brown, deeply and narrowly ridged and fissured.

Leaf-blade up to $7 \times 2\frac{1}{2}$ " , narrowly elliptic with the sides upcurled, the stipules rather small.

Flower-heads .3-.4" wide (excluding the corolla-tubes), often 2-3 together, on stalks 1-2 long.

Fruits $1 \times \frac{3}{8}$ " , ripening black, rather lumpy, slightly foetid.

Malay Peninsula: very common from Malacca northward, chiefly in open country and in secondary jungle on poor laterite soils.

Curiously this little tree, so common elsewhere, does not occur in the middle or south of Johore or in Singapore. It is most abundant in the secondary jungle and lalang-wastes between Gemas and Tampin and again in the vicinity of Sungei Patani. Through its tough, rugged bark it is able to withstand the lalang-fires which destroy most of the secondary vegetation which endeavours to cover such derelict land, *c.f.* the *Simpoh*-tree (*Dillenia aurea*), the *Gelam* (*Melaleuca*) and the Sea Apple (*Eugenia grandis*).

This *Mengkudu* can be mistaken for a small *Tembusu* (*Fagraea fragrans*) which it resembles in bark, leaves and conical crown, but the upcurled sides of the leaves and the flower-heads are sufficiently distinctive.

NAUCLEA

(Gr., a little ship)

Like *Anthocephalus* but the calyx-tubes of the flowers joined firmly together and inseparable.

About 12 spp., Africa, Indo-Malaysia: 4 spp. in Malaya.

What we call the Bur-Flower trees, because of their bur-like flower-heads, belong to the four genera, *Adina*, *Anthocephalus*, *Nauclea* and *Neonauclea*. They differ only in small characters, and almost as closely related is the genus of climbing plants, *Uncaria* (or *Akar Kekait*), to which the Gambir-bush belongs. Of the genus *Nauclea* the two species *N. subdita* and *N. Maingayi* are noteworthy, the first because it is a common bush in parts of the country and the second because its large leaves and flower-heads render it a handsome tree worthy of cultivation.

The genera *Neonauclea* and *Uncaria* are remarkable also among our Malayan Rubiaceæ because the leaves of their species wither red.

Key to the Species

- Leaf small, 1-2½" wide : flower-heads about 1" wide ... *N. subdita*
 Leaf larger, 2-6" wide
 Flower heads ½" wide : stipules early caducous, only
 terminal pair persistent *N. Junghuhnii*
 Flower heads about 2" wide : stipules persistent ... *N. Maingayi*

N. Junghuhnii

Lesser Bur-Flower Tree

(F. W. Junghuhn, 1809-1864, the Dutch
 botanist of Java)

Bengkai, Bengkal, Mengkal

As *N. subdita* but : leaves larger, 5-10 × 2-6", often broadly rounded at the base, with stalks ½-¾" long : *flower-heads small*, ½" wide, on stalks 1-2" long, *set in threes* (or fives) at the ends of the twigs.

Indo-Malaysia : in open lowland country, often in rice-fields.

N. Maingayi

Great Bur-Flower Tree

(A. C. Maingay, 1836-1869, doctor and
 botanist of the East India Co.)

Bengkai, Bengkal, Mengkal

A tall tree with dark grey bark : *leaves 5-10 × 3-5"*, *large, obovate*, with stalks ½-¾" long, side-veins 13-15 pairs : *flower-heads very large*, 1½-2½" wide, yellow.

Malaya, Borneo : chiefly in low-lying swampy country, especially by rivers.

N. subdita

Bur-Flower Bush

(Lat., placed beneath)

Bengkai, Gedembah, Kedembai

A bush or small tree to 40 ft. high : *bark pale silvery brownish grey, inner bark and wood turning deep yellow on exposure to the air.*

Leaf-blade 2-6 × 1-2½", elliptic, *tapered to each end*, with 6-9 pairs of side-veins : stalks up to ½" long.

Flower-heads ¾-1½" wide, solitary, on stalks ½-1", long, very fragrant (foul when old).

Fruit-heads ¾-1½" wide, shallowly knobbed and pitted, green then pale brownish buff.

Malaysia : common in Malaya, *on river banks in low country and in rice-fields*, occasionally grown as a hedge.

An intensely yellow dye can be obtained from the root-bark.

NEONAUCLEA

(Gr., neos—new, the genus *Nauclea*)

Like *Anthocephalus* but the *flower-heads covered for a long while by a pair of large, boat-shaped bracts* : seeds winged, minute.

35 species, Indo-Malaysia : 3 species in Malaya.

RUBIACEÆ

N. calycina Text-Fig. 191
(Lat., with a cup)



Text-Fig. 191. *Neonauclea purpurascens*, $\times \frac{1}{2}$.

Hooded Bur-Flower Tree
Mengkal Batu, Bengkal Batu

A small tree to 40 ft.:
leaves withering red.

Leaf-blade $3-9 \times 1-4''$,
elliptic, tapered to each
end.

Flower-heads $1\frac{1}{2}''$
wide, white, very frag-
rant, on stalks $1\frac{1}{2}-3''$
long, singly or in threes
at the ends of the twigs.

Fruit $1-1\frac{1}{2}''$ wide,
falling to pieces when
ripe.

Sumatra, Java,
Malaya: common on
the rocky banks of
Saraca-streams.

See the remarks
under *Nauclea*.

PAVETTA

(a Ceylonese plant-name)

Like *Ixora* but:—

Leaves always with small swellings on the veins (bacterial nodules), thin and often hairy.

Flowers white: style projecting far ($\frac{1}{2}-1''$) beyond the corolla-tube, not forked at the end: petals occasionally 5.

About 70 spp., Africa, Asia: about 4 spp. in Malaya.

The species of this genus are interesting because there occur in the little, oblong, dark green, thickened flecks or warts on the leaves nitrogen-fixing bacteria like those on the roots of leguminous plants and *Casuarinas*. As a consequence, Pavettas are said to give a rich green manure and to be useful as a cover-crop under shady conditions.

Key to the Species

- | | |
|---|------------------------|
| Corolla-tube $\frac{1}{2}-\frac{3}{4}''$ long: flower-clusters loose, 3-6" wide: open country, villages and forests ... | <i>P. indica</i> |
| Corolla-tube 4" long: flower-clusters dense, 2" wide, set on rather long side-branches: forests ... | <i>P. naucleiflora</i> |

P. indica Text-Fig. 196
(Lat., Indian)

White Pavetta
Bunga Jarum, Jarum Jarum, Nyarum Nyarum
Nyarong, Gading Gading

A shrub or spindly treelet to 20 ft. high, glabrous or with the leaves finely hairy or velvety.

Leaf-blade $3-11 \times 1-3\frac{1}{2}''$, elliptic, tipped, tapered gradually to the base: stalk $\frac{1}{4}-1\frac{1}{2}''$ long.

Flowers $\frac{1}{2}$ " wide, white, in loose stalked green clusters, 3-6" wide, terminal or from the upper leaf-axils, the petals tipped green, faintly fragrant: style projecting $\frac{3}{4}$ -1".

Berries .3" wide, round, greenish black.

India, S. China, Malaysia, N. Australia: frequent in the forest generally by streams or in swampy places, common in the villages and waste land of the north of the country.

This is a very variable plant in size and leaf-characters. A mountain form has the flowers only .3" long.

P. naucleiflora

Long-stalked Pavetta

(with flowers like Nauclea)

Like *P. indica* but:—flowers smaller, arranged in compact clusters, 2-3" wide, at the ends of long-stalked side-branches bearing only one pair of leaves (just below the flower-cluster): corolla-tube .4" long: style projecting $\frac{1}{2}$ - $\frac{3}{4}$ ": twigs, inflorescences and undersides of the leaves very hairy.

India, Burma, Malaya: frequent in the lowland forest.

PRISMATOMERIS

(Gr., with sewn parts: from the sharply cut flowers)

Like *Ixora* but:—

Flowers in sessile or shortly stalked clusters at the ends of the twigs, in the leaf-axils and on the twigs behind the leaves, each flower with a rather long slender stalk. 2-8 flowers in a cluster: petals 5, white: stamens 5, inside the corolla-tube of the bisexual flowers, but at the mouth of the tube in the male flowers.

P. tetrandra

Text-Fig. 192

(with 4 stamens)

A bush or small tree to 25 ft. high, flowering at 5 ft., glabrous: bark dark grey brown, fissured: twigs brittle.

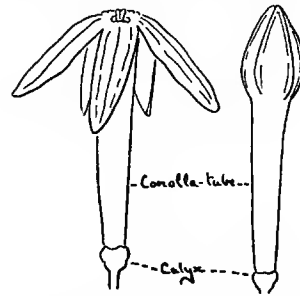
Leaf-blade $1\frac{1}{2}$ -5 x $\frac{3}{4}$ -2", elliptic, pointed: stalk $\frac{1}{4}$ " long.

Flower-clusters 1-2" wide: flowers white, fragrant, $\frac{1}{4}$ - $\frac{3}{4}$ " wide, the stalks $\frac{1}{4}$ -1" long, the corolla-tube $\frac{1}{2}$ " long, the petals pointed with 3 irregular ribs (occasionally 6).

Indo-China, Indo-Malaysia: common in the forest and open country in Malaya, frequent in the villages of Kelantan.

In BURKILL'S Dictionary this is called *P. malayana*. It may be night-flowering, the corollas falling off about noon.

Robin's Coffee
Kahwa Utan, Kopi Utan, Setulang



Text-Fig. 192. *Prismatomeris tetrandra*, x 2.

RANDIA

(Isaac Rand, d. 1743, a London pharmacist)

Flowers in axillary clusters on the uppersides of the twigs, fragrant: corolla white to cream, trumpet-shaped, large or small, with 5 petals, or 6-10 in the thorny species: ovary with 2 cavities.

RUBIACEÆ

Fruit not splitting open, round or oblong, with a thin green, yellow or brown rind and a thick woody wall enclosing the numerous seeds: the rind in a few species pulpy: generally crowned by the sepals or the short calyx-tube.

About 100 spp., throughout the tropics: 25 spp. in Malaya, chiefly in the lowlands.

The garden-shrub called Angels' Trumpets (*R. macrantha*), which is a native of Africa, makes a good introduction to this large genus for its flowers are exceptionally big and easy to dissect. The Malayan species are climbers, shrubs or small trees scarcely worthy of cultivation except the tree *R. exaltata* and one or two of the climbers, but several are common in open country or at the edges of the forest and one, *R. macrophylla*, is a forest shrub with flowers almost as big as those of the Angels' Trumpets.

It seems that the flowers of our species open at dusk, or later, and if, as generally happens, they last for several nights, their colour changes during the day from white to cream. They are fragrant like the Evening Lilies and are evidently pollinated by moths. Even the Angels' Trumpets are occasionally pollinated though what moth has a tongue long enough we do not know. This species (*R. macrantha*) is peculiar, also, because it shows, like the coffee-bushes, *Angsana* and Pigeon-Orchids, the phenomenon of frequent gregarious flowering, when many bushes in the same district bloom together (p. 38). A short spell of dry weather makes the old leaves fall from some or all of the twigs and then the new shoots expand. After they have grown to a certain length, their buds appear to become sensitive to some changes in the weather such as the sudden drop in temperature which accompanies a heavy storm, and, after the stimulus, the flower-clusters develop from the ends of the new twigs, and the bushes flower together for several days. The flowers open a half to one hour after dusk and last for 7-8 days. Little or nothing is known about the habits of the wild species.

In many *Randia*s there is a tendency to suppress some of the leaves and to elaborate peculiar branch-systems, notably among the climbers which may have an extraordinary complicated rhythm of scale-leaves, foliage-leaves, long and short internodes, hooks and flower-clusters. The beginning of such systems may be seen in some of the trees on their inclined branches where there is a distinction between upper and lower surface. In the common little trees *R. anisophylla* and *R. Scortechinii* the leaves of a pair on the horizontal twigs are generally very unequal, that on the upperside being much smaller than that on the lower, and the flower-clusters always develop on the uppersides of the twigs, that is to say in the axil of what would be the small leaf of a pair; but this small leaf is then reduced to a vestige called a scale-leaf and the flower-cluster appears opposite a single big leaf. In *R. exaltata* the leaves on the branches are arranged in well-spaced groups of three. Each group consists of two nodes, that is to say two pairs of leaves separated by a very short internode, so that there should be four leaves in a cluster, but, as the leaves are in alternating pairs one must be on the upper side of the twig, and this leaf is completely suppressed: from its axillary bud the flower-cluster develops. (Compare the flower-heads of *Morinda*, (p. 549).

There are no Malay names distinctive of the species. They may be called *Chempaka Utan* from the fragrance of the flowers: *Jarum Jarum* or *Jenjarum* from the resemblance of the unopened flowers, or the projecting styles, to needles as in the white *Ixoras*: or *Randa* as in the *Gardenias*, and, curiously, this Malay word has no connection with the botanical name of the genus.

The species of *Tarenna* may be mistaken for those of *Randia* but they have terminal flower-clusters and are allied rather with the *Ixoras* than with the *Gardenias* to which *Randia* is akin.

Key to the Species

- Thorny shrubs or treelets
 - Leaves blunt, white silky beneath: flowers 1" wide, petals 7-10 *R. tomentosa*
 - Leaves pointed, not white beneath: flowers ½" wide, petals 5-6 *R. spinosa*
- Not thorny
 - Shrubs or treelets to 15 ft. high: flowers very large
 - Garden shrub: flower 8-9" long *R. macrantha*
 - Forest shrubs
 - Corolla-tube 4-6" long, with broad petals *R. macrophylla*
 - Corolla-tube 1" long, with long narrow petals *R. stenopetala*
 - Trees
 - Leaves and twigs hairy *R. anisophylla*
 - Leaves and twigs glabrous
 - Leaves up to 7" wide, obovate: corolla-tube ½" long *R. Scortechinii*
 - Leaves not above 4" wide, elliptic
 - Corolla-tube not ¼" long: flowers in dense clusters: fruit small *R. densiflora*
 - Corolla-tube 1" long: flowers few: fruit large *R. exaltata*

R. anisophylla Plate 171
(with unequal leaves)

Wild Randa
Randa Utan, Chempaka Puteh Utan,
Tinjau Belukar, Ulai Ulai

A small evergreen tree to 60 ft. high: twigs, leaf-stalks, inflorescences and under-sides of the leaves velvety hairy, the twigs brownish hairy: leaves in unequal pairs.

Leaf-blade 3-14 × 1-7", broadly obovate, shortly tipped, tapered gradually to the base, thin, with many conspicuous side-veins: stalk ½-1" long.

Flower-clusters 1½-2½" wide, small, dense, shortly stalked, few to many flowered, only 1-4 flowers open at a time: flowers ¾-1" wide: corolla-tube ½-¾" long: sepals as rather long teeth.

Fruits 1-1½" long, broadly oblong, shortly velvety, green, crowned by the short calyx-tube (¼" long).

Sumatra, Malaya, Borneo: very common in the lowlands, at the edge of the forest, often in thickets in open country, and up to 4,000 ft. altitude.

Saplings of this Randa may be mistaken for sterile plants of Greenea.

R. densiflora Text-Fig. 193
(with dense flower-clusters)

Wild Randa
Jarum Jarum, Jenjarum

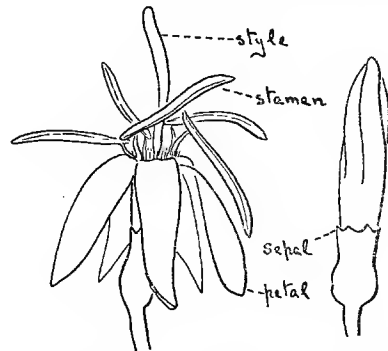
A shrub or small tree to 60 ft. high: glabrous.

Leaf-blade 3-9 × 1-4", narrowly elliptic, with 7-11 pairs of side-veins: stalk ¼-½" long.

Flowers small, fragrant, in small dense, shortly stalked clusters 1-2½" wide: calyx .1" long, with 5 tiny green teeth: corolla with a short tube (.2" long) and 5 narrow spreading or recurved petals making an irregular star ½-¾" wide, the style projecting ¼".

Fruit ½" wide, a small round berry ripening yellow then red and finally black and pulpy.

India and S. China to N. Australia: abundant in Malaya in forest and in thickets in open country.



Text-Fig. 193. *Randia densiflora*,
× 2.

RUBIACEÆ

The flowering twigs are specialised in that the leaves on the upper sides are completely suppressed and the flower-clusters therefore are placed opposite the leaves which are on the lower side.

This *Randa* may be mistaken for a *Canthium* (green or yellowish flowers, leaves not suppressed, fewer veins to the leaf) or a *Tarenna* (terminal inflorescences).

R. exaltata

Crow's Mallet Tree
Kelompang Gagah

A small or rather lofty tree to 80 ft. high : glabrous : *leaves in groups of three*.
Leaf-blade 3-6 × 1-3", narrowly elliptic, thin, with 6-9 pairs of side-veins : stalks less than $\frac{1}{4}$ " long.

Flowers large, in small clusters : corolla-tube $1\frac{1}{2}$ " long, $1\frac{1}{4}$ " wide at the mouth, *white speckled purple in the throat*.

Fruit round, large, 3" wide, woody.

Tenasserim, Siam, Malaya, Java : Penang, Kedah, Perlis and the East Coast from Pahang northward.

This beautiful tree requires a drier climate than that which is general in Malaya. Nevertheless it may well be cultivated from Perak northward and along the coasts.

R. macrantha Plate 171

Angels' Trumpets

(Gr., makros—long, anthos—a flower)

A garden shrub to 12 ft. high, very bushy : new foliage light green.

Leaf-blade $2\frac{1}{2}$ -7 × 1-2 $\frac{3}{4}$ ", narrowly elliptic with a long tip, thin, with wavy edge, upcurled sides and many strongly marked veins : stalks $\frac{1}{2}$ -1 $\frac{1}{2}$ ".

Flowers few in a cluster at the end of a twig : corolla-tube 8-9" long, with 5 recurved petals, *white then dull cream yellow, the throat blocked by the thickened end of the style* : sepals $\frac{1}{2}$ " long.

Fruit about 1" long, broadly oblong, ripening yellow.

Native of Africa : frequently cultivated in Malayan gardens.

R. macrophylla

Purple Trumpet *Randa*

(Gr., makros—long, phullon—a leaf)

A forest shrub or treelet to 15 ft. high, sparingly branched : twigs and undersides of the leaves hairy or glabrous.

Leaf-blade 6-13 × 2-4", oblong *elliptic, almost sessile*.

Flowers 1-2 in a leaf-axil or at the end of a twig, *very large, hanging* : corolla 4-6" long, 2-3" wide at the mouth, *white turning pale cream blotched purple in the tube* : sepals narrow, $\frac{3}{4}$ " long : petals broad recurved.

Fruit 1 $\frac{1}{2}$ -2" long, oblong, crowned by the 5 sepals.

Sumatra, Malaya : common in lowland forest, rather seldom flowering.

R. Scortechinii

Wild *Randa*

(B. Scortechini, 1845-1886, the
Italian missionary and botanist)

Randa Utan, Tinjau Belukar, Ulai Ulai

Very like *R. anisophylla* but :—twigs and undersides of the leaves *glabrous* : *sepals* as very short, scarcely noticeable teeth : *corolla-tube* $\frac{1}{2}$ " long, $\frac{1}{2}$ - $\frac{3}{4}$ " wide across the petals.
Borneo, Malaya : abundant throughout the country, mostly in the forest.

On Penang Hill this species is common and its saplings suggest very large, lanky coffee-bushes with big yellow-green leaves.

R. spinosa Text-Fig. 194

Thorn Randa
Duri Timun Tahil, D. Timbang Tahil.

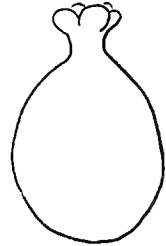
A small thorny bush or tree like *R. tomentosa* but more straggling, the leaves pointed and not white beneath, the thorns of the upright stem generally in whorls of 3; the flowers much smaller with only 5 (-6) petals, and 5 broad, blunt sepals.

Leaf-blade $1-3\frac{1}{2} \times \frac{3}{4}-1\frac{1}{2}$ ", elliptic, thin, slightly hairy, rapidly wilting.

Flower $\frac{1}{2}$ " wide, or a little more: calyx with 5 rather broad, blunt, green sepals: corolla with 5, occasionally 6, petals, cream white turning yellow then dull egg-yellow, the tube only $\cdot 2$ " long.

Fruit $1-1\frac{1}{2} \times \frac{3}{4}-1\frac{1}{4}$ ", rather pear-shaped, crowned with the 5 blunt sepals.

Siam, Malaya: rather common in secondary jungle from Pekan to Kelantan on the East coast of Malaya and in Kedah and Perlis on the West.



Text-Fig. 194.
Randia spinosa:
fruit $\times \frac{1}{2}$.

On the upright stems and branches, the leaves and spines are set in whorls of 3; on the horizontal, straggling branches they are in pairs, and on the drooping twigs they are generally single.

Compare *Vangueria spinosa*, which is very similar in general appearance.

R. stenopetala

Tree Crinum

(Gr., stenos—narrow, petals)

A forest shrub or treelet very like *R. macrophylla* but:—

Leaf-blade $7-14 \times 2-6$ " : stalk $\frac{1}{2}-\frac{3}{4}$ " long.

Flowers in clusters of 3-6: corolla with a rather short tube, $\frac{3}{4}-1$ " long, and 5 very long, narrow petals, 3-4" long: sepals $\frac{1}{2}-\frac{3}{4}$ " long, narrow.

Malaya: Malacca to Perak, rather local in the forest.

The long petals and the fragrance suggest the flowers of a Crinum-lily.

R. tomentosa Plate 220, Text-Fig. 195

White Thorn-Randa

(Lat., woolly)

Duri Timun Tahil, D. Timbang Tahil

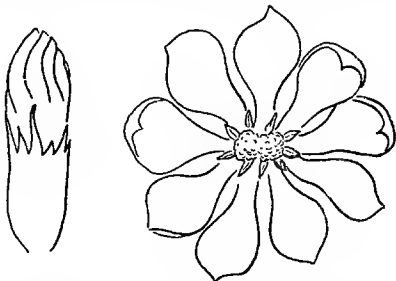
A thorny shrub or small tree up to 20 ft. high, with a short grey trunk and long, straggling branches leaning horizontally, the crown open: woody spines 1-4" long, set in pairs on the trunk and ascending branches but mostly singly on the horizontal branches and twigs.

Leaf-blade $1-2\frac{1}{2} \times 6-1\frac{1}{2}$ ", obovate-elliptic, blunt, rather dark shiny green above, white silky beneath, with 4-8 pairs of side-veins: stalk $\cdot 1-3$ " long.

Flowers $1-1\cdot 2$ " wide, singly or 2-3 together in the small leafy rosettes on the branches, slightly fragrant: calyx brown silky, with 6-9 long narrow teeth and generally a short one between each pair of long ones: corolla with 7-10 petals, white turning light yellow and finally light orange, the tube $\frac{1}{2}$ " long and no longer than the calyx.

Fruit $1\frac{1}{2} \times 1\frac{1}{2}$ ", barrel-shaped with several shallow grooves, crowned with the calyx tube, velvety, green or khaki then dull olive brown, filled with many small brown seeds: the fruit-wall softening and the fruit smelling of rotten apples when ripe.

Burma, Indo-China, Siam, N. Malaya, Java: common in secondary jungle from K. Trengganu northward, (? in Kedah and Perlis).



Text-Fig. 195. *Randia tomentosa*,
nat. size.

In shape and thorns, this species much resembles the coppiced Hawthorn (*Cratægus*) of English hedges. The main stem of the sapling

grows straight to a height of 6-7 ft., when it sags and becomes a horizontal branch from which others break out to grow upward and sag in their turn, and so a crown of stiffly horizontal branches is built up, in the same way as that of the Jujube (*Zizyphus*) and *Bulangan* (Gmelina). The leaves on the young growing branches are soon shed and, as in the Wood Apple (*Feronia*), their axillary buds produce small rosettes of leaves which persist as the dwarf foliage shoots and from which the flowers are developed. Its habit is highly peculiar.

Compare *R. spinosa* and *Vangueria spinosa* with the same Malay names, which are derived from the likeness of the spreading thorns to the arms of a balance.

RENNELLIA

(J. Rennell, 1742-1830, the English oceanographer)

Like *Morinda* but the heads few-flowered and set in a terminal spike, *the flowers violet, lilac or white with lilac petals.*

5-6 species, Burma, Siam, Malaysia: 1 or 2 species in Malaya.

R. speciosa

(Lat., handsome)

Lilac Berry
Mengkudu Rimba

A shrub or treelet to 20 ft., flowering at 2 ft., glabrous, with orange root-bark and broad leaves like *Morinda citrifolia* (the blade occasionally narrow like *M. elliptica*): young leaves lilac.

Flowers fragrant, the corolla-tube $\frac{1}{2}$ - $\frac{3}{4}$ " long, in some cases borne singly: petals as long as the tube or half as long.

Burma, Malaya, Sumatra and Borneo: common in the forest, in lowland and mountains.

Generally the flower-heads are sessile on a terminal, lilac or violet spike up to 6" long. In some cases the spike is so short as to appear like one large terminal head and in other cases the individual heads are stalked, and such a condition is the basis of the species *R. paniculata*. *R. speciosa* is a beautiful plant which should be improved by cultivation.

SAPROSMA

(Gr., sapos-rotten, osme—a smell)

Like *Canthium* but the *twigs and leaves very foetid when bruised: flowers greenish white, sessile, in tiny clusters* in the leaf-axils: *petals 4: fruit as a small round berry with 2 seeds.*

India, S. China, Malaysia: 6 spp. in Malaya.

S. glomerulatum

(Lat., with little clusters)

Foetid Coffee
Kentut Kentut, Sekentut

A shrub or small twiggy tree to 20 ft.: *leaf-blade 3-8 × 1-3½"*, glabrous, elliptic, tipped, the stalk $\frac{1}{4}$ " long or less: *berry blue-black.*

Malaya, common in the lowland forest.

SCYPHIPHORA

(Gr., skuphos—a cup, pherein—to bear)

Flowers small, in axillary clusters.

Fruit oblong, with several grooves, separating into two halves when ripe.
1 sp., Asia, Australia, in mangrove swamps and on muddy shores.**S. hydrophyllacea**(like the plant *Hydrophyllum*)

Chengam, Chingam

An evergreen shrub or small tree up to 25 ft. high, glabrous: twigs and leaf-stalks reddish when young: *old leaves yellow then beautiful shining pink*: bark greyish black, ridged and fissured: buds varnished with resin.*Leaves upright, light shiny green, fleshy-leathery, obovate, blunt, with recurved sides.*Flowers .15-.2" wide, scentless, in clusters 1-1½" wide on a very short stalk: *corolla with 4 white recurved lobes and a short pink tube ¼" long.*

Fruit .3" long, in tight bunches in the leaf-axils, green then white, oblong with 6-8 ridges.

This plant is described and figured by WATSON (20, p. 53). It is very common in the mangrove and sea-shore vegetation and the small grooved fruits abundant in the drift.

TARENNA

(from the Ceylonese plant-name *tarana*)Like *Pavetta* but:—*Sepals, petals and stamens 5: flowers white, yellow or green:* fruit with 2 large: several to many small seeds: no bacterial nodules on the leaves.

About 100 species, throughout the tropics: about 20 species in Malaya.

Key to the Species

Inflorescence bent down or upside down: flowers white, fragrant	...	...	...	...	<i>T. longifolia</i>
Inflorescence upright, at least not bent down					
Petals white changing to yellow: fragrant					
Leaves glabrous, rather leathery and yellowish green	...	...	...	...	<i>T. fragrans</i>
Leaves velvety hairy, thin	...	...	...	...	<i>T. mollis</i>
Petals white tipped green: fragrant: leaves narrow	...				<i>T. appressa</i>
Petals green or greenish yellow: ? not fragrant					
Petals greenish yellow: corolla-tube ⅓-½" long:					
tree	...	...	...	...	<i>T. costata</i>
Petals green: corolla-tube not ¼" long: shrub or treelet	...	...	...	...	<i>T. stellulata</i>

The species with more than 2 seeds in the berry are sometimes placed in the genus *Stylocoryne* (as in BURKILL'S Dictionary), but the distinction from *Tarenna* is scarcely practicable.

T. appressa

Green-tipped Tarenna

(Lat., pressed together)

A shrub or slender treelet up to 15 ft. high.

Leaf-blade 3-8 × ¼-2", lanceolate or narrowly elliptic, tipped, thin or rather leathery, often dark green, glabrous or hairy beneath, with 7-12 pairs of side-veins: stalk ¼-½" long.

Flower-clusters 1-2" wide, sessile: corolla-tube white, ¼-½" long, the petals blunt or slightly notched, with recurved sides and green ends: flower ¼" wide, generally very fragrant: style projecting ¼".

Berry ½" wide, round, with several (4-8) brown, flattened, seeds.

Malaya: rather frequent in lowland and mountain forest.

T. costata

Green Tarenna

(Lat., ribbed)

A tree 20-50 ft. tall: bark light brownish buff, rather pocked: twigs and under sides of leaves finely hairy, becoming glabrous.

Leaf-blade 3-4½" wide, rather broad, elliptic to obovate, ribbed with 9-14 pairs of side-veins.

Flowers in shortly stalked dense clusters, greenish yellow: corolla-tube ¼-½" long.

Berries ½" wide, green then black, with many seeds.

Sumatra, Malaya: not so common.

T. fragrans

Text-Fig. 196

River Tarenna

Bujang Semalam

A bush or small tree to 25 ft. high: glabrous.

Leaf-blade 3-8 × 1¼-3", elliptic to obovate, tipped, rather leathery and shiny, generally yellowish green, with 7-13 pairs of side-veins: stalk ¼-½".

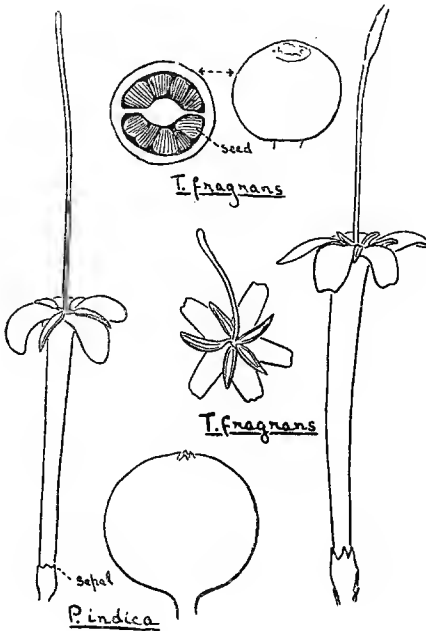
Flower-clusters loose, 2-6" wide, stalked: flowers ½" wide, white changing next day to cream then ochre-yellow, the tube greenish, petals with recurved edges, very fragrant: the style projecting ¼-½".

Berry ½" wide, round, green then purple-black or blue-black, containing many small brown seeds.

W. Malaysia: common in the lowlands especially on the banks of swampy streams and rivers, occasionally in villages.

The Malay name must refer to the change in colour which the flowers undergo.

Compare *Randia densiflora* with a much shorter corolla-tube and lateral bunches of flowers.



Text-Fig. 196. *Tarenna fragrans*, *Pavetta indica*: × 2.

T. longifolia
(Lat., long-leafed)

Pendant Tarenna

A shrub or small tree to 20 ft., flowering at 5 ft.

Leaf-blade $7-13 \times 1\frac{1}{2}-6$ ", varying lanceolate to elliptic or obovate, tipped, thin, glabrous or velvety on the underside, with 12-26 pairs of side-veins: stalk $\frac{1}{2}-1$ " long.

Flowers about $\frac{1}{4}$ " wide, white, fragrant, arranged in clusters ending the branches of a long-stalked panicle, the stalk sharply bent down from the end of the twig, hairy: panicle 4-10" long, 2-4" wide: corolla-tube $\frac{1}{4}-\frac{1}{2}$ " long: style projecting $\frac{1}{8}$ ".

Berry containing 2 large seeds.

Siam, Malaya, Sumatra: frequent in the lowland forest.

The curious inflorescence distinguishes this from all other Malayan plants except the pendulous *Ixora* (*I. pendula*) which has scentless pink flowers.



Text-Fig. 197. Hairy Tarenna (*T. mollis*), $\times \frac{1}{4}$.

T. mollis Text-Fig. 197
(Lat., soft)

Hairy Tarenna

Like *T. fragrans* but:—a tree 15–40 ft. high: *twigs, leaves and inflorescences velvety hairy*: leaves thin, generally larger, 2–4" wide: stipules large, $\frac{1}{2}$ –1" long: *flowers smaller*, $\frac{1}{2}$ " wide, with the corolla-tube $\frac{1}{2}$ – $\frac{3}{4}$ " long, *smelling of crushed banana-leaves*: style pale green, projecting $\frac{1}{2}$ ".

Sumatra, Malaya: frequent in woods and by streams.

T. stellulata
(Lat., bearing little stars)

Star Tarenna

A shrub or treelet to 15 ft. high, flowering at 3 ft.

Leaf-blade 4–10 × $1\frac{1}{2}$ –4", varying lanceolate to elliptic, tipped, thin, *glabrous*, with 7–11 pairs of side-veins: *stalk* $\frac{1}{2}$ – $1\frac{1}{2}$ " long, *rather long*.

Flower-clusters 1–2" wide, *sessile*: flowers $\frac{3}{4}$ " wide, *the green, pointed petals much longer than the short corolla-tube* (not $\frac{1}{2}$ " long), *the tips of the unopened petals projecting and recurved to form a minute star at the top of the pointed flower-bud*: corolla-mouth hairy.

Berry .4" wide, containing 2 large seeds.

Malaya: rather common in the forest.

TIMONIUS

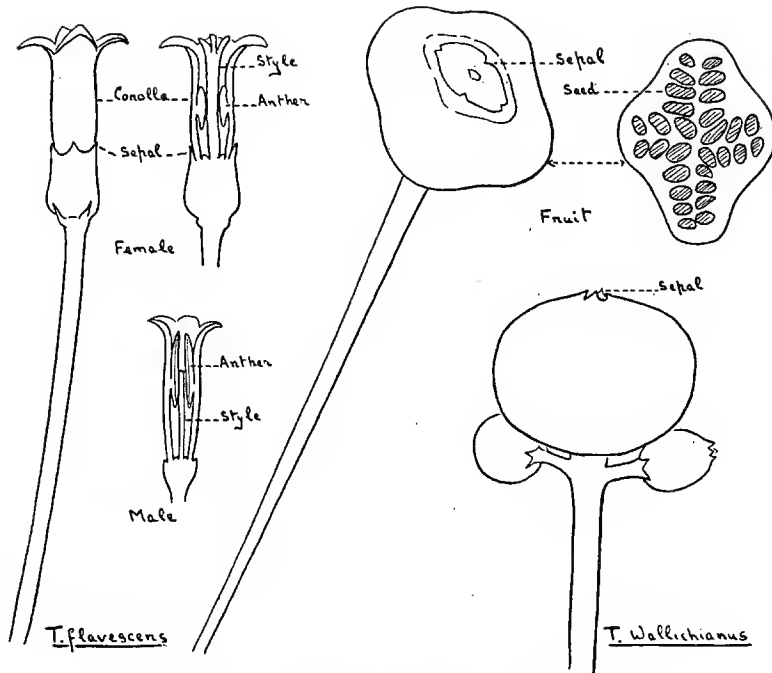
(from the Amboina plant-name *timon*)

Flowers small, cream-white or yellow, in axillary clusters, male and female on separate trees: *female flowers* singly, or 3 together, on a stalk, *the corolla-tube generally larger than in the male* and with sterile anthers hidden in the lower half: *male flowers many in a stalked cluster*, seated along one side of the forked branches of the cluster: *corolla* with 4 or 5 lobes, the 4 or 5 fertile anthers of the male-flower hardly projecting from the corolla-tube: style with 4–7 short arms.

Berry round, or oblong, often with 4 blunt angles, *with many small woody oblong seeds*.

About 30 species, tropical Asia and Polynesia: 10 species in Malaya, in the lowlands and mountains.

Though several species of *Timonius* are common, they have no familiar Malay name and, indeed, none that can be attributed to them with certainty. *Merombong* or *Berombong* may be mentioned but they are applied also to other plants, e.g. *Adina*. The genus, which is rather peculiar in the family on account of its male and female plants, can always be recognized from the axillary clusters of small, tubular yellow flowers, and the two common species can be recognized from their characteristic leaves, the one with the leaves silvery beneath, the other with them purple-veined. They are evergreen but seasonal in flowering after spells of dry weather; and it seems that they may be night-flowering, for the yellow corollas fall off during the day. But there is little information concerning them.



Text-fig. 198. Timonius: flowers and fruits, x 2.

Key to the Species

Seashore shrub or treelet: flowers cream-white, with 5 petals: leaves obovate, blunt, nearly sessile ...	<i>T. compressicaulis</i>
Inland trees: flowers yellow, with 4 petals: leaves pointed	
Leaves thin, silky or silvery beneath ...	<i>T. Wallichianus</i>
Leaves glabrous, rather leathery, purple-veined beneath ...	<i>T. flavescens</i>

T. compressicaulis

(Lat., with flattened stem)

Seashore Timon

A seashore shrub or small tree to 15 ft. high, flowering at 3 ft., the twigs rather flattened.

Leaf-blade $3\frac{1}{2}$ -8 × $1\frac{1}{4}$ - $3\frac{1}{2}$ ", obovate, blunt or scarcely pointed, almost sessile, glabrous, light yellowish green with pale yellow midrib, rather upright, thinly fleshy: side-veins 6-8 pairs: stalk $\frac{1}{4}$ " long or less: stipules $\frac{1}{4}$ - $\frac{1}{2}$ " long, hairy.

Male flowers .4" wide, cream-white, not yellow, with 4-5 petals, set loosely in clusters 1-2 $\frac{1}{4}$ " wide on stalks $\frac{1}{2}$ - $1\frac{1}{4}$ " long, the corolla-tube .3" long: female flowers with a smaller corolla, .2" wide (the tube .1- $\frac{1}{2}$ " long) with 6-7 petals, singly or 2 together on stalks $\frac{1}{4}$ -1" long.

Berry $\frac{1}{2}$ " wide, round.

Sumatra, Malaya: frequent on sandy and rocky shores of islands round the coast of Malaya, apparently rare on the mainland.

T. flavescens Text-Fig. 198
(Lat., yellowing)

Purple-veined Timon

Like *T. Wallichianus* but:—*Leaf-blade* thinly leathery, glabrous, with only 4-7 pairs of side-veins, the midrib and side-veins showing as dark purple or blackish thick lines on the underside: (young leaves wholly pale green).Flower-clusters on longer stalks $\frac{1}{2}$ -2" long: male flowers $\frac{1}{4}$ " wide, 3-7 in a cluster, rich yellow, the corolla-tube $\frac{3}{4}$ -1" long: female flowers solitary, $\frac{1}{4}$ " wide, paler but stouter, on long slender stalks $1\frac{1}{2}$ -3" long.Fruit $\frac{1}{4}$ " wide, as wide as long, solitary.

W. Malaysia: common in the forest, especially on ridges and on stream-banks, rarely found in the open.

(In BURKILL'S Dictionary, this is called *T. peduncularis*).**T. Wallichianus** Plate 172, Text-Fig. 198
(N. Wallich, 1786-1854, the Danish hotanist at Calcutta)

Silver Timon

A small tree up to 40 ft. high: bark brown, smooth or finely cracked.

Leaf-blade 3-8 × $1\frac{1}{4}$ -3", elliptic, tipped, thin, light green or yellowish green, finely silky or silvery on the underside, with 7-11 pairs of side-veins: stalk $\frac{1}{4}$ - $\frac{1}{2}$ " long: stipules rather small.Male flowers $\frac{1}{4}$ " wide, pale yellow, in dense clusters $\frac{1}{2}$ -1" wide on stalks $\frac{1}{2}$ -1" long, the corolla-tube $\frac{1}{2}$ " long: female flowers stouter, 3 together at the end of a common stalk.Fruit $\frac{1}{2}$ " wide, oblong, bluntly 4-shouldered, arranged in groups of 3, ripening pinkish purple or reddish, with numerous yellow oblong seeds.

Malay Peninsula: very common in helukar, open country and at the edges of the forest throughout Malaya.

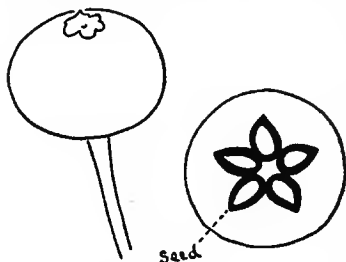
VANGUERIA(from a vernacular name *voo-vanguier*)Like *Canthium* but the fruit containing 5, occasionally 4, rather large stones.
60 species, tropical Africa and Asia: 2 species in Malaya.**V. spinosa** Text-Fig. 199

False Thorn Randa

Duri Timun Tahl, D. Timbang Tahl

A straggling thorny bush or treelet to 15 ft. high, like *Randia spinosa*, but with longer leaves, much smaller greenish flowers in axillary clusters and much smaller fruits containing only 4-5 large seeds.Leaf-blade 2-5 × 1-3", elliptic or ovate, pointed, thin, hairy, with 6-10 pairs of side-veins, not white beneath: stalk $\frac{1}{4}$ - $\frac{1}{2}$ " long.Flowers $\frac{1}{4}$ " long, greenish, on short stalks and arranged in axillary clusters of 3-20: calyx with 5 thiny teeth: corolla-tube $\frac{1}{2}$ " long, with 4-6, mostly 5, petals.Fruit $\frac{3}{4}$ -1" long and wide, round or fig-shaped, on stalks about $\frac{1}{2}$ - $\frac{3}{4}$ " long and arranged in clusters along the branches, yellow.

India, S. China, Siam, N. Malaya, Java: frequent in secondary jungle and by ricefields in Kelantan.

Text-Fig. 199. *Vangueria spinosa*, nat. size.In general appearance, this so greatly resembles the species of *Randia*, *R. spinosa*, called by the same Malay name, that it is not at all easy to distinguish them without flowers or fruits: moreover, they often grow together in Kelantan, and, perhaps, also in the north of Trengganu. It has the same arrangement of the leaves, spines and rosettes of leaves as we have described for the *Randia*, though the flowering twigs often have no thorns.

WENDLANDIA

(J. C. Wendland, 1755-1828, the German botanist)

Flowers small, white, in rather large terminal panicles: corolla with 5 lobes or teeth: stamens 5, slightly projecting from the corolla-tube.

Fruit a small capsule containing many minute seeds and splitting into 2 parts.

About 50 species, tropical Asia: 3 species in Malaya.

W. Burkillii

(I. H. Burkill, b. 1870, Director of Gardens, Straits Settlements, 1912-1925)

A small mountain tree up to 20 ft. high, with irregular crown and easily broken twigs: leaves withering scarlet.

Leaf-blade 2-6 × $\frac{3}{4}$ -2 $\frac{3}{4}$ ", elliptic, pointed, thin, *bulging between the veins*, glabrous, with 7-11 pairs of side-veins: leaf-stalk $\frac{1}{4}$ - $\frac{1}{3}$ " long: *stipules $\frac{1}{4}$ - $\frac{1}{3}$ " wide, semilunar or ear-shaped*, not pointed.

Panicles 6-14" long and broad: flowers $\frac{1}{4}$ " long, .1" wide, white, sessile, arranged in groups on the branches of the panicle.

Malaya: rather common in the mountains of the main-range, especially in secondary growth at the hill-stations.

The easily broken twigs, the paired leaves fading scarlet and the terminal panicles, which remain brown and withered on the twigs for a long time, distinguish this little tree of our hill-stations.

ORANGE FAMILY

Rutaceæ

(Ruta, the genus of the Rue)

With resinous, glandular tissues.

Leaves dotted with minute oil-glands, generally smelling of citronella or resin when crushed, various in form and arrangement.

Flowers regular, small to medium-size: sepals and petals 3, 4 or 5, the petals free: stamens generally double as many as the petals: ovary superior, with one style and 3, 4, 5 or many cavities.

Fruit a capsule or berry.

130 genera, 1,600 species, throughout the world, mostly in warm climates: 16 genera, 50 species in Malaya, mostly in the lowlands.

This is a large family of trees, shrubs and climbers recognized most easily from the resinous, aromatic or lime-like smell of the broken twigs or fruits or of the crushed leaves. The oil-glands in the leaves appear either as dark green spots or pimples on the under surface or as translucent spots when the leaf is held to the light. Many essential oils, such as citronella and bergamot, are won by distillation from plants of this family: and for these same oils, many species are used in native medicine.

The Lime-tree and Pomelo (Citrus), and the *Kemuning* and the Curry bush (*Murraya*) provide the best introduction to the family. The Mediterranean Rue (*Ruta graveolens*) with its ashen grey, pinnate leaves is occasionally grown as a pot-plant.

From the Ivy-family (Araliaceæ) which also has resinous tissues, this is distinguished by its superior ovary. The members of the Ivy-family have commonly palmate leaves which are not found in the Rutaceæ.

Key to the Genera

- Trunk or twigs armed with spines
- Leaves simple
 - Fruits as limes, oranges, pomelo, etc. 1" or more wide: leaf-stalk often winged: mostly cultivated *Citrus* p. 568
 - Fruits less than 1" wide, like a small green lime: leaf-stalk not winged: wild
 - A sea-coast tree with round berries *Atalantia*
 - A mangrove shrub with 3-4 angled fruits *Paramignya* p. 577
 - Leaves compound
 - Leaves trifoliolate
 - Very spiny shrub with small leaflets and small orange red berries *Triphasia* p. 578
 - Small tree with larger leaflets, 2-4" long, and large lime-like fruits *Aegle*
 - Leaves pinnate
 - Leaves small, 3-6" long: lowland tree in villages from Batu Gajah north: fruit 2-5" wide *Feronia* p. 573
 - Leaves large, 6-24" long: wild trees with tiny fruit *Zanthoxylum* p. 578
 - Unarmed trees (without thorns)
 - Leaves simple *Citrus* p. 568
 - Leaves opposite, trifoliolate *Evodia* p. 571
 - Leaves spirally arranged, pinnate
 - Leaves and twigs with a foetid or harshly resinous and lime-like smell when crushed: hairy or harshly scurfy: leaflets often very many
 - Berries yellow, white or pink, in hanging panicles, round *Clausena* p. 570
 - Berries orange turning red, oblong *Micromelum* p. 575
 - Berries green then black, round: leaflets many, $\frac{3}{4}$ -1" wide: Curry bush of villages *Murraya Kœnigii* p. 576
 - Not harsh or foetid, at most with a faint lime-smell: glabrous or nearly so: leaflets 1-3 pairs, with a terminal one
 - Flowers $\frac{3}{4}$ " wide or more, large, solitary or a few together: twigs whitish
 - Leaf-stalk not winged: flowers $\frac{3}{4}$ " long: fruit red, small, oblong *Murraya paniculata* p. 577
 - Leaf-stalk winged, the lowest pair of leaflets very small: fruit yellow, lemon-like *Merrillia* p. 575
 - Flowers smaller, in panicles: fruit round, pink *Glycosmis* p. 574

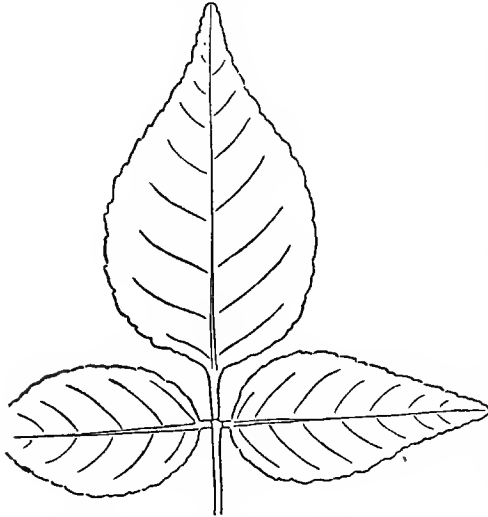
AEGLE

(Gr., aigle—the light of the sun)

Twigs thorny: all parts with a sour smell of citron- and chenopodium-oils. Leaves trifoliolate, alternate: leaflets toothed, jointed to the stalk. Fruit large, smooth, with a fibrous rind and 8-15 cavities filled with thick, sweet, aromatic, orange-coloured pulp: seeds many, slimy-woolly.
 1 species, native of India.

A. marmelos Text-Fig. 200
 (a Portuguese word)

Bel-Fruit
Bel, Bila, Maja



Text-Fig. 200. *Aegle marmelos*, $\times \frac{1}{2}$.

A small, shabby, deciduous tree up to 40 ft. high, with rather dense drooping branches: *bark* pale grey, entire or slightly fissured: *spines* $\frac{1}{2}$ -1" long, pale grey, *woody, singly or in pairs on a few of the twigs, mostly on suckers and low shoots: young leaves* pinkish: glabrous.

Leaves 4-6" long, dull green, with a long-stalked, elliptic, terminal leaflet ($2-4 \times \frac{3}{4}-2$ "), the tip long, narrow, blunt and recurved, and two smaller sessile or very shortly stalked leaflets.

Flowers greenish white, fragrant, in axillary clusters.

Fruits 2-5" wide, round, *green or greyish then yellow*, singly or 2-3 together.

This tree is occasionally seen in the villages of the north of the country: it will not fruit in the south where there is no prolonged dry season. The best specimen in the country was that in the Residency Garden at Penang; it reminded one of an old apple-tree. The unpleasant smell of the

crushed leaves is most characteristic. Because of the pungent oils in the tissues, the fruit, bark, root and leaves are variously used in native medicine, as described by BURKILL. The pulp of the fruit is eaten raw or the fruits may be preserved. A slime oozes from the bark or broken branches and, as it dries, may hang like icicles.

ATALANTIA

(from Atalanta's golden apple)

A thorny plant with simple, spirally arranged leaves like Citrus but:—stamens 6-8: fruit a small green, orange-like berry.
 30 spp., Himalayas to Australia: 2 spp. in Malaya.

A. spinosa

Sea Lime
Merlimau, Limau Hantu

An evergreen bush or small tree up to 40 ft. high: *trunk* rather deeply fluted from the base and *set with many short stiff thorny twigs: bark* greyish brown: smooth: *twigs* usually with short, solitary, sharp spines in the leaf-axils.

Leaf-blade $2\frac{1}{2}-4\frac{1}{2} \times 1\frac{1}{2}-2\frac{1}{2}$, elliptic, rather leathery, glabrous, notched at the tip: leaf-stalk $2-4$ " long, narrow.

RUTACEÆ

Flowers $\frac{1}{2}$ " wide, white or tinged pink, in small axillary and terminal clusters.

Fruit $\frac{1}{2}$ - $\frac{3}{4}$ " wide, rounded oblong, green.

India, Burma, Siam, Malaya: *common on rocky and sandy coasts* from Penang northward on the west and from Johore northward on the East.

In habit the Sea Lime looks very like a Citrus, its leaves standing obliquely erect. It must not be mistaken for the False Lime (*Gelonium*) which also grows on the sea-coast and has the same Malay names, but is not thorny.

CITRUS

(the Latin name for the citron)

All parts smelling of lime or orange when crushed.

Twigs generally thorny.

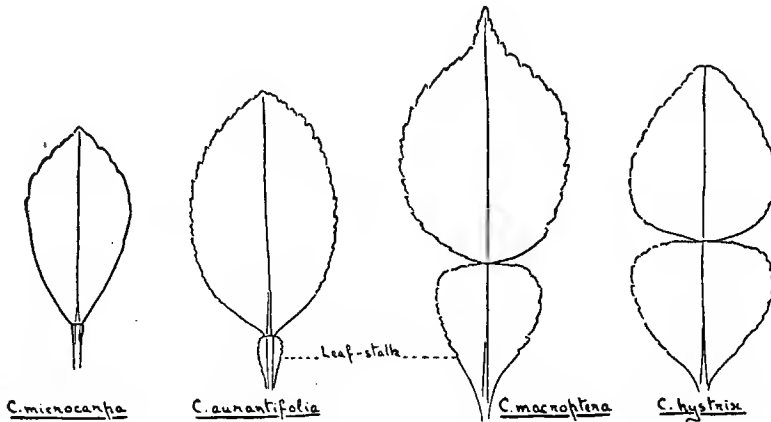
Leaves simple, spirally arranged, the stalk often winged.

Flowers clustered in the leaf-axils, white, fragrant: calyx-cup 3-5 lobed: petals 4-8, oblong: stamens 20-60, often joined: ovary 8 or more celled.

Fruit like oranges and lemons, pulpy with a rind, not opening, many-seeded.

About 30 species of tropical Asia, cultivated throughout the world: about 12 species in Malaya, two being wild.

This well-known genus is so fully described in BURKILL'S Dictionary that we give only the barest outlines necessary for identification. Beside the eight species which we describe as the commonest in villages, the following are also familiar as imported fruits: Orange (*C. sinensis*), Mandarin Oranges or Tangerine (*C. nobilis*), Grape-fruit (*C. paradisi*), Lemon (*C. limon*) and Kumquat (*C. japonica*). The most remarkable Malayan species is the False Shaddock (*C. macroptera*), the fallen fruits of which in the forest seem incongruous because they look like delicious grape-fruits, but disappointment soon follows on cutting them open.



Text-Fig. 201. Citrus-leaves, $\times \frac{1}{2}$.

Key to the common wild and village species

Leaf-stalk not or only narrowly winged, not $\frac{1}{2}$ " wide	
Leaf-stalk distinctly but narrowly winged: fruits very sour	... .. <i>C. aurantifolia</i>
Leaf-stalk not or barely winged	
Leaf oblong, not toothed: fruits 1" wide, several in a bunch	... .. <i>C. Swinglei</i>
Leaf more or less toothed or notched along the edge	
Fruit oblong, 2-3" wide: leaf 3-5 × 1-2 $\frac{1}{2}$ " : stalk not jointed to the blade	... .. <i>C. medica</i>
Fruit round: leaves narrower: stalk jointed to the blade	
Fruit 2-3" wide, rather loose-skinned	... .. <i>C. suhuiensis</i>
Fruit 1-1 $\frac{1}{2}$ " wide	... .. <i>C. microcarpa</i>
Leaf-stalk broadly winged, $\frac{1}{2}$ " wide or more	
Fruit 1 $\frac{1}{2}$ -2 $\frac{1}{2}$ " wide, wrinkled or bumpy: wing of leaf-stalk as wide as blade	... .. <i>C. hystrix</i>
Fruit 4-10" wide	
Wing of leaf-stalk much smaller than the blade: cult.	... .. <i>C. grandis</i>
Wing of leaf-stalk as wide as the blade or nearly so: wild	... .. <i>C. macroptera</i>

C. aurantifolia . Text-Fig. 201 Lime
(with leaf like the orange) *Limau Kapas, Limau Nipis*

Leaf-blade 1-3 $\frac{1}{4}$ × $\frac{3}{4}$ -2", elliptic, the edge shallowly toothed: leaf-stalk $\frac{1}{4}$ -1" long, always, with a distinct, though narrow, wing.

Fruit 1-2" wide, round, with a slight point, in clusters, green then yellow, thin-skinned, rough, with very acid yellowish green pulp.

C. grandis Pumelo, Shaddock
Limau Besar

Leaf-blade 2-6 × 1 $\frac{1}{4}$ -5 $\frac{1}{4}$ ", broadly elliptic, the edge slightly toothed: leaf-stalk strongly winged, $\frac{1}{2}$ -2 $\frac{1}{4}$ " wide, but always less than half the size of the blade.

Fruits 4-10" wide, very large, shaped as pears or grape-fruits ripening pale green to light yellow, with pale greenish yellowish or reddish pink pulp: the pegs covered by strong membranes and easily pulled apart.

(This is called *Citrus maxima* in BURKILL'S Dictionary.)

C. hystrix Text-Fig. 201 *Limau Purut*
(Gr., a hedge-hog)

Leaf-blade 1-2" long, almost as wide, slightly toothed: leaf-stalk so widely winged as to appear like the other half of a blade divided into two.

Fruit 1 $\frac{1}{2}$ -2 $\frac{1}{2}$ " wide, round, wrinkled or bumpy, green, turning more or less yellowish with sour, rather bitter, slightly fragrant, yellowish green pulp.

C. macroptera Text-Fig. 201 False Shaddock
(Gr., makros--long, pteron--wing) *Limau Hantu*

Leaf-blade 2-4 × 1 $\frac{1}{4}$ -3", broadly elliptic, distinctly toothed: leaf-stalk winged as widely as the blade and appearing as half of it.

Fruit 4-6" wide, rounded, like a grape-fruit, ripening yellow with very thick white rind and a little sour resinous pulp.

A wild tree of the middle and north of Malaya, common by the Hot Springs at Grik.

RUTACEÆ

C. medica

Citron
Limau Susu, L. Mata Kerbau

Branches spiny.
Leaf-blade 2-5 × ¾-2½", elliptic, finely toothed : leaf-stalk ¼-½" long, not winged, not jointed to the blade.

Fruits 2-3" wide, oblong, pointed, like lemons, ripening yellow, rather thin-skinned, with yellowish or whitish, very fragrant, sour but not bitter pulp.

In a variety of the Citron the five parts of the ovary develop separately to form the curious five-fingered large fruit of *limau jari* or Buddha's Fingers.

C. microcarpa Text-Fig. 201

Musk Lime
Limau Kesturi, L. Chuwit

Generally thornless.
Leaf-blade 1-2½ × ¾-1¼", elliptic, blunt or slightly pointed, slightly toothed : leaf-stalk ¼-½" long, not or scarcely winged.
Fruit 1-1½" wide, small, round, green then yellow.

C. subuiensis

(Suhu—a Chinese name) *Limau Manis, L. Hijau, L. Koppe*

Leaf-blade 1½-4 × ½-1¼", lanceolate-elliptic, the edge slightly toothed : leaf-stalk ¼-½" long, scarcely winged.
Fruit 1½-2½" wide, round, green, or yellowish green, shiny, with rather loose skin, sweet.

(This is called *C. retusa* in BURKILL'S Dictionary).

C. Swinglei

(W. T. Swingle, the American botanist) *Limau Pagar, L. Kesturi Bukit*

Leaf-blade 3-6 × 1-2", elliptic, the edge entire : leaf-stalk not or scarcely winged.
Fruit 1" wide, round or oblong, several in a bunch, yellow.

This is sometimes mistakenly called kumquat in Malaya.

CLAUSENA

(dedicated by Burman to a botanist called Clausen)

Leaves pinnate, the leaflets alternate or nearly opposite, asymmetric, with a terminal leaflet.

Flowers small, in terminal panicles longer than broad : petals 4 : stamens 8, alternately long and short, their stalks thickened.

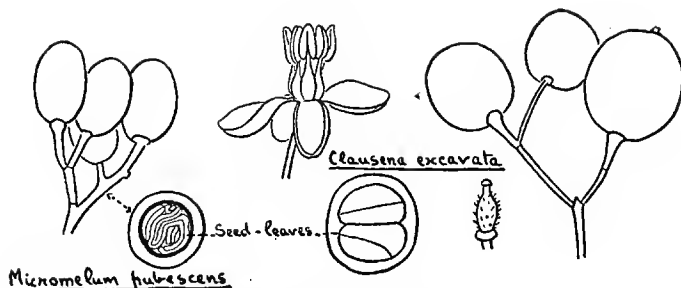
Berry small and oblong or round and medium-sized, with a short persistent style : the seed-leaves thick, fleshy, green (not crumpled).

About 25 species, mostly Indo-Malayan, a few African : 2 species in Malaya, 1 introduced.

A little care is needed to distinguish this genus from *Micromelum*, especially as Malays often give the same names to the wild species of both.

Key to the Species

Wild : leaflets many : berries small, white or pink *C. excavata*
Cult. : leaflets few : berries ¾" wide, yellow *C. lansium*



Text-Fig. 202. Clausena and Micromelum: flowers $\times 2$: fruits, nat. size.

C. excavata Text-Fig. 202
(Lat., hollowed out)

Pink Lime-Berry
Semeru, Semura, Chama, Chemama,
Cherek, Secherek, Kematu

An evergreen shrub or small tree to 40 ft. high, laxly branched and spreading, the branches ending in tassels of long, slender leaves: bark pale grey, smooth: twigs and leaf-stalks finely hairy or, more often, coarsely rough scurfy with pale yellowish scales or hair-tufts, giving a nauseous smell of resin, lime and ivy when crushed.

Leaves 8-24" long: leaflets $1-4\frac{1}{2} \times \frac{3}{4}-1\frac{1}{2}$ ", 7-20 pairs, dull green, thin, glabrous, tapered from the asymmetric base, the edge slightly wavy or faintly notched, the middle leaflets generally the largest, generally with several undeveloped leaflets at the end: leaflet-stalks $\cdot 1$ " long, short.

Flowers $\cdot 3-4$ " wide, greenish white with yellow anthers, in elongate, green panicles 4-12" long.

Fruits $\cdot 3-4$ " long, rounded, in hanging panicles green then white or translucent pink, pulpy, gland-dotted with a smell of sour, resinous oranges when crushed: containing 1-2 green seeds.

India and S. China throughout Malaysia: common throughout Malaya but especially in the north, in villages and secondary jungle and at the edge of forests.

The smell of the crushed twigs, the numerous asymmetric leaflets, the rough hairiness of many plants, and the loose bunches of white or pinkish berries easily distinguish this little tree. It is generally known as *Semeru*.

C. lansium
(as the *Langsat*, Lansium)

Wampi, Wampoi, Wang Pei

A bush or small tree with only 3-6 pairs of rather large leaflets $1-2\frac{1}{2}$ " wide.

Panicles 10-20" long.

Fruits $\frac{3}{4}$ " wide, round, finely hairy, with 5 faint ridges from the apex, gland-dotted, dull greyish yellow, in bunches: with thin rind and 2-5 green seeds each surrounded by a little white acid pulp: cut fruits with a resinous sour smell.

China: occasionally grown by Chinese in Malaya.

The clusters of resinous-smelling fruits like small, round limes distinguish this plant.

EVODIA

(Gr., euodes—sweet smelling)

Leaves trifoliate, opposite, with long stalks: leaflets finely dotted with oil-glands, smelling slightly resinous-aromatic when crushed.

Flowers very small, white or greenish white, fragrant, in stalked clusters in the leaf-axils: the parts of the flower in fours or fives: stamens 4-5.

Fruit a small 2-4 lobed thin capsule, each lobe splitting open and containing 1-2 small, dark, hard, shiny seeds: the fruits in axillary bunches like the flowers.

100 spp., Mascarene Is., E. and S. E. Asia, Polynesia: 8 spp. in Malaya, lowland and mountain.

Our only other trees with opposite, trifoliate leaves are the species of *Vitex* (Verbena-family), the leaves of which are not dotted with glands. The Malay names for *Evodias* appear to be *Inggek Burong*, *Tinggek Burong*, *Setenggek Burong* and *Pauh Pauh*, but these should be used with caution because they are given to other plants as well. Our *Evodias* are wild and rather inconspicuous trees of the forest and secondary jungle. Little is known about them.

Key to the Species

Twigs and undersides of the leaflets hairy : leaflets large, thin	<i>E. latifolia</i>
Twigs and leaves glabrous	
Flowers and fruits in long-stalked, flat-topped clusters, 4-8" wide : leaflets 6-12" long	<i>E. glabra</i>
Flowers and fruits in smaller, tapering clusters 2-4" wide	
Leaflets up to 6" long : fruits ½" wide or less, lowland	<i>E. Roxburghiana</i>
Leaflets 6-12" long : fruit ¾-1" wide : mountains	<i>E. macrocarpa</i>

E. glabra Text-Fig. 203



Text-Fig. 302. *Evodia glabra*: fruit × 2.

A tree up to 70 ft. high : *bark* pinkish grey : *leaflets* 4-10 × 2½-5" rather leathery, fleshy, with a faint lime-smell when crushed : *fruits* 2-4" wide.

Andaman Is., Malaya, Sumatra : not common.

E. latifolia

(Lat., with broad leaf)

A bush or small tree up to 30 ft. high : *leaflets* 5-12 × 2½-6", obovate or elliptic, entire, rather suddenly tipped, thin, the stalk 4-9" long : *flowers* ½" wide, in conical clusters 3-6" wide, with a rancid waxy smell (as Cinnamon-flowers).

Siam, W. Malaysia : common in secondary jungle.

E. macrocarpa

(Gr., with large fruit)

Like *E. Roxburghiana* but with large fruits and larger, leathery leaflets. Malaya : frequent in the mountains.

E. Roxburghiana

(W. Roxburgh, 1751-1815, the Scottish botanist of Calcutta)

A tree up to 80 ft. high : *bark* light brown or buff, smooth : *twigs* and leaf-stalks often blackish : *leaflets* up to 6 × 3", rather small, with upcurled sides, the leaf-stalk 1-4" long : *inflorescences* 2-3" wide.

Indo-Malaysia : common in the lowlands.

FERONIA

(an ancient Latin god)

Twigs spiny.

Leaves pinnate with a terminal leaflet, spirally arranged.

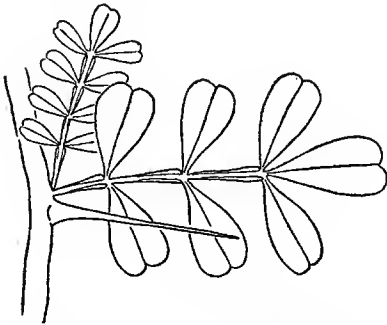
Flowers with 10-12 stamens.

Fruit large, with a woody rind and a single cavity filled with pulp, the numerous seeds embedded in it.

1 species, India, Siam.

F. limonia Plate 173, Text-Fig. 204
(late Latin for the citron)

Wood Apple

Belinggai, GelinggaiText-Fig. 204 *Feronia limonia*, $\times \frac{1}{2}$.*Fruit 2-5" wide, round, with a greyish white scurfy surface: seeds embedded in dark brown resinous pulp.*

Common in the villages of Perlis, scarce in Kedah and Upper Perak.

Like the Bel-Fruit (Aegle), the Wood Apple will thrive only in a monsoon climate. We have not seen a fruiting specimen further south than the tree in a garden off Brewster Road at Batu Gajah. In the villages of Perlis, particularly near Kangar, it is as characteristic, and almost as conspicuous; as the *Tui* (*Dolichandrone*) in the rice-fields.

In habit, the Wood Apple so much resembles a Tamarind-tree or the Madras Thorn (*Pithecellobium dulce*) that one would be hard put to it to distinguish them at a distance. It is also reminiscent of the Hawthorn-trees (*Cratægus*) of Europe. The young shoots develop like those of the Madras Thorn: at first they are clothed with leaves throughout, but these fall off and from their axillary buds there develop small clusters of leaves on unextended short shoots.

The Wood Apple grows slowly. A tree such as that in our Plate would be about 25 years old. It does not fruit till the 15th year, or even later. The leaves are shed about January: flowering begins about February or March: and the fruits gradually develop for some nine months until they ripen about October or November. Thus the tree has a simple rhythm with a single leafing, flowering and fruiting in one year.

The brown pulp of the ripe fruit is best eaten after straining through a sieve—to get rid of the seeds—and mixing with brown sugar so that it becomes like treacle: or it can be used as a flavouring. The taste is very resinous.

GLYCOSMIS

(Gr., sweet-smelling)

Leaves with 1-several pairs of leaflets and a terminal leaflet, (in a few species simple), spirally arranged.

Flowers small, in small panicles: sepals and petals 4-5: stamens 8-10: style very short.

Berry small, with 1-3 seeds.

About 40 species, S. E. Asia and Malaysia: about 8 species in Malaya, lowland and mountain.

Key to the Species

- | | |
|---|------------------------|
| A common village shrub from Perak and Kuantan northward: panicles axillary | <i>G. pentaphylla</i> |
| A small tree of forest or secondary jungle: panicles terminal, solitary | <i>G. chlorosperma</i> |

G. pentaphylla Text-Fig. 205
(Gr., with five leaves)

Village Rue
Nyerapeh, Kenapeh, Terapai, Terapeh



A sprawling, ever-green shrub up to 12 feet high: young leaves hoary.

Leaves 6-14" long with 2-3 pairs of more or less upstanding leaflets and a terminal one, the crushed leaves with a lemony smell: leaflets 2½-8 × 1-2½", narrowly elliptic, tapered to each end, the apex rather blunt, with 8-14 pairs of rather inconspicuous side-veins: leaflet-stalks 1-2" long.

Flowers ¼-½" wide, white, not or slightly fragrant, in axillary panicles 2-6" long, generally several on a twig.

Berries ½" wide, ripening white then translucent pink, slimy, edible, sweetish but with a resinous taste.

India, W. Malaysia: common in the villages of Perak (north of Ipoh), Penang, Kedah, Perlis, Kelantan and Trengganu, sprawling in the orchards and by rice-fields.

Text-Fig. 205. Village Rue (*Glycosmis pentaphylla*),
× ½: section of fruit, nat. size.

G. chlorosperma

Sweet Rue-Tree

(Gr., with green seeds)

A shrub or small tree to 40 ft. high: *bark* greyish brownish, slightly fissured.*Leaflets* 1-2 pairs (and a terminal one), with 4-8 pairs of rather strong side-veins.*Flowers* white, very fragrant (of hawthorn), in terminal panicles, 2-5" long (one at the end of each twig).

W. Malaysia: common in the lowland forest throughout the country.

MERRILLIA

(E. D. Merrill, b. 1876, the American botanist of Manila)

Like *Murraya* but *the fruit large and Citrus-like*, containing 5 cavities filled with pulp and with numerous flat seeds embedded in it.

1 species, Burma, Lower Siam, Malaya from Pahang northwards.

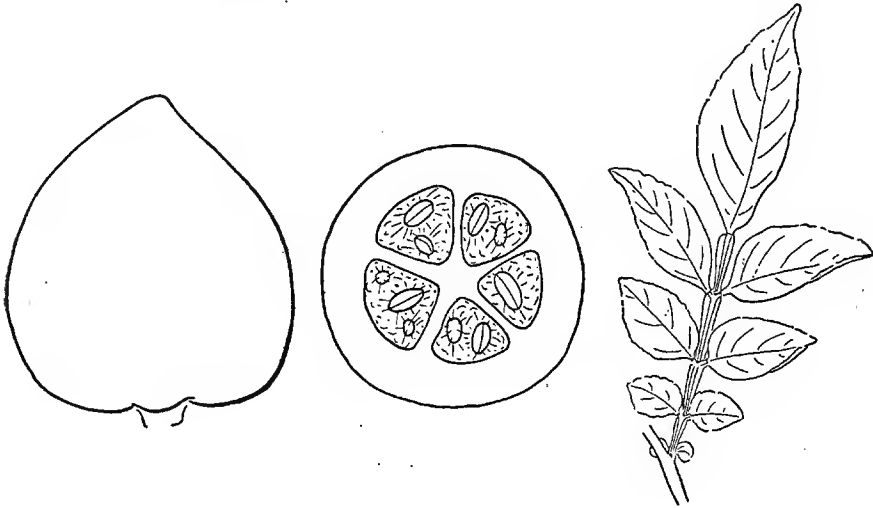
M. caloxylon Text-Fig. 206

Malay Lemon

(Gr.; kalos—beautiful, xylon—wood)

*Kemuning Gajah, Ketenggah*A small tree very like the *Kemuning* (*Murraya paniculata*) but:Leaves with or without a terminal leaflet: *leaflets* 2-4 pairs, generally more or less opposite, generally with wavy, faintly toothed edges, paler green: *leaf-stalk* narrowly winged throughout: the lower pair of leaflets very small and stipule-like: flowers larger, petals 1½" long: *fruits* 4 × 3", lemon-shaped, ripening yellow, with thick yellow rind.

This is an uncommon Malayan tree, only occasionally seen in villages. It is described and illustrated by FOXWORTHY (7, p. 52).

Text-Fig. 206. *Merrillia caloxylon*, nat. size.**MICROMELUM**

(Gr., mikros—little, melon—apple)

Like *Clausena* but:—petals 5, stamens 10, their stalks thread-like: *seed-leaves* thin, folded or crumpled: *berries* red or orange-red, without a style.

10 species, S. E. Asia, Pacific: 2 species in Malaya.

Key to the Species

- Twigs and leaves more or less glabrous: flowers in flat-topped clusters, wider than long: fruit glabrous .3" long *M. pubescens*
- Twigs and undersides of leaflets velvety: flowers in loose panicles: fruits .5" long, finely hairy *M. hirsutum*

M. pubescens Text-Fig. 202 Red Lime-Berry
(Lat., hairy) *Chama, Chemama, Cherek, Secherek*

A shrub or small tree to 25 feet high: *all parts with a harsh lime-like smell when bruised: bark grey.*

Leaves 6-18" long: leaflets 1-7 × ¾-2", 3-6 (-8) pairs, dark shiny green, thin, asymmetric, pointed, often rather large, the edges rather wavy or uneven, the stalks .1-.3" long.

Flowers .3" wide, greenish white, fragrant, in rather flat-topped, dense bunches 4-10" wide: petals bent back, white.

Fruit .4 × .2", oblong, in bunches wider than long, yellow then scarlet, glabrous, shiny, with 1-3 green seeds.

Indo-China to the Pacific: common in Malaya, especially in the north.

M. hirsutum Red Lime-Berry
(Lat., hairy) *Chama, Chemama, Cherek, Secherek*

Generally a bush: leaflets 6-10 pairs, generally finely toothed: flowers in loose panicles longer than broad, or not flat-topped: fruit ½" long, reddish.

Siam, W. Malaysia: rather infrequent in Malaya, from Negri Sembilan northward.

MURRAYA

(J. A. Murray, 1740-1791, a pupil of Linnæus)

Leaves spirally arranged, pinnate with alternate leaflets and a terminal one. Flowers solitary or clustered, axillary: sepals and petals 5: stamens 10, 5 long and 5 short.

Fruit a small oblong or rounded berry with 1-2 rather large seeds with a firm coat. 9 species, S. E. Asia, New Guinea, tropical Australia, New Caledonia: 2 species in Malaya (1 introduced).

Key to the Species

- All parts fœtid when crushed: leaflets 4-11 pairs: flowers ⅓" wide: fruits round, ⅓-½" long, black *M. Kœnigii*
- Not fœtid: leaflets 2-3 pairs: flowers ¾" wide: fruit oblong, red, ½-1" long *M. paniculata*

M. Kœnigii Curry Bush
(J. G. Kœnig, 1728-1785, a pupil of Linnæus) *Karwa Pale, Garupillai, Kerupulai*

An evergreen bush or small tree: twigs, leaf-stalks and, often, the undersides of the leaflets finely hairy.

Leaves 4-15" long: leaflets 1-2 × ¼-1", very asymmetric, narrowly elliptic and tapered to a blunt point, the lowest being the smallest, the uppermost the largest, the edge finely wavy or minutely notched.

Flowers small, white, numerous, in stalked clusters.
Ceylon, India, Siam, Indo-China : commonly grown in Malayan villages, especially by Indians.

The leaves are always eaten in Indian curries. All parts of the plant have the fulsome and rather foetid smell.

M. paniculata Plate 174, Text-Figs. 207, 208

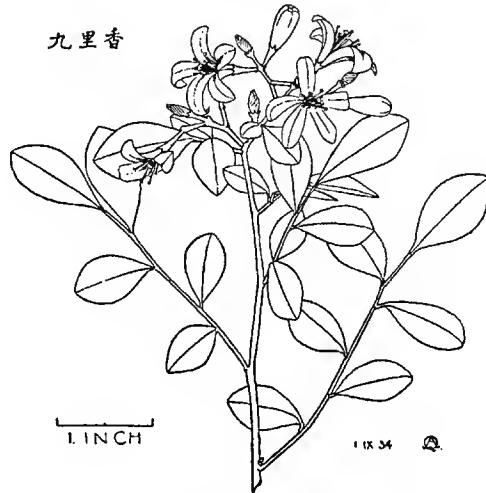
Mock Orange
Kemuning

A shrub or small tree: twigs and leaves *glabrous*.

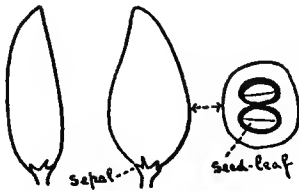
Leaves 3-6" long, leaflets 2-2½ × 1-1½, rather leathery, dark shiny green, the terminal one the largest, upstanding with up-curved sides.

Flowers solitary or few together, white.

Almost as widespread as the genus: wild in many parts of Malaya, mainly in the drier parts of the North and on the East coast, or on limestone hills: often planted in gardens.



Text-Fig. 207. *Kemuning* (*Murraya paniculata*): (by courtesy of G. A. C. Herklots, Hongkong University).



Text-Fig. 208. Fruits of *Murraya paniculata*, nat. size.

The roots of the *Kemuning* give the pale yellow wood so much prized for *kris*-handles and sheaths. The wood of the trunk is hard and dense like box (*Buxus*). The flowers are sometimes found among those offered for decorating the hair in native shops. In appearance the *Kemuning* looks like a *Citrus* on account of the dark green, upstanding leaflets. It is evergreen and, apparently, night-flowering.

PARAMIGNYA

(Gr., paramignunai—to mix in)

Differing from *Atalantia* only in a few details of the flower such as the narrow anthers and cylindrical honey-disc.

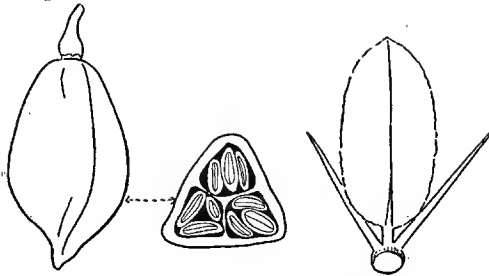
About 10 species, Indo-Malaysia: 4 species in Malaya.

RUTACEÆ

P. angulata Text-Fig. 209

Mangrove Lime

Limau Lelang, L. Lilang



Text-Fig. 209. *Paramignya angulata*: fruit and leaf, nat. size.

A thorny lime-like bush giving out a lime-like resinous odour when bruised: thorns $\frac{1}{2}$ - $1\frac{1}{2}$ " long, in pairs on the twigs.

Leaf-blade 1-5 x $\frac{1}{2}$ -2", oblong, blunt or slightly pointed, slightly notched round the edge, upturned: stalks 1-2" long.

Flowers axillary, $\frac{1}{2}$ " long, white, fragrant: 5 petals; 10 stamens.

Fruit about 1" long, 3-4 angled, pointed, green, with 3-4 cavities filled with slimy green seeds, singly or in pairs in the leaf-axils.

Malaysia: frequent in mangrove swamps in the southern half of Malaya.

This plant is much sought for by Malays who value it medicinally.

TRIPHASIA

(Gr., threefold)

Twigs spiny.

Leaves trifoliate, alternate.

Flowers solitary or in groups of 3 in the leaf-axils: petals 3: stamens 6.

Fruit a small berry with thin, gland-dotted wall and 3 cavities each filled with 1-3 large slimy seeds.

2 species, tropical Asia: 1 species introduced to Malaya.

T. trifolia Plate 174

Lime-Berry

Limau Kiah, L. Kikir, L. Kelingket

A low, spreading, spiny, evergreen bush with slender zig-zag twigs and pairs of axillary spines.

Leaves 1-1 $\frac{3}{4}$ " long, small, very shortly stalked, leathery, dark green.

Flowers $\frac{1}{2}$ " wide, white, turned to the underside of the twig.

Berry $\frac{1}{2}$ " long, green then dull orange and finally dull red, with a slimy resinous taste.

Possibly a native of China but not found in the wild state: frequent in Malayan villages, especially in the north of the country.

As a small village-fruit, the Lime-Berry appears to be losing favour. It makes a useful hedge.

ZANTHOXYLUM

(Gr., xanthos—yellow, xulon—wood)

Trunk and twigs spiny with conical or recurved thorns: twigs with septate pith, often becoming hollow.

Leaves pinnate with a terminal leaflet, spirally arranged, the leaf-stalk often thorny: the crushed leaves (and twigs) with a resinous, lime-like smell.

Flowers small in long-stalked, axillary or terminal clusters, male and female on different trees: sepals 4-5, small: petals 4-5: stamens 4-5: ovaries with 1-3 parts.

Fruit single or 3-lobed, each lobe splitting as in *Evodia* and containing 1 rounded black seed.

About 200 species throughout the tropics: 5 species in Malaya.

A few kinds of sprawling thorny shrubs, a rather common mountain tree and an uncommon tree of the neighbourhood of Kota Bahru, conspicuous from their horrid stems, belong to this genus. The fruits of some exotic species of India, China and Japan are used as substitutes for pepper, and the bark, fruit and seeds of others are used medicinally.

The following species must not be mistaken for the spiny trees of the Ivy-family (Araliaceæ) which have an inferior ovary to the flower, berries for their fruits and, generally, palmate leaves.

Key to the Species

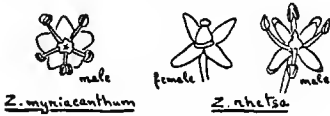
Mountain tree with the leaflets finely toothed *Z. myriacanthum*
 Lowland tree of Kelantan with entire leaflets *Z. rhetsa*

Z. myriacanthum Text-Fig. 210
 (Gr., thousands of thorns)

Thorny Ivy-Rue
Chenkring, Kabu Kabu Utan

A small or moderate-sized tree up to 60 ft. high with pale grey or brownish *trunk studded with small and generally thorny knobs*: crown open, with a few spreading upcurved branches: *twigs stout, hollow, densely prickly*: leaf-stalks and inflorescence-stalks often thorny.

Leaves 12-24" long with 5-10 pairs of leaflets speckled with fine transparent dots: leaflets 3-7 × 1-2½", elliptic, pointed, the base rounded and slightly asymmetric, *the edge very minutely and closely toothed*, with 9-16 pairs of side-veins: leaflet-stalks 2-3" long.



Text-Fig. 210. *Zanthoxylum*, × 2.

Flowers 15-2" wide, white, scentless, in flat-topped, axillary clusters, 3-6" wide, on stalks 4-7" long: *sepals, petals and stamens 5*.

Fruit 3" wide, 3-lobed, each lobe with a seed.

Malay Peninsula, Sumatra: rather common in forest and secondary jungle from 1,500-4,000 ft., from Malacca northward: abundant on Penang Hill and Fraser's Hill.

The Malay name, *Kabu Kabu Utan*, merely indicates the resemblance of the tree to the *Kabu Kabu* or *Kapok* (*Ceiba* and *Salmalia*).

Z. rhetsa Text-Fig. 210
 (an Indian plant-name)

Indian Ivy-Rue
Hantu Duri, Hantu Duri

A deciduous tree, with the shape of a *Spondias* (*Kedondang*), but thorny like the preceding species and differing from it in these points:—

Trunk set with very stout woody, conical or compressed thorns ½-1" long, often in rows.

Leaves smaller, 6-20" long, with 5-14 pairs of rather smaller *nearly sessile, entire leaflets with a rather long point and very asymmetric base*.

Flowers greenish white, in terminal panicles: *sepals, petals and stamens 4*.

Fruit as a single rounded green body, ¼" wide, from each flower, splitting open and showing the one black seed.

India, Indo-China, Siam, Malaya: frequent in the rice-fields and open jungle of Kelantan.

This tree has been found, as yet, in Malaya only in the neighbourhood of Kota Bahru where it is well-known in the villages. The thorny trunk suggests that of the *Chekring* (*Erythrina fusca*). The trees are deciduous about March or April and they flower just after the new leaves have unfolded or, on some twigs, before they develop. The hard black seeds are collected by the children as pellets for their bamboo pea-shooters (*bedil buloh*).

WILLOW FAMILY

Salicaceæ

Leaves alternate or spirally arranged, simple: stipules small.

Flowers very small and simplified, unisexual, *set in catkins*, male and female on different trees: sepals and petals none: male flowers consisting of a cluster of stamens in the axil of a small bract: female flowers consisting of a small ovary in the axil of a bract.

Fruit a tiny capsule containing silky, plumed seeds.

2 genera, some 200 species, chiefly in the north temperate region.

To this family belong the Willows (*Salix*) and the Poplars (*Populus*), common in temperate countries of the northern hemisphere. Only one species occurs extensively in Malaya. It is a willow that has been brought from India or China and it seems that only the male plant has been introduced because neither female plants nor seedlings have been found. It is commonly grown in rice-fields from Negri Sembilan northward to Perlis and Kelantan, as isolated trees marking boundaries or as a hedge, and it is propagated by cuttings. It is a deciduous tree that sheds its leaves after the dry weather in the beginning of the year and, generally, also after the second dry spell about July and August. The catkins are produced at the ends of very short twigs that have only dwarfed leaves and that develop from the bare-parts of the branches about the time that the new leafy shoots are forming at the ends. They are sweet-scented and attract insects which come for the honey that is secreted from the nectary at the base of the stamens.

The narrow drooping leaves, the drooping ends of the branches and the catkins give to the Willow an appearance unlike that of most Malayan trees except the *Gurah* (*Sapium indicum*) which has a similar habit and grows in the same places, though never so far inland. But the *Gurah* has a heavier, darker green crown, large round fruits, different bark and latex in the twigs, so that the two are not likely to be mistaken.

SALIX

(Lat., a willow)

Key to the Species

- | | |
|--|---------------------------|
| Twigs and leaf-stalks reddish on the upper side, glabrous: | |
| foliage dark green: rice-fields ... | ... <i>S. tetrasperma</i> |
| Twigs and leaf-stalks light green, finely hairy: foliage | |
| light green: branches drooping: gardens ... | ... <i>Salix</i> sp. |

S. tetrasperma Plate 175
(Gr., with 4 seeds)

Indian Willow
Dalu Dalu, Dedalu, Medalu, Mendalu

A graceful, deciduous tree reaching 80 ft. high, generally much less, with leafy, cylindrical crown composed of several upright branches drooping at the ends and often set with numerous upright twigs along their upper sides, the lower branches strongly drooping, the trunk carried high into the crown of large trees: *bark* light grey to brownish grey, becoming rather deeply furrowed with flat ridges: *twigs and leaves glabrous: the upper sides of the leaf-stalks and the young twigs reddish*: young leaves pale green.

Leaf-blade $3-6\frac{1}{2} \times \frac{1}{4}-1\frac{1}{2}$ "", lanceolate, narrow, tapered to a long tip, the edge toothed, thin, rather glaucous beneath, dark green above, side-veins numerous: stalk $\frac{1}{2}$ - $\frac{3}{4}$ " long.

Catkins $1\frac{1}{2}$ -4" long, hairy: stamens 3-10 in each male flower.

(Fruits tiny, $\frac{1}{8}$ " wide, crowded on the female catkin: each with 4-6 seeds).

India, China: in the rice-fields of the middle and north of Malaya, introduced.

Salix sp.

Weeping Willow

A small tree with thin light-green crown and slender drooping twigs: *twigs and leaf-stalks finely hairy, light green*.

Leaf-blade $3-6 \times .4-6$ "", light green, slightly glaucous beneath: stalk $\frac{1}{4}-\frac{1}{2}$ " long.

Male catkins short, bracts hairy, disc 2-lobed, stamens 2.

Occasionally cultivated in Malayan gardens.

This quick-growing and dainty tree deserves to be much better known because it is one of the few 'weeping trees' which we have to ornament our gardens. What its botanical name is or how it was introduced, we have not been able to discover. It seems closely related, if not identical, with the Chinese Weeping Willow (*Salix babylonica*) of temperate countries.

SOAP-NUT FAMILY

Sapindaceæ

(from the genus *Sapindus*)

Leaves spirally arranged, pinnate and generally without a terminal leaflet, in a few cases trifoliate and even simple (*Dodonæa*): *leaflets generally alternate*.

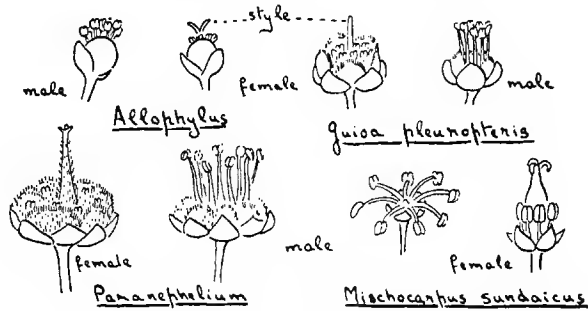
Flowers small, often rather lop-sided, commonly male or bisexual in the same inflorescence or on different plants, clustered or paniced: *sepals* 4-5: *petals* 4-5 or absent, often small and inconspicuous, *separate*, often with 1-2 hairy scales at the base of each: *stamens* 5-8: *ovary* superior, with 2-3 lobes or 2-3 cavities and surrounded by a ring-like nectary or honey-disc.

Fruit variable but characteristic of each genus, typically 3-angled, 3-lobed or of 3 separate parts (1-2 parts often being abortive).

About 2,000 spp., 150 genera, throughout the world, mostly tropical: 20 genera, 60 spp. in Malaya, chiefly in lowland forest.

This large family contains our fruit trees *Rambutan* and *Pulasan* (*Nephelium*) and several common, yet little known, wayside trees deserving of cultivation. The family consists mainly of trees and shrubs with a few climbers, and its typical members can be recognized from the panicle of small flowers, the pinnate leaf without a terminal leaflet and the groove or pit at the base of the leaf-stalk which is continuous with a groove on the twigs. The last leaflet on the

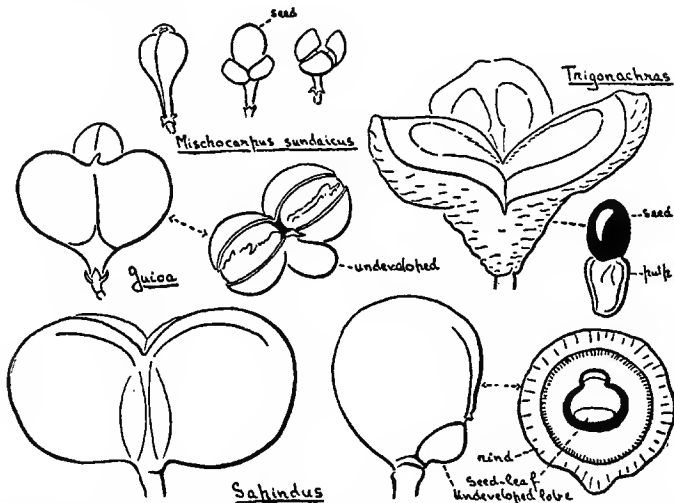
leaf-stalk may appear to be terminal but, actually, in all cases (except *Paranephelium*) a small spike can be found on one side of the stalk of this leaflet to indicate the real end of the leaf-stalk. The *Rambutan*, *Kelat Layu* (*Erioglossum*) and Hop Tree (*Arfeuillea*) provide the best introduction.



Text-Fig. 211. Flowers of the Soapnut-family (Sapindaceæ). × 2.

It is not easy to distinguish the genera without the fruit. The flowers are also distinctive but, being small, they are difficult to study. In the five genera *Allophylus*, *Erioglossum*, *Nephelium*, *Pometia* and *Xerospermum*, the lobes of the ovary enlarge separately into fleshy fruits so that three separate fruits should spring from one flower but generally one or two lobes are abortive and remain at the base of the one (or two) which enlarges. In *Guioa*, *Mischocarpus*, *Arfeuillea* and *Dodonæa*, by contrast, the ovary has two or three cavities and enlarges into a capsule with two or three angles.

Allied with the family are the north temperate Sycamore and Maple trees (*Acer*: *Aceraceæ*), one species of which (*A. niveum*) occurs in our high mountains, its "keys" being found on Gunung Brinchang at Cameron Highlands, and also the north temperate Horse-Chestnut trees (*Aesculus*) which are sometimes included in the *Sapindaceæ*.



Text-Fig. 212. Fruits of the Soapnut-family (Sapindaceæ), nat. size.

Key to the Genera

- Leaves simple *Dodonaea* p. 586
 Leaves trifoliate *Allophylus* p. 584
 Leaves pinnate
 Leaves with 1-2 (-3) pairs of leaflets
 Fruit oblong, containing a pulpy seed like the
Rambutan: fruit round, wrinkled or set
 with small pointed warts
 Fruit yellow, with yellow pulp *Xerospermum* p. 596
 Fruit red with white pulp *Nephelium glabrum* p. 591
 Fruit 3-angled, splitting open, small: often
 coastal
 Leaves rather whitish or glaucous beneath,
 the stalk more or less winged: inflores-
 cences not or scarcely branched: fruits
 strongly angled or 3-winged *Guioa* p. 587
 Leaves not glaucous, the stalk not winged:
 inflorescences branched: fruits slightly
 angled, not winged: seashores *Mischocarpus* p. 588
 Leaves with 3 to many pairs of leaflets
 Leaflets toothed: young leaves reddish pink, in
 flushes
 Leaflets 4-5 pairs, with a terminal leaflet:
 small weak tree *Paranephelium* p. 593
 Leaflets 4-10 pairs or more, without a
 terminal leaflet, but the lower leaflets
 on the stalk stipule-like: big trees with
 orange-brown bark *Pometia* p. 594
 Leaflets not toothed
 Twigs and leaves finely hairy: fruits $\frac{1}{2}$ " long
 or less, red then black, smooth, pulpy:
 common village tree *Erioglossum* p. 586
 Not so
 Small tree with bun-shaped crown: fruits
 like green bladders with 3 wings:
 planted in Singapore *Arfeuillea* p. 585
 Fruits like *Rambutan* or *Pulasan* with a
 large pulpy seed *Nephelium* p. 589
 Not so
 Fruit round, with soapy sap, not open-
 ing: leaflets many: cultivated,
 scarce *Sapindus* p. 595
 Fruit 3-shouldered, yellow to red,
 splitting open, $1\frac{1}{2}$ " long or more:
 wild *Trigonachras* p. 596
 Not so: fruit $\frac{2}{3}$ " long or less, splitting
 open: wild
 Leaflets whitish or glaucous beneath:
 inflorescences not or scarcely
 branched: fruits 3-winged *Guioa* p. 587
 Leaflets not glaucous: inflorescences
 branched: fruits slightly 3-angled *Mischocarpus* p. 588

ALLOPHYLUS

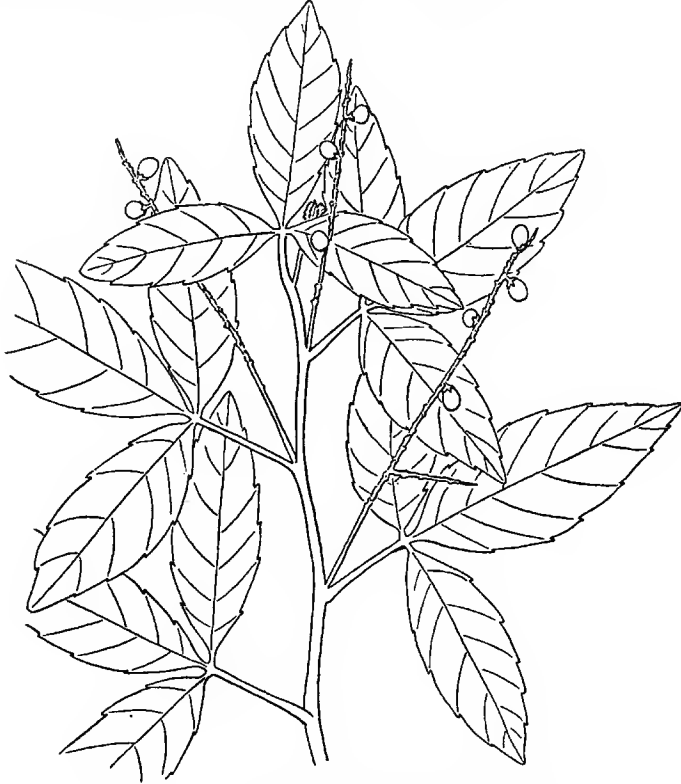
(Gr., of another tribe)

Leaves trifoliate, spirally arranged, the leaflets shortly stalked and generally more or less toothed.

Flowers small, about $\cdot 1$ " wide, *white*, faintly fragrant, shortly stalked, *flattened and oblique*, male or female, *in unbranched or sparingly branched spike-like inflorescences from the leaf-axils*: *sepals* 4, persistent: *petals* 4, white, hairy, grouped on one side of the flower: *stamens* 8, with hairy stalks grouped on the other side of the flower from the petals: *ovary* with 2 lobes, generally only one enlarging into a fruit, the other abortive.

Fruit $\frac{1}{3}$ " long; *oblong or round*, *thinly fleshy*, *dull orange red*, containing one large seed, not splitting open: several fruits on an inflorescence.

Several spp. throughout the tropics: 1 sp. in Malaya.



Text-Fig. 213. Tit-Berry (*Allophylus cobbe*), $\times \frac{1}{2}$.

A. cobbe Text-Figs. 211, 213
(the Ceylonese plant-name *kobbæ*)
Tropical Asia.

Tit-Berry

Under this name we group some common and very variable evergreen shrubs and small trees (up to 40 ft. high). They have been divided into eight species but the divisions are unsatisfactory and there are so many intermediate states that we prefer the opinion of the older botanists who regarded them as one species. The trifoliate leaves and the axillary spikes of small flowers or orange berries will at once distinguish them. They occur mostly on the seashore

Key to the Varieties of *A. cobbe*

- Twigs, leaf-stalks and undersides of the leaflets velvety with rather long hairs: leaflets $4-12 \times 1\frac{1}{2}-5''$, thin, toothed: *inland jungle* var. *villosus*
- Twigs and leaf-stalks glabrous or only finely velvety, the leaflets never velvety beneath
- Leaves without hair-tufts to the axils of the veins:
- glabrous: leaflets $3-11 \times 1-4''$, large, thinly leathery: *inland jungle* var. *glaber*
- Leaves with hair-tufts in the axils of the veins on the underside of the blade
- Twigs and leaf-stalks finely velvety: leaflets rather small and narrow ($2-5 \times \frac{3}{4}-2\frac{1}{4}''$), thin: *sandy and rocky coasts* (? inland) var. *velutinus*
- Twigs, etc., soon glabrous
- Leaflets large, $2\frac{1}{2}-8 \times 1\frac{1}{2}-4''$, light green: twigs whitish: generally a spindly tree: *sandy and rocky shores of the East Coast* var. *marinus*
- Leaflets small, $2-5\frac{1}{2} \times \frac{3}{4}-2\frac{1}{2}''$, dark shining green, drooping, with wavy edge: twigs dark brownish: generally bushy: *mangrove forest and mud* var. *limosus*

ARFEUILLEA

(probably named by the French botanist Pierre, of Indo-China, after a friend Arfeuille)

Leaves pinnate, spirally arranged, no terminal leaflet.

Flowers in terminal panicles, some flowers male, others bisexual: sepals 5: petals 4-5, very small: stamens 7-8.

Fruit inflated, bladder-like, with 3 wings, dry and papery, thin, *splitting into 3 parts with 1-2 seeds attached to each, the parts blowing away*: seeds hard, round, black, finely hairy, without pulp.

1 species, Siam, Cambodia.

A. arborescens Plate 176
(tree-like)

Hop Tree

A small tree up to 30 ft. high with *light green, broad, compact, round but rather uneven crown*: twigs greyish, brittle, rough.

Leaflets $1-3 \times \frac{1}{2}-1\frac{1}{2}''$, 3-4 pairs, elliptic, rather asymmetric at the base, shortly stalked, *the sides curled back*.

Flowers $\frac{1}{2}''$ wide, *star-shaped, greenish-white*, in softly hairy panicles, 6-10" long: *sepals purplish brown*: petals white: stamens green with pinkish orange anthers: honey-disc green.

Fruit $1-1\frac{1}{2}''$ long, yellowish green.

This shady little tree has been introduced to Singapore and has been planted along Orchard Road, Edinburgh Road and a few other thoroughfares of the town. It grows slowly and it tends to lose its even bun-shaped appearance now and again by sending out a few long, leafy, straggling branches in advance of the general crown, but normally it has the ideal shape for a small roadside tree. It is ever-green and produces flowers and fruits after dry weather. It is a good example of the family for botanical teaching.

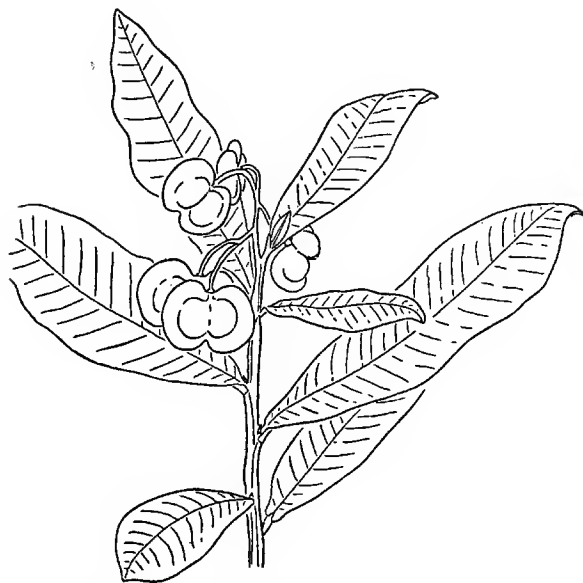
DODONÆA

(R. Dodoens, 1517-1585, a Dutch physician and botanist)

*Leaves simple, spirally arranged.**Flowers small, green, in axillary clusters, a few male, mostly bisexual: sepals 4: petals 0: stamens 4-5, very short: style thickened and flattened.**Fruit a flattened, bag-like capsule with 2 halves each with a rounded wing, splitting open and disclosing 1-2 round black seeds in each half.*

54 species, tropics: 1 species in Malaya.

The distribution of this genus is remarkable. All but two species occur in Australia. Of these Australian ones, *D. viscosa* occurs also throughout the tropics and sub-tropics of both hemispheres, and a second species occurs also in South Africa. Of the two which are not native to Australia, one occurs in Madagascar and the other in the Hawaiian Islands. Some of the Australian species have pinnate leaves.

D. viscosa Text-Fig. 214Text-Fig. 214. *Seringan Laut (Dodonaea viscosa)*, $\times \frac{1}{2}$.*Seringan, S. Laut*

A bush or small tree up to 20 ft. high: bark grey-brown, narrowly but deeply ridged and fissured: twigs rather angular, green: buds thinly varnished with resin.

Leaves $2-5 \times \frac{1}{2}-1\frac{1}{2}$ ", lanceolate-elliptic, occasionally tipped, gradually narrowed to the very short stalk ($\cdot 1$ " long or less), light green, the sides recurled and wavy, entire, with many side-veins.

Flowers $\cdot 2$ " wide, in clusters $1-1\frac{1}{2}$ " long.

Fruit $\cdot 6-8$ " wide, notched between the lobes, green then light brownish or buff and papery.

Tropics generally: frequent on the sandy shores of the East Coast from Kuala Sedili northward, on the West Coast from Lumut northward.

This elegant little tree resembles a sapling *Tembusu (Fagraea fragrans)* in its light, fine foliage, its bark, and its varnished buds. The timber is extraordinary hard.

ERIOGLOSSUM

(Gr., erion—wool, glossa—tongue: from the petal-scale)

*Leaves pinnate, without a terminal leaflet, the upper leaflets being the largest.**Flowers small, radially symmetrical, male or bisexual, in terminal panicles: sepals 5: petals 4, each with a hairy scale at the base: stamens 8: ovary with 3 lobes and a single undivided style.**Fruit as small, oblong, thinly fleshy, smooth, succulent berries singly or 2-3 together (1-3 from each flower) set in panicles: berries with one large seed.*

1 species, tropical Asia to N. Australia.

E. rubiginosum Plate 177
(Lat., rust-coloured)

Kelat Layu, Mertajam,
Terajah, Terajan (Kel., Tr.)

An evergreen shrub or medium-sized tree with compact bushy crown of light green, drooping leaflets: all parts softly hairy, the buds and young shoots bronzen silky: bark rufous brown, becoming dingy and flaky: twigs reddish brown, faintly grooved when young.

Leaves 6–20" long: leaflets $3-7\frac{1}{2} \times 1\frac{1}{4}-2\frac{3}{4}$ ", 4–6 pairs, rather large, shortly stalked, narrowly elliptic, blunt, thin, with 10–15 pairs of side-veins, stalk becoming flushed reddish brown on the upperside and at the swollen base, with a faint groove on each side of the base.

Flowers $\frac{1}{4}$ " wide, very fragrant (honey sweet), never opening fully, in small groups arranged in upright panicles 5–12" long, the crowded shrubby flower-stalks persisting: petals white.

Fruits $\frac{1}{2}-\frac{3}{4}$ " long, finely hairy, ripening yellow, then orange, dull cherry red, purple and finally nearly black, with thin, juicy, sweetish and slightly astringent pulp, no rind.

Common in villages and waste places: occasionally wild in the forest.

Where it grows in villages the Kelat Layu is usually lopped and misshapen, but if allowed to develop to perfection it is a beautiful tree with soft, pale drooping foliage, fragrant white panicles and attractive bunches of fruits which pass through kaleidoscopic colours as they ripen. The fruits are barely worth eating, though much relished by children who walk about with the grape-like bunches in their hands. The young shoots can be eaten as a vegetable. Nowhere have we seen the tree so abundant as in the kampongs of Kota Bahru.

Like the Rambutan (*Nephelium lappaceum*), the Kelat Layu flowers twice a year after the periods of dry weather. The male and bisexual flowers occur on the same panicles. The bisexual flowers occur singly in the flower-clusters near the base of the inflorescence and its branches, and they are the first to open: after they have flowered, the males begin to open. Each panicle has therefore a short female phase of a few days, followed by a long male phase, just as in the Buah Keras (Aleurites) and the Rubber Tree (Hevea), and self-pollination is unlikely or impossible on the same inflorescence.

The name Kelat Layu refers to the resemblance of the opposite leaflets and the fruits to the opposite leaves and fruits of the Kelat-trees (*Eugenia*): the leaflets, moreover, droop as if withering (*layu*).

Compare the Mata Kuching (*Nephelium malaiense*) with dark green, shiny leaves.

GUIOA

(J. Guio, an eighteenth century Spanish botanist)

Leaves pinnate, spirally arranged, without a terminal leaflet.

Flowers small, white, often fragrant, in simple or sparingly branched, spike-like inflorescences from the leaf-axils: sepals 5: petals 5, each with two hairy scales at the base and often nearly as large as the petal: stamens 8: ovary with 3 angles and cavities.

Fruit boldly 3-lobed but often only 1–2 lobes with fully developed seeds, splitting open along the lobes, with one seed in each lobe, ripening pink to red, glabrous: seeds more or less covered with thin orange pulp.

About 60 spp., Indo-Malaysia, Australasia: 4 spp. in Malaya.

The plants of this genus are small trees up to 40 ft. high, most easily recognisable from their fruits. Their leaflets are generally distinctly curved or asymmetric and greenish white or glaucous beneath. One of the leaflets towards the end of the leaf-stalk often appears to be terminal but on one side of its attachment the little spike-like end of the leaf-stalk can always be found. The species appear to be called indiscriminately by the Malay names which we have listed for *G. pleuropteris*.

Key to the Species

- Glabrous or nearly so: leaflets 1-2 pairs, the leaf-stalk more or less winged: throughout Malaya, chiefly riverbanks *G. bijuga*
- Twigs, leaf-stalks and undersides of the leaflets more or less silky hairy
- Leaflets 2-3 pairs, rather broad: leaf-stalk winged: sandy beaches of the East Coast *G. pleuropteris*
- Leaflets 3-5 pairs, rather narrow: leaf-stalk not winged: inland
- Leaflets closely silky beneath: Malacca, Johore, Singapore *G. pubescens*
- Leaflets thinly hairy beneath: Perak, Penang, Kedah *G. fuscidula*

G. bijuga

Senyamok

(Lat., with two yokes)

As *G. pleuropteris* but:—glabrous: leaflets 1-2 pairs: leaf-stalk narrowly or rather widely winged: flowers scentless.

Siam, Malaya: in secondary jungle throughout the country.

G. fuscidula

Senyamok

(Lat., rather dark)

Like *G. pubescens* but the leaflets only sparsely hairy beneath.

Siam, North Malaya: in secondary jungle, common on Penang Hill.

G. pleuropteris

Text-Figs. 211, 212

Nyamok, Senyamok,

(Gr., pleuron—a rib, pteron—a wing)

Penyamok, Sugi Damar (Kel.)

Leaves 6-12" long, leaflets $1\frac{1}{2}$ -7 × $\frac{3}{4}$ -2 $\frac{1}{2}$ ", 2-3 pairs.

Inflorescences 2-5" long: flowers .15" wide: stamens pinkish.

Fruit $\frac{3}{4}$ " long and wide.

W. Malaysia and the Philippines: only on the East Coast of Malaya: often only a shrub.

G. pubescens

Plate 178

Senyamok

(Lat., hairy)

As *G. pleuropteris* but:—leaflets 3-5 pairs, rather narrow, distinctly curved and asymmetric, finely and closely silky beneath, the leaf-stalk not winged: flowers faintly fragrant.

W. Malaysia, Philippines: common in secondary jungle in the south of Malaya.

The flowering season of this species, which is our only one in Singapore, is variable and lies generally between July and October.

MISCHOCARPUS

(Gr., mischos—a stalk, karpos—a fruit)

Leaves pinnate, spirally arranged, no terminal leaflet.

Flowers small, greenish yellow or greenish white, in axillary and terminal spikes or panicles, male and bisexual flowers on different trees: sepals 5: petals 0: honey-disc yellow: stamens 8.

Fruit rather small, pear-shaped, stalked, sharply or bluntly 3-angled (not winged), with thin smooth rind splitting into 3 parts shrinking or curling back on themselves and exposing the single seed: seed large, shiny brown, covered with a thin red waxy-pulpy layer, dangling on a white stalk.

20 species, Indo-Malaysia to Australia: 2 species in Malaya.

It is difficult to distinguish the species of this genus from those of *Nephegium* unless they are in fruit. The common species, *M. sundaicus*, is easily recognized however, by its few pairs of leaflets. The red seed-pulp is said to be edible.

Key to the Species

Leaflets 1-3 pairs : sandy heaths and seashores ... *M. sundaicus*
 Leaflets 3-6 pairs : inland *M. sumatranus*

M. sumatranus

Sugi

Like *M. sundaicus* but,—*leaves* larger, up to 20" long : *leaflets* 4-11 × 1½-3", 3-6 pairs, narrowly elliptic and oblong, with 12-16 pairs of side-veins : *inflorescences* 6-12" long, with frequent branching throughout : *fruits* larger, about ¾" long, with 3 rounded, faint angles, ripening greenish black.

Malaya, Sumatra, Borneo : chiefly by riversides and inland secondary jungle.

M. sundaicus Text-Figs. 211, 212

Sugi

(from the Sunda IIs.)

A shrub or small tree up to 40 ft., glabrous except the inflorescence : *young leaves* pinkish brown.

Leaves up to 10" long : *leaflets* 2-9 × ¾-3", 1-3 pairs, pointing down, elliptic or ovate elliptic, tapered to a rather blunt notched apex, shortly stalked, thinly leathery, entire, with 8-11 pairs of side-veins.

Inflorescences 3-9" long, unbranched or with only a few branches at the base, green : *flowers* ½" wide.

Fruit ½" long, at first sharply 3-angled, ripening red.

Indo-Malaysia Australia : common on sandy heaths and sandy coasts in Malaya.

Trees of this are like the *Rambutan* (*Nephegium lappaceum*) but the inflorescences are denser, the leaflets point down and the young leaves are pinkish. The young shoots can be eaten. (The species is called *M. Lessertianus* in BURKILL'S Dictionary).

NEPHELIUM

(Gr., nephelion—a little cloud)

Twigs grooved when young : buds and young shoots brownish silky.

Leaves pinnate with alternate or opposite, entire, shortly stalked leaflets, no terminal leaflet : leaf-stalk with a pit or groove on each side of the base.

Flowers small, greenish white to pinkish in terminal panicles, male and bisexual flowers generally on different plants : sepals 4-5 : petals 4-5 or absent : stamens 6-8 : ovary with 1-2, rarely, 3, lobes, one or both lobes enlarging separately into a fruit.

Fruit medium to large, with a hairy, softly bristly or knobby, yellow, red or purple rind enclosing a large seed surrounded with white or yellowish pulp : the seed-leaves in line with the long axis of the seed.

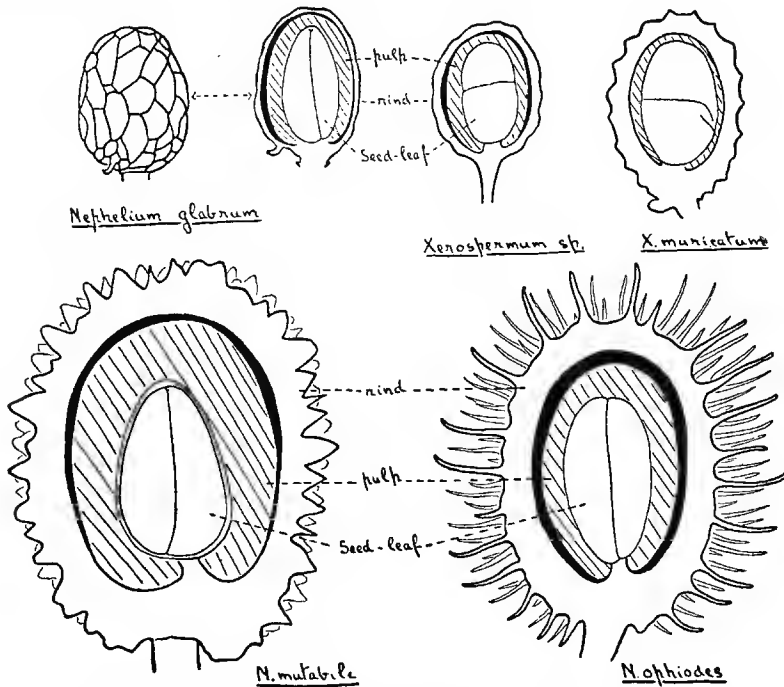
About 70 species, tropical Asia and Australia : 16 species in Malaya, in lowland forest.

The fruit trees known as *Rambutan*, *Pulasan*, *Mata Kuching* and *Litchi*, together with several rather common forest allies belong to this genus. In flower and foliage the species are much alike, but they are readily distinguished by a few obvious characters of the fruits, twigs and leaflets. The genus is not difficult to recognize, even in the case of sterile plants, from the grooved twigs, the leaflets varying alternate to opposite and scarcely asymmetric, and the absence of the terminal leaflet.

The pulp of the seed is edible in all our species though it is scant and acid in several wild ones. The *Pulasan* and Penang-variety of the *Rambutan* are considered to have the best because it is full and sweet and separates from

the seed, though neither can equal the Chinese Litchi. This property of the pulp, by which it separates from the seed at maturity, appears to be the result of cultivation because it is seldom, if ever, found in wild fruits, e.g. plums, mangoes.

All the Malayan species are evergreen and flower after dry weather, generally giving two crops of fruit a year at the same time as the *Durian* and *Mangosteen* (January, July). It is doubtful, however, if every tree flowers twice a year. It should be remarked in this respect that, because of the separation of the male flowers and bisexual flowers on different trees, the male trees will not set fruit.¹



Text-Fig. 215. *Nephelium* and *Xerospermum*: fruits, nat. size.

As for the origin of these fruit trees, it seems that *Rambutan*, *Pulasan* and *Mata Kuching* are wild in the Malayan forests: or, if not, then there are wild species so close to them that there can be no doubt of their origin in Western Malaysia. It seems that they, or their progenitors, as is the case with most of our local fruits, evolved on the Sunda-shelf at the time when there was one tract of rain-forest connecting Malaya, Borneo, Sumatra and Java. But who first cultivated them, no one knows.

The Malay names of the wild species require further study, as BURKILL remarks. *Rambutan Utan* and *Rambutan Pachat* are frequently used as well as *Sanggal Lotong* by which is meant that "the processes of the fruit are braided as hair by the lotong monkeys." *Grik* is said to be Sakai name. There are probably several undescribed species of *Nephelium* in the middle of the country.

1. The bisexual trees carry pollen. It seems therefore that the male trees are useless though it is possible that the bisexual flowers must be cross-pollinated from the male trees to set fruit. The relation is not known.

Mata Kuching and Litchi are placed by some botanists in a separate genus, mainly because the pulp of the seed is separable from the seed-coat, but there is little to gain from dissociating plants so obviously akin as these are with the other species of *Nephelium*.

Key to the Species

- Twigs and leaf-stalks brown velvety: wild
 - Leaflets glaucous beneath, narrow *N. ophioides*
 - Leaflets velvety beneath, not glaucous, rather broad *N. eriopetalum*
- Not brown velvety
 - Undersides of leaflets finely velvety: fruit nearly smooth, round, brownish: *Mata Kuching* ... *N. malaiense*
 - Underside of leaflets nearly or quite glabrous: fruit oblong
 - Leaflets rather broad, 1½-3½" wide
 - Leaflets 2-4 pairs: fruit set with long thick wavy hairs or soft spines: *Rambutan* ... *N. lappaceum*
 - Leaflets 1-2 pairs: fruit faintly knobbed or wrinkled: *Redan* *N. glabrum*
 - Leaflets narrow, ¾-2" wide, whitish or glaucous beneath
 - Cultivated tree, not flowering or fruiting: *Litch* *N. litchi*
 - Flowering and fruiting
 - Fruit red, set with small blunt flattened spines: wild: *Geringgong* *N. rubescens*
 - Fruit purple or crimson, with large, blunt, fleshy spines: cultivated or wild: *Pulasan* *N. mutabile*

N. eriopetalum

Lotong (N. Semb., Mal.), *Grik* (Sakai)

(with woolly petals)

A forest tree up to 80 ft. tall, with the habit of *N. malaiense*: twigs, leaf-stalks and inflorescences brown velvety or furry.

Leaflets 4-12 × 1½-4½", 3-7 pairs, large, drooping, light green, oblong elliptic, velvety beneath, leathery, with 15-26 pairs of side-veins.

Flowers with petals.

Fruits 1½-2" long, thickly set with soft spines like the *Rambutan*, ripening dark red: seed-pulp sour or ? sweetish.

Malaya, Sumatra: frequent, very striking.

N. glabrum

Text-Fig. 215

Redan

A forest tree up to 80 ft. tall, slightly fluted at the base: bark pinkish brown or rufous, entire, rather pimply: twigs and leaves glabrous.

Leaflets 1-2 pairs, more or less upturned with upcurled sides, as in the *Rambutan* but often glaucous beneath.

Fruit ¾-1" long, oblong, set with small, faint elongate plaques or small compressed knobs or merely wrinkled, not spiny, ripening reddish pink to bright red, glabrous (always single, never paired, the ovary having only one lobe): seed-pulp white, transparent, sweet when ripe.

Malaya: common, especially in the south.

N. lappaceum

Rambutan

(like the Burdock, Lappa)

An evergreen bushy tree up to 60 ft. high: *crown dense, low, spreading, rounded, dull green, untidy*: bark greyish brown or fuscous, smooth, slightly scaly in old trees: *glabrous* except the young shoots: *young leaves pale green*.

Leaves 6-16" long: *leaflets 3-8 × 1½-3½"*, 3-8 arranged roughly in 2-4 pairs, *elliptic, blunt, more or less upstanding with upcurled sides*, with 7-12 pairs of side veins: *stalk pale brown, woody*.

Flowers ½-1½" wide, *greenish white, fragrant*; petals none.

Fruit 1½" long, *red or, in some varieties, yellow, densely set with thick coarse wavy hairs or soft spines ½"* long or more, 1-2 fruits from each flower: *seed-pulp white, opaque or translucent, sweet or sour*.

Cultivated throughout Malaysia: apparently wild in the middle of Malaya.

This is one of the best known fruit trees of the East. It is most easily recognized when hung with the red fruits, looking at a distance like bunches of strawberries, but the dense untidy crown with upstanding leaflets soon becomes familiar to the eye. There are many varieties. The poorest have thin, dry, insipid, sour flesh inseparable from the seed, and the best, such as the *Rambutan Pinang*, has plump, sweet, separable flesh. Village trees have not been selected because they have mostly developed from chance seeds, and the seeds, being often if not always cross-pollinated, will not necessarily breed true. The seedling trees fruit in 5 or 6 years: marcots fruit in one or two years and, of course, come true. Mangosteen, *Durian* and *Rambutan* generally flower together.

Though the panicles appear to be terminal, they are actually axillary, having developed from small scales produced at the beginning of the development of a new shoot; and the terminal bud of this shoot subsequently produces foliage-leaves in the same way as in the Oaks (*Quercus*).

It is said that the seeds, not the pulp, are poisonous.

N. litchi

Litchi

(from the Chinese name)

A small to moderate-sized tree, up to 50 ft. high, *with very dense, rounded, dark green, glossy crown*: bark warm brown, dippled with fine scales: young leaves pale green.

Leaflets 3-7 × 1-2½", 2-4 pairs, *rather narrow and leathery*, drooping with slightly upcurled sides, *deep shining green, glaucous beneath*.

(Fruits 1-2" long, oblong or rounded, wash-leather buff more or less flushed red or crimson, with knobby surface: seed-pulp white, easily separable from the smooth brown stone).

South China.

The Litchi is occasionally seen in Malayan gardens, chiefly in the north where it grows well but seldom flowers and still more rarely fruits. The deep shade of well grown trees is equalled only by that of the *Rumenia* (*Bouea microphylla*). Fresh fruits are imported to Malaya from China and dried fruits are sold in the shops. A cool dry season seems necessary for the setting of the fruit.

N. malaiense Plate 179

Cat's Eyes

Mata Kuching, Bedara, Bendara, Bidara

A handsome tree up to 70 ft. high, *with heavy, dark glossy green foliage and hairy twigs*.

Leaflets 3-11 × 1½-4½", 3-5 pairs, *greenish white or rather glaucous and thinly velvety beneath, drooping*, with 14-25 pairs of side-veins.

Flowers ½" wide, fragrant, with 5 hairy petals.

Fruits ½-¾" wide, *round, with a thin brown shell with darker flecks*: *seed-pulp translucent, opalescent grey, thin, sweet separable from the dark brown shiny seed*.

Malaya, Sumatra, Borneo, Celebes: common in villages, gardens and by roadsides.

In its fruit, seed and taste the *Mata Kuching* resembles the Litchi more closely than any other Malayan species. Unfortunately the seed-pulp is too meagre in most trees for it to have much value as a fruit, but fleshy kinds occur and should be selected. Village trees are often small and ill-shapen, but, when grown to perfection, the *Mata Kuching* is one of the handsomest trees in the country. The flowers are borne in large, white, exceedingly fragrant panicles, but it seems that they are produced only once a year about the same time as those of the *Binjai* (*Mangifera caesia*), the misty pink domes of which then blend with the white ones of the *Mata Kuching* in the village orchards.

The *Kelat Layu* (*Erioglossum*) may be mistaken for the *Mata Kuching*, but it has dull green leaflets, not greenish white beneath, and browner twigs.

N. mutabile Text-Fig. 215 *Pulasan, Grak* (Perak), *Paik* (Tr.)
(Lat., changeable).

Like the *Rambutan* but:—bark light brown: leaflets $2\frac{1}{2}$ –7 × 1–2", 2–4 pairs, narrower, dark glossy green above, greenish white or glaucous beneath, lanceolate elliptic, with 12–16 pairs of side-veins: fruits 2" long; large, fleshy, crimson to dark reddish purple, thickly set with short blunt fleshy spines or knobs: seed-pulp generally pale yellow, sweeter, always separable from the seed.

W. Malaysia: common in villages and orchards, occasionally wild in the lowland forest in the middle of the country.

Seedless races of *Pulasan* are known and are said to be under selection in Siam so that we may hope for success in the cultivation of this fruit, which is certainly the best of the Malayan species. "Boiled or roasted seeds may be used for the preparation of a dish like cocoa" (BURKILL).

N. ophiodes Text-Fig. 215 *Rambutan Utan*
(Gr., snake-like)

A forest tree up to 80 ft. high, with light brown velvety twigs and inflorescences. Leaflets $4\frac{1}{2}$ –8 $\frac{1}{2}$ × 1 $\frac{1}{2}$ –2 $\frac{3}{4}$ ", 3–5 pairs, oblong lanceolate, narrow, drooping, rather dull pale green above, the underside glaucous and finely brown hairy, young leaves beautifully purple-crimson.

Petals none.

Fruit 1 $\frac{1}{2}$ " long, set with soft spines like the *Rambutan* but not so long, ripening dull red with white, very sour pulp.

Malaya: frequent in lowland forest.

The narrow leaflets make this a beautiful tree.

N. rubescens *Geringgong* (Johore), *Kerip Buntal* (Sel.)
(Lat., reddening)

A forest tree up to 80 ft. high, glabrous: bark chocolate brown, finely pimply, entire.

Leaves 4–12" long: leaflets $2\frac{1}{2}$ –5 $\frac{1}{2}$ × $\frac{3}{4}$ –1 $\frac{1}{2}$ ", 3–6 pairs, narrowly oblong elliptic or lanceolate, whitish beneath, with 16–24 pairs of faint side-veins.

Flowers with 5 pinkish white petals.

Fruit about 1" long, oblong, set with short, blunt, compressed spines, ripening yellow then reddish: seed pulp thin, acid.

Malaya: common, especially by rivers.

The Malay name must not be mistaken with *Geronggang* (*Cratoxylon arborescens*). Both trees commonly grow together.

PARANEPHELIUM

(similar to *Nephelium*)

Like *Nephelium* but the flowers reddish, the leaves with a terminal leaflet, the fruit spiny, splitting open and displaying 1–2 large dry brown seeds without pulp: the male and perfect flowers in the same inflorescence.

8 species, Indo-Malaysia: 3 species in Malaya, in lowland forest.

P. macrophyllum Text-Fig. 211
(Gr., makros—long, phullon—leaf)

Gohor, Gaha (Perak)

A weak, rather flopping shrub or sparingly branched tree up to 30 feet high, evergreen: twigs reddish brown: *young leaves bright pink*: glabrous.

Leaves large, with 4-5 pairs of *large leaflets* and a terminal one; *leaflets* 4-12 × 2-5½", *drooping, rather hard, leathery and shiny, with the edge toothed and almost spiny, strongly ribbed by the numerous veins*, the lower leaflets being the smaller.

Panicles 12-30" long, *large, upright, pinkish or reddish, with small fragrant reddish flowers* ¼" wide: sepals 5, red: petals 5, white, tiny: honey disc yellow: stamens pink, 8: ovary and style crimson: the male flowers opening after the bisexual flowers.

Fruit 1-1½" wide, *rounded, greyish brown, thickly set with durian-like spines*: seeds like pale horse-chestnut seeds: fruits numerous on each panicle.

L. Siam, Malaya: from Perak northward, common round Kuala Kangsar and Ipoh in villages and in secondary jungle.

This striking small tree much resembles a sapling *Kasai* (*Pometia*) in its flushes of reddish pink leaves with toothed, ribbed leaflets; but the flopping habit, smaller number of leaflets and absence of stipule-like leaflets at the base of the leaf-stalk will easily distinguish it when sterile. Formerly it was much grown in villages in the north of the country because the oil from the large seed was used as an illuminant in lamps, but with the advent of kerosene the plant has become little else than a weed and is not likely to be met with except in Perak. The oil of the seed is also used for skin-complaints.

POMETIA

(P. Pomét, 1658-1699, a French writer)

Buttressed trees with bright orange-brown, dimpled-scaly bark: inner bark with abundant, thin, red gum: *young leaves bright red or pink*: twigs grooved.

Leaves spirally arranged, *pinnate, the lowest pair of leaflets on the leaf-stalk much reduced and like stipules*, without a terminal leaflet.

Flowers small, *in large hanging panicles* of male and bisexual flowers: sepals and petals 4-5: stamens 5, with long filaments: ovary with 2-3 lobes.

Fruit oblong with smooth thin rind, containing one large thin pulpy seed: 1-2 fruits from a flower.

7 species, Indo-Malaysia and tropical Australasia: 4 species in Malaya, in lowland forest.

The two common Malayan species of this genus are called *Kasai* and they are easily distinguished by their beautiful bark, their toothed leaflets and the massed red bunches of new leaves. The more conspicuous *Kasai*, *P. pinnata*, occurs on the banks of Saraca-streams and is often seen by the roads which pass through forest reserves: its young foliage is almost more conspicuous than that of any other Malayan tree. The other *Kasai*, *P. alnifolia*, occurs in swampy forest: it is seldom as large but it is more beautiful in its fine soft foliage, brighter bark and more drooping panicles, the branches of which toss in the wind like catkins. Saplings of both are common: they must not be mistaken for plants of *Gohor* (*Paramaphelium*), which have a terminal leaflet.

The light red wood is tough and hard: "the fruits may be eaten and also the oily seeds after roasting" (BURKILL).

Both species would make desirable additions to our roadside trees if they could be brought into cultivation.

The name *Kasai* is given also to species of *Aglaia* (p. 455).

Key to the Species

- Leaves 1½–3 ft. long : leaflets 1½–6" wide ... *P. pinnata*
 Leaves up to 1½ ft. long : leaflets 1–2" wide ... *P. alnifolia*

P. alnifolia

Kasai

(with leaves like the Alder, Alnus)

Like *P. pinnata* but with smaller leaves and flowers, pale green delicate crown, and with hairy twigs, leaf-stalks and undersides of the leaflets.

Leaflets up to 7 × 2", with 12–20 pairs of side-veins: *the lowest pair of leaflets much reduced, ¼–½" long, curved with one half of the blade missing on the side next the twig.*

Inflorescence up to 12" long.

Malaya, Sumatra, Borneo: in swampy forest.

A very closely related species, *P. Ridleyi*, has glabrous, entire (not toothed) leaflets. It is possibly as common as *P. alnifolia* but is generally mistaken for it.

P. pinnata

Kasai, Langsir (Tr.), Kelisar (Kel.)

A large evergreen forest tree up to 100 ft. high, with rather uneven and open, coarse-leaved crown, *with sharp spreading buttresses* up to 8 ft. high: *more or less glabrous* except the inflorescence.

Leaflets up to 14 × 6", 3–6 pairs, (up to 16 pairs in saplings), oblong elliptic, tipped, *toothed*, thinly leathery, shortly stalked with 20–27 pairs of side-veins: *the lowest pair of leaflets small, ½–1½" wide, round, ear-shaped or cushion-shaped, with one side more or less reduced, more or less clasping the twig like stipules.*

Inflorescences up to 24" long, with stipule-like leaflets at the base of the branches: flowers ½" wide, yellowish white or greenish, scentless.

Fruits ½–1½" long, ripening red then black.

Indo-Malaysia, to the Pacific: common by Saraca-streams in Malaya.

Ants often use the lowest, stipule-like pair of leaflets for shelter or for making their nests.

SAPINDUS

(Lat., sapo—soap; indus—Indian)

Like Nephelium but the fruit with smooth, thick, fleshy-leathery rind.

13 species, tropical America, Asia, Polynesia: 1 species introduced to Malaya.

S. mukorossi Text-Fig. 212

(a Japanese name)

Soap Nut

Buah Lerak

An evergreen tree reaching 70 ft. high with rather fine, feathery foliage: *glabrous or nearly so: twigs brown.*

Leaf-stalks 6–14" long, with 6–11 leaflets on each side: *leaflets 3–6 × ¾–1½", lanceolate or narrowly elliptic, asymmetric at the base, tapered gradually to the point, the edges wavy, thin; leaflet-stalks ½" long or less.*

Flowers white, ½" wide, in *rambutan*-like panicles.

Fruits ¾–1" wide, singly with 1–2 abortive fruits at the base, or twinned, *round, generally with a ridge, ripening greenish grey, the wall with very soapy sap.*

China, Japan.

In suitable soil, this forms quite a shapely tree in Malaya, like a fine-leaved *Rambutan* or *Mertajam* (*Erioglossum*). There are a few trees in Singapore and Penang and there is one tall tree on the Residency Hill at Malacca. The narrow wavy leaflets, the brown twigs and, especially, the smooth soapy fruits enable one to recognize it. The fruits, pounded in water, give a soapy lather

SAPINDACEÆ

which is commonly used in Asia for washing the hair (the lather being germicidal) and for sundry other purposes as mentioned by BURKILL. For this demand, the dried Soap-Nuts are imported from China and Japan.

Concerning the other species of the genus which have soapy sap there is an account in BURKILL'S Dictionary.

TRIGONACHRAS

(Gr., a 3-angled pear)

Like Guioa but :—

Fruit large, pear-shaped, more or less 3-shouldered, with thick, fleshy walls, velvety when ripe and gaping along the three lines: seeds black, shiny, with a yellow, waxy lump like a stalk at one end, 1-6 seeds in each fruit.

9 species, all but the following in the Philippines.

T. acuta Text-Fig. 212

Cardinal Tree

Seremkan (Pahang), Tangisong Burong

A wild tree up to 70 ft. high, with graceful feathery crown: twigs hairy when young: new leaves pale green.

Leaves with stalks 4-8" long, glabrous: leaflets 2-4 × ¾-1½", 4-8 pairs, lanceolate, curved backward, asymmetric at the base, gradually tapered to the long tip, with 7-10 pairs of side-veins: leaflet-stalks ¼" long.

Flowers ¼" wide, white, in wide terminal panicles 6-12" long.

Fruits 1½-2" long, 1¼" wide, pinkish yellow to orange red.

Malaya: river banks and open country, chiefly in the south, frequent in East Johore.

This graceful tree should become one of our ornamentals because of its delicate foliage and splendid fruits. It is deciduous, changing its leaves and then flowering on the new shoots after dry weather about June to August, sometimes also at the beginning of the year. It must not be mistaken for a Meliaceous tree like Dysoxylon which may also have large red fruits splitting into three parts. The seeds of Dysoxylon are more or less covered by the pulp.

XEROSPERMUM

(Gr., xeros—dry, sperma—seed)

Like Nephelium but :—

Leaves with 1-2 pairs of leaflets.

Inflorescences short, unbranched or with only a few short branches.

Fruits ripening yellow, closely set with small pointed knobs (not bristly-hairy): seed-pulp yellow: seed-leaves set across the long axis of the seed.

20 species, Indo-Malaysia: 6 species in Malaya.

Key to the Species

Leaflets 1½-4" wide	...	...	...	<i>X. muricatum</i>
Leaflets ¾-1½" wide	...	...	...	<i>Xerospermum sp.</i>

X. muricatum Text-Fig. 215

(Lat., armed with prickles)

Kikir Buntal,

Gigi Buntal, Rambutan Pachat

A small forest tree: leaflets 4-11" long, 1-2 pairs.

Fruit 1" long, covered with short pointed warts, yellow: pulp of seed thin, sweet.

Malaya: frequent in lowland jungle.

This tree is recognized from its fallen fruits which are like those of the *Redan* (*Nephelium glabrum*) but are yellow. The epithet *Buntal* refers to the resemblance between the swollen prickly appearance of the fruit and that of the globe-fish.

Xerospermum sp. Text-Fig. 215
(unidentified)

Nasi Dingi
Buah Sakor

A tree like the *Rambutan* (*Nephelium lappaceum*) but with fine-leaved crown. *Leaflets* 2-4" long, 1-3 pairs, mostly 2, *small*, glabrous, *dark green*, point *g* down with upcurled sides.

Fruits $\frac{3}{4}$ " long, oblong, pale yellow with slightly knobby, wrinkled rind: *pu*lp of *seed* *pale orange-yellow*, opaque, held to the stone by fibres.
Trengganu.

This tree is wild in the forest of Trengganu and is occasionally planted in villages, there being a fine specimen near Bukit Payong. In the season, which is about April, baskets of fruit can be seen in the markets of Kuala Trengganu where they are called *Buah Sakor*. We have not collected flowers and have thus been unable to identify the species, which may be undescribed.

CHIKU FAMILY

Sapotaceæ

(from the Chiku, *Achras zapota*)

Nearly always with white latex: twigs, buds and young parts often set with fine, chaffy, rusty-brown hairs or scurf.

Leaves simple, entire, elliptic to obovate, more or less leathery, generally upward pointing, *spirally arranged*, often in rosettes at the ends of the twigs, *in a few cases alternate*.

Flowers small, facing downward, often nocturnal, regular set in small clusters in the leaf-axils or on the twigs behind the leaves: calyx of 4-8 sepals arranged in two whorls, closely covering the bud: *petals white or green, joined in a short tube*, as many as the sepals or through additional lobes twice or three times as many (Mimosops): *stamens* generally in 2 rows, each row with as many stamens as the sepals and the inner row often sterile: *ovary superior*, with as many cavities as the sepals or twice as many.

Fruit a berry, large or small, *few-seeded*, with slit like cavities: generally with the persistent sepals at the base: *seeds large, hard*.

47 gen., 614 spp., throughout the tropics and subtropics: 8 gen., 120 spp., in Malaya, chiefly in the lowland forest.

Excepting a few exotic shrubs, the members of this family are trees. Many are common in the Malayan forests, of which they are truly characteristic, and they vary in size from 20-200 ft. high. They are easily recognised from their latex and spirally arranged, simple leaves but specifically they are rather difficult to distinguish. The timber-trees, described by FOXWORTHY (7, p. 52), are called by Malays *Nyatoh*, *Betis*, *Belian*, *Taban*, *Semaram* and *Sundek*, the first name being the commonest, but none indicates a botanical group. There is no better introduction to the family than through the *Chiku*-tree (*Achras*), to which some of our wild trees bear a remarkable resemblance. The flowers recall those of the Tea-family (Ternstroemiaceæ) but differ in the definite number of stamens.

It seems that all our species are evergreen and that the wild ones are very seasonal in flowering. Their flowers invariably race downward, like those of the *Kenanga*-family (Annonaceæ); some are sweetly fragrant but others have a strange, strong odour of musang or fox, or one that reminds us of burnt sugar

SAPOTACEÆ

or the beer and treacle of our moth-catching nights. The flowers are produced generally on the incidence of dry weather but in several cases, like the Gutta Percha (*Palaquium gutta*) and the common *Taban Puteh* (*P. obovatum*), the flower-buds develop to a certain pitch and then wait for months, even more than a year, before they open and such must depend on a subtle and rare state of the weather for the necessary stimulus. In contrast the *Chiku* and *Bunga Tanjong* (*Mimusops*) flower and fruit during the greater part of the year.

Terminalia-branching occurs in many species, particularly in the big genus *Palaquium*.

From this genus, *Palaquium*, are obtained numerous varieties of gutta-percha, a full account of which is given in BURKILL'S Dictionary.

The fruits of several wild species are edible but small and of little value. They are sought, however, by monkeys, squirrels, fruit-bats and musang in season.

Key to the Genera

- Leaves white beneath, very blunt and stiff : cult. ... *Manilkara*
- Leaves coppery beneath, at least when young
 - Leaves alternate : cultivated ... *Chrysophyllum*
 - Leaves spirally arranged
 - Inland forest tree : veins of leaf fine ... *Palaquium* p. 600
 - Sea-shore or mangrove tree : veins of leaf coarse *Planchonella* p. 601
- Not so
 - Leaves large, 3-6" wide : wild ... *Palaquium* p. 600
 - Leaves 1-3" wide, often wavy : cultivated
 - Leaves in close tufts or rosettes at the ends of the twigs : fruits 2" or more long ... *Achras*
 - Leaves spaced along the twig, alternate or laxly spiral : fruits 1" or so long, red ... *Mimusops* p. 600

ACHRAS

(Gr., the pear-tree)

With white latex.
Twigs with Terminalia-branching.
Leaves spirally arranged

Flowers solitary in the leaf-axils : *calyx* with 6 sepals (in 2 rows) : *corolla* with a short tube and 12 petals : *stamens* 6 : *ovary* with a shortly projecting style and 12 cavities.

Fruit a large berry with thin skin and 12 slit-like cavities each with one seed (generally only a few seeds developed in each fruit) : seeds *black*, flattened, hard, fairly large.

1 sp., native of South Mexico and Central America.

A. zapato

(from the Mexican name *cochit-zapottl*)

Sapodilla, Naseberry
Chiku, Sauh Menila

An evergreen tree up to 40 ft. high, with conical or rounded, fairly dense, dull green or shabby crown : *bark* light grey, becoming shallowly fissured : *young twigs* thinly brownish woolly.

Leaf-blade $1\frac{1}{2}$ -6 × $\frac{3}{4}$ -2 $\frac{1}{2}$ ", narrowly elliptic, dark green, glabrous : stalk $\frac{1}{4}$ - $\frac{3}{4}$ " long.

Flowers $\frac{1}{2}$ - $\frac{1}{2}$ " wide, white, the calyx thinly brownish or greyish woolly, the stalks $\frac{1}{2}$ - $\frac{3}{4}$ " long, standing up.

Fruit 2-3 $\frac{1}{2}$ " long, round or oblong, greyish to brownish, like a potato, with pinkish white to reddish brown, sweet flesh.

Common in all orchards and village gardens in Malaya.

This common fruit-tree is well-known in Malaya as *Buah Chiku*. It appears to flower and fruit throughout the year, though certain seasons produce bigger crops. In BURKILL's Dictionary there is a full account of its history and of the extraction of the latex for making chewing gum. From the *Sau* (Manilkara) the *Chiku* is told by its thinner, narrower, elliptic leaves which are not white beneath.

CHRYSOPHYLLUM

(Gr., chrusos—gold, phullon—a leaf)

With white latex.

Leaves alternate, coppery silky beneath, with many pairs of side-veins.

Flowers clustered in the leaf-axils, shortly stalked: *sepals* 5: *corolla* with 5 petals and a short tube: *stamens* 5, opposite the petals: ovary with 8-10 cavities, the stigma with 8-10 rays.

Fruit fleshy, large, round, with 8-10 cavities each with one seed (generally only a few seeds developed in each fruit) and *with a star-like core* (as seen in transverse section).

60 spp., mostly in tropical America, a few in tropical Asia: 2 spp. wild in Malaya, 2 spp. introduced.

C. cainito

Star-Apple, Caimito

(from the West Indian plant-name *caimito*)

An evergreen tree up to 50 ft. high, with, a *spreading crown of dark, glossy green foliage*: bark light greyish, becoming slightly fissured: *twigs coppery silky*.

Leaf-blade 3-7 × 1-4", narrowly or broadly elliptic, tipped, drooping, with upcurled sides: *stalks* ½-¾" long, slender, *coppery silky*.

Flowers purplish white.

Fruits 2-3" wide, *as large as apples*, glabrous, smooth, hard, green then turning white or purple according to the variety, with the flesh of the same colour: seeds large dark brown.

Trop. America: occasionally cultivated in Malaya.

This fine tree deserves to be better known because of its beautiful crown with coppered foliage. It flowers seldom in Malaya and the fruit, if set, is inferior to the delicious Star-Apples described from Tropical America. Indeed, it may be assumed, for most American fruit-trees, that better kinds are still to be imported.

MANILKARA

(a Malabar plant-name)

Like *Mimusops* but the leaves densely spirally arranged, the parts of the flower in sixes, the petal-star with 18 points.

About 35 spp., in all tropical countries: 1 sp. in Malaya.

M. kauki

Sawai, Sawah, Sawoh, Sau

(an Indian plant-name)

An evergreen tree up to 40 ft. high, like an old gnarled *Chiku*-tree: bark greyish brown, deeply fissured and cracked.

Leaf-blade 2-4 × 1¼-2½", *obovate, blunt, thick, leathery, stiff*, dark green above, very white and finely silky beneath: *stalk* 1-2" long.

Flowers several at the end of the twigs, on stalks 1-1½" long.

Fruits 1-1½" long, *dark orange-red*, with 6 sepals at the base.

W. Malaysia: wild on rocky headlands and islands of the East coast of Malaya but uncommon, occasionally planted in villages.

There are fine old trees of this species in the Istana Gardens at Alor Star. "The fruits are eaten raw or cooked: they are sweet but rather flavourless" (BURKILL).

MIMUSOPS

(Gr., mimo—an ape, opsis—appearance)

Flowers with 8 sepals, 8 petals (each petal with 2 lobes, giving a star-like corolla of 24 points), 8 fertile stamens and sterile stamens: ovary with 8 cavities.

About 20 spp., throughout the tropics except America: none wild in Malaya.

M. elengi Plates 180, 181, Text-Fig. 216
(a Malabar plant-name)

Tanjong Tree
Tanjong, Mengkulah, Mengkulang

An evergreen tree up to 50 ft. high, with dense round spreading dark green crown, the trunk soon breaking up into several limbs: bark greyish brownish, becoming rather deeply ridged and fissured: leaves spaced along the twigs, not in rosettes, alternate or laxly spirally arranged.

Leaf-blade 2-6 × 1-3", oblong elliptic, tipped, with wavy upcurled edges, dull green, thinly leathery: stalk $\frac{1}{2}$ -1" long.

Flowers $\frac{1}{2}$ " wide, very fragrant, shortly stalked, in axillary clusters of 2-6: petals white, falling off in a star-like ring.

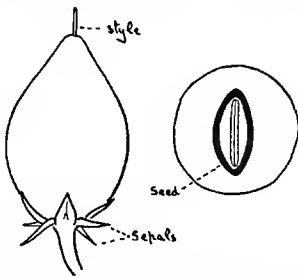
Fruit 1-1 $\frac{1}{2}$ × $\frac{1}{2}$ - $\frac{3}{4}$ ", oblong, pointed, smooth, fleshy, green then orange-red with floury yellow flesh, with 8 persistent sepals at the base and containing one large hard blackish brown seed: young fruits hairy.

India, Burma, Ceylon: cultivated throughout the tropics: commonly planted in villages, gardens, by roadsides and on the shore in Malaya.

This well-known village tree is put to many uses in native medicine, as described by BURKILL. The fragrant flowers may be worn for adornment and children will string the fallen petal-stars into necklaces. The ripe fruit is edible but rather astringent and is worth very little.

From a distance the tree is not easy to recognise unless one is familiar with its dense spreading crown. It is generally in flower or fruit but in the absence of these the wavy edged leaves are characteristic. There are shapely trees round the padang at Kota Bahru.

The latex is scant and watery and is easily overlooked.



Text-Fig. 216. *Mimusops elengi*.
fruit, nat size.

PALAQUIUM

(from the Philippine plant-name palak-palak)

Leaves spirally arranged, often coppery beneath.

Flowers shortly stalked, in sessile clusters in the axils of the old leaves or on the twigs behind the leaves: sepals 6: petals 6: stamens generally 12, but in some cases varying between 8 and 36.

Fruit oblong, pointed, with 6 slit-like cavities and 1-3 seeds: with 6 small persistent sepals at the base.

About 100 spp., Indo-Malaysia to Polynesia: 14 spp. in Malaya, in the lowland forest.

Key to the Species

Leaves coppery brown beneath, rather small	...	...	<i>P. gutta</i>
Leaves slightly glaucous beneath, large	...	...	<i>P. obovatum</i>

P. gutta
(from the Malay getah)

Gutta Percha Tree
Taban, T. Merah

An evergreen tree reaching 100 ft. high, generally much smaller: crown rather conical and open, though inclined to be flat-topped like Terminalia, brownish green: bark greyish brown, becoming rather fissured.

Leaf-blade 3-9 × 1-3", more or less obovate, tipped *dark green above, coppery brown beneath* from fine silky hairs, with many fine side-veins: stalk 1-1½" long.

Flowers ¾" wide, with *pale green* petals and strong, heavy, sickly odour rather of burnt sugar.

Fruits ¾-1¼" long, broadly oblong, pointed.

Sumatra, Malaya, Borneo: frequent throughout the lowland forest.

Because of the great destruction of trees to obtain the gutta during the last century, the *Taban Merah* is not nearly as common as it was except where it has been protected in forest reserves. One of the more extensive reserves lies on the main road between Trolak and Bidur in the south Perak and there the trees can be seen to advantage: when the wind blows a copper sheen flits over the crown, as with the *Durian* and *Bayur* (*Pterospermum*). There is a small plantation at the foot of the path to Bukit Timah in Singapore.

Flowering occurs between January and April in Penang, and between July and September in the middle and south of the country where, however, there may also be a flowering at the beginning of the year. The tree grows moderately fast: records show that it will reach 25 ft. in 7 years and 50 ft. in 23 years. Open flowers are to be found on the trees at midday so that it is possibly day-flowering, unlike most species of the genus.

P. obovatum Plate 182, Text-Fig. 217
(from the leaf-shape)

White Gutta
Taban Puteh, Nyatoh

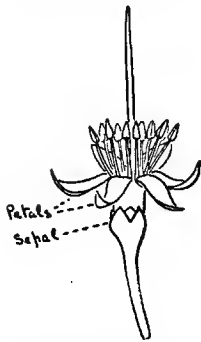
A medium to fairly large tree, up to 100 ft. high: *crown* rather cylindric, heavy, the lower branches often drooping considerably: *bark* greyish brown, somewhat ridged and fissured: *twigs* stout, dingy greyish brown, with the leaves set in close or rather open rosettes: *buds* rather large, with several scales covered with fine chaffy brown hairs: *latex* copious, sticky: *old leaves turning brownish orange-yellow*.

Leaf-blade 6-12 × 2½-6", *large, leathery, dark, green above, slightly glaucous beneath, glabrous*, narrowly to broadly *obovate*, scarcely tipped, with 9-13 pairs of side-veins: stalks 1-1½" long, thick.

Flowers green, with a strong smell of fox or musang, crowded along the twigs behind the leaves, each flower with its own stalk ½-1" long: flower-buds green, reaching .7" long, the white style projecting .4": calyx ¼" long, small: corolla 1" wide on opening, green, with 6 spreading recurved star-like petals with upturned tips.

Fruit ¾-1" wide, broadly oblong or round, rather pulpy when ripe, green, with 1-2 seeds.

W. Malaysia to the Philippines: common throughout Malaya in lowland forest, frequent at the edge of forest reserves and in secondary jungle.



Text-Fig. 217.
Palaquium obovatum, nat. size.

The flowers open about dusk when they give out their strong smell of musang, sour milk and burnt sugar: indeed, the smell escapes from the buds some while before they open. The flowers remain on the tree for about 24 hours but they lose their smell after the first evening. It seems that the trees are deciduous at certain seasons, but we have no reliable observations.

PLANCHONELLA

(J. E. Planchon, 1823-1888, a French botanist)

Like *Palaquium* but the parts of the flower in fives, there being 10 stamens (5 fertile, 5 sterile).

About 80 spp., S. E. Asia to Australia and Polynesia: 1 sp. in Malaya, and several dubious.

P. obovata

(from the leaf-shape)

Sea Gutta

Menasi, Misi (Tr., Pah., Joh.)

An evergreen *sea-shore* tree up to 90 ft. high, with irregular, conical or round, uneven, rather brownish green crown: *with low, sharp, spreading buttresses* up to 3 ft. high: *bark rich dark brown, somewhat ridged and fissured*, not flaky, the inner bark pinkish: *twigs, buds, leaf-stalks and undersides of young leaves finely rusty brown scurfy*, the rustiness wearing off the old leaves: leaves spaced along the twigs, not in dense rosettes: old leaves withering yellow orange or reddish.

Leaf-blade 2-8 × $\frac{3}{4}$ -4", elliptic to obovate, acute or blunt, narrowed to the base, thinly leathery dark glossy green above, rather upright: stalks $\frac{1}{2}$ -1" long.

Flowers $\frac{1}{4}$ " wide, greenish white, shortly stalked, in small axillary clusters or on the twigs behind the leaves.

Fruit $\frac{1}{2}$ " long, oblong, with 5 sepals at the base and 1-3 seeds.

India, Malaysia, N. Australia: common on all rocky and sandy shores, also in inland sandy heaths in Kelantan and Trengganu.

Misi and *Jambu Laut* (*Eugenia grandis*) are the more important trees of the forest which develops on the coast immediately behind the Terminalia-Barringtonia line of trees just above the high water mark, and accordingly they are often found in the secondary jungle where such forest has been cut down. *Misi* is at once recognised from the rusty scurfy undersides of the shiny, upward pointing leaves and from the white latex.

TREE-OF-HEAVEN FAMILY

Simarubaceæ

(from the genus *Simaruba*, of Tropical America)

Trees or shrubs *generally with bitter bark*.

Leaves simple or pinnate, alternate or spirally arranged.

Flowers small, generally male and female or male and bisexual, in panicles: the parts of the flower in fours or fives: ovary with 2-5 lobes, often separate from each other, seated on the lobed honey-gland.

Fruit pulpy, 1-seeded, 1-5 developing from each flower.

30 genera, 200 species, throughout the tropics: 6 genera, 8 species in Malaya, mostly lowland.

This family can be recognized only from the detailed structure of the flower. It has few members in Malaya, and they seem to bear little resemblance to each other. The vast *Irvingia* is so unlike the spindly *Brucea* in every respect, save the general plan of the flower, that one may well doubt whether they should belong to the same natural group. The best-known member of the family is the Chinese Tree of Heaven (*Ailanthus glandulosa*) which is not grown in Malaya, but another species of the genus (*A. malabarica*) occurs in Kedah and Perlis and may be mistaken for the Sentang (*Melia excelsa*): the leaflets of the *Sentang*, however, wither yellow whereas those of the *Ailanthus* wither red. The *Quassia*-shrub (*Q. amara*), occasionally grown in gardens, also belong to the family. The bitter bark of many species gives them a medicinal use in native medicine.

Key to the Genera

A big, buttressed tree with simple, alternate leaves	...	<i>Irvingia</i>
Spindly trees or shrubs with pinnate leaves		
Leaflets toothed	... ..	... <i>Brucea</i>
Leaflets entire	... ..	... <i>Eurycoma</i>

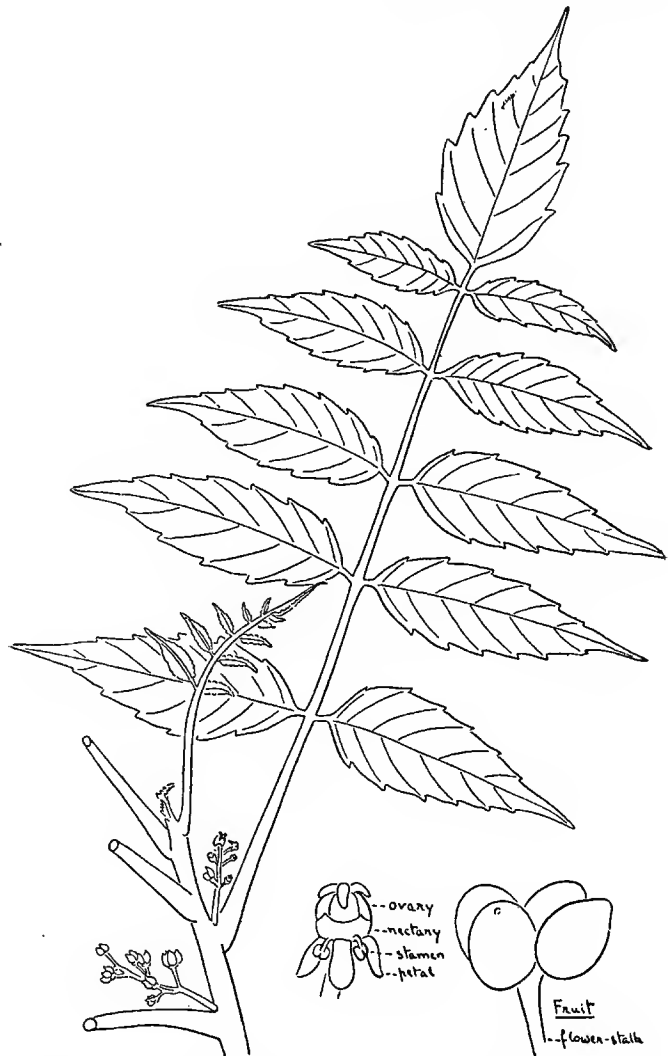
BRUCEA

(J. Bruce, 1730-1794, a Scottish scholar and explorer)

*Leaves pinnate, spirally arranged, with a terminal leaflet.**Flowers minute in axillary spike-like panicles: sepals and petals 4: stamens 4: ovary 4-lobed, with 4 sessile stigmas.**Fruits in groups of 2-4 from each flower, small, occasionally solitary.*
7 species, Old World: 1 species in Malaya.**B. amarissima** Text-Fig. 218
(Lat., most bitter)*Lada Pahit*
*Melada Pahit, Embalau**A lax evergreen shrub or spindly tree up to 20 feet high, flowering at 3 feet: twigs and leaves softly hairy.*Leaves 7-20" long, with 5-7 pairs of leaflets, 2-5 × $\frac{3}{4}$ -2", with short stalks, light green.*Flowers .1" wide, red except the green ovary, the spikes 1-12" long, (very variable).**Berries $\frac{1}{4}$ " long, green then purplish black with green flesh.*

India to N. Australia: common in villages and secondary jungle in Malaya, not in the forest.

The bitter fruits are used in Malay and Chinese medicine for many purposes, as described by BURKILL, but particularly for the cure of dysentery. Like other bitter fruits, they are eaten by small fruit-bats which disperse the seeds.

Text-Fig. 218. *Lada Pahit* (*Brucea amarissima*), $\times \frac{1}{2}$: flower $\times 5$: fruit $\times 1\frac{1}{2}$.

EURYCOMA

(Gr., eurus—broad, kephale—head)

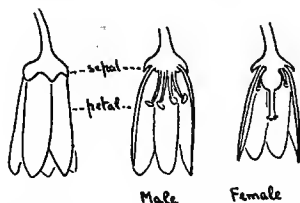
*Leaves pinnate with terminal leaflets and many pairs of entire leaflets.**Flowers in long, branched, drooping panicles: sepals 5, minute: petals 5, forming a bell-like flower: stamens 5: ovary with 5 lobes pressed together, and one style with a 5-lobed stigma.*

Fruits as in Brucea, 1-5 per flower.

4 species, Indo-china to Borneo and the Philippines: 2 species in Malaya.

E. longifolia Text-Fig. 219
(with long leaf)Ali's Umbrella
Payong Ali, Tongkat Ali,
Bedara Pahit, Penawa Pahit*A spindly unbranched shrub or tree, up to 40 feet high, or with a few upright branches each crowned by an umbrella-like rosette of leaves: twigs stout with rusty brown scurf: leaf-scars big.**Leaves 1-3 feet long, glabrous, with 20-30 pairs of narrowly oblong, leathery, entire, dark green leaflets, 2-5 × ½-1¼", upstanding with wavy edges: leaf-stalk shining dark brown, like a twig.**Flowers ½" wide, purplish-crimson, hairy, in dangling axillary inflorescences 1-2 feet long, male and bisexual flowers on different trees, slightly fetid.**Fruits ¼" long, oblong, ripening yellow then red.*

Indo-China to Sumatra and Borneo: common in the forest throughout Malaya.

Text-Fig. 219. *Eurycoma longifolia*, × 2.

The curious shape of this plant, like an impoverished *Belimbing*, will easily distinguish it. Malays sometimes call it *Payong Ali* (Ali's umbrella) which is not inept. It is more generally known as *Penawa Pahit* (bitter antidote) from the exceeding bitterness of the bark, particularly of the roots. The bark is used by Malays as a general febrifuge, being one of their native remedies for malaria.

IRVINGIA

(E. G. Irving, 1816-1855, a Scottish botanist)

*Twigs with ring-like scars at the nodes, from the falling off of the conical stipules covering the buds, thin.**Leaves simple, alternate.**Flowers small, in axillary panicles: sepals and petals 5: stamens 10: ovary with 2 cavities and one style.**Fruit like a small mango, with a large very fibrous stone.*

4 species, tropical Africa and Malaysia: 1 species in Malaya.

I. malayana
(from Malaya)Barking Deer's Mango
Pauh Kijang*A more or less deciduous large tree, reaching a vast size, even 200 feet high, set with very prominent, thin steep buttresses and long straight bole: bark smooth, greyish-white, becoming pale fawn-buff and rather flaky: crown dense: buds ¼-½" long, conical; glabrous.**Leaf-blade 3-7 × 1-3", elliptic, pointed, entire, thinly leathery, the base often rounded, often slightly glaucous beneath, with 10-16 pairs of side-veins.**Flowers ¼" wide, greenish white, bisexual, in panicles 2-6" long.**Fruit 1½-2" long, slightly flattened, like a small oblong mango, green then yellowish with yellowish flesh, slightly nauseous or inodorous, brownish when rotting.*

Indo-China to Sumatra and Borneo: frequent in lowland forest in Malaya, occasionally left by roadsides and in clearings.

This magnificent forest tree finds a place in our book for the same reason as the *Tualang* (*Koompassia excelsa*): because of its hard wood and big buttresses, it is often left in forest-clearings and thus by its great size stands out on the landscape. There was a big tree, for instance, at Changi and two by the Riding School in Singapore, a big tree by the bridge at Sungei Buloh Kasap in north Johore, and another about 2 miles south of Tanjong Malim at the side of the former main road, where it was commonly marred by notices. It is in many ways a remarkable tree, the botanical affinity of which is very uncertain. Its shape of trunk and crown, flowers and fruits suggest a wild Mango: its buttresses and hard pale wood suggest a *Keranji* (*Dialium*): and its twigs, buds and leaves suggest a Fig-tree without latex. The bark is not bitter as that of other members of the family.

It flowers on the bare branches before or with the new leaves, but it seems that the whole crown may not be deciduous at once.

POTATO FAMILY

Solanaceæ

(from the genus *Solanum*)

Leaves spirally arranged, simple, lobed or almost pinnate: without stipules.

Flowers generally conspicuous, regular, variously arranged: sepals 5: petals 5, joined in a ring or very short tube: stamens 5, generally with very short stalks and large anthers grouped together round the style: ovary superior with one style and 2 or 4 (rarely more) cavities.

Fruit as a small or large, many-seeded berry, the calyx persistent at the base.

About 1,500 spp., throughout the warmer parts of the earth: 1 genus wild in Malaya, several introduced.

This family consists mainly of herbs and small climbers, many of which are highly poisonous. It includes the Potato and Tomato (*Solanum*), the Chilli (*Capsicum*), the Thorn-Apple (*Datura*), the Cape Gooseberry (*Physalis*), the Tobacco (*Nicotiana*) and the Belladonna (*Atropa*). Only a few herbaceous species of *Solanum* are wild in Malaya, but two soft-wooded shrubby trees are common in cultivation, namely the Tree Tomato and the Potato Tree.

Key to the Genera

Thorny: flowers violet: lowlands	...	...	<i>Solanum</i>
Thornless: flowers pale pink: mountains	...	...	<i>Cyphomandra</i>

CYPHOMANDRA

(Gr., a hunchback)

Very like *Solanum* but with broad anther-stalks.
30 spp., S. America: 1 sp. introduced to Malaya.

C. betacea Text-Fig. 220
(like the beet-plant, *Beta*)

Tree Tomato

An evergreen thornless shrub or small tree up to 15 ft. high.
Leaf-blade up to 9 × 5", more or less heart-shaped, softly hairy, thin, drooping:
stalks up to 3½" long.

STERCULIACEÆ



Text-Fig. 220.
Cyphomandra
betacea, nat.
size.

Flowers $\frac{3}{4}$ " wide, pale pinkish white, fragrant, in small, loose, stalked clusters from the stems but not from the leaf-axils: stamens yellow.

Fruit about 2" long, oblong, pointed, shiny, red and often striped in some varieties, yellow in others, with the green calyx at the base: with a musky tomato-like taste.

Commonly grown in the mountains of Malaya.

The Tree Tomato does not fruit in the lowlands but the fruit is commonly brought to the markets. There are generally two gritty lumps in the wall of the fruit on opposite sides of it.

SOLANUM

(a Latin plant-name)

Often thorny, even the leaves.

Flowers in clusters: petals white or blue, crumpled in the bud: stamens with short, rather slender stalks, the anthers forming a yellow cone round the style and opening by pores at the tips.

Fruit a small or large berry with the persistent calyx at the base, with 2 or 4 cavities filled by the pulpy flat seeds.

About 750 spp., throughout the warmer parts of the world: 6 spp. wild in Malaya, and several introduced.

The Potato, Tomato, Egg-plant or Brinjal, various kinds of Terong and several garden plants belong to this genus. Of our six wild species, three are shrubs, one is a herb, another an epiphyte, and the sixth is a small tree.

S. Wrightii Plate 183

Potato Tree

A thorny evergreen shrub or small tree up to 40 ft. high, with wide-spread limbs, flowering throughout the year: bark pale grey, thorny: twigs and leaves rough hairy.

Leaf-blade up to 12 x 7", large, deeply pinnately lobed, with a few long spines on the underside of the stalk and midrib, the base often unequal.

Flowers $2\frac{1}{2}$ " wide, large, deep violet then blue fading white, in clusters arising from the twigs some distance from the leaf-axils and up to 8" long: sepals recurved.

Berry $1\frac{3}{4}$ " wide, round, seated on the large calyx, like hard tomatoes, green then ochre-yellow, with 4 cavities.

Tropical South America: cultivated in gardens.

(This species has been called *S. grandiflorum*, *S. macranthum*, *S. maroniense*).

CACAO FAMILY

Sterculiaceæ

(from the genus Sterculia)

Bark generally tough, stringy.

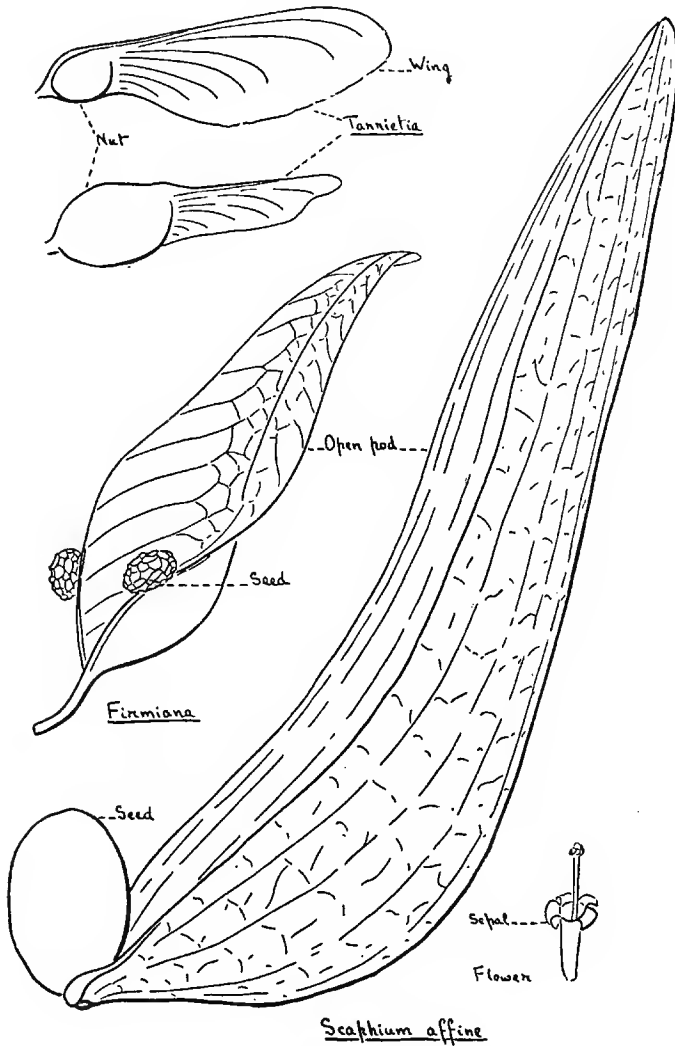
Leaves alternate or spirally arranged, simple or in a few cases palmately compound: stipules present.

Flowers small to medium-size, often either male or female, generally in many-flowered inflorescences: sepals 5: petals 5, or absent, separate: stamens 5, 10, 15 or more, separate or joined in a column with the anthers at the top: ovary superior, with 2-5 cavities or 2-5 separate parts (carpels).

Fruit various, generally capsular.

About 600 species, tropics and subtropics generally: 18 genera, 56 species in Malaya. in lowland forest, very few in the mountains.

The flowers of this family show such great diversity that it is a difficult one to define. It is closely allied with the Hibiscus and Jute-families (Malvaceæ, Tiliaceæ) and in several respects, such as the tendency to have unisexual flowers, with the Rubber-tree family (Euphorbiaceæ). Although we have several common members of the family in Malaya, remarkably little is known about them.



Text-fig. 221. Fruits of Sterculiaceæ, nat. size.

The Cacao or Cocoa tree (*Theobroma cacao*) is the best known representative. It is native in tropical America whence it has been introduced to all parts of the tropics. It came to Malaya in the eighteenth century, where it is called *Pokok Choklat*; it is occasionally seen in villages, but it does not thrive enough for commercial use. It is a small tree with rather large, dark green, drooping leaves

STERCULIACEÆ

and a few, large, purple-brown, longitudinally ribbed pods hanging on the trunk and branches. Very few flowers set fruit so that it is possible that their means of pollination is deficient. There is an account of its produce—coco-powder and coca-butter—in BURKILL'S Dictionary.

The Kola-Nut of African (*Cola nitida*) also belongs to the family. The fresh seeds are chewed by African natives as a stimulant. The species has been introduced to the Singapore Botanical Gardens where it has grown well and fruited regularly (*see* BURKILL'S Dictionary).

Key to the Genera

- Seashore or mangrove trees
 - Leaves simple, leathery, silvery beneath ... *Heritiera* p. 612
 - Leaves palmate: rocky or sandy coasts ... *Sterculia foetida* p. 619
- Not so
 - Leaves alternate on the twigs
 - Leaves brownish beneath: trees of secondary jungle, often large ... *Pterospermum* p. 614
 - Leaves hoary white beneath: fruits round, woolly: flowers white, tiny: small tree ... *Commersonia*
 - Not so: flowers 1-2" long: fruits long: shrubs with straggling branches ... *Helicteres* p. 610
 - Leaves spirally arranged on the twigs, with rather long stalks
 - Shrub with conspicuous pink flowers 1" wide: cult ... *Dombeya*
 - Shrub or tree with panicles of small pink flowers ½" wide
 - Leaves toothed: fruits as 5-angled capsules, ⅓" long ... *Melochia* p. 613
 - Leaves entire: fruits as pink bladders, ¾" wide ... *Kleinhovia* p. 612
 - Not so: trees, mostly large (except the shrubby *Sterculias*): petals none: sepals often petal-like
 - Flowers brilliant orange-scurfy, in bunches on the bare twigs: pods split open, transparent, with one small seed on each edge ... *Firmiana* p. 610
 - Flowers green to dull pink or brownish, in hanging sprays: fruit of 3-5 red pods with several large black or brown seeds ... *Sterculia* p. 618
 - Not so: big forest trees with fissured bark
 - Leaves simple: pods split open, with one big seed at the base ... *Scaphium* p. 616
 - Leaves simple or palmate: fruits like seeds with a flattened wing ... *Tarrietia* p. 621

COMMERSONIA

(P. Commerson, 1727-1773, the French botanist and explorer)

Leaves alternate, slightly asymmetric.
Flowers small, white, bisexual, in flat axillary clusters: sepals and petals 5.
Fruit a woolly, softly bristly, round capsule splitting into 5 parts, with numerous small seeds (not winged).
 About 8 species, Australian except the following.

C. Bartramia Plate 184

Mason Bee Tree,
(J. Bartram, 1699-1777, an American naturalist) *Angkut Angkut, Angkut Best,*
Menarong Gajah, Menkiri

A small, rather sparingly branched, evergreen tree up to 30 ft. high, with flattened, horizontal leafy sprays having the clusters of flowers and fruits all along the upper side: bark dark grey brown, rather scaly and fissured: twigs, inflorescences and under sides of the leaves woolly-felted.

Leaf-blade 3-10 × 1½-6", ovate gradually tapered, toothed, the base heart-shaped and often oblique, drooping, white hoary beneath: stalk ¼-½" long, brown hairy.

Flowers ½" wide, in clusters 2-3" wide, facing upward: sepals white, triangular: petals white, tiny, narrow: flower-clusters often opposite the leaves.

Fruit 1" wide, turning brown or greyish.

South China through Malaysia to the Pacific Isles: a common tree of villages and secondary jungle, occasional in the high forest.

The shape and the white hoary undersides of the leaves and the softly bristly fruits easily distinguish this tree. The old empty fruits remain for a long time on the branches rendering them shabby. It evidently flowers throughout the year. The leaves are apt to be much eaten by beetles.

The branching of the tree is rather stiff and at a wide angle. There is no leader shoot to the trunk so that the general aspect is that of a large-leafed Cherry Tree (*Muntingia*).

Malays sometimes mistaken the Mason Bee Tree for the *Menarong* (*Trema*, p. 693) and may give them the same names.

Compare the White Isora, *Helicteres viscida* (p. 612).

DOMBEYA

(J. Dombey, 1742-1794, an English doctor and naturalist in the W. Indies)

Leaves simple or shortly 3-lobed, spirally arranged.

Flowers in stalked clusters from the leaf-axils, bisexual: sepals 5: petals 5, large: stamens 15 fertile, 5 sterile and strap-like, all joined in a ring at the base: ovary sessile, style with 5 short rays like a star at the top.

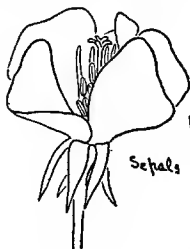
Fruit a capsule.

100 spp., tropical Africa: 1 sp. introduced to Malaya.

D. spectabilis Text-Fig. 222

African Mallow

(Lat., remarkable)



A bush up to 8 feet high, evergreen, flowering throughout the year: twigs, leaf-stalks and undersides of leaves rather scurfy hairy.

Leaf-blade 3-7 × 2-5", almost as broad as long, generally with 3 points, sometimes without lobes, the base heart-shaped, the edge toothed, rather dull dark green, wavy: stalk 2-4" long, long.

Flowers 1" wide, pale pink, scentless, in clusters 2-3" wide on green stalks 2-3" long: sepals green, long, reflexed, pointed: petals upstanding, wavy: the 5 strap-like, upstanding sterile stamens pink: style cream-colour.

East Africa: occasionally cultivated in Malaya.

Text-Fig. 222.
Dombeya spectabilis, nat. size.

We include this plant in our book because it is likely to become well-known through its elegant flowers, the clear structure of which commends them for botanical classes.

FIRMIANA

(Count K. J. von Firmian, 1716-1782, an Austrian patron of science)

Like *Sterculia* but the flowers with a large tubular calyx containing both stamens and ovary: *pod thin-walled, opening long before maturity, 2-seeded, with one small seed on each edge near the base.*

2 species, India, Malaysia: 1 species in Malaya.

F. fulgens Text-Fig. 221
(Lat., shining)

Bullock's Eyes
Mata Lembu

A *deciduous* tree up to 70 ft. high, generally much less, with *Terminalia*-branching, the main branches in whorls on the trunk, *sharply buttressed: bark silvery grey, smooth: twigs, leaf-stalks and undersides of the leaves softly hairy.*

Leaf-blade $3\frac{1}{2}$ -8 × 2-5", *drooping, broadly elliptic, occasionally 3-lobed, the base heart-shaped, with a long tip, the edge wavy and uneven, thin, with 7-9 pairs of side-veins, leaf-stalk and veins of the leaf bright pink underneath: stalk 1-6" long, without a knee.*

Flowers vivid orange, scurfy, in tassels up to 4" long at the ends of the bare twigs, scentless: calyx 1½" long, with 5 teeth, pinkish inside.

Fruits 3-4" long, in bunches on the bare twigs, pale brownish, papery, beautifully veined, shaped like boats, with slender stalks: seeds pale brown, marked with a network.

Malay Peninsula: river banks and open forest in Malaya from Gemas northward, occasionally planted in villages.

In flower this tree is a beautiful sight. It is deciduous after a dry weather and remains bare for 6-8 weeks during which time not only do the flowers develop in brilliant orange masses on the gaunt twigs but the fruits ripen and begin to blow off. The fruits take only 4-5 weeks to develop so that the reproduction of the tree is completed before the new leaves appear. The fruits spin rapidly as they fall and may be blown for distances of 100-200 yards. The flowering season lies between December and March in the north of the country but in the neighbourhood of Gemas and Jerantut it appears that the trees may flower twice a year, in February and again about July or August.

In its broad leaf-blade, grey bark and vivid bunches of flowers the tree resembles the *Dadap* (*Erythrina indica*) and it is occasionally miscalled *Dadap Utan*. Like the *Erythrinas*, it prefers a monsoon climate and does not thrive in the south of the peninsula. In Penang and Kedah and on the East Coast it would make an excellent roadside tree. But the bark of two trees in the Singapore Botanical Gardens has been much damaged by boring beetles: the bark is thick and juicy and contains curious pockets of gum.

When sterile, the Bullock's Eyes can be distinguished from *Sterculia*-trees, particularly *S. parviflora*, by the colour of the inner bark which is pale yellowish (pink or red in *Sterculias*), the presence of the gummy pockets in it and by the absence of a knee at the top of the leaf-stalk. (In BURKILL'S Dictionary the species is called *Erythropsis fulgens*).

HELICTERES

(Gr., helikter—twisted: from the twisted fruit)

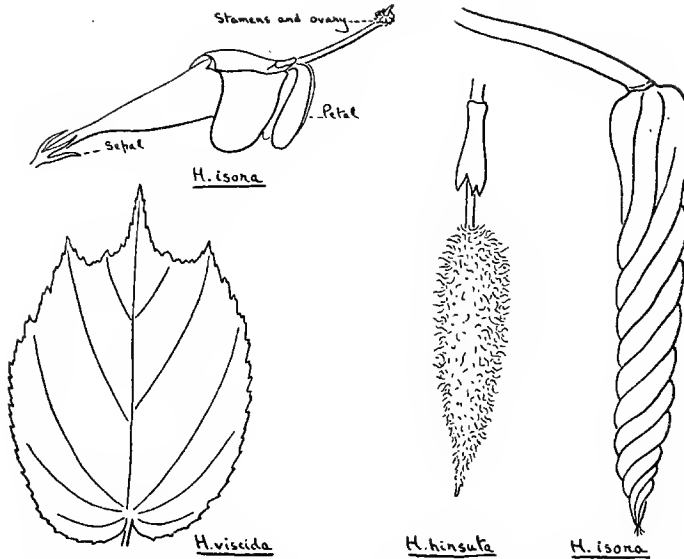
Shrubs or bushy treelets, with hairy twigs and leaves.

Leaves alternate, toothed, rather shortly stalked.

Flowers in clusters in the leaf-axils, compressed laterally and bilaterally symmetric, bisexual: calyx with a large conspicuous tube with 5 teeth at the top or irregularly torn: petals 5, recurved, generally two larger than the others: stamens numerous, minute, at the top of the stalk bearing the ovary and concealing it.

Fruit a capsule splitting into 5 long cavities, each with many seeds.

50 species, Asia and America: 5 species in Malaya, in the northern part.



Text-Fig. 223. Helicteres: flower and fruit, nat. size: leaf $\times \frac{1}{2}$.

Key to the Species

- Leaves more or less heart-shaped at the base, generally with 3 points
 Leaf-stalk $\frac{1}{2}$ -1" long: flowers red: fruit twisted ... *H. isora*
 Leaf-stalk shorter: flowers white: fruit very woolly, straight *H. viscida*
 Leaves not heart-shaped, with only one point: flowers pink *H. hirsuta*

H. hirsuta Text-Fig. 223
 (Lat., hairy)

Pink Isora

A straggling shrub up to 10 ft. high: twigs tough.
 Leaf-blade 3-7 \times 1-2 $\frac{1}{2}$ ", lanceolate or elliptic, generally rather curved or asymmetric, rather rough on the upper side: stalk $\frac{1}{2}$ -1" long.
 Flowers 1" long, pink, in axillary racemes 1-1 $\frac{1}{2}$ " long: calyx purplish: petals deep pink with white stalks, nearly all equal in size: a flat pink gland on the upper side of the raceme at the base of each flower.
 Fruits 1-1 $\frac{1}{2}$ " long, straight, woolly.
 S. E. Asia: common in secondary jungle on the west side of Malaya from Kuala Kubu northward, especially in Kedah and Perak.

H. isora Text-Fig. 223

Red Isora

(from the Malabar plant-name *isora-murri*)
 A shrub or bushy little tree to 15 ft. high, with long straggling limbs: twigs zig-zag.
 Leaf-blade 3-8 \times 2 $\frac{1}{2}$ -7", generally with 3 points (a large tooth on either side of the pointed apex), thin, base heart-shaped: stalk $\frac{1}{2}$ -1" long.
 Flowers 2" long, scarlet, a few in the leaf-axils: calyx-tube green turning yellowish: petals 5, at first green tinted blue, gradually reddening to scarlet.
 Fruit 2-2 $\frac{1}{2}$ " long, twisted with 5 spiral strands, on a woody stalk 2" long.
 India to Java: occasional in the North of Malaya and in gardens.

This is a beautiful and unusual bush that deserves to become much better known. The dried fruits, like twisted pods, are a well-known native medicine and are sold in shops.

H. viscida Text-Fig. 223

White Isora

A straggling shrub, to 12 ft. high, many-stemmed, like *H. hirsuta* but:—
 Leaf-blade 3-5 × 1½-4½", broad, mostly 3-pointed, heart-shaped at the base, light yellow green above, whitish-woolly beneath, the stalk ¼-½" long or less.

Flowers white, the calyx very woolly.

Fruit very woolly, green then brown.

Burma, Indo-china to Java: common locally in the Eastern part of Malaya from Pahang to Kelantan, from Kuala Lipis and Pekan northward.

Whether it is true that *H. hirsuta* occurs only on the West side of Malaya and *H. viscida* on the East has yet to be proved.

The oblong fruits, strongly toothed leaves and bushy habit distinguish this from *Commersonia* (p. 608).

HERITIERA

(C. L. L'Heritier de Brutelle, 1746-1800, the French botanist)

Like *Sterculia* but the leaves brownish silvery scaly beneath: pods massive, not opening, with a ridge or keel but no wing, filled by the one large seed.

7 species, tropical Africa, Asia, Australia: 2 species in Malaya.

H. littoralis Text-Fig. 224
(belonging to the sea-shore)

Dungun

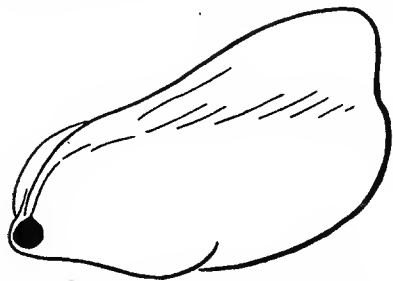
A low, much-branched, dingy, evergreen sea-shore and mangrove tree, up to 50 ft. high, often, with leaning trunk and gnarled branches: bark pinkish grey, entire, rather fissured flaky in old trees: young twigs and leaf-stalks brown-scurfy: old leaves turning dull orange-yellow.

Leaf-blade 2½-10 × 1½-4", leathery, oblong or elliptic, gradually tapered, the base rounded and slightly heart-shaped, dark green above, silvery white beneath: stalk ¼-1" long.

Flowers ¼" wide, as dull purple-bells with 4-6 teeth, hanging in yellowish tassels, 2-7" long, from the leaf-axils.

Fruit 1½-3" long, purple brown, massive, woody, compressed, glabrous, shiny, with a keel or short flange on one side.

Tropical shores of the Indian and W. Pacific Oceans: common on sandy and rocky coasts and in mangrove swamps.



Text-Fig. 224. *Heritiera littoralis*:
fruit, nat. size.

The curious boat-like fruits of the *Dungun* are common objects of the drift. They can float for several weeks in the sea and they germinate where they are stranded at high tide. The dingy crown and oblong leaves, silvery beneath, suggest a *Durian*. The timber is hard and strong but small: "possibly the toughest of Malayan timbers" (FOXWORTHY).

Compare *Brownlowia* (Tiliaceæ, p. 634) which is also called *Dungun*, and *Katong* (*Cynometra ramiflora*, p. 391) with different leaves but very similar general appearance.

KLEINHOVIA

(C. Kleynhoff, d. 1777, a German physician)

Leaves more or less heart-shaped, entire, long-stalked, spirally arranged.

Flowers in terminal panicles, bisexual: sepals 5, longer than the petals: petals 5, the upper one rounded and incurved: stamens numerous, minute, clustered round the stalked ovary: style very short.

MELOCHIA

Fruit a bladder-like, 5-shouldered capsule, splitting along the shoulders, with 5 compartments each with 1-2 round seeds.
 1 species, throughout tropical Asia, from the Mascarene Islands to Polynesia.

K. hospita Text-Fig. 225
 (Lat., hospes—guest)

Guest Tree
 Temahau

An evergreen bush or bushy tree up to 70 ft. high with dense rounded crown and *upright pink sprays of flowers and fruits*: trunk soon breaking into branches, developing many suckers when old: bark pale grey, yellowish internally: *twigs and leaves often softly hairy.*

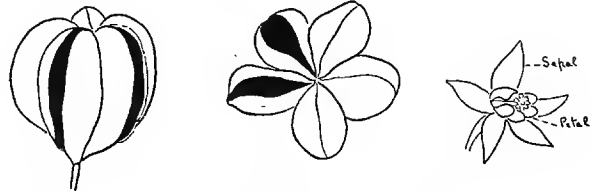
Leaf-blade 2-6 × 1½-5", about as broad as long, ovate or heart-shaped, pointed, the edge entire, soft green: *stalk long, 1-4"*: sapling leaves much larger, up to 10 × 9" with stalks 8" long.

Flowers ¼" wide, softly pink, scentless, in rather loose upright panicles 6-14" long: *sepals pink: petals inconspicuous, the upper incurved one yellow.*

Fruit ¾-1" long and wide, pink, with thin-walls: seeds whitish.

Abundant along the whole course of the Perak River and its tributaries, on the road to Baling and on the coasts of Pulau Tioman and P. Aor.

This tree looks remarkably like the Sea Hibiscus, *H. tiliaceus*, except for its flowers and fruits: its leaves are never so firm. It would make a useful small roadside tree especially in loose or sandy soil. Though it is so widespread in the Eastern tropics, it is curiously restricted in Malaya.



Text-Fig. 225. *Kleinhovia hospita*: fruit, nat. size: flower × 2.

MELOCHIA

(from the Arab plant-name *melochiech*)

Leaves spirally arranged, heart-shaped, toothed, long-stalked: the young twigs with conspicuous stipules.

Flowers small, pink, symmetrical, bisexual, clustered at the ends of the branches of upright terminal panicles: calyx-cup with 5 teeth: petals 5, longer than the sepals: stamens 5, opposite the petals: styles 5.

Fruit a small, oblong, 5-angled capsule: seeds small, winged, flattened.
 60 species, tropics generally: 2 species in Malaya.

M. umbellata Text-Fig. 226

Meloch
 Tampu, Tapu, Chapah, Singah

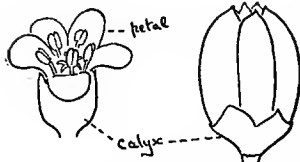
A bush or small tree up to 30 ft. high, with softly hairy twigs, leaves and inflorescences: bark greyish white with persistent leaf-scars: inner bark very thick, pinkish: young leaves pale green, very silky: *stipules green, leafy, rounded, ¼-½"* wide.

Leaf-blade 3-10 × 2-8", toothed, thin, rather drab green, the stalks 1-6" long: side-veins 7-11 pairs.

Flowers ½" wide, the green panicles 4-12" long: stamens white with yellow anthers: styles yellow.

Capsules ½" long, clustered on the panicle.

India, Malaysia to New Guinea: frequent from Malacca northwards in Malaya, especially by the banks of rivers.



Text-Fig. 226. *Melochia umbellata*, × 2.

STERCULIACEÆ

In its general aspect this rather untidy little tree resembles a wild Hibiscus or Kleinhovia, from both of which it is at once distinguished by the toothed leaves and conspicuous stipules. From all Malayan trees it is distinguished by the hairy, toothed, heart-shaped leaves and the panicles of small flowers with five pink petals.

PTEROSPERMUM

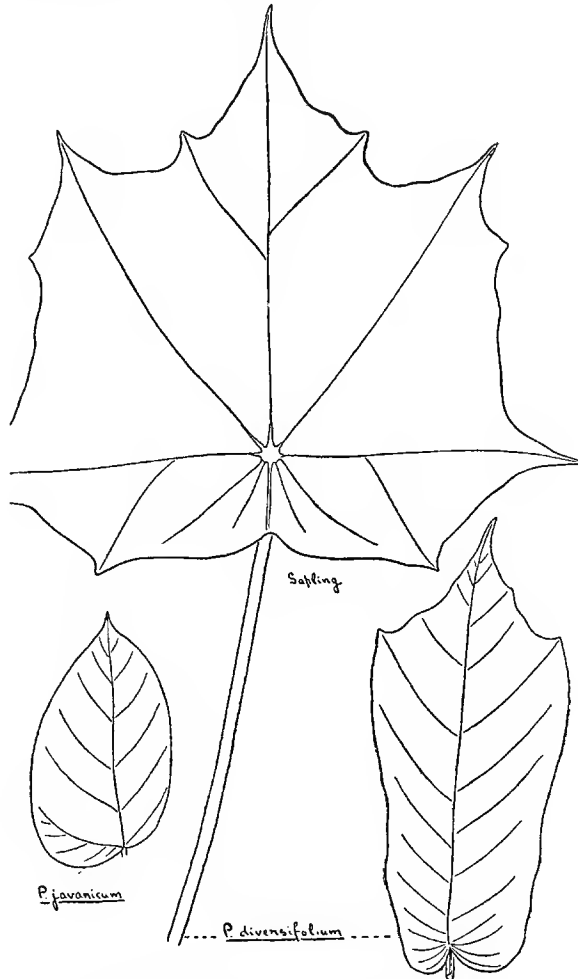
(Gr., pteron—a wing, sperma—a seed)

Leaves alternate on the twigs, generally asymmetric with obliquely heart-shaped base, *coppery or rusty beneath*.

Flowers medium to rather large, 1-3 in the leaf-axils, long, narrow, bisexual: calyx tubular with 5 teeth, splitting along one side: petals 5, wavy, white or yellow: stamens 15, ten being fertile, 5 sterile.

Fruit a large woody or leathery stalked capsule splitting into 5 parts: seeds many, flat, winged.

18 species, Indo-Malaysia : 3 species in Malaya.



Text-Fig. 227. Pterospermum, $\times \frac{1}{2}$.

Key to the Species

Leaves deeply heart-shaped at the base, almost symmetric, often jaggedly toothed at the apex: sapling leaves peltate, often lobed	...	...	...	<i>P. diversifolium</i>
Leaves asymmetrically heart-shaped at the base, not toothed	...	...	...	<i>P. javanicum</i>

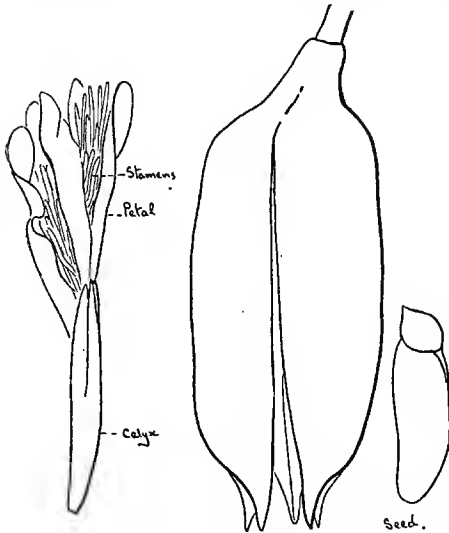
P. diversifolium Text-Figs. 227, 228
(from the varied leaf-shape)

Bayur, Bayu

A moderate-sized tree up to 70 ft. high: *twigs and leaf-stalks orange-brown woolly or scurfy, especially when young.*

Leaf-blade 4½-12 × 2½-6", broadly elliptic to obovate, *dark green above, orange-brown to brownish white or silvery underneath*: stalks ½-1" long: stipules simple.

Sapling leaves 12-24" wide, *peltate, often palmately lobed with 5-11 points*: stalk 4-12" long.



Text-Fig. 228. *Pterospermum diversifolium*, × ½.

Flowers 4-6" long, fragrant: *petals white, much longer than the calyx.*

Capsule 4-5" long, the stalk 1" long, woody, *brown scurfy*, with 5 angles, like a small thornless *Durian*.

India to the Philippines: rather uncommon in lowland forest in the middle and north of the country.

There is another, apparently somewhat rare, species in Malaya, *P. acerifolium*, which has very dark brown woolly twigs and leaf-stalks, *stipules consisting of about 4 teeth*, broader, rounder, tougher and more deeply heart-shaped leaves with white undersides and stalks 1-2" long, larger flowers and larger, woollier and more prominently angled fruits. Both species are striking and unmistakable trees either in the adult or the sapling state. The difference between these states is like that in *Scaphium* and several species of *Artocarpus*.

P. javanicum Text-Fig. 227

Bayur, Bayu

Letop Letop (Johore), Melerang

A tall tree, up to 150 ft. high in the forest, generally up to 70 ft. in secondary jungle, with *wide-spread branches and rather flat-topped crown*, developing sharp, steep buttresses: bark light grey to greyish brown, somewhat fissured or entire: *twigs and undersides of the leaves rusty scurfy.*

Leaf-blade 2½-7 × 1-3", oblong, tipped, *the underside rusty brown to brownish white scurfy*, edge often wavy and uneven but not toothed: stalk ¼" long or less: stipules small, simple.

Flowers 2-3" long: *petals yellow, shorter than the long, narrow, rusty scurfy sepals.*

Capsule 3-4 × 1½", *blackish, glabrous.*

W. Malaysia: common in Malaya, especially in secondary jungle.

STERCULIACEÆ

This beautiful tree is at once recognized from the rusty brown undersides of the asymmetric, drooping leaves. The base of the leaf is unequal, the broadest side being toward the end of the twig (as in the Cherry, Muntingia) and thus giving the twig an untidy appearance. The sapling-leaves are somewhat larger than the adult but not differently shaped. The leaves of seedlings a few feet high are, however, narrowly peltate and symmetrical. Big trees generally have small leaves, 3-4" long, with brownish-white undersides.

This *Bayur* is abundant in secondary jungle in the middle of the country, and we soon learn to recognize it from the small-leaved, dingy brownish, open crown inclined to be flat-topped. It seems to have two flowering periods, one about March-May, the other about September-October.

The tree *Schoutenia accrescens* (p. 645) can be mistaken for this *Bayur*, but it has smaller 3-veined leaves. The rusty-leaved Nutmeg-trees differ in their symmetrical leaves.

SCAPHIUM

(Gr., skaphion—a skiff: from the shape of the fruit)

Large trees with short thick buttresses: bark grown, becoming fissured and flaky. *Leaves spirally arranged*, simple: *sapling leaves very large and palmately lobed*, *Flowers* as in *Sterculia* but not bell-shaped, *small*, cream-colour, tubular, *set in upright scurfy panicles*: the anthers on the top of a stalk.

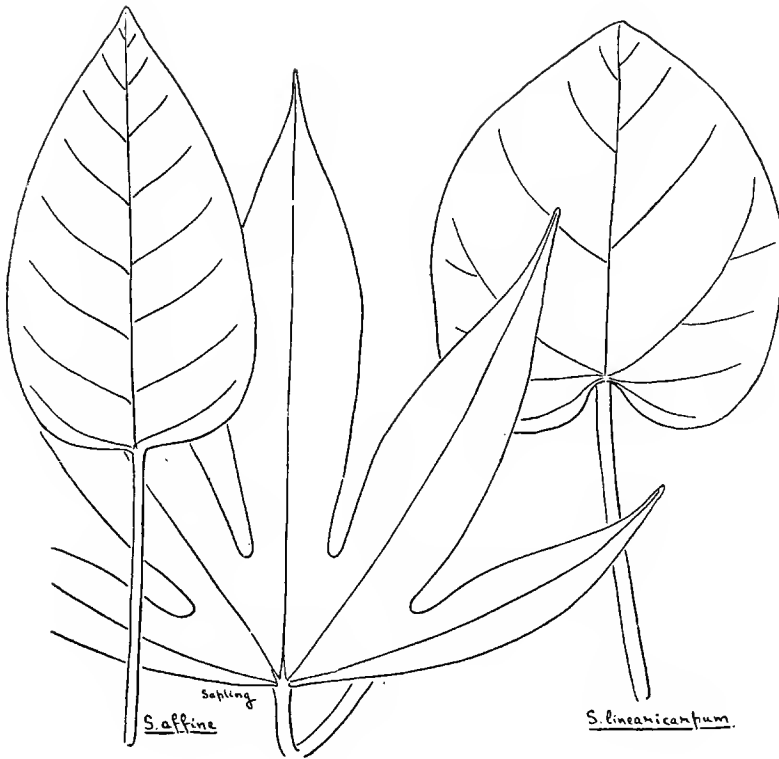
Fruit a large, green, thin-walled pod, opening along one side long before maturity and becoming boat-shaped, each pod with one large seed at the base.

4 species, Burma, Indo-China, Siam, Malaya, Borneo: 3 species in Malaya, in lowland forest.

This genus is allied with *Sterculia* and *Firmiana* but differs in the flower and the curious fruit which opens long before it is ripe. There are two common species in this country and they are well-known to Malays as *Kembang Samangkok* or "Fill-a-cup". If a ripe seed is cut and soaked over-night with a little water in a cup it gives out a mucilage which swells and fills the cup. This jelly is drunk as a febrifuge and for coughs, asthma and dysentery: it is a little sour and tasteless but palatable when sweetened with sugar. The dried seeds are exported for medicine from their native countries to India, China and even Europe under the name *Pungtalai* or, in Java, *Buah Tampayang*. The same brown jelly envelops the germinating seeds and is eaten by monkeys.

Both our common species are deciduous forest-trees. They flower on the bare twigs before the new leaves develop and the fragrant blossom attracts countless numbers of bees, flies, beetles and butterflies in variety and profusion that is seldom seen. In the south of the country the flowering season lies between February and June, but by no means every year: there is a big tree (*S. affine*) in the Reservoir Jungle in Singapore that has flowered only once, to our knowledge, in eight years. The pods spin as they fall like those of *Firmiana*. The wood is sometimes used as timber. The bark is identical with that of *Mengkulang* (*Tarrietia*) described by FOXWORTHY (7, p. 52).

The saplings of *Kembang Samangkok* are so remarkable that we do not think of associating them with the mature tree until we have seen the intermediate stages, between twenty and forty feet high, bearing both kinds of leaves with every transitional shape. Very few kinds of tree have such differences between the juvenile and adult foliage, e.g. *Pterospermum*, *Artocarpus*.



Text-Fig. 229. Scaphium, $\times \frac{1}{2}$.

Key to the Species

Adult leaves deeply heart-shaped: pods yellow-brown			
hairy: seeds hairy	...	...	<i>S. linearicarpum</i>
Not so: pods and seeds glabrous	...	...	<i>S. affine</i>

S. affine Text-Figs. 221, 229
(Lat., allied)

Kembang Sa-mangkok.

Adult leaf-blade 3-10 \times 2-6", ovate oblong, gradually tapered to the apex, the base rounded, with 7-14 pairs of side-veins: stalks 1-6" long.

Sapling leaves 1-2 ft. long, nearly as wide, with 3-5-7 finger-like lobes, the base more or less heart-shaped: stalks 1-2 ft. long.

Pod 7-8" long: seed 1" long, egg-shaped, brownish.

Malay Peninsula: common in lowland forest.

STERCULIACEÆ

S. linearicarpum

Text-Fig. 229

Kembang Sa-mangkok

(with linear fruit)

Adult leaf-blade 6-14" long, nearly as wide, not tipped, with 6-8 pairs of side-veins : stalk 3-8" long.

Sapling leaves as in *S. affine* but deeply heart-shaped at the base, their stalks together with the twigs light-brown scurfy.

Pods 9-11" long.

Malaya : fairly common from Perak to Singapore, in lowland forest.

STERCULIA

(Lat., stercus—dung : from the smell of the flowers)

Trees with Terminalia-branching : or shrubs.

Leaves simple or palmate, entire, with a knee at the top of the stalk.

Flowers male or female or bisexual, facing down, generally in hanging racemes: calyx-cup with 5 sepals, rather bell-shaped : petals absent: stamens joined in a long or short column with the anthers at the top: ovary of 5 separate parts.

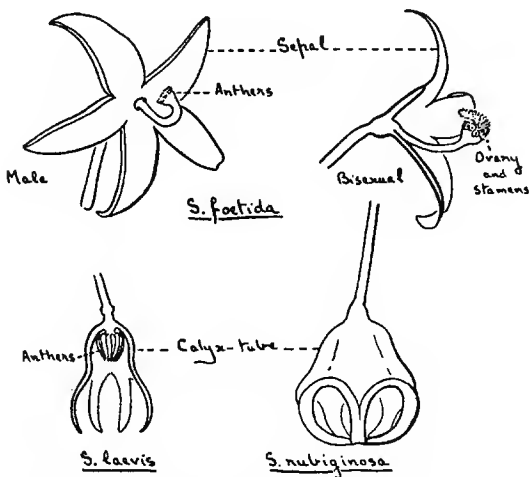
Fruit consisting of 1-5 pink or scarlet, leathery pods, radiating from a common-stalk (the flower-stalk), splitting open along the inner face, with the large brown or velvety black seeds hanging from the split edges: seeds covered with a very thin layer of pulp : (seeds winged in *S. alata*).

200 species, throughout the tropics : about 20 species in Malaya.

From the striking fruits a Sterculia can be recognized. To Malays the species are generally known indiscriminately as *Kelumpang*, *Kelumpang*, *Kelumpang* and *Kerombang* : occasionally, because of the red hanging pods, they are called *Tangisong Burong* (see p. 6).

The Terminalia-habit is best seen in the species with large leaves, such as *S. fœtida*, *S. macrophylla* and *S. parviflora*. In most species the leaves are so arranged that those on the upperside are smaller and have shorter stalks than those on the underside, the vertically uppermost leaf being smallest and the vertically undermost on the twig being largest, thus affording the least overlapping.

The flowers are pollinated mainly by flies and beetles. In most species they are fragrant of honey but, also, with a slightly foetid smell which is most



Text-Fig. 230. Sterculia-flowers, nat. size.

marked in *S. fœtida*. The male and the female flowers occur on separate sprays on the same tree. What animals distribute the seeds, we do not know. Monkeys lick the juice from unripe seeds as though it were coconut-milk.

The Chinese *S. balanghas*, with sticky brown edible seeds, is occasionally found as a small tree in Chinese gardens.

Key to the Species

- Large trees, 30-100 ft. high when flowering
- Leaves palmately compound *S. foetida*
 - Leaves simple
 - Leaves oblong, slightly heart-shaped, glabrous ... *S. parviflora*
 - Leaves deeply heart-shaped, large
 - Leaves hairy beneath *S. macrophylla*
 - Glabrous: pods with winged seeds: scarce ... *S. alata*
- Small trees or shrubs, seldom exceeding 30 ft. high
- Twigs and undersides of the leaves brown scurfy
 - Pods 2-3" long: stipules large, persistent: lowlands *S. rubiginosa*
 - Pods 3-4" long: stipules small, soon falling off:
 - mountains *S. rostrata*
 - Glabrous: leaves narrow
 - Spindly shrub or treelet, up to 15 ft. high: pods
 - 2-3" long: flowers pale pink or green, $\frac{1}{2}$ - $\frac{3}{4}$ " long *S. laevis*
 - Bushy shrub or tree to 30 ft. high: pods $1\frac{1}{2}$ -2" long: flowers reddish pink, $\frac{1}{3}$ - $\frac{1}{2}$ " long ... *S. parvifolia*

S. alata Plate 102 Kasah
(Lat., winged)

A big tree, up to 150 ft. high, with rounded, shady crown and large buttresses: bark light grey.
Leaves 5-12" long (18" in saplings), large, with a stalk 3-6" long (24" in saplings).
Pods very massive, woody, 5-6 x 4", filled with large winged seeds.
India, Indo-China, Siam: occasional in Malayan forests in the middle and north of the country.

This fine tree has been planted along with *S. foetida* in Penang and wild specimens are rather common in the neighbourhood of Grik. It is like *S. macrophylla* except for its remarkable seeds which are exceptional in the genus. Nothing is known about its leafing and flowering.

S. foetida Plate 217, Text-Fig. 230 Great Sterculia, Java Olives
Kelupang

A big deciduous tree, up to 100 ft. high, without buttresses: bark grey to brownish: twigs massive: the twigs and leaf-stalks of saplings coated with sticky hairs: young leaves pinkish.

Leaves with 5-9 elliptical leaflets 4-6 x $1\frac{1}{2}$ -3": stalks 4-7" long: (up to 11 leaflets in saplings).

Flowers $\frac{3}{4}$ -1" wide, crimson, foetid, woolly, set in loose green panicles, up to 12" long, from the ends of the twigs.

Pods 3-4" long, nearly as wide, massive, woody, curved, reddish, set 2-5 in star-like clusters hanging on stalks from behind the leaves: seeds 1" long, purple-black with a velvety sheen and with a small yellow waxy lump at one end.

A coastal tree on rocky and sandy shores from East Africa to Queensland: occasional on the northern and eastern coasts of Malaya (as far south as Pulau Tioman on the East, Penang on the West).

From a distance this tree looks like a mixture of a *Pulai* (*Alstonia*), a Rubber-tree and a Kapok (*Ceiba*). The *Terminalia*-habit is pronounced, the main branches being in whorls of 4-8 and set at intervals of 4-6 ft. along the trunk which tapers to the vertex of the crown. Saplings evidently make rapid growth and they give the appearance of gigantic *Tapioca*-plants. The leaves are shed after pronounced dry weather, about December or January in Penang

and rather later in Kelantan, and the flowers appear before or with the new leaves. In Singapore the trees may be imperfectly deciduous, shedding the leaves on some branches and not on others.

This *Sterculia* has been planted on Patani Road and Coolie Lines Road in Penang, and it is common in the neighbourhood of Kota Bahru where it is used both as a quick-growing shade-tree and, along with the *Kedondong* (*Spondias cytherea*), as stakes for *Sireh*-plants (*Piper betle*). The magnificent specimen shown in our Plate is the largest that we have seen.

The flowering is soon over so that the smell is not an obstacle to the use of the tree as an ornamental.

S. lævis Text-Fig. 230

Shrub *Sterculia*

(Lat., smooth)

A glabrous, evergreen shrub or treelet to 15 ft. high, *spindly, sparingly branched*. *Leaf-blade* 4-11 × 1½-5", oblong lanceolate, elliptic or obovate, suddenly tipped, the edge often undulate, *with 7-12 pairs of side-veins*: stalk ½-3" long.

Flowers ½-¾" long, *pale pink* (? *pale green*), *hairy*, in slender hanging sprays 2-12" long.

Pods 1½-3" long, in solitary hanging stars.

Malay Peninsula, Borneo: common in lowland forest throughout the country.

Allied with this are two other species which differ only in the shape and veins of the leaf so that they may be merely varieties. One of these, *S. hyposticta*, has smaller leaves 3-8 × ¾-3", with 5-7 pairs of side-veins: the other, *S. elongata*, has long, narrow, lanceolate leaves 4-12 × 1-2½", generally widest near the base, with 15-26 pairs of side-veins. It appears that these species have green flowers and that the true *S. lævis* has pink, but we need more observations on the living plants to be able to classify them. All three kinds appear to be equally common.

S. macropyhlla

Broad-Leafed *Sterculia*

(Gr., makros—long, phullon—a leaf)

Kelumpang

A *large deciduous tree*, up to 150 ft. high, *with sharp spreading buttresses* (up to 10 ft. high), the main branches stiffly ascending: *bark silvery grey, smooth*, with ring-like leaf-scars: twigs massive.

Leaf-blade 7-16 × 5-12", *large, leathery*, ovate or rounded, *heart-shaped at the base, closely hairy beneath*: stalk 3-7".

Flowers ½" wide, *greenish yellow, purple hairy*, in hanging racemes up to 1 ft. long.

Pods 2 × 1½", *massive but short, velvety, carmine*: seeds brown.

W. Malaysia: common in lowland and swampy forest.

In Singapore and Penang this species sheds its leaves at intervals of 7-9 months and flowers before the new leaves develop. The fruit takes 4 months to ripen.

S. parviflora

Common *Sterculia*

(Lat., small-flowered)

Kelumpang Burong

A deciduous tree up to 80 ft. tall, slightly buttressed or not at all: *bark greyish or pinkish*, rather uneven and coarsely flaky: *young shoots finely brown scurfy*.

Leaf-blade 4-11 × 2-6", *thin, more or less tipped, the base rounded and slightly heart-shaped*, yellowish green beneath from minute yellow dots: stalk 1-4" long.

Flowers ¼" long and wide, *pale yellow and pink at the base becoming wholly reddish pink*, *hairy, in reddish brown, scurfy hanging sprays* 5-8" long, developing on the bare twigs before the new leaves.

TARRIETIA

Pods 3-5 × 2-4", very large, velvety, yellow flushed pink then brilliant carmine and orange-red.

N. E. India to Singapore: common in lowland forest and secondary jungle, occasionally planted in towns and villages.

This is our commonest large tree-Sterculia. In fruit it is a beautiful and unmistakable object. There is a fine row of trees along Grange Road, in Singapore, in the garden of Roseland (6r, Grange Road).

S. parvifolia

Shrub Sterculia

(Lat., small-leaved)

A shrub or treelet like *S. laevis* but bushy, much more branched and generally taller (up to 30 ft.).

Leaf-blade 3-7 × ¾-2", narrow, lanceolate, tipped, with 7-11 pairs of side-veins.

Flowers 3-5" long, reddish pink.

Pods 1½-2" long.

Malaya: frequent in the forest in the middle and north of the country.

S. rostrata

Mountain Sterculia

(Lat., beaked)

Like *S. rubiginosa* but:—leaves less hairy: stipules small, soon falling off: pods larger, 3-4½" long, with a long beaked end.

Malaya: frequent in the mountains of the main range, above 3,000 ft.

S. rubiginosa Plate 185

Rusty Sterculia

(Lat., rust-coloured)

An evergreen or partly deciduous, small, bushy tree up to 30 ft.: bark brown, smooth: *twigs, inflorescences, leaf-stalks and undersides of the leaves brownish scurfy hairy.*

Leaf-blade 4-12 × 2-5½", very variable, lanceolate to elliptic or obovate, suddenly tipped, the base slightly heart-shaped: stalk ¼-3" long: stipules rather large, lanceolate, persistent.

Flowers ¼" wide, pale yellow with pink hairs and edges, the inside of the cup crimson, the sepals arched together but eventually spreading, in hanging sprays up to 10" long.

Pods 1½-3", pointed, velvety scarlet: seeds blue-black, 3-8 in a pod.

Burma, Indo-China, W. Malaysia: common in lowland forest and secondary jungle, scarce in the mountains.

In Singapore, this little tree flowers twice a year, about January-March and July-September, after the spells of dry weather and it is one of the quickest trees to respond to these seasons. The fruits take 3 months to ripen. The trees are very attractive both in flower, with the sprays of pink bells, and in fruit.

TARRIETIA

(from the Sundanese plant-name *tariti*)

Like *Scaphium* but the adult leaves in many cases palmate; *Pods 1-seeded, not opening, drawn out on one side into a broad or narrow wing* (like a Sycamore).

10 species, Indo-Malaysia, N. Australia: 6 species in Malaya, frequent in lowland forest.

SYMPLOCACEÆ

The species of *Tarrietia* are mostly timber-trees known to Malays as *Mengkulang* or *Bengkulang* and as *Melima* in parts of Pahang. They are described and figured by FOXWORTHY. Very little is known concerning them: they flower seldom and they appear to be deciduous. The characteristic fruits fall when green and turn brown on the ground (Text. Fig. 221). The genus is related to *Heritiera* but the fruits are more specialized.

ALUM-TREE FAMILY

Symplocaceæ

Leaves simple, alternate or spirally arranged, often toothed.

Flowers white, or greenish, regular, rather small: in small panicles, spikes or clusters, generally male on one tree and bisexual on another: sepals and petals 5, the *petals more or less joined in a tube*: *stamens many*, slender, projecting: *ovary inferior*, style 1.

Fruit pulpy, oblong or round, *with a large stone, crowned by the calyx*: the endosperm star-like in cross-section.

1 genus, throughout the warmer parts of the world except Africa, mostly Asiatic.

SYMPLOCOS

(Gr., interwoven)

About 400 species; about 30 species in Malaya, lowlands and mountains.

Although there are many species of this genus in Malaya, few are easy to recognize because of their ordinary leaves and inconspicuous flowers. The following species have always attracted our attention, however, by their manner of flowering. At dawn, the leafy sprays appear as if decked with white fluff. In an hour or so the corollas begin to fall and by 9 o'clock no open bloom is left on the tree. At dusk new flower-buds open and their corollas fall next morning. Thus for several days, in the season of flowering, the trees are whitened by night. Whether all the species have nocturnal flowers, we do not know but the character seems peculiar enough to distinguish the genus.

As described by BURKILL, the bark of some species contains a yellow dye and that of others is rich in alum, for which reason infusions of it are used to mordant fabric preparatory for treatment with other vegetable dyes, for instance in the *batik*-industry.

Key to the Species

Leaves alternate, narrow, $\frac{1}{2}$ - $1\frac{1}{2}$ " wide: flowers and fruits in small dense clusters on the twigs ...	<i>S. fasciculata</i>
Leaves spirally arranged, 1-3" wide: flowers and fruits in sparingly branched spikes	
Twigs and leaves glabrous	<i>S. laurina</i>
Twigs and undersides of leaves more or less brown hairy or velvety	<i>S. javanica</i>

S. fasciculata Text-Fig. 231
(Lat., clustered)

Alum Tree
Menasi, Nasi Nasi, Nenasi

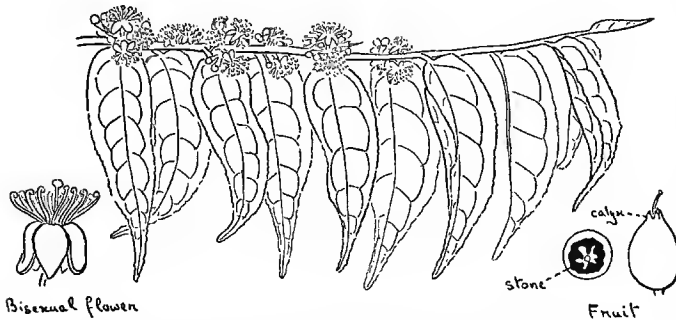
An evergreen tree up to 80 ft. high with smooth grey trunk and fine-leaved crown : twigs glabrous, drooping.

Leaf-blade 2-4 × 1-1½", narrowly elliptic or lanceolate, pointed, drooping with upcurled sides, the edge finely notched, or entire, about 5-7 pairs of side-veins, light shiny green : stalk 1-2" long, short.

Flowers ½" wide, white, fragrant, in clusters ½-¾" wide in the leaf-axils : stamens 15-25.

Berries ¼" long, oblong, ripening white then blue, clustered in the leaf-axils.

W. Malaysia : common in rice-fields, secondary jungle and forests throughout Malaya.



Text-Fig. 231. Alum Tree (*Symplocos fasciculata*), × ½ : flower × 2 : fruit, nat. size.

This tree may easily be mistaken for *Eurya acuminata*, of the Tea-family, p. 628, which has the same vernacular names. The position of the ovary is the most certain distinction, but the twigs of the *Symplocos* are glabrous whereas those of the *Eurya* are generally hairy. The vernacular name refers to the white fruit, like grains of cooked rice.

S. javanica

A small to moderately large tree : twigs, inflorescence, and undersides of the leaves (especially the veins) brown hairy.

Leaf-blade 5-9 × 1½-3½", elliptic, narrowed to each end, toothed, with 11-15 pairs of side-veins : stalk ½-¾" long.

India, S. China, Malaysia : frequent in the middle and north of Malaya.

S. laurina
(like a laurel)

Kendong

A small to medium-sized tree : twigs and leaves glabrous.

Leaf-blade 3-7 × 1-2½", elliptic, pointed, tapered to the base, toothed, with 5-9 pairs of side-veins : stalk 2-5" long.

Flowers ½" wide, white, scentless, in short, sparingly branched spikes 2-3½" long from the leaf-axils : stamens about 40.

India, W. Malaysia : frequent in secondary jungle and rice-fields in Malaya. common in Kelantan and Trengganu.

(= *S. spicata* of BURKILL'S Dictionary)

TEA FAMILY

Ternstroemiaceæ

(from the genus Ternstroemia)

Leaves simple, alternate or spirally arranged, often toothed, mostly leathery and glabrous: stalks short: stipules absent.

Flowers mostly solitary, axillary and stalked, regular, often showy: sepals 5, free, overlapping: petals 5 (occasionally more), white or yellowish, free or joined at the base, overlapping: stamens numerous, free or joined to the base of the petals: ovary superior, with several cavities.

Fruit a berry or capsule with the sepals persistent at the base.

23 genera, about 380 species, throughout the tropics, few in Africa: 11 genera, 43 species in Malaya, in lowland and mountain forest.

Most Malayan members of this family are small or medium-sized evergreen trees, rather dull-looking but with distinctive barks. Their young leaves are reddish or pink and it seems that the old leaves of many of them wither red. Three species are characteristic of secondary jungle, two are common forest-trees whose fallen flowers are often encountered; and another, *Schima Noronhæ*, is abundant in the mountains. The best known member of the family is the Tea-bush, *Camellia sinensis*, native of South China, of which there is an excellent account in BURKILL'S Dictionary: in Malaya, it is grown mainly at Cameron Highlands. The family is also called Theaceæ.

Several genera of this family have a curious distribution, their species occurring only round the Pacific, some in Eastern Asia and others in Tropical America, e.g. *Archytæa*, *Gordonia*, *Eurya*. Doubtless they travelled by the land-bridge which formerly joined Siberia with Alaska across the Bering Strait.

Key to the Genera

- Leaves alternate: fruit as pulpy berries
 Leaves $\frac{1}{2}$ –1" wide: flowers $\frac{1}{4}$ " wide, in small axillary groups: berries blue-black, $\frac{1}{4}$ " wide or less ... *Eurya* p. 628
 Leaves over 1" wide: flowers larger, singly or 2–3 together: fruit larger ... *Adinandra*
 Leaves spirally arranged: fruit hard, generally splitting open
 Leaves sessile, $\frac{1}{2}$ –1 $\frac{1}{2}$ " wide, fleshy, shiny: small tree or shrub ... *Archytæa* p. 627
 Leaves stalked, wider: generally big trees
 Twigs and leaves hairy: leaves 5–12" long: fruit apple-like ... *Pyrenaria* p. 629
 Glabrous: leaves up to 6" long: fruit as a capsule
 Leaf-stalk short $\frac{1}{4}$ " long: fruit oblong ... *Gordonia* p. 629
 Leaf-stalk $\frac{1}{2}$ –1" long: fruit round ... *Schima* p. 630

ADINANDRA

(Gr., adinos—crowded, aner—man; from the crowded stamens)

Trees with smooth, entire, warm brown bark, marked with persistent leaf-scars, and with the inner bark hard, thick, dry, pinkish brown and traversed with woody fibres.

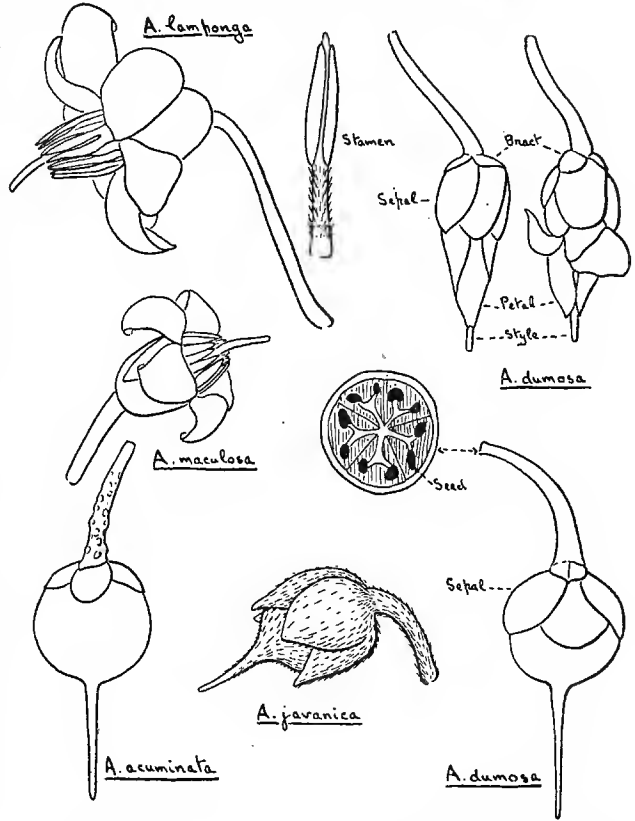
Leaves alternate, finely toothed or entire.

Flowers solitary or a few together in the leaf-axils, facing down, petals white: stamens hairy with long anthers: style long, projecting: ovary with 5 cavities.

Fruit as a berry with small brown seeds, crowned by the long style.

About 45 spp., S. E. Asia : 10 spp. in Malaya.

The Malay name for this genus is *Tiuþ Tiuþ* or *Tetiþ*, apparently because the long style suggest a blow-pipe. "There is a curious and closely allied genus, *Adinandropsis*, on the west of Africa" (BURKILL). The *Tiuþ Tiuþ* must not be confused with *Mata Pelandok* (*Ardisia*) which has spirally arranged leaves and more numerous flowers in clusters.



Text-Fig. 232. *Adinandra*: flowers and fruits, nat. size.

Key to the Species

- | | | |
|---|--------|---------------------|
| Twigs and undersides of the leaves hairy: sepals and fruit silky hairy | ... .. | <i>A. javanica</i> |
| More or less glabrous, at least the leaves | | |
| Leaves rather fleshy, the veins invisible on the under-side | | |
| Lowlands: flowers not opening: ovary and fruit glabrous | ... .. | <i>A. dumosa</i> |
| Mountains: flower opening: ovary and young fruit silky | ... .. | <i>A. maculosa</i> |
| Leaves with the veins distinctly visible on the under-side | | |
| Flowers 1-1 1/2" wide, on stalks 1-1 1/2" long: petals 7-9: twigs rather flattened: swampy riverbanks | | <i>A. lamponga</i> |
| Flowers 3/4-1" wide, on stalks 1/2-3/4" long: petals 5: secondary forest | ... .. | <i>A. acuminata</i> |

A. acuminata Text-Fig. 232
(Lat., pointed)

Tiup Tiup, Tetiup

Like *A. dumosa* but:—*seasonal in flowering: leaves thinner, more pointed, with distinct veins: flowers $\frac{3}{4}$ –1" wide, the petals opening wide, generally 2 flowers in each leaf-axil: fruit $\frac{3}{4}$ " wide, the sepals clasping only the base, the stalk thick, woody, and warty with lenticels.*

Sumatra, Malaya: less common than *A. dumosa* in Malaya.

A. dumosa Plate 186, Text-Fig. 232
(Lat., of shrubby aspect)

Tiup Tiup, Tetiup

An evergreen tree up to 60 ft. high, with dingy crown: *leaves withering dull scarlet: young leaves reddish pink.*

Leaf-blade $2\frac{1}{2}$ –6 × 1–2 $\frac{1}{2}$ ", elliptic, shortly and bluntly tipped, very slightly toothed or entire, *leathery with almost or quite invisible veins, pointing upward with upcurled sides, dark green, pale greenish white beneath: stalks .1–.2" long.*

Flowers not opening or only 1–2 petals unfurling, 1–2 in the leaf-axils, scentless, on reddish stalks $\frac{1}{2}$ – $\frac{3}{4}$ " long: petals .6" long, cream white: anthers brown with white filaments.

Fruit .6" wide, half-covered by the sepals, ripening green to brownish, on a slender stalk without lenticels.

W. Malaysia: common in secondary jungle throughout Malaya, especially in the southern parts, often forming almost pure stands.

This tree, which is one of the commonest in the country, produces new leaves and flowers throughout the year: it begins to flower at a height of 6 feet, when it is 2–3 years old, and continues daily for some hundred years. It grows slowly but steadily, even in the most impoverished places, and it can withstand lalang-fires. It is said that the flowers are pollinated by bees but, as they do not open, it is likely that they are self-pollinated. The seeds are distributed, like those of the Cherry Tree (*Muntingia*), by small fruit-bats which carry the fruits one at a time from the tree to their resting places, where they suck out the pulpy contents and disgorge the seeds. The timber is hard but usually small: it is much used in native houses and for pig-pens and so on.

A. javanica Text-Fig. 232
(from Java)

Tiup Tiup, Tetiup

Like *A. dumosa* but:—*twigs and undersides of the leaves more or less finely hairy or velvety: leaf with distinctly visible veins, withering dull greenish or brownish: flowers 1" wide, opening wide, fragrant, on short stalks $\frac{1}{2}$ – $\frac{3}{4}$ " long: sepals large, .4–.5" long, silky hairy: ovary silky: fruit .6" wide, silky hairy, pink then dull purple soft and juicy, more than half-covered by the large pointed silky sepals.*

W. Malaysia: frequent in the mountains from 2,000–5,000 ft.

This species has been called *A. villosa* in Malaya.

A. lamponga Text-Fig. 232
(the Lampong-district of Sumatra)

Tiup Tiup, Tetiup

A forest-tree up to 100 ft. high, often with prominent buttresses: *twigs often slightly winged, generally 4-angled when young.*

Leaf generally distinctly veined: stalk .1–.2" long, stout.

Flowers 1–1 $\frac{1}{2}$ " wide, rather large, opening wide, on stalks $\frac{3}{4}$ –1 $\frac{1}{2}$ " long, scentless, with 7–9 petals.

Fruit $\frac{3}{4}$ " wide, glabrous, the rather slender stalk without lenticels.

Sumatra, Java, Malaya: *in lowland swampy forests* and by lowland rivers, easily recognized from the fallen flowers.

This species has been called *A. macrantha* in Malaya.

A. maculosa Text-Fig. 232
(Lat., spotted)

Like *A. dumosa* but:—buds hairy: leaves with dark speckles on the underside (? withering yellow): flowers $\frac{3}{4}$ –1" wide, opening wide, with 5 petals, waxy white: sepals finely hairy: ovary silky hairy: fruit silky-hairy becoming glabrous.

Malaya: frequent in mountain forest, abundant at Fraser's Hill.

From *A. lamponga* this differs in its mountain habit, the invisible veins of the leaves, the smaller flowers with fewer petals, and in the twigs.

ARCHYTÆA

(Archytas, a Greek philosopher and friend of Plato)

Leaves sessile, clasping the stem with short lobes, spirally arranged.

Flowers in small terminal clusters: stamens in 5 bundles opposite the petals: styles 5.

Fruit a thinly woody, conical capsule splitting from base to apex into 5 parts and leaving a central column, crowned with the persistent styles.

5 species, tropical S. America, Malaysia: 2 species in Malaya.

A. VahlII Text-Figs. 233, 234
(M. Vahl., 1749–1804, a Norwegian botanist)

Cicada Tree
Riang Rieng, Reriang,
Kayu Kuat, Kuat Kuat

An evergreen shrub or small bushy tree to 40 ft. high, with conspicuous *Terminalia*-branching: bark warm brown to greyish brown, narrowly but deeply ridged and fissured: old leaves withering yellow to reddish orange or dull red.

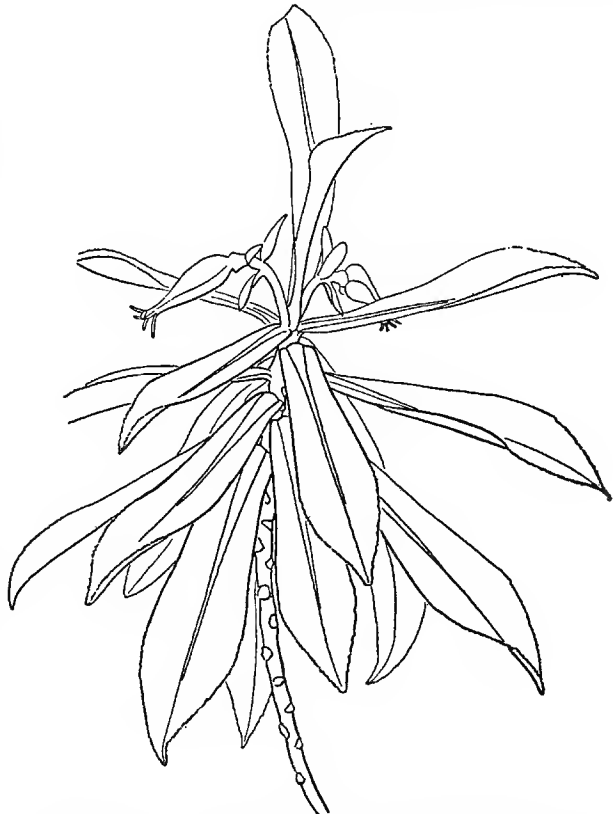
Leaf-blade 2–4 $\frac{1}{2}$ × $\frac{1}{2}$ –1 $\frac{1}{4}$ " narrow, oblong lanceolate, pointed, rather fleshy, shiny, the veins almost invisible, rather yellowish green with a minutely toothed pink edge, with a dark grey speckled spot on each side of the base on the upperside.

Flowers 1" wide, fluffy from the numerous stamens, on stalks 1–1 $\frac{1}{2}$ " long: sepals green, edged pink: petals white, tipped pink, curved back: ovary reddening after pollination, with 5 yellow nectaries round the base.

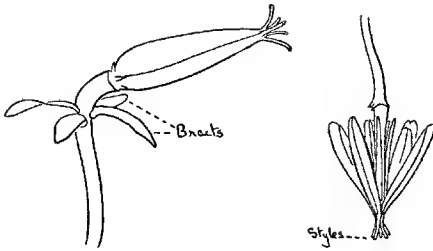
Fruit $\frac{3}{4}$ " long, on reddish stalks.

Lower Siam, Sumatra, Malaya: common in secondary jungle, especially in swampy ground, sometimes in pure stands, occasional on mountain-tops and mossy bogs.

The Cicada Tree is easily recognized from its narrow sessile, fleshy leaves and its



Text-Fig. 233. Cicada Tree (*Archytæa VahlII*), × $\frac{1}{2}$.



Text-Fig. 234. *Archytæa Vahlîi*: fruit, nat. size.

curiously split fruits. The leaves have coiled up sides in the bud and as they unfold from the tip downward they appear like the flower (spathe) of a miniature Aroid. In very swampy ground numerous slender stilt-roots develop from the trunk, even from a height of 8 ft., and, descending perpendicularly,

they surround the trunk like a giant besom. The wood is very hard and heavy, and is valued for house-work and for implements. In the swampy, virgin-forest on peaty soil, old trees can be found with massive, stilted trunks reaching nearly 100 ft. high: in shape they resemble the trees of *Tetramerista* described by FOXWORTHY (p. 52).

EURYA

(Gr., eurus—broad)

Leaves alternate.

Flowers very small, either male or female, crowded in small axillary clusters: ovary with 3-4 cavities, the style with 3-4 branches at the apex.

Fruit a small berry.

80 species, on both sides of the Pacific: 4 species in Malaya.

E. acuminata Text-Fig. 235 (Lat., pointed)

Jirak, Mempadi, Beras Beras, Beberas

An evergreen shrub or small tree up to 50 ft. high: bark dark brown or grey brown finely fissured or nearly entire: twigs hairy or glabrous.

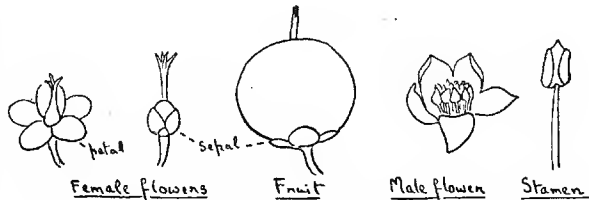
Leaf-blade $1\frac{1}{2}$ -4 \times $\frac{1}{2}$ -1", narrow, oblong-lanceolate, narrowed abruptly to a blunt tip, thinly leathery, finely toothed, shiny, drooping with the sides curled up, with 8-13 pairs of fine dark green veins: stalk .5" long, very short.

Flowers $\frac{1}{4}$ " wide, in clusters of 2-6 in the leaf-axils or on the twigs behind the leaves: petals white or yellowish greenish, slightly joined: stamens with deep orange-brown anthers.

Fruit $\frac{1}{4}$ " wide or less, round, ripening greenish white then blue and finally bluish black, pulpy, crowned by the short styles, seated on the persistent calyx.

India, Japan. China, Malaysia: common in secondary jungle throughout Malaya, lowland and mountain.

The *Mempadi* bears a very close resemblance to the Alum Tree or *Menasi* (*Symplocos fasciculata*, p. 623) and in the absence of flowers it is difficult to distinguish. The *Mempadi* is not night-flowering like the *Menasi*. The Malay name refers to the likeness of the half-ripe fruits to grains of rice.



Text-Fig. 235. *Eurya acuminata*: flowers and fruit, \times 2.

GORDONIA

(J. Gordon, d. 1781, an English horticulturist)

Trees with scaly bark: bark greyish or brownish, mottled with pale patches of new bark and dark or black irregular flaky scales of old bark: inner bark rich red brown, fibrous, thick.

Leaves spirally arranged.

Flowers solitary in the leaf-axils, as in *Adinandra* but *the petals joined at the base, the stamens joined to the petals* and with short anthers like pin-heads.

Fruit an oblong woody capsule splitting from apex to base into 5 pieces, leaving a central column: seeds flat, winged.

30 species, tropics and subtropics of Asia, one in N. America: 10 species in Malaya, mostly in the mountains.

G. singaporeana Plate 186, Text-Fig. 236

Gordonia

An evergreen tree up to 100 ft. high.

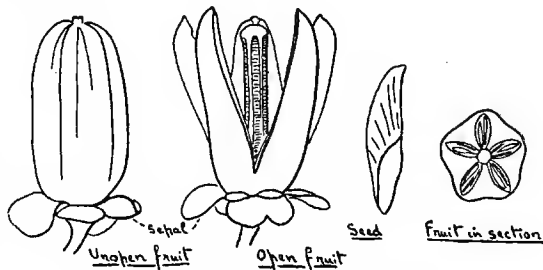
Leaves like Adinandra dumosa, withering dull red.

Flowers $1\frac{1}{2}$ " wide, scentless, on stalks $\frac{1}{4}$ " long: *petals cream white*, rather fleshy, opening wide: stamens yellow.

Fruit $1\frac{1}{2}$ " long, green then brown, woody, angled.

Malaya: common in lowland forest.

This is a nocturnal tree. Its Tea-like flowers open at dusk and the ring of petals, to which the stamens are attached, falls next morning. The flowering is seasonal and occurs more than once a year, perhaps after dry weather. The fallen petal-rings and the black scaly bark, which gives the trunk a chequered look, enable one to recognize the tree in the forest.

Text-Fig. 236. *Gordonia singaporensis*, nat. size.

Several species of *Gordonia* are common in the mountains, but we have not had an opportunity to study and identify them.

PYRENARIA

(Lat., pyrena—the stone of a fruit)

Leaves spirally arranged.

Flowers like *Gordonia*: the style divided above the middle into 3-5 short green arms.

Fruit not opening, like a small hard apple, round but more or less flattened, with a thinly fleshy rind and 2-6 dark brown, very hard, flattened seeds: the style not persistent on the fruit.

13 species, Indo-Malaya: 2 species in Malaya, in lowland and mountain forest.

TERNSTRÆMIACEÆ

P. acuminata Text-Fig. 237
(Lat., pointed)

Bat's Apple
Lida Kerbau, Lida Lembu

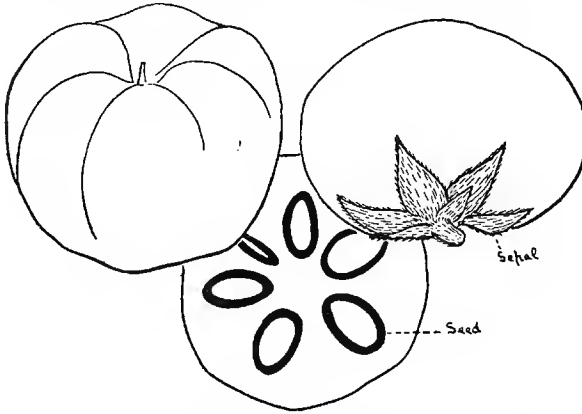
A small tree up to 40 ft. high with rather narrow crown: bark brown or grey-brown, entire, smooth: twigs, leaf-stalks and undersides of the leaves velvety hairy.

Leaf-blade 5-12 × 1½-4", rather large, narrowly or broadly elliptic, with a long, rather sudden tip, finely toothed, with 10-14 pairs of conspicuous veins: stalk ½" long.

Flowers 1-1½" wide, pale yellow, solitary, very shortly stalked: sepals and petals pointed, silky outside.

Fruit 1-1½" wide, slightly hairy, green to yellowish.

Malaya: common throughout the country.



Text-Fig. 237. *Pyrenaria acuminata*: fruit, nat. size.

As with *Gordonia*-trees, one often meets in the forest the fallen rings of petals with attached stamens of the Bat's Apple. It is possibly night-flowering. The fruits are unmistakable.

The other Malayan species, *P. Kunstleri*, has glabrous leaves and twigs and reddish brown fruits: it is uncommon and has been found only from Negri Sembilan northwards.

SCHIMA

(Gr., skiasma—a shadow: from the dense crown of leaves)

As *Gordonia* but the capsule round.

18 species, S. E. Asia: 1 species in Malaya.

S. Noronhæ Plate 187, Text-Figs. 238, 239
(F. de Noronha, d. 1787,
the Spanish naturalist and explorer)

Schima
Cha Antan, Medang
Changkoh

A moderate-sized to large evergreen tree, up to 100 ft. high, or flowering as a bush on mountain-tops: crown dense: trunk cylindrical, not buttressed: bark fuscous or greyish black, very rugged, cracked into thick angular pieces: buds silky: young leaves pink: old leaves falling green, turning brown on the ground.

Leaf-blade 2½-6 × 1-2½", elliptic, acute, the edge generally uneven or coarsely toothed but in some cases entire, leathery, drooping, dark green above, generally glaucous beneath, with 7-11 pairs of side-veins: stalk ½-1", rather long, reddish, flat or slightly winged.

Flowers 1½-2" wide, solitary in the leaf-axils but crowded at the ends of the twigs, the stalks thickened upward and 1" long: petals white with hairy edges: stamens yellow.

Fruit $\frac{1}{2}$ - $\frac{3}{4}$ " wide, silky when young.

China, Indo-Malaya: common in the mountain forest of Malaya, less common in the lowlands.

This magnificent tree is common at all our hill-stations but nowhere so abundant as on Penang Hill, where it occurs at all altitudes from sea-level, at Batu Feringi for instance, up to the summit. When it is in flower, it is best seen from the Crag Hotel: on looking down on the forest, the whitened crowns, like those of the flowering Sea Apples (*Eugenia grandis*), can be seen in profusion against the sombre foliage of the jungle canopy. As with *Gordonia*, we recognize the trees on a walk in the forest from the fallen petal-rings and from the dark rugged bark: generally there may be found also the little round capsules like split oak-apples. In detail the individual trees seem to vary much both in the size of the flower and in the toothing of the leaf. The timber is strong and durable. A fish-poison, like *tuba*, can be obtained

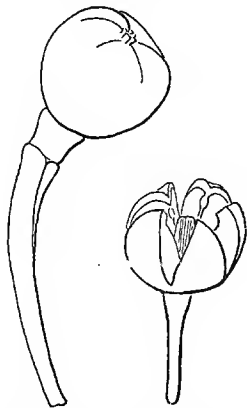


Text-Fig. 238. *Schima* (*S. Noronhæ*): (by courtesy of G. A. C. Herklots, Hongkong University).

from the bark, and its sap is said to be irritating to the skin. The flowers are used in native medicine and dried flowers are sold in the shops as *Changkoh*.

The name *Medang* is usually given to Laurel-trees and is by no means indicative merely of *Schima*.

We know nothing of the seasonal behaviour of *Schima*.



Text-Fig. 239. *Schima Noronhæ*: fruit, nat. size.

DAPHNE FAMILY

Thymelæaceæ

(from the genus *Thymelæa*)

Leaves alternate or spirally arranged, *simple*, entire very shortly stalked : without stipules.

Flowers small, in little heads on short or long stalks, singly from the leaf-axils : *calyx* with a short or long tube and 4-5 lobe-like sepals, regular : *petals none* : *stamens twice as many as the sepals* and attached to the inside of the tube : ovary superior.

Fruit pulpy, or dry and splitting into 2 parts : seeds 1-2 in the fruit.

About 40 gen., 400 spp., throughout the world : 5 gen., 9 spp. in Malaya.

The headquarters of this family are in the less arid, subtropical regions of Africa and Australia. It seems ill-suited to the Malayan climate. In English gardens the family is known from the pink-flowered *Daphne mezereum*, and a white-flowered species of the genus occurs in our mountains. But to us the family is important because it contains the curious Eaglewood Tree (*Aquilaria*) with its lumps of fragrant diseased wood, which find employ in a manner comparable with the pathological ambergris of sperm-whales.

The bark of the Malayan members of the family is remarkably tough and stringy, and strips readily from the wood in long sheets.

Key to the Genera

Lowland forest tree ...	...	...	...	...	<i>Aquilaria</i>
Mountain shrub with fragrant white flowers ...	...	...	...	...	<i>Daphne</i>

AQUILARIA

(Lat., aquila—an eagle)

Calyx with 5 lobes and a short tube : stamens 10.

Fruit a capsule with two 1-seeded cavities, the capsule splitting in 2 flaps.

About 12 spp., N. E. India, S. China, Malaysia to New Guinea : 3 spp. in Malaya.

A. malaccensis (of Malacca)

Malayan Eaglewood Tree
Karas, Kekaras, Tengkaras, Kayu Gaharu

A medium-sized tree reaching 100 ft. high : *trunk* of old trees more or less strongly fluted at the base : *bark dark to pale grey, smooth, entire, becoming finely and irregularly fissured* : *inner bark cream-white, soft, stripping in long pieces* : glabrous.

Leaf-blade $2\frac{1}{2}$ -4 × $\frac{3}{4}$ -1 $\frac{3}{4}$ " , rather small, elliptic, with a long tip, thinly leathery, with exceedingly fine crowded transverse veins (like parallel lines) between the main side-veins of the blade : stalk 1-2" .

Flowers 15" long, pale greenish yellowish white, fragrant, in little shortly stalked clusters of about 6 flowers, the clusters, 1" long or less, very inconspicuous.

Fruit 1-1½" long, ¾-1" wide, *flattened egg-shaped*, rather woody, green with the small persistent calyx at the base: *seeds* ¼" long, pear-shaped, *orange-brown hairy*, rather hard, *dangling out of the fruit on a string attached to one end of the seed*.

W. Malaysia: throughout Malaya in the lowland forest, frequent.

This tree, which is well-known to Malays, is one of several which yield a fragrant wood known as *Kayu Gaharu*. In BURKILL's Dictionary there is an excellent account of the discovery of the use of this wood and of the etymology of the local names. The fragrant wood is found only in the dying trees and it appears to be caused by a disease which gains entry through the old decaying limbs. Normally the wood is soft, pale and odourless, but in stag-headed trees there are found hard dark fragrant pieces embedded in the healthy wood and these lumps, when chipped out and cleaned, are the Eaglewood or Aloewood of commerce—the *Kayu Gaharu* of Malays.

The Malayan Eaglewood Tree is recognised from its grey smooth bark which strips so easily and from the small fallen leaves which have such very fine parallel veinlets. The flowers and fruit are inconspicuous and appear to be seldom produced. The seeds are very remarkable and imperfectly understood. There are several trees in the Bukit Timah Forest Reserve in Singapore.

DAPHNE

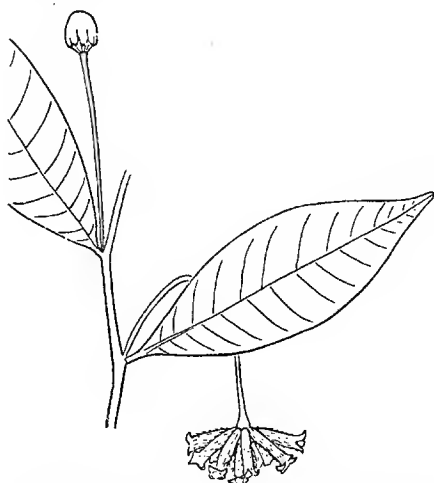
(the Greek name for the laurel)

Calyx with 4 lobes: stamens 8, in 2 rows of 4 each.

Fruit pulpy, not splitting open, with one seed.

About 80 spp, Europe, Asia: 1 sp. in Malaya.

D. composita Text-Fig. 240 (from the clusters of flowers)



Text-Fig. 240. Nodding Daphne (*D. composita*), × ¼.

Nodding Daphne

A *mountain shrub* or treelet to 18 ft. high: glabrous except the flowers.

Leaf-blade 2-8 × ¾-2", *narrowly elliptic* or lanceolate, pointed at each end, with a rather long tip, *glaucous beneath*, thinly leathery, with many pairs of side-veins: stalk 1-2" long.

Flowers ½" long, *like little white silky tubes*, fragrant, sessile, 5-9 in a head on a slender *nodding pendulous stalk* 1-2½" long: young flower-heads at first covered by a pale green sheath breaking off round the base in one piece: anthers orange.

Fruit ¼" wide, round, black when ripe.

Burma, Malay Peninsula, Sumatra, Java: frequent in all mountain woods above 3,500 ft. in Malaya.

"A charming shrub"
(H. N. RIDLEY).

JUTE FAMILY

Tiliaceæ

(Tilia, the genus of the European Lime-tree)

Leaves alternate or spirally arranged, simple with stipules.

Flowers rather small, radially symmetrical, generally in racemes or panicles: *sepals* 4 or 5: *petals* 4 or 5, *separate*, or absent: *stamens many*, with slender filaments, attached to a small thickened ring round the base of the ovary: ovary superior, with 2-5 cavities.

Fruit various.

45 genera, 600 species, throughout the world, mostly tropical: 11 genera, 80 species, in Malaya, mostly trees of lowland forest.

This family includes such a diversity of plants that it is difficult to circumscribe. It is allied with the Hibiscus and Sterculia-families (Malvaceæ and Sterculiaceæ). The Lime-tree or Linden of Europe (Tilia) has no connection with the Lime-tree of the tropics (Citrus) except in the misleading English name. The most important Malayan genus is that of the Oil-Fruits (Elæocarpus) which, however, is considered by some botanists to represent a family of its own, the Elæocarpaceæ.

A few herbaceous species of Jute (Corchorus) occur in Malaya, but they are not cultivated. There is an account of the genus in BURKILL'S Dictionary.

Key to the Genera

Leaves spirally arranged

Leaves olive or brownish beneath, leathery: mangrove plants

Brownlowia

Not so: leaves generally withering red: flowers in unbranched sprays

Elæocarpus p. 635

Leaves alternate

Leaves sticky hairy, toothed, very unequal at the base: cultivated

Muntingia p. 644

Not so: wild

Underside of the leaves coppery or silvery-white, or the leaves papery: mostly forest trees

Schoutenia p. 645

Undersides of the leaves green, greenish white and woolly or brownish white, never papery: leaves often with 3 large veins from the base: fruits pulpy

Grewia p. 642

(see also *Elæocarpus stipularis* with leaves withering red)

BROWNLOWIA

(Lady Brownlow, a patroness of botany in the early nineteenth century)

Mangrove bushes or small trees with the undersides of the leaves dull brownish or olive-brown from minute scales.

Leaves spirally arranged, simple.

Flowers small, in panicles: calyx split into 3-5 lobes: *petals* 5, pink: stamens many, five being sterile and petal-like: ovary 3-5 lobed, with as many styles.

Fruit consisting of 1-5 separate round or oblong bodies arranged in a rosette, each containing one large seed and splitting open.

17 species, Burma and Indo-China to New Guinea, mostly in the west: 5 species in Malaya.

Key to the Species

Leaves large, heart-shaped, with long stalks *B. argentata*
 Leaves small, rather narrow, with short stalks *B. lanceolata*

B. argentata

(Lat., silvery)

Dungun, Durian Laut

An evergreen bush or bushy tree to 30 ft. high.

Leaf-blade 4-9 × 2-7", more or less heart-shaped, slightly leathery, with 4-6 pairs of side-veins: stalk $\frac{1}{2}$ -3" long.

Flowers $\frac{1}{4}$ " wide, in terminal panicles 6-12" long: *panicles brown scaly*: stamens yellow.

Fruit ?

Burma to New Guinea: common in the *Nipa*-zone and upper stretches of the mangrove.

This plant must not be mistaken for *Heritiera littoralis* which is also called *Dungun* and has brownish undersides to the leaves. But the leaves of *Heritiera* are also silvery beneath and they are not heart-shaped. The leaves of the *Brownlowia* resembles those of *Hibiscus tiliaceus* and *Thespesia* in shape, and as all three may be found growing together some care is needed in distinguishing them. The leaves of the *Hibiscus* are rather ashen white underneath, those of *Brownlowia* brownish and those of *Thespesia* green.

B. lanceolata

Dungun

A bush 3-6 ft. high, often in masses.

Leaf-blade 2 $\frac{1}{2}$ -5 × $\frac{3}{4}$ -1 $\frac{1}{2}$ ", narrowly elliptic, the base not heart-shaped, the stalk $\frac{1}{4}$ - $\frac{1}{2}$ " long.

Panicles 2-3" long, short, often in the leaf-axils.

Burma, Malay Peninsula, Philippines: common in the mangrove.

Compare *Heritiera* p. 612.

OIL-FRUIT TREES

ELÆOCARPUS

(Gr., *elaion*—oil, *karpos*—fruit)

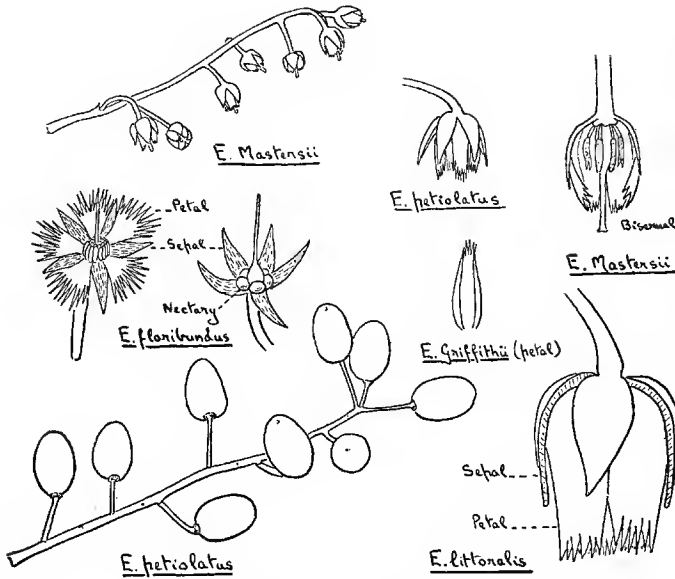
Small to fairly large trees with pinkish-brown, pinkish-grey or brownish-grey, entire or more or less fissured bark: young leaves pinkish, red or purple: *buds often resin-coated*.

Leaves spirally arranged, generally with a knee at the top of the stalk, mostly withering red, often toothed or notched: in some cases alternate.

Flowers small to medium-size, facing down, in unbranched racemes from the leaf-axils or the twigs behind the leaves, never terminal, mostly fragrant: sepals 4-5 separate; petals 4-5, *toothed or fringed at the end, white, cream or greenish*: stamens 10-many: ovary with 2-5 cavities and one style.

Fruit a blue, blue-green, blue-grey or brownish green, stalked berry with oily greenish pulp and a large stone enclosing 1-5 seeds (each in its own cavity): calyx not persistent: the stone often pitted, warted, knobby or spiny.

100 species, Indo-Malaysia, Australasia: about 30 species in Malaya, mostly in the lowlands, a few in the mountains.

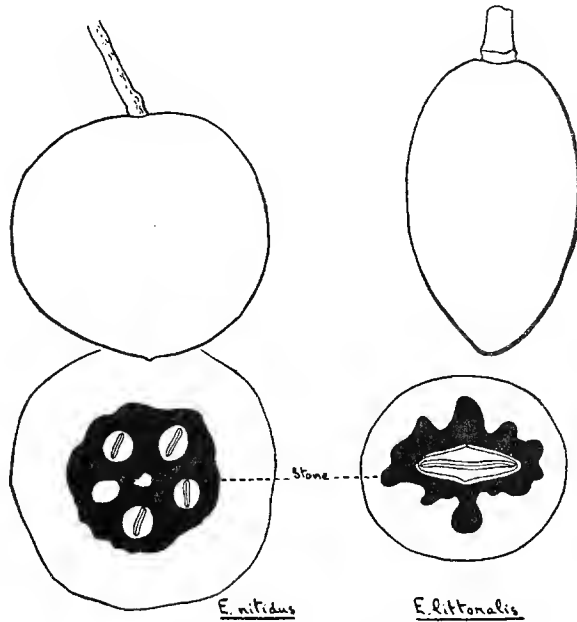


Text-Fig. 241.—Elæocarpus.

The Oil-Fruits, or Pigeon Plums, are one of our common sorts of tree in secondary jungle; their fruits are eaten by birds and the seeds are thus dropped in open places where they sprout vigorously. It is easy to recognize them at all times of the year and in spite of their variety. When sterile, the reddening old leaves distinguish them; when in flower, the sprays of fragrant white blossom like rows of fairy lanterns: and, in fruit, the sprays of oblong bluish berries

with the single hard stone. There are, of course, exceptions which can be appreciated after acquaintance with the typical examples. Thus the leaves wither yellow in *E. littoralis* and apparently, in *E. Griffithii*; they turn red in some trees of *E. pedunculatus* or, as often, yellow in others: and very occasionally one meets a tree of *E. petiolatus*, *E. Mastersii* and *E. nitidus* with yellowing leaves. The commoner species are *E. ferrugineus*, *E. Mastersii*, *E. petiolatus* and *E. stipularis*, which occur in almost every patch of *belukar* in the country.

Except, perhaps, the *Genitri* (*E. sphaericus*) our species are evergreen, but they develop new shoots and flowers seasonally after spells



Text-Fig. 242. Elæocarpus-fruits nat. size.

of dry weather. The flowering takes place generally twice a year, about March–May and August–October, yet it is possible that some species flower three times a year like the Sea Apple (*Eugenia grandis*). The common little *E. Mastersii* may be an exception in that it seems to flower only once a year at very uncertain periods. The genus should be a fascinating one to study in this aspect: at present we have no accurate information.

The blue colour of the fruit is caused, not by a blue pigment, but by the structure of the cuticle which reflects blue light: thin pieces of skin are green in transmitted light.

The Malay names for the Oil-Fruits are usually *Pinang Punai* or *Pinang Pergam*, and *Jiremong* with such variants as *Derumun* and *Jerumun*. They are also called *Medang* on account of their soft wood, but this name is applied to too many plants to be useful unless it is restricted to the Laurel-trees. Occasionally some species, as *E. floribundus*, are called *Menkenang* or *Lenkenang*. *E. robustus* with big edible and marketable fruits has, as one would expect, distinctive names of which *Sangah* is the most used.

The Terminalia-habit of branching is present to some extent in most species of the genus, but it is very pronounced in a few like *E. littoralis*, *E. pedunculatus*, *E. rugosus* and *E. pseudopaniculatus*. Such species may be mistaken for true Terminalias, but they have different flowers, stalked fruits and generally more or less toothed leaves or resinous buds.

Other trees which can be mistaken for Oil-Fruits are the Bat's Laurel (Pygeum), the Malayan Spindle-Tree (Kurrimia) and the *Rambai*- and *Tampoi*-trees (*Baccaurea*). These last can always be distinguished by their very thin bark and non-resinous buds, and by the fact that their leaves wither yellow.

Key to the Species

- Petals 4, sepals 4: flowers small, '2-4" long, scarcely opening, the petals slightly toothed: fruit oblong, less than 1" long ... *Group A*
- Petals 5, sepals 5: flower '2-2" long, generally opening wide, the petals often deeply toothed or fringed: fruit oblong or round, small or large *Group B*

GROUP A

- Twigs and leaf-stalks thickly brown velvety ... *E. ferrugineus*
- Not so
 - Twigs glabrous: buds resin-coated: inflorescences 3-6" long: mountains ... *E. pseudopaniculatus*
 - Twigs and buds finely silky hairy: mostly low-land
 - Leaves rather large, 2-4" wide: buds resinous: inflorescence 3-8" long ... *E. polystachyus*
 - Leaves about 1" wide, small: infloresc. 1-1½" long *E. Mastersii*

GROUP B

- Flowers 1" or more long: leaves blunt: fresh-water tidal rivers or creeks ... *E. littoralis*
- Not so, flowers smaller, about ½" wide or long
- Twigs and undersides of leaves velvety: fruit round: leaves nearly alternate ... *E. stipularis*
- Twigs thinly hairy or glabrous
- Buds coated with resin: twigs glabrous: petals shortly toothed: fruit oblong, ½-¾"
- Inflorescences 7-10" long: leaves pointing up, dark green ... *E. paniculatus*
- Infloresc. less than 6" long
- Infloresc. 2-3" long: leaf-blade small, up to 5 × 2": twigs slender ... *E. palembanicus*
- Infloresc. 3-6" long: blade generally larger
- Leaves generally more than 2½" wide, the edge entire ... *E. petiolatus*
- Leaves less than 2½" wide, entire or faintly toothed
- Leaf blunt, obovate or scarcely pointed: twigs rather stout, with the leaves crowded near the end ... *E. pedunculatus*
- Leaf pointed: twig rather slender with the leaves well spaced ... *E. Griffithii*
- Buds not resinous: twigs glabrous or finely silky: petals often with rather long teeth or fringes: fruit oblong or round
- Leaves narrow, lanceolate, ½-2" wide: infloresc. 2-3" long: fruit round
- Leaf-stalk ¼-½" long: blade 1-2" wide: fruit 1" wide ... *E. sphaericus*
- Leaf-stalk ½-1" long: blade ½-1" wide: fruit ¾" wide ... *E. salicifolius*
- Leaves elliptic, generally broader: infloresc. usually longer
- Infloresc. 1-3" long: leaf small, 1-2" wide: fruit round, 1-1½" wide ... *E. nitidus*
- Infloresc. longer: leaf wider
- Leaf 1-3" wide, with 5-7 pairs of side-veins: leaf-stalks pinkish: fruit oblong ... *E. floribundus*
- Leaf 2½-4½" wide, with 8-12 prs. of side-veins: fruit broadly oblong or round, 1½-2½" long ... *E. robustus*

E. ferrugineus

Rusty Oil-Fruit

(Lat., rusty)

Twigs, leaf-stalks, inflorescences and veins of leaf covered with rusty brown velvet: young leaves thickly brown velvety.

Leaf-blade 4-9 × 2½-4½", elliptic, tipped, leathery, entire, the base narrowed or heart-shaped, with 8-11 pairs of side-veins: stalk 1½-4" long.

Flowers $\cdot 3''$ wide, cream-colour to greenish, in sprays $2-3\frac{1}{2}''$ long.
Fruit $\frac{1}{2}-\frac{3}{8}''$ long.
Malaya, Borneo: common in lowlands and mountains to 4,000 ft.

Easily known by the brown velvety twigs. Compare the brown-velvety Laurel (*Cryptocarya Griffithii*) with shorter leaf-stalks, without a 'knee' at the top, and with glaucous undersides to the leaves.

E. floribundus Text-Fig. 241
(Lat., full of flowers)

Rugged Oil-Fruit

A medium or large tree: *the trunk becoming ridged and fissured, dark brown: twigs soon glabrous: buds finely silky.*

Leaf-blade $3-7 \times 1-3''$, elliptic, pointed, toothed, with 5-7 pairs of side-veins: the stalk $\frac{1}{2}-2\frac{1}{2}''$ long, generally pinkish on the upper side.

Flowers $\cdot 3-\cdot 5''$ wide; white, in sprays $1\frac{1}{2}-6''$ long: petals cut half-way into a fringe.

Fruit $1-1\frac{1}{2} \times \frac{1}{2}-\frac{3}{8}''$, oblong, 1 per inflorescence.

Tenasserim to Java: frequent in the lowlands in Malaya, especially in the north.

Full-grown trees are easily recognized because they have tall dark-green crowns like the *Durian* and dark rugged bark like the *Tembusu* (*Fagraea fragrans*).

E. Griffithii Text-Fig. 241
(W. Griffith, 1810-1845, the English botanist in India)

Griffith's Oil-Fruit
Derumon, Jerumon

Like *E. petiolatus* but narrower leaf-blades ($2\frac{1}{2}-6 \times \frac{1}{2}-2\frac{1}{2}''$), shorter stalks ($\frac{1}{2}-1\frac{1}{2}''$ long) and faintly toothed leaf-edge: ? leaves always withering yellow: petals pale greenish: ovary slightly hairy or glabrous.

W. Malaysia: common, especially by rivers, in the lowlands.

E. littoralis Text-Figs. 241, 242
(Lat., belonging to the shore)

Stilted Oil-Fruit
Medang Jangkang

A tree of tidal rivers and creeks in the freshwater zone: glabrous: leaves withering yellow: buds silky, the scales very slightly glued with resin.

Blade $3-7 \times 1\frac{1}{2}-3''$, leathery narrowly elliptic obovate, blunt, with 7-10 pairs of side-veins: stalks $\frac{1}{2}-1\frac{1}{2}''$, without a knee at the top.

Flowers $1-2''$ long, white, scentless, large, in short sprays $2-3''$ long, 3-6 flowers per inflorescence: petals pink at the base.

Fruit $1\frac{1}{2}-1\frac{3}{4} \times 1''$, oblong, greyish green.

Burma, Siam, W. Malaysia: common in the lowland swampy forest in freshwater tidal stretches.

This tree is generally buttressed and provided with stilt-roots, and from its underground roots there project into the air breathing roots like those of the mangrove trees *Bruguiera* and *Avicennia*. The breathing roots are loops shaped like an inverted Y: they reach 3-5 ft. high and their tops are often knobbed. They serve to conduct air to the feeding roots in the mud.

E. Mastersii Text-Fig. 241
(M. T. Masters, 1833-1907, the English botanist)

Small-leaved Oil-Fruit

A small to moderate-sized tree: twigs slender, the bud scales silky and slightly glued together with resin.

Leaf-blade $2-4 \times \frac{1}{2}-1\frac{1}{2}''$, lanceolate-elliptic, tipped, with 5-8 pairs of side-veins: stalk $\frac{1}{2}-1''$ long, slender.

Flowers $\cdot 15''$ wide, as pale green bells, small, in sprays $\frac{1}{2}-1\frac{1}{2}''$ long: stamens 7-10.

Fruits $\frac{1}{2}''$ long, ellipsoid, greyish blue.

W. Malaysia: very common in Malaya, especially in the south.

The small leaves, withering red, with slender stalks having a 'knee' at the top, distinguish this species from other Malayan trees. Compare the Sea Bilberry (*Vaccinium malaccense*) with pink flowers in terminal sprays.

The flowering of the trees in a district is gregarious and evidently takes place only after marked dry weather, often at the beginning of the year. The flowering lasts for a few days during which the trees give off a fragrance like Lily of the Valley.

E. nitidus Text-Fig. 242
(Lat., shiny)

Walnut Oil-Fruit

Like *E. Mastersii* but:—flowers ($\frac{1}{4}$ " wide) with 5 sepals and petals, white, densely set along sprays 1-3" long: fruit 1-1 $\frac{1}{2}$ " wide, large, round, to rather lumpy, dull greenish, one per inflorescence, the stone with 5 chambers: (twigs and leaf-stalks silky for a long time).

Siam, Malaya, Borneo: rather common in the lowlands.

E. palembanicus
(from Palembang)

Like *E. Griffithii* but with short inflorescences 2-3" long, smaller flowers $\cdot 3$ " wide, the petals distinctly fringed: leaves withering red: ovary densely hairy.

Sumatra, Malaya: not infrequent in the lowlands.

E. paniculatus

Panicled Oil-Fruit

Like *E. petiolatus* but with much longer inflorescences, 7-10" long, mostly from the axils of the leaves near the ends of the twigs: leaf-blade rather narrow, 4-8 \times 1 $\frac{1}{2}$ -3" long, pointing up, dull dark green, the end of the leaf-stalk bent-up: petals with a few teeth or none: ovary hairy: (fruits $\frac{1}{2}$ - $\frac{3}{4}$ " long).

Siam, Malaya, Borneo, Sumatra: common in the lowlands.

Compare *E. polystachyus*.

E. pedunculatus

Blunt-leaved Oil-Fruit

A small or moderate tree with pronounced *Terminalia* branching, the side-branches with the upturned leafy ends of the twigs forming leafy mats: old leaves withering red or yellow.

Blade 2 $\frac{1}{2}$ -5 \times 1-2 $\frac{1}{2}$ ", narrowly obovate, blunt or scarcely tipped, rather leathery, with 6-9 pairs of side-veins: stalk 1-1 $\frac{1}{2}$ " long: the veins and stalk yellowish.

Flowers $\cdot 3$ " wide, white, in sprays 3-4" long, mostly on the twigs just below the tufts of leaves: ovary glabrous.

Fruit $\frac{1}{2}$ " long, oblong, greyish blue with green oily pulp.

Malaya, Borneo: frequent in lowlands and mountains to 4,000 ft., especially on rocky cliffs by the sea.

E. petiolatus Plate 188, Text-Fig. 241

Broad-leaved Oil Fruit

A small to moderate-sized tree, the buds thickly coated with resin: glabrous.

Blade 4-12 \times 1 $\frac{1}{2}$ -7", large, elliptic, tipped, entire, downturned, with 6-10 pairs of side-veins: stalk 1-3" long, downcurved at the apex.

Flowers $\cdot 5$ " wide, white, in sprays 3-5" long, mostly on the twigs below the leaves: petals with many short teeth at the tip, the sides incurved: ovary glabrous.

Fruits $\frac{1}{2}$ - $\frac{3}{4}$ " long, oblong, grey-blue with green oily pulp.

Indo-China, W. Malaysia: very common in the lowlands.

E. polystachyus

Silky Oil-Fruit

(Gr., polys—many, stachus—an ear of corn)

Twigs finely silky hairy: buds coated thinly with resin.

Leaf-blade 3 $\frac{1}{2}$ -9 \times 1 $\frac{1}{2}$ -4", elliptic, tipped, thinly leathery, more or less dark green, pointing up, toothed always, with 7-10 pairs of side-veins: stalk 1 $\frac{1}{2}$ -4" long, bent up at the end.

Flowers $\frac{1}{2}$ " wide, cream or pinkish brownish, in hairy sprays 3-8" long, from the axils of the upper leaves: ovary hairy.

Fruit $\frac{1}{2}$ -1" long, oblong.

Malaya, Borneo: common in the lowlands.

This species may easily be mistaken for *E. paniculatus* in the absence of flowers, but it has toothed leaves, hairy twigs and larger fruits.

E. pseudopaniculatus

Mountain Oil-Fruit

A mountain tree (with Terminalia branching) very like *E. Griffithii* but the leaves withering red, the flowers with 4 sepals and 4 petals: ovary densely hairy.

Malaya: rather common in the mountains at 4,000 ft., abundant at Fraser's Hill.

E. robustus

Great Oil-Fruit

Sangah, Melemoh (Kel.), Medang Kelawar, Setoi Tupai.

A small to rather large tree: twigs and buds silky, the twigs soon glabrous.

Leaf-blade 5-10 × 2½-5½", rather large, elliptic, pointed, *toothed*, the base rather broad or rounded, *pointing up*, dull green, with 8-12 pairs of side-veins: stalk 1½-3½", often pinkish at the ends.

Flowers ½" wide, or rather less, white, in sprays 3-6½" long: petals deeply fringed.

Fruit large, oblong or oblong-rounded, 1½-2½" long, one per inflorescence, greenish-brownish with thick, firm, oily, yellow-green flesh and a very hard massive stone.

N. E. India to Malaya: rather frequent in the lowlands and mountains.

This tree is common in the villages round Baling and Kota Bahru and in Upper Perak, where it has larger fruits, and, in the season, these fruits are sold in the market for a cent each. The taste is very oily.

E. salicifolius Plate 188

Willow-leaved Oil-Fruit

(with leaves like willows, Salix)

Like *E. nitidus* but with narrow, lanceolate leaves (silvery-silky when young): 2½-5 × ¼-1", with slender stalks ½-1" long: fruit .8-.9" wide, round.

Malaya: not common, though frequent on Bukit Timah.

E. sphæricus

Indian Oil-Fruit, Genitri

A large tree, partly deciduous.

Leaf-blade 3-6 × 1-2", lanceolate, slightly toothed, with 10-13 pairs of side-veins: the stalk 2-5" long.

Flowers ¼" wide, white, on sprays 2-3" long, mostly on the twigs behind the leaves.

Fruit ¾-1" wide, round, bright metallic blue, pulp green: stone brown, ridged and pitted.

N. E. India, W. Malaysia: frequent in the lowland forest in Malaya, occasionally planted.

The narrow leaves withering scarlet and the round blue fruit distinguish this tree from all others in Malaya. Indeed, from the fallen red narrow leaf with short stalk and slightly toothed edge, like a cherry- or willow-leaf in shape, it can invariably be recognized. The dried stones of the fruits are commonly used in India for such ornaments as necklaces, hatpins and charms, and as such they may be found in shops in Malaya. In India these stones are called "Radrak" or "Radraksha".

The trees are often deciduous by several branches at a time and then they show red "autumn tints" better than any other Malayan tree.

E. stipularis Plate 189

Benzoin Oil-Fruit

(with conspicuous stipules)

A small to rather large tree with drooping twigs: leaves inclined to be alternate: twigs, buds and undersides of leaves more or less velvety: *stipules large, generally triangular or with 2-5 points.*

TILIACEÆ

Leaf-blade 3-6½ × 1-3½", elliptic, entire, with 6-12 pairs of side-veins: stalk ¼-1" long: leaves of saplings toothed.

Flowers 3-4" wide, white, in sprays 3-5" long, mostly on the twigs behind the leaves.

Fruit 1" wide, round, one per inflorescence.

W. Malaysia: very common in lowlands and on mountains of Malaya.

The drooping sprays of bright green, soft foliage flecked with red withering leaves make this a beautiful tree at all times of the year. In general appearance it resembles the wild Benzion-trees (Styrax).

GREWIA

(Nehemiah Grew, 1641-1712, the English microscopist)

Leaves alternate, often slightly asymmetric, with 3 conspicuous basal nerves (the midrib and a vein on either side of it).

Flowers rather small, hoary-scurfy, in terminal and axillary panicles: sepals 5: petals 5, yellow or white, much smaller than the sepals, generally minute.

Fruit as small, pear-shaped berries, the fibrous pulp generally inseparable from the 1-2 large seeds.

About 150 species, the warmer parts of the Old World: 13 species in Malaya, mostly in the lowlands.

Except the common climbing plant, *G. umbellata*, our Malayan species are small trees. The *Chenderai* (*G. tomentosa*) is the commonest and from a knowledge of it there should be no difficulty in recognizing the others. Their fruits are edible, but acid. The bark is tough and stringy.

Key to the Species

Lateral basal veins extending ⅔-¾ the length of the blade				
Scurfy hairy: common	...	...	...	<i>G. tomentosa</i>
Glabrous	...	...	...	<i>G. laurifolia</i>
Lateral basal veins extending ⅓-½" the length of the blade				
Glabrous	...	...	...	<i>G. antidesmæfolia</i>
Velvety hairy				
Leaves leathery, entire: fruit nearly glabrous	...			<i>G. blattæfolia</i>
Leaves thin, finely toothed: fruit golden hairy				<i>G. fibrocarpa</i>

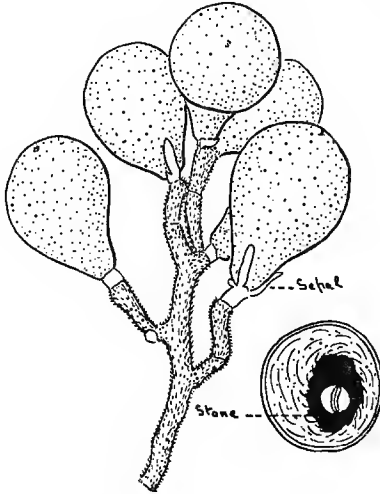
G. antidesmæfolia

(with leaves like *Antidesma*)

Like *G. blattæfolia* but glabrous, except the hoary flowers: *leaf-blade* lanceolate-elliptic, 4-8 × 1½-3", with 6-8 pairs of side-veins: *flowers* ¼" wide, white, fragrant: fruit yellow or orange, glabrous.

Malaya: frequent in lowland forest.

G. blattæfolia Text-Fig. 243
(with leaves shaped like the wing of a cockroach, Blatta)



Text-Fig. 243. *Grewia blattæfolia*: fruits, nat. size.

A small evergreen tree to 40 ft. high: twigs, leaf-stalks, inflorescences and undersides of the leaves velvety with pale washy brown hairs: stipules lanceolate, not toothed, soon falling off.

Leaf-blade 4-11 × 2-5½", broadly elliptic, slightly asymmetric, entire, not tipped, leathery, with 7-10 pairs of side-veins: stalk ½" long.

Flowers pale yellow, ½" wide.

Fruit 1" long, pear-shaped, nearly or quite glabrous, ripening yellow then dull orange, sour, with very tough, fibrous, slightly juicy flesh.

Malaya: common in lowland woods.

G. fibrocarpa
(with fibrous fruit)

Asam Damat

Like *G. blattæfolia* but:—

Frequently a shrub or treelet: twigs, etc. hairier, often brownish velvety: stipules generally conspicuous, toothed.

Leaf-blade smaller, thin, pliant, finely toothed.

Flowers dull yellowish green, slightly fragrant: the petals and stamens golden-yellow: inflorescences only 1½-3" long.

Fruit brilliant deep orange with golden hairs.

Malaya: frequent in lowland forest.

G. laurifolia
(with leaves like the laurel, Laurus)

A tree up to 80 ft. tall, glabrous except the hoary flowers.

Leaf-blade 3-8 × 1-2½", oblong, entire, thinly leathery, with 3-4 pairs of side-veins: stalk ½-1" long, slender.

Flowers clear yellow.

W. Malaysia: in lowland forest in the middle and north of Malaya, beginning to flower as a 5 ft. bush.

The striking, 3-veined leaves recall those of the Wild Cinnamon (opposite-leaves) and of the species of *Anisophyllea* (with numerous axillary buds). It should make a fine ornamental tree in cultivation.

G. tomentosa Plate 190
(Lat., woolly)

Chenderai

Chenerah, Chenerai, Chenirai, Jenerai

A small, bushy, evergreen, tree up to 50 ft. high: crown dense, round or cylindrical, rather drab green, the branches arching out and drooping: trunk deeply fluted for the greater part of its length, not buttressed: bark dark grey to brownish buff, entire, slightly flaky: twigs, inflorescences and undersides of the leaves densely pale brownish scurfy-hairy: young leaves deep pinkish brown.

TILIACEÆ

Leaf-blade 3-8 × 1¼-3½", elliptic-oblong to obovate, often wedge-shaped, rather leathery, the edge generally jaggedly toothed towards the sudden tip, occasionally entire, with 5-7 pairs of side-veins, drooping, whitish green beneath: stalk ½ long.

Flowers ½" wide, yellow, fragrant.

Fruit green then black with 1 seed.

Indo-Malaysia: very common in secondary jungle from Malacca northward, scarce in the south.

The 3-veined, jaggedly toothed leaves and scurfy twigs will always distinguish this common and well-known tree. The flowering is seasonal after dry weather. The Malay name must not be confused with that of the Purple *Millettia* (*Millettia atropurpurea*, p. 372).

MUNTINGIA

(A. Munting, 1626-1683, a German physician)

Leaves alternate, toothed, asymmetric.

Flowers singly on stalks, 1-3 flower-stalks arising together from the twig just above the leaf-axil: sepals and petals 5: stamens many: ovary with 5 cavities and a sessile stigma with 5 ridges.

Fruit a berry, the tiny yellow seeds embedded in sweet pulp.

1 species, tropical America, now wide-spread throughout tropical Asia.

M. calabura Plate 184, Text-Fig. 244
(? a West Indian name)

Cherry Tree
Buah Cheri

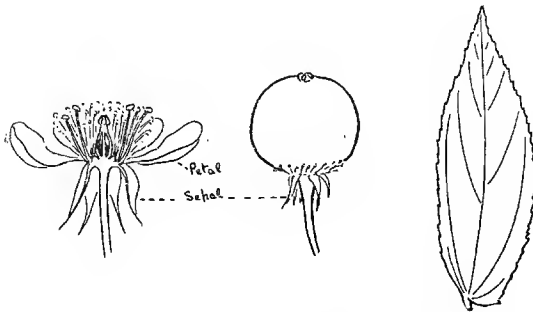
An evergreen tree, 10-40 ft. high, with dense, spreading crown, the branches drooping: bark smooth, pale brownish grey, tough, fibrous: twigs and leaves hairy and sticky.

Leaf-blade 1-6 × ½-2¼", narrowly ovate, broadest near the asymmetric base, dark green, thin, soon wilting: stalk ¼" long or less.

Flowers 1" wide, green with white petals, stalks about 1" long.

Berry ½" wide, pink then red, crowned with the knob-like, 5-ridged stigma: the withered stamens at the base.

Very common in gardens and villages throughout Malaya.



Text-Fig. 244. *Muntingia calabura*: flower and fruit, nat. size: leaf × ½.

Our local name for this familiar tree is misleading. It is not a true Cherry which, botanically, implies a species of the genus *Prunus* of the family Rosaceæ, having a fruit with a large, 1-seeded stone. And it is often called the Japanese Cherry Tree but it is a native of tropical America which has been brought to the East by way of the Philippine Islands. Nevertheless the white flower and red fruit bear a superficial likeness to a real Cherry.

The Cherry Tree makes an excellent small shade tree and it grows very quickly. But, because of its drooping limbs and leaves, it gives a shabby appearance which is not ornamental. The sweet berries are much sought after by children and, also, by birds and animals and, herein, lies its chief objection. The berries attract small fruit-bats which shelter in the eaves of houses during the day and spatter the contents of the berries about the verandah and garden during the night: there is no remedy for the unsightly pink splashes of small yellow seeds but to cut down the trees.

For school teachers, the Cherry Tree is useful because it shows: 1. a tree that flowers unceasingly every day of its life after the first year in the sapling-state; 2. a typical, simple and familiar flower that is not too small for class-work; 3. a plant the minute seeds of which are readily dispersed by birds, bats and squirrels so that the saplings abound in every thicket; and 4. an asymmetric leaf with unequal base, the broad side of which is directed toward the end of the twig so as to give a peculiar leaf-pattern. The flowers last but one day, the petals falling off in the afternoon.

SCHOUTENIA

(W. C. Schouten, d. 1625, a Dutch navigator)

Leaves alternate, with 3 basal veins (the midrib and a prominent vein on either side reaching $\frac{1}{2}$ - $\frac{2}{3}$ the length of the blade).

Flowers with a large, 5-lobed, bell-shaped calyx ($\frac{1}{2}$ - $1\frac{1}{2}$ " wide): *petals none*.

Fruit a small capsule surrounded by the large, brown, papery calyx.

About 8 species, S. E. Asia: 3, or more, species in Malaya, in lowland forest.

Key to the Species

Leaves small, coppery beneath	...	...	...	<i>S. accrescens</i>
Leaves rather large, papery, silvery beneath	...	...	...	<i>S. glomerata</i>

S. accrescens Text-Fig. 245
(Lat., growing together)

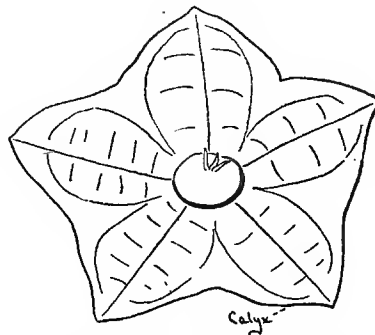
Bayur Bukit

A deciduous tree, up to 120 ft. high, generally much less, with *dense, dark, fine-leaved, rounded crown*, the trunk more or less fluted, *the bole knobby with burs: bark dark rich brown to greyish brown, finely fissured and flaky: twigs, leaf-stalks, inflorescences and under-sides of the leaves light rusty brown scurfy*.

Leaf-blade $1\frac{1}{2}$ - $3\frac{1}{2}$ × $\frac{1}{2}$ - $1\frac{1}{4}$ ", in some cases only $\frac{1}{2}$ - $1\frac{1}{2}$ × $\frac{1}{2}$ - $\frac{3}{4}$ ", *small, lanceolate, slightly asymmetric, entire dark glossy green, with 4-6 pairs of side-veins: stalk .1-2" long*.

Flowers about $1\frac{1}{2}$ " wide, yellow.

Malaya, Borneo: common in lowland forest.



Text-Fig. 245. *Schoutenia accrescens*: fruit, nat. size.

URTICACEÆ

This beautiful tree flowers about May, either on the bare branches or with the new leaves. Its flowers are not at all typical of the family, but it is easily recognized from the small leaves with rusty under sides. The Malay name indicates its similarity with the *Bayur* (*Pterospermum*) of the *Sterculia*-family. A variety, perhaps a distinct species, in the East of Johore has the undersides of the leaves powdery white.

S. glomerata

(Lat., clustered)

An evergreen tree, up to 40 ft. high, *very common with Saraca by lowland forest streams.*

Leaf-blade 6-12 × 2½-5", broadly elliptic, often asymmetric, the base narrowly heart-shaped, *large, very thin, papery, tough, silvery white beneath*, with 7-10 pairs of side-veins: *stalk* 1-2", *short.*

Flowers 4" wide, *in small clusters in the leaf-axils.*

Malaya: common by *Saraca*-streams.

A closely allied species, *S. Kunstleri*, has smaller leaves and larger flowers (1-1½" wide). No other trees in the country have such peculiar leaves.

FIG FAMILY

Urticaceæ

(*Urtica*, the genus of the Stinging Nettles)

Often with latex.

Leaves simple, or in a few cases pinnate or pinnately lobed, alternate or spirally arranged: *stipules often conical and leaving ring-like scars on the twigs.*

Flowers very small, male or female, greenish, without petals, in many cases clustered in fleshy heads or in figs: sepals 3-6, generally 5, the *stamens* generally as many and *opposite the sepals:* *ovary with 1 cavity* containing one ovule *and, generally, with 2 styles* or one forked style.

Fruit various, in some cases small, fleshy, with a single stone and, often, the two styles persisting, in other cases with the individual fruits joined to form a large fleshy compound fruit containing many large or small seeds.

About 100 gen., 2,000 spp., throughout the world but mainly tropical: 27 gen., 150 spp. in Malaya, mostly in the lowlands.

Like the Rubber-tree family (*Euphorbiaceæ*), this is a difficult one to appreciate because of the insignificant flowers and variety of fruits, but it contains a few genera such as the Fig-trees and the Breadfruit-trees which are very characteristic; and, thus, it is easier to learn the genera. The family is sometimes divided into two—the Mulberry-family (*Moraceæ*) with latex and fleshy flower-heads such as the Mulberries (*Morus*), the Figs and the Breadfruits, and the Nettle-family (*Urticaceæ*) with dry, stringy stems, and spikes, panicles or clusters of separate flowers such as the Nettles, the Indian Hemp (*Cannabis*) and the trees called *Trema*. Our Malayan trees belong mainly to the first group. We have no Stinging Nettles in the botanical sense, but we have in the forest two kinds of small tree or shrub called *Jelatang* (*Laportea*) with very vicious stinging hairs. Fortunately they are uncommon or very local, though in other countries, such as Borneo, some species are abundant and a great nuisance in the secondary jungle.

Key to the Genera

Without latex

Leaves entire : buds conical, long : fruits yellow to orange, 2-whiskered, in short sprays ... *Gironniera* p. 688

Leaves toothed

Leaves leathery with prickly teeth : small forest tree ... *Taxotrophis* p. 692

Leaves thin, not prickly, but often rough or harshly velvety, 3-veined from the base : generally in secondary jungle or in the open *Trema* p. 693

With latex

Thorny : small forest tree with small leaves ... *Phyllochlamys* p. 690

Not thorny

Fruits as stalked or sessile *figs* containing the *minute* flowers and *seeds*, arranged in pairs on the twigs, or in clusters or on strings on the branches and trunk : bark mostly pale and smooth ... *Ficus* p. 658

Fruits medium to large, 1" or more wide, round or oblong, often prickly, containing many *large seeds* : twigs and leaves often large : bark generally dark and rough ... *Artocarpus* p. 649

Not so

Leaves rough, stiff : berry orange-yellow, 2-whiskered : gardens, villages and rice-fields in the north of Malaya ... *Streblus* p. 692

Leaves smooth : in forest and secondary jungle

Leaves narrowed to the base : twigs glabrous : flowers in catkins : berries white : bark dark grey-brown, rough ... *Sloetia* p. 690

Leaves round or heart-shaped at the base : twigs hairy : fruit red to black : bark greyish white, smooth ... *Antiaris*

ANTIARIS

(from the Malay plant-name *Antjar*)

Latex present in all parts.

Leaves alternate, simple : stipules rather small.

Flowers in the leaf-axils, male and female on the same tree, the male heads lower on the twigs than the female flowers ; *male flowers very small, arranged in short stalked heads*, each flower with 4 sepals and 3-8 stamens : *female flowers not in heads*

URTICACEÆ

but grouped in the leaf-axils, pear-shaped and set with little scales on the outside, with 2 styles.

Fruit small, pulpy.

3-4 spp., Africa, Indo-Malaya: 1 sp. in Malaya.

A. toxicaria

(Gr., *toxikon*—an arrow-poison)

Upas Tree

Ipoh

A medium-sized to lofty tree, 50-150 ft. high, with smooth greyish white, fig-like bark becoming slightly fissured and rather pimply, the inner bark pale yellowish: latex creamy white, rather watery, soon turning dirty brownish and granular on exposure to the air: twigs, leaf-stalk and veins on the underside of the leaf hairy, though in some cases glabrous.

Leaf-blade 3-8 × 1½-3½", oblong elliptic, shortly tipped, the base rounded, often heart-shaped and generally more or less unequal-sided, thin, with 10-14 pairs of side-veins: stalk 1-4" long, short.

Male heads ½" wide, pale green, rounded, with the slender stalk (¼" long) sunk in the head, like little green mushrooms, 2-4 in a cluster.

Fruit ½" wide, pear-shaped, velvety, crimson then black.

India, S. China, Malaysia: scattered in lowland forest in Malaya.

In Malaya the Upas-tree is rare and we meet with it more often in books than in our walks. It is mentioned in this work because there is no handy description of it. Concerning its poisonous properties, its discovery, the fables surrounding it and the truth, there is a complete account in BURKILL'S Dictionary: suffice it to say that the tree is not nearly so deadly as ERASMUS DARWIN supposed. Malays and jungle-folk will collect the latex without special precaution; Chinese will chop up the branches with bare hands; and children eat the fruit though it contains the poisonous sap: but we have not done these things ourselves. The latex of some kinds of *Artocarpus* is also poisonous and used on arrows by jungle tribes.

In its leaves the Upas-tree suggests the *Tampang* (*Artocarpus dadah*) but the fewer pairs of side-veins, the rounded or heart-shaped base of the blade which some, at least, of the leaves possess, and the smooth grey bark distinguish it. In this last feature it suggests a Fig-tree but the oblong leaf with rounded base and short stalk is unlike the leaf of any of our fig-trees, and the way that the latex, oozing from a cut, quickly changes on exposure to dirty brownish, so as to look like muddy water, is also distinctive.

The Upas grows for a long time in the monopodial, fir-tree manner, having a stout trunk tapering to the vertex of the crown and rather short, but wide-spread branches crowded in its upper third. In this state, which may persist until the tree is over 100 ft. high, it looks remarkably like a stalwart *Kenanga* (p. 131), and the resemblance is heightened by the similarity in bark and in shape, size and arrangement of the leaves. Eventually, when the trunk can reach no higher, a few of the larger limbs develop strongly and form a spreading crown: the conical shape is transformed into a bushy dome which, in its turn, is slowly changed by age and decay into the venerable, but gnarled and unkempt head of a forest-giant.

There is a Upas-tree in the Singapore Botanic Gardens and one or two on Bukit Timah. Behind the Resthouse at Raub, between the servants' rooms and the garage, there is a tree which was struck by lightning a few years ago and has lost the upper part of its crown. J. N. MILSUM, in discussing "The Blow-Pipes and Poison-Darts of Upper Perak", describes and illustrates a tree by the Christian Church at Grik (M.A.H.A. Mag. vol. VIII, 1938, p. 120).

BREADFRUIT TREES

ARTOCARPUS

(Gr., artos—bread, karpos—fruit)

Thick, white, latex in all parts of the tree: bark rough, fissured or flaky, dark grey or brown to reddish or orange brown.

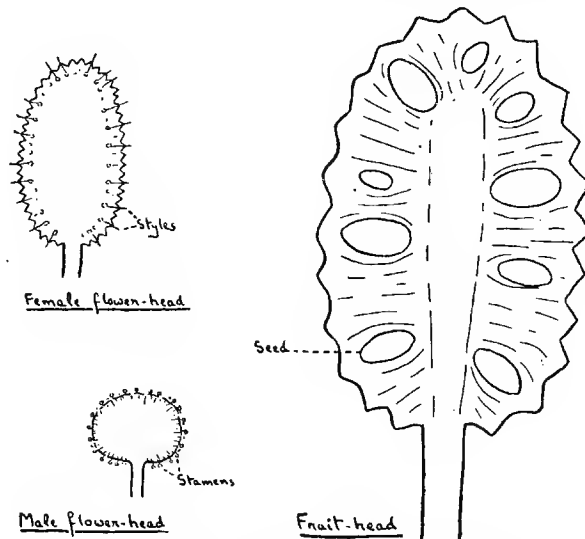
Leaves spirally arranged, simple, pinnately divided or truly pinnate: *stipules generally large and conical, covering the buds and leaving ring-like scars on the twigs.*

Flowers male or female, very small, set in heads, male and female heads on the same tree: *flower-heads* small or large, long- or short-stalked: *male heads* singly or in pairs in the leaf-axils, near the ends of the twigs, generally smaller than the female, smooth, often differently shaped, round, oblong, finger-shaped or club-shaped; *female heads* singly in the leaf-axils, often lower on the twigs than the males, fewer, with stouter stalks, round or oblong, often prickly, scaly or chequered: *male flowers* with a tiny calyx of 2-4 lobes and one stamen: *female flowers* with a tiny calyx tube, a single ovary and a long style.

Fruit a fleshy, smooth, prickly, scaly, warted or chequered head, small to gigantic, derived from the swollen female flower-head: *seeds large,* embedded in the fruit-head and surrounded with a waxy or pulpy succulent layer (the enlarged calyx tube), the strap-shaped parts between the "seeds" being the undeveloped female flowers.

About 50 spp., S. E. Asia to the Pacific Isles: about 20 spp. in Malaya, in lowland forest or cultivated.

The Breadfruit, the Jack and the *Chempedak* are placed in this genus with their wild allies. It is one of the most characteristic genera of the Eastern Tropics and it is readily distinguished by the fig-like leaves and latex, the peculiar flower-heads, looking like stalked burs, and the fruit-heads suggesting those of Pandans or even Pineapples. The flowers are so small, simplified and thickly crowded that, to study them in detail, they must be dissected under the microscope. (Drawings of the flowers of the Jack and *Chempedak* are to be found in the Gardens Bulletin vol. X, 1939, pp. 56-81). The male flower-heads are generally near the ends of the twigs with the female below them on the lower part of the twig and the two kinds always differ in shape (Text-Fig. 246). When ripe, the male heads are dusted with yellow pollen and the minute



Text-Fig. 246. Artocarpus (diagrammatic).

stamens can just be discerned with the naked eye: after flowering, the male heads fall off but the female persist and gradually enlarge in the course of several months into the fruit-heads. In the Jack, the *Chempedak* and the Green *Tampang* (*A. dadah*), the ripe male heads have a sweet scent of honey and burnt sugar by which they attract small flies and beetles and these undoubtedly carry the pollen to the female heads. In the Breadfruit, Monkey Jack (*A. rigidus*) and *Terap* (*A. elasticus*), in contrast, the male heads have no scent but, on being tapped or swung, give off clouds of pollen so that it seems that they are wind-pollinated: we have not been able to determine this point with satisfaction but, if true, then these species must be ranked with Casuarina, the Conifers and, perhaps, the Malay Beams (*Engelhardtia*) as exceptional among our native trees for their wind-pollination. A few, only, of the flowers in a female head are pollinated and set seed: the remainder are pulled out, by the swelling head, to form the straps or strings between the "seeds" of the ripe fruit. If all the flowers in a female head of the Jack, for instance, were to set seed, the resulting fruit would be unable to contain itself.

Unlike the Figs, our species of *Artocarpus* are without exception trees of moderate height, seldom exceeding 100 ft., and they have a simple, unspecialised manner of branching. Their leaves tend to point up—a position most noticeable in the Jack, Monkey Jack and *Chempedak Ayer* (*A. kemando* and *A. Maingayi*)—but as they age, and as new ones develop beyond them, so they are pushed round until they point down about the time when they fall off: this rotation is readily seen in the *Terap* (Plate 193). Young leaves are pale fresh green, except in the Shiny *Tampang*, *A. Gomezianus*, in which they are pink: the old leaves turn yellow and then, in most cases, dull orange brown. The bark is grey to dark brown, smooth or roughened with shallow fissures and small flakes which, on detaching themselves, leave uneven pocks: the one exception is the Orange-barked *Tampang* (*Artocarpus* sp., p. 658). The roughness of the bark is the only character by which one can distinguish a tree of *Artocarpus* from one of *Ficus* in the sterile state (p. 667). The only species to develop buttresses is the *Terap*. The latex is gummy and elastic in all but the *Miku* (*A. Lowii*) in which it has remarkable greasy properties (p. 656). In some wild species, not mentioned in this book, the latex is poisonous like that of the closely allied Upas-tree (*Antiaris*). Except in the two kinds of *Tampang* (*A. dadah* and *A. Gomezianus*) and the Orange-barked *Tampang*, the buds at the ends of the twigs are large, pointed and covered by the big conical stipules which, on falling, leave the ring-like scars on the twigs showing where they were attached. In the Breadfruit and *Terap* the buds are gigantic and, if a bud that is just about to open is taken, we can make out its structure which is on the principle of "Chinese boxes" packed inside each other: the stipule which covers the bud belongs to the leaf which has just unfolded and, on picking off the stipules one by one, the succession of smaller and smaller leaves, each inside the stipule of the preceding leaf, can be discovered.

In most species of *Artocarpus*, apparently, the sapling leaves are differently shaped from those of the adult tree and in no Malayan flowering plant is this distinction more striking than in the *Terap*. The sapling leaves are cut into finger-like lobes. The *Miku*, Jack, *Chempedak* and *Keledang* have only a few such lobes. The Green *Tampang* (*A. dadah*) has a few lobes that are themselves notched and the end of its leaf is prolonged into a finger. In the *Terap* (*A. elasticus*), and the allied *A. Scortechinii*, the blade is deeply cut almost to the midrib into many lobes and these lobes are themselves cut almost as deeply to their midribs so that, in botanical parlance, their sapling-leaves are

twice or thrice pinnatifid. As the saplings grow, their new leaves are less deeply cut and eventually the simple adult leaves are produced. A sapling *Terap* one would never imagine to be the offspring of its parent tree by mere inspection, yet it is not difficult to find trees from 20–30 ft. high, the lower branches of which bear the juvenile leaves, the upper the adult leaves and some intermediate branches the intermediate leaves: sapling and adult leaf may even occur on the same twig. In the forests of Johore we meet a sapling the leaves of which are so extraordinarily dissected they look as if a pixie had been snipping patterns from them: to what species it belongs we have not been able to discover: we suspect the *Chempedak Ayer* (*A. kemando*), but it will be necessary to raise the plant from seed before this can be proved. On the other hand, the Breadfruit seems never to discard its sapling leaf-form, and the Tree of Glory (*A. anisophyllus*) has wrought it into a kind of pinnate leaf peculiar to itself.

If a tree with such sapling-leaves be felled and coppice-shoots arise from the stool or if, through some injury, a bud break from the bole, then the new shoots, being near the ground, bear the sapling leaf-form. Evidently the height of the branch above ground has some connection with the form of the leaf. With the height of the branch is related the value of the root-pressure, that is the pressure with which the water is forced by the roots into the trunk and branches. The root-pressure, of course, is greatest at ground-level and, as the water is forced up the trunk against gravity, so the root-pressure diminishes upward. This relation leads one to suppose that where the root-pressure is high and the buds are forcibly injected with water, as in saplings or in the lower part of tree-trunks, these buds will develop the sapling leaf-form, but in the upper part of the tree where the pressure is low or, even, negative, the buds produce the simple adult form. Similarly, in the Shiny *Tampang* (*A. Gomezianus*), which does not have lobed sapling leaves, small trees and low branches of the big trees have leaves much larger than the small blades which clothe the upper branches of the big trees.

Twice a year, after the pronounced dry weather about January and February and again about July and August, our species of *Artocarpus* develop new leaves and flower on the new shoots. At such times the Green *Tampang* (*A. dadah*) is often deciduous. The *Terap* is commonly deciduous in the northern part of the country and on the East Coast. The Monkey Jack (*A. rigidus*) may shed its leaves with such abandon about the time that the buds are opening that on occasion it may almost be said to be deciduous. The other species, so far as known, are evergreen. But the genus has great interest in showing how the deciduous habit may be evolved.

The unripe fruit is full of latex. The ripe fruit softens and may ultimately fall to pieces. That of the *Chempedak* and the *Terap* has a powerful smell. In the three species of *Tampang* the ripe fruit is smooth or finely velvety with juicy, pink or light yellow flesh that can be eaten raw or made into confection: the odour and sour-sweet taste are pleasant, but the flesh is too gummy for much enjoyment. In the other species it is the pulp or plaster round the seed which is eaten, and, excepting the *Keledang*, their fruits are more or less spiny or knobbed. The fruit of the Breadfruit and *Chempedak*, as it begins to soften, may be cut into slices and cooked, but such 'bread' is always tasteless and tough.

The history and uses of the cultivated species are given in BURKILL'S Dictionary.

Key to the Species

- Fruits on the trunk or branches, large: village trees
with simple leaves
- Fruit up to 14" long: twigs and leaves with wiry
hairs *A. integer*
- Fruits bigger: twigs and leaves glabrous *A. heterophyllus*
- Fruits on the leafy twigs
- Leaves pinnate with leaflets of two sizes: wild *A. anisophyllus*
- Leaves deeply cut into lobes
- Village tree: *Sukun, Kulur* *A. incisus*
- Wild tree: *Terap* *A. elasticus*
- Leaves not divided, entire: mostly wild
- Blade small 2-5" long: fruits 1-2" long
- Blade blunt: fruit chequered, the stalk $\frac{1}{2}$ " long
or less *A. Maingayi*
- Blade pointed: fruit velvety, the stalk $\frac{1}{2}$ -1 $\frac{1}{4}$ "
long *A. kemando*
- Blade 9-22" long, very large, stiff, hairy and
strongly ribbed beneath *A. elasticus*
- Not so: blade 5-14" long
- Fruits spiny, warted or velvety and chequered
with little bumps: twigs with ring-scars
- Blade pointed, glabrous
- Blade thin: fruit yellow, small, oblong,
with pointed warts *A. Lowii*
- Blade very leathery: fruit olive-brown,
massive, round, chequered, velvety *A. lanceifolius*
- Blade blunt or scarcely pointed, stiff: fruit
rather large, round, strongly spiny *A. rigidus*
- Fruit smooth, velvety: no ring-scars: *Tampang*
- Glabrous: twigs thin: fruit with pink flesh
Blade hairy beneath: twigs brownish hairy,
rather thick
- Bark orange-brown: blade oval, side-veins
6-8 prs: fruit orange-yellow *Artocarpus sp.*
- Not so: blade oblong, side-veins 11-20
prs.: fruit with pink flesh *A. dadah*

A. anisophyllus Plates 191, 192
(Gr., with leaves of dissimilar sizes)

Tree of Glory
Keledang Babi

An evergreen tree, up to 100 ft. high, with dark glossy green heavy rounded crown: twigs very stout: buds 1-4" long, massive, brown hairy, onion-shaped: the withered, pinnate leaves falling off in one piece.

Leaves 1-3 ft. long, 8-12 pairs of stalked, alternate leaflets and a terminal leaflet: leaflets of two sizes, small and large, a small pair alternating with a large pair and, generally, a small and a large pair grouped together: large leaflets 8-12 × 3-4 $\frac{1}{2}$ ", oblong, pointed, with asymmetric base, leathery, with upcurled sides.

Flower-heads on the leafy twigs: male heads 2-3 × $\frac{3}{4}$ ", finger-like, on a stalk 2-2 $\frac{1}{2}$ " long.

Fruits 4-5 × 3-4", massive, oblong-oval or rounded, khaki-brown or yellowish-olive-brown, set with blunt, thick spines about $\frac{1}{2}$ " long: fruit-stalk 1 $\frac{1}{2}$ -3 $\frac{1}{2}$ " long, with the apex sunk in the fruit (as in an apple): seeds with thick orange pulp.

W. Malaysia: frequent in lowland forest in Malaya.

Not only is the leaf of this species remarkable in the genus for being pinnate but it has certain peculiarities which distinguish it from the pinnate leaves of all other Malayan plants, whatsoever their family. In the first place it has large and small leaflets in regular order, the small leaflets lying to the upperside of the larger ones; and, in the second place, when the leaf is shed it drops off in one piece: and it is from these fallen, big brown, complete leaves with their two kinds of leaflet that one recognises the tree. In no other Malayan plants with pinnate leaves are there two kinds of leaflets and in most cases, when the leaf withers, the leaflets detach themselves from the leaf-stalk which lastly drops by itself: in a few Burseraceous trees (p. 177), the pinnate leaf is shed entire but it generally comes to pieces on the least handling.

The species is given as *A. superba* in BURKILL'S Dictionary and it is unfortunate that this name must be displaced by an older, for it is indeed a superb tree. The English name, that we suggest, is in deference to its having crowned itself with such distinction.

A. dadah

(a vernacular name from Lampong, Sumatra)

Green *Tampang*

Tampang, Chempedak Ayer

A bushy deciduous tree to 80 ft.: twigs, leaf-stalk and undersides of the leaves hairy, *the twigs brown hairy, at least on the upperside*: buds small, up to $\frac{1}{4}$ " long.

Leaf-blade 4-12 × 2-5", oblong, often rather unequal-sided and appearing curved, tipped, rounded or tapered to the base, often somewhat glaucous beneath, side-veins 11-20 pairs: stalk $\frac{1}{2}$ -1" long.

Flower-heads on the leafy twigs: *male heads* yellowish, small, round, $\frac{3}{4}$ - $\frac{1}{2}$ " wide on stalks $\frac{1}{2}$ - $\frac{3}{4}$ " long, like mushrooms or stalked cushions: *female heads* $\frac{1}{2}$ - $\frac{3}{4}$ " wide, on stalks 1-1 $\frac{1}{2}$ " long.

Fruits 1-3 $\frac{1}{2}$ " wide, *roundish or lumpy*, finely velvety or appearing smooth and matt, *not spiny or chequered, pale green, with deep pink flesh, pulpy*: stalks 1-1 $\frac{1}{2}$ " long: seeds $\frac{1}{2}$ " long.

W. Malaysia: common in lowland woods and open country, frequent in villages.

This is the commonest wild species of *Artocarpus* with simple leaves. *Tampang* is the better Malay name for it because *Chempedak Ayer* is probably used in mistake for *A. kemando* and *A. Maingayi*. Various epithets may be given to *Tampang*, but *Tampang Besi* is the shrub *Callicarpa* (p. 697).

This species must not be mistaken for the Shiny *Tampang*, *A. Gomezianus*, with shiny glabrous leaves, nor for the Upas-tree (*Antiaris*), which it much resembles but the Upas has shorter leaf-stalks, a more or less heart-shaped base to the leaf, smooth greyish white bark and different latex. Compare also the Orange-barked *Tampang* (p. 658).

A. elasticus

Plates 193, 194

Teraf

(from the latex)

A tall forest tree, reaching 150 ft. high: *old trees with strong, buttresses*: twigs and leaves rather coarsely hairy: *twigs very stout*: buds 4-7" long, covered by the conical yellow stipules with silky brown hairs.

Leaves of saplings, lower branches of medium-sized trees, and coppice-shoots *deeply and variously cut into pointed lobes or fingers*: 2-4 ft. long (up to 6 ft. long in saplings).

Leaves of full-grown trees simple, elliptic, large, very stiff and leathery, up to 9-22 × 5-12", *rough hairy on the upperside, more densely hairy and strongly veined on the underside*: stalks 2-4" long.

Flower-heads on the leafy twigs: *male heads* 6-8 × 1-1 $\frac{1}{2}$ ", large, *finger-like, curiously furrowed*, yellow then brownish, hanging from stalks 2-3" long: *female heads upright, barrel-shaped*, about 4 × 3", appearing cut off at the base owing to the recurved spines, *green then cream-colour, woolly or shaggy with stout, soft, hairy, recurved spines*, projecting up to 1", with smaller conic spines intermixed, the massive dark green stalks 3-4" long.

URTICACEÆ

Fruits 6-7 × 3½-4", cream yellow then brownish, shaggy woolly with soft recurved spines like the female flower-heads, with a nauseous rancid smell when ripe: seeds with white pulp.

Malaysia generally: common in lowland forest and open country throughout Malaya.

The *Terap* is, undoubtedly, the commonest and best known of our wild species of Artocarpus. Young and medium-sized trees can be recognised from the fancifully cut, often gigantic, leaf-blades and the full grown trees from their big, stiff, coarse blades. But in the absence of fruits it is not easy to distinguish it from the related species, *A. Scortechinii* (see below).

The bark is tough and strips readily in big sheets. It is used as clothing by jungle-folk, and by Malays for lining baskets and bins, for making house-walls and for string. The latex is most tenacious and is used for bird-lime: the trunks of trees are commonly scored, herring-bone-fashion, for this reason. The fruits are eaten by monkeys and squirrels and it is said that children will eat the pulp round the seeds: but ripe fruits have the extraordinarily nauseating smell of the *Mengkudu* (*Morinda citrifolia*).

It is possible that the *Terap* is deciduous in parts of Malaya such as in the north and on the East coast where the dry weather is pronounced.

A. Gomezianus Plate 195

(Casimiro Gomez Ortega, 1740-1818, a Spanish botanist)

Shiny *Tampang*
Tampang

Very like *A. dadah* but:—

Evergreen, glabrous, with slender twigs: leaf-blade leathery, shiny, narrowly oblong with shorter stalk ¼-½" long: young leaves pink.

Male head rather pear-shaped, ½-¾" long, on a very short stalk ½" long, yellow: *female heads* flushed pink on equally short stalks, ½" long.

Fruits 1½-2" thick, rather flattened-rounded, shiny, very smooth, green turning orange-pink with bright pink flesh.

W. Malaysia: frequent in Malaya, in lowland forest and open country: occasional in villages.

The raw fruits are edible like those of *A. dadah* and, were it not for the slight gumminess, they would be palatable. Big trees in the forest reach 100 ft. high and have small, narrow leaves not exceeding 3½ × 1¼" in size, so that one scarcely takes them at first sight for the same species. The lower branches of medium-sized trees also have longer leaves than the upper branches. Observations on a tree in Singapore have shown that it renews its leaves once a year, about February or March.

Compare the *Tempinis* (Sloetia, p. 691) which in habit and leaf is rather similar, but has catkins and different fruits.

A. heterophyllus

(Gr., heteros—different, phullon—leaf,

from the two forms of sapling and adult leaf).

Jack, Jak
Nangka

An evergreen tree reaching 50 ft. high, the crown conical in vigorous growth, then becoming rounded: *leaves, twigs, etc. glabrous* or with minute white harsh hairs: sapling leaves with one or two pairs of lobes.

Leaf-blade 2-9 × ¾-4¾", elliptic to obovate, bluntly tipped, thinly leathery, gradually tapered to the stalk, very dark shiny green on the upper side: stalk ½-1½" long.

Male flower-heads oblong, barrel-shaped (ellipsoid) 1½-3" long, ¾-1½" wide, dark green, with a green ring at the end of the stalk: on the ordinary leafy twigs or on the short fruiting twigs from the trunk and branches and then above the female heads.

Female heads with a green ring at the top of the stalk.

Fruits 1-3 ft. long, 10-20" wide, barrel- or pear-shaped, gigantic, cream to golden yellow, set with sharp conical warts, born on short stout, often leafy, twigs from the trunk and main branches, smelling rather sickly sweet: the rind and core of the fruit inseparable from the seeds: the pulp round the seeds waxy-firm, golden yellow: seeds with a rather thick gelatinous jacket.

Cultivated throughout the tropics: undoubtedly derived from tropical Asia but its exact origin unknown, perhaps Peninsular India.

Many varieties of Jack occur in India, but in Malaya we have only one or two. It is said that there is an excellent variety which bears its fruits underground and as they ripen they raise mounds of earth: it is supposed to occur in Malaya as well as in Ceylon and India, but we have been unable to discover it. The Jack grows quickly and will fruit at three years, when it may be 30-40 ft. high. Its fruit is the biggest and one of the most complicated in creation, though it may be rivalled in size by exceptional marrows and pumpkins. (In BURKILL'S Dictionary the Jack is called *A. integra*.)

A. incisus Plate 196
(Lat., cut into)

Breadfruit Tree
Suku, Sukun, Kulur

A village tree: twigs very thick, sparsely hairy: buds 4-12" long, covered by the big conical stipules.

Leaves very large, 1-2 ft. long, deeply cut into several pointed lobes.

Flower-heads on the leafy twigs: male heads 6-10" long x 1" thick, club-shaped, rather spongy, dangling on stalks 2-3" long: female heads stiffly upright.

Fruits 5-12" thick, rounded or oblong, smooth or prickly, with stout stalks.

Native of the Pacific Islands, cultivated throughout the tropics: frequent in villages in Malaya.

In Malaya, the Breadfruit tree is evergreen but flowers generally twice a year after dry weather. In monsoon countries and in the southerly Pacific Isles, with a slight winter, it is deciduous. The history and uses of the tree are given in BURKILL'S Dictionary. Perhaps the best account of its natural history is to be found in the pages of HERMANN MELVILLE'S novel TYPEE (p. 164): in Malaya, the withered leaves never have the vivid tints which that author described. A seeding variety in the middle of the country is called *Telawi*. The correct botanical name is *A. allilis*.

A. integer

(Lat., entire, as opposed to the cut leaf of the Breadfruit)

Chempedak, C. Utan, Bangkok, Barok (Johore)

A tree like the Jack (*A. heterophyllus*) but reaching a greater size and:—*leaves, twigs, buds,* and the stalks of the flower-heads and fruits set with long, brown wiry hairs (the Wild *Chempedak* occasionally glabrous): leaf-blade dull and rather light green, rather sharply tipped, narrowed abruptly to the stalk: male flower-heads cylindrical, smaller, up to 2 x ½", pale greenish or yellowish, without a green ring at the top of the stalk: female flower-heads without a green ring at the top of the stalk: fruits smaller, up to 14 x 6", cylindrical, often baggy like a badly stuffed stocking, ochre to golden brown, set with rather flat, scarcely prickly warts, mostly on the branches, the rind and the core separable from the seeds, with a very strong stench: pulp round the seeds custardy-slimy, opaque: seeds with a very thin papery jacket.

Cultivated throughout the Malay Archipelago: wild in Malaya.

Though the *Chempedak* is often mistaken for the Jack, they are so different in detail that Malay children learn to distinguish them as soon as they can talk. By the colour of the leaves one distinguishes them at a distance; by their size, shape and smell one distinguishes the fruits; by their state and texture, their edible parts; and by their jackets, the seeds. If the Jack has the biggest of fruits, the *Chempedak* has the strongest and richest smell of any in creation: the smell is pervasive like that of the *Durian* but much harsher.

We have little doubt that the cultivated *Chempeidak* has been derived from the Wild *Chempeidak* of Malaya. This plant, which is known usually as *Bangkong*, is widely distributed to an altitude of 4,000 ft. (Fraser's Hill) but is nowhere common. It reaches a height of 100-150 ft. Its leaves may be hairy or glabrous and they do not show the orange-brown autumn-tints of the cultivated *Chempeidak*, as they wither. Its fruits look like small Jack-fruits and they have no smell when ripe, but the seeds have the decisive characters of those of the *Chempeidak*. The pulp round the seeds has a slight sour-sweet taste. There are not many instances of fruit-trees in the East, the wild states of which are known to exist.

(The characters of the Jack, *Chempeidak* and Wild *Chempeidak* are compared in detail in the Gardens Bulletin, S.S., vol. X, 1939, pp. 56-81).

In BURKILL's Dictionary, the *Chempeidak* is called by the doubtful and botanically incorrect name *A. chempeden*.

A. kemando

(the vernacular name from Lampong, Sumatra)

Squirrel's Jack
Pudu, *Chempeidak* Ayer

Very like *A. Maingayi* but:—twigs and leaves not conspicuously hairy: *leaf-blade* pointed and generally distinctly tipped: *male flower-heads* with longer stalks (2-3" long) thickly set with spreading hairs: *fruits*, up to $1\frac{1}{2} \times \frac{3}{4}$ ", smaller, thickly velvety and not evidently chequered, on longer stalks $\frac{1}{2}$ - $1\frac{1}{4}$ " long, set with spreading hairs like the stalks of the male-heads.

Malaya, Borneo, Sumatra: frequent in lowland forest, especially in swampy ground.

A. lanceifolius

Plate 197

Keledang

A forest tree like an enormous Jack, *twigs and leaves glabrous*, buds $\frac{1}{2}$ -1" long. *Leaf-blade* 5-14 × 2 $\frac{1}{2}$ -8", elliptic, very leathery, shiny, slightly tipped: stalk $\frac{1}{2}$ -1" long, side-veins 6-10 pairs. *Inflorescence* in the leaf-axils: male heads 1-1 $\frac{1}{2}$ " long, oblong, on stalks 1-1 $\frac{1}{2}$ " long.

Fruits on the leafy twigs, 3 $\frac{1}{2}$ -4 $\frac{1}{2}$ " long, rounded, very massive, dull olive brown, finely velvety with minute brown hairs, chequered with 4-6 angled areas $\cdot 1$ - $\cdot 15$ " wide, not spiny: stalk 3-5" long, the upper end sunk in the fruit.

Malay Peninsula: rather common in lowland forest.

The *Keledang* is a timber tree, described and illustrated by FOXWORTHY (7, p. 52). Specimens are to be found in most parks and public gardens in Malaya.

A. Lowii

(Sir Hugh Low, 1824-1905)

False Jack
Miku

A tree resembling a Jack when young, but reaching the dimensions of the *Tempunai* (*A. rigidus*) when old: *twigs and leaves often slightly glaucous, glabrous: latex oily, scarcely sticky*: buds 1-3" long.

Leaf-blade 5-14 × 1 $\frac{1}{2}$ -5", larger in young trees and up to 22 × 8", long and rather narrow, lanceolate elliptic, tapered to each end, shortly tipped, rather thin, with 10-17 pairs of side-veins: stalk $\frac{3}{4}$ -1 $\frac{1}{2}$ " long.

Inflorescences in the leaf-axils: the male with a cylindrical head, 1" long, on a stalk 1-1 $\frac{1}{4}$ " long, upright.

Fruit-heads on the leafy twigs 2-3 × 1-1 $\frac{1}{4}$ ", ellipsoid or barrel-shaped, rather small, densely set with small conical warts, rather prickly, green then yellow: stalks 1 $\frac{1}{2}$ -2" long.

Malay Peninsula: widely spread throughout the country in lowland forest, nowhere common, occasionally in villages: a few trees on Bukit Timah in Singapore.

This is a remarkable species on account of its latex. Instead of being gummy as in the other species, it is oily or greasy so that on rubbing between finger and thumb it disappears. From this property it has several uses among Malays

as an ointment for sores and cracked skin, being smeared on the lips of children, for instance, and as a cooking oil particularly excellent, it is said, for frying fish. The fruit is made into a preserve: after cutting off the rind and removing the hard seeds, it is candied. The tree is well known in Malaccan villages. It is like a Jack with long thin leaves, but the little fruits near the ends of the twigs are distinctive, as is the latex. The sapling-leaves have a few lobes, never so marked as in the *Terap*, and trees of thirty feet may have leaves nearly 18 inches long on the lower branches.

There is a tree in the Public Gardens at Kuala Lumpur, beside the Cannon-Ball Tree at the entrance to the Department of Agriculture.

A. Maingayi

(A.C. Maingay, 1836-1869, doctor and botanist of the East India Co.)

Squirrel's Jack

Pudu, Chempedak Ayer

A tree up to 80 ft., like a small-leaved *Chempedak*: *twig, leaf-stalk and underside of leaf distinctly hairy*: buds $\frac{1}{2}$ - $1\frac{1}{4}$ " long, hairy.

Leaf-blade 2-5 × 1-2 $\frac{1}{4}$ ", small, rather obovate, blunt or scarcely pointed, often notched at the end: stalk $\frac{1}{2}$ - $1\frac{1}{2}$ " : side-veins 10-14 pairs.

Inflorescences on the leafy-twigs: *male heads* 1-2 $\frac{1}{2}$ " long, finger-like, $\frac{1}{4}$ " thick, on *finely velvety stalks* 1-2" long.

Fruits small, 2 × 1", oblong, slightly velvety, *strongly chequered with hexagonal patches* (1-2" wide): stalk up to $\frac{1}{2}$ " long, *short, finely velvety*.

Malaya, Sumatra: frequent in lowland forest, especially in swampy ground.

This species is very close to *A. kemando* and might be considered a variety of it but it differs in the flower-heads and generally in the blunter, hairier leaves. Both species are united in BURKILL'S Dictionary. They can be mistaken for *Gironniera* which, however, has no latex. They seldom flower.

A. rigidus

Plates 198, 199

(from the rigid spines on the fruit)

Monkey Jack

Tempunai, Tempuni,

Gias (Perak), *Jelatoh* (Kedah), *Perian* (Pahang)

A tree to 100 ft. high with dense heavy, dark green, spreading crown supported by several long stout limbs, not drooping: trunk stout, massive, with greyish brownish, rough bark: *twigs, leaf-stalks and veins on the underside of the leaf rather harshly hairy*: buds $\frac{1}{2}$ -1" long.

Leaf-blade generally 5-7 × 2 $\frac{1}{2}$ -3 $\frac{1}{2}$ ", obovate, elliptic, blunt or slightly tipped, narrowed to the base, *dark shiny green, stiff and rigid*: side-veins 11-15 pairs: stalks $\frac{1}{2}$ -1" long.

Flower-heads in the leaf-axils: *male heads* $\frac{1}{2}$ -1" wide, flattened oval, yellow, on short stalks $\frac{1}{4}$ " long.

Fruits 3-5" wide, round, thickly set with stiff conical spines (projecting $\frac{1}{3}$ "), *greenish yellow then dull orange*: stalks $\frac{1}{2}$ - $\frac{3}{4}$ " long, sunk in the fruit (as in an apple): seeds with orange waxy pulp.

W. Malaysia: frequent in lowland forest and open country in Malaya, especially in Malacca and the F.M.S.

This is a fine tree with strong limbs. The orange jacket round the seed has a pleasant taste but is apt to give a rawness to the mouth. The fruit requires six months to ripen.

A. Scortechinii

(B. Scortechini, 1845-1886, the Italian missionary and botanist)

Nangka Pipit, Terap

A tree very like *A. elasticus* but:—

Leaves not so large and wide: *male flower-heads* small, 2-3" long, on stalks 1 $\frac{1}{2}$ " long: *fruit-heads* like those of the *Keledang* (*A. lanceifolius*), not set with long soft spines, yellow.

URTICACEÆ

Malay Peninsula : scattered throughout the lowland forest, perhaps not uncommon but generally mistaken for the *Teraφ*: abundant round Kuala Lumpur.

There is specimen of this species in the Seremban Lake Garden as well as in the Singapore Botanic Gardens.

Artocarpus sp. Plate 197
(unidentified)

Orange-barked *Tamϕang*
Tamϕang

An evergreen tree with heavy crown : like *A. dadah* but :—*bark orange-brown or reddish-brown, the new bark reddish-orange*; twigs coarsely brown velvety.

Leaf-blade 5-9 × 3-6½", broadly elliptic or oval, generally decidedly asymmetric, stiffly leathery, on the underside stiffly hairy, rather bluish-green (nearly glaucous) and beautifully and strongly veined with 4-8 pairs of side-veins : stalk ½-1" long, velvety.

Fruit-heads 2-3" wide, rounded, velvety, not chequered or prickled, at first sooty-brown, then ripening orange-yellow with yellow flesh: the stalk very short and sunk in the fruit (as in an apple).

Malaya : occasional throughout the country.

This beautiful species suggests a *Dillenia* in its heavy dark green crown and orange-brown trunk. There is a tree at Batu Gajah, to the left of the top of Hill Road, one by the main road at Slim River, another in the Seremban Lake Garden and one in the Singapore Botanic Gardens.

FIG-TREES

FICUS

(Lat. a fig-tree)

Trees with latex; bark generally smooth and entire; twigs marked with a ring-like scar at each node, from the falling off of the conical stipule covering the bud; twigs of small trees often hollow.

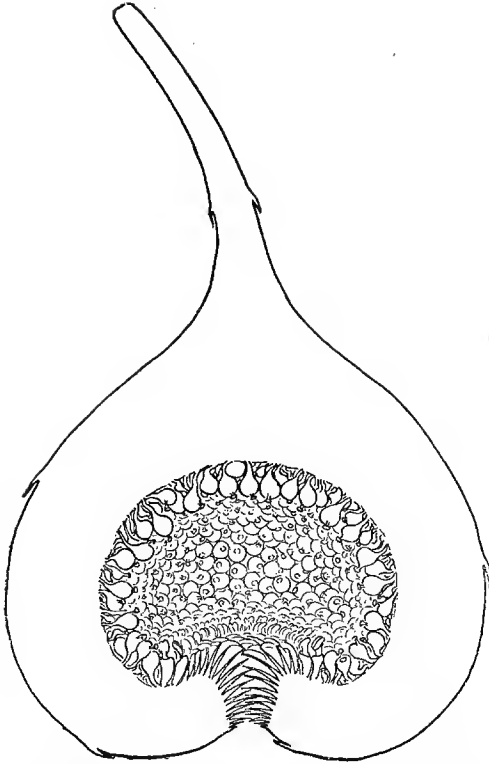
Leaves simple or lobed, arranged spirally, alternate or opposite, commonly rather unequal-sided.

Flowers tiny, set inside the fleshy figs, of three kinds; male flowers with 1-5 stamens; female flowers with an ovary and a long style, each setting one seed; gall-flowers like the female but swollen, balloon-like, with a short funnel-shaped style, each containing a fig-wasp, not setting seed; flowers with 3-5 tiny, often wine-red, sepals or merely a cup-shaped calyx.

Fruits as full-grown ripened figs.

About 600 spp. (1,000, according to some authors) in all warmer parts of the earth, mostly tropical and mainly Indo-Malaysian; about 100 spp. in Malaya, in lowlands and mountains.

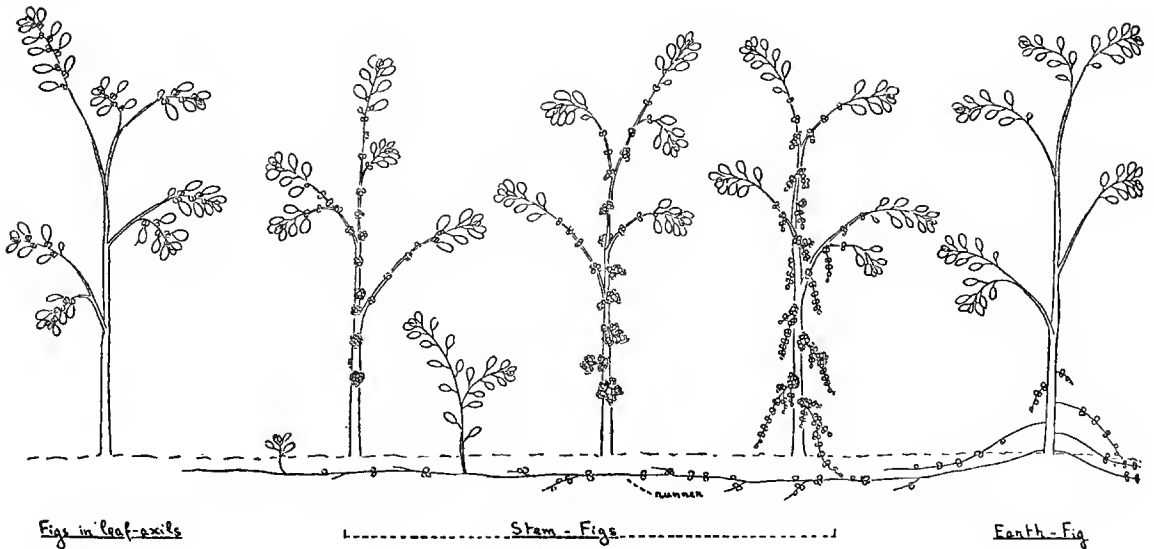
After *Eugenia*, our next largest genus of woody plants is *Ficus*. *Eugenia* consists of trees and shrubs, but in *Ficus* we find many kinds of growth-form, such as scrambling climbers, creepers and epiphytes, and a remarkable tree-form known as the "strangling fig": none, however, is herbaceous. In abundance of individuals there is no other Malayan genus of trees to equal it and in variety, whether it be shape of tree, leaf, or fruit, it is unsurpassed. Nevertheless, if the wild Fig-trees are so common, they are in a sense curiosities and we find ourselves obliged to explain in detail their peculiar construction. Yet so little do we know of their intricacy, that who can tell what is happening when the *Waringin* ripens a crop of fruit? We will describe first the nature of the fig and its flowers and how pollination occurs. Then we can appreciate the various growth-forms of the trees.



Text-Fig. 247. Section of a fig showing the orifice closed by interlocking scales, the numerous gall-flowers, and the male flowers in two circles round the orifice.

In all members of this family (Urticaceæ) the flowers are small. In some, like the Breadfruit-trees, the Mulberries, and the Fig-trees, the flowers become crowded into compact clusters, forming heads or spikes, which ripen completely into fleshy fruits each representing an entire inflorescence, *c.f.* the pineapple, and in these plants the flowers are smaller still and simpler in structure. In the Breadfruit-trees and the Mulberries, the flowers are placed on the outside of the fleshy stalk that supports them: in the Figs they are, as it were, on the inside. The fig is made by the widening of the inflorescence-stalk and the arching over and contraction of the edge until a cup or vase is formed, with a narrow mouth, like a hollow pear, and the flowers line the inside of the vase. A fig is thus

a head of flowers turned outside in: it is not a flower itself, like that from which a pear develops, but a cluster of flowers within a vase (Text-Fig. 247). The mouth of the fig is closed by many small, interlocking scales, which are the bracts of the inflorescence; in some figs the scales occur also on the sides, *e.g.* Text-Fig. 252; and in all cases there are three scales, rarely two, at the base of the fig, if it is sessile, or on the stalk, and they together form the 'collar' of the fig. The shape of the figs, whether sessile or stalked, round or oblong, smooth or ribbed, hairy or glabrous, the colour which they ripen, the part of the plant from which they are produced, and the position of the collar and the size of its scales are characteristic points of each species. Unripe figs are green, then they turn yellow, brown, pink, orange, red, purple or black: in a very few kinds they stay green. In most species the figs are borne in pairs, occasionally singly, in the axils of the leaves or on the twigs just behind the leaves. In others they are borne on the trunk or branches, being produced in clusters on woody knobs or short, leafless twigs developed from dormant buds: such we call Stem-figs, or *cauliflorous* (lat., *caulis*-stem, *flores*-flowers) (Text-Fig. 248). And in a few kinds the figs are borne on underground runners: these, which we call Earth-figs or *geocarpic* (gr., *ge*-earth, *karpos*-fruit), we will explain on page 665. Such a downward displacement of the fruits on the plant suggests that the downward transference of food-materials from the leaves to the trunk is somehow promoted in fig-plants, and a comparable instance may be seen in the luxuriance of the roots of the strangling figs.

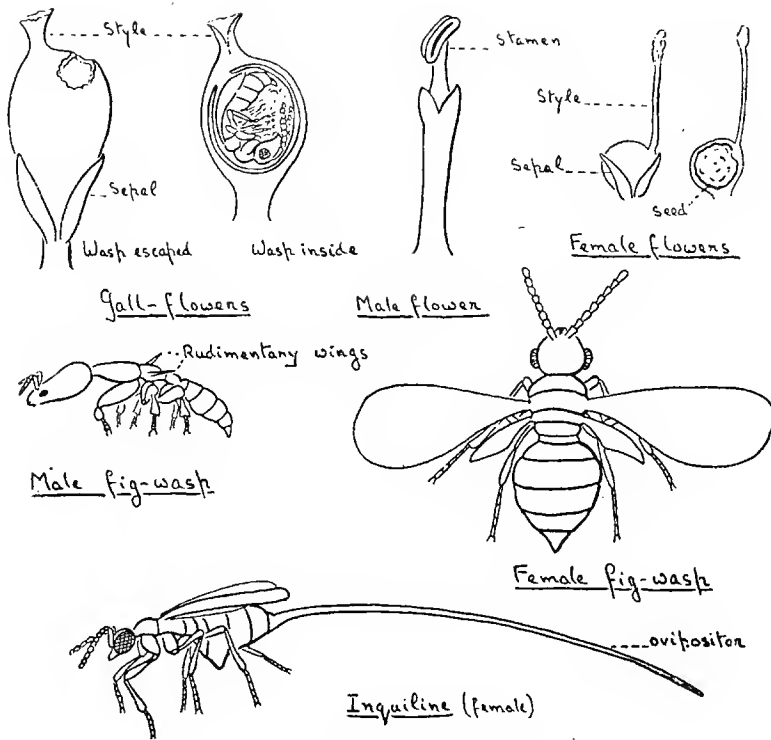
Text-Fig. 248. Habits of Fig-trees (*Ficus*).

POLLINATION OF FIGS

The flowers of Fig-plants are of three kinds:—*male flowers* with stamens, *female flowers* that set seed, and *gall-flowers*, so-called because they contain the little wasps that pollinate the flowers (Text-Fig. 249). The gall-flowers are sterile female flowers and they can be distinguished very easily on breaking open a ripe fig because they look like little, stalked bladders or balloons with a hole bitten on one side, which marks where the wasp came out. The female flowers can be recognised from the small, flat, hard yellowish seed which each contains, and the male flowers from the stamens. In the unripe figs the three kinds are not easy to distinguish because they are not fully developed and a pocket-lens is needed to see their true shape. The red or pink colour of the flowers is caused by the sepals.

In all the strangling Fig-trees (Group A, p. 674), excepting *F. gibbosa*, and in *F. glomerata* the three kinds of flower occur inside each fig. In the other fig-trees, as well as *F. gibbosa*, there are two kinds of figs, one containing only male and gall-flowers, the other only female flowers, and both kinds never occur on the same tree. Of such species we may therefore speak of gall-trees and of seed-trees, the figs of the gall-trees producing only pollen and wasps and those of the seed-trees producing only seeds. There is no external difference between the two kinds so that we must cut open their figs to see which they are (Text-Fig. 247).

The pollination of fig-flowers is, perhaps, the most curious relation between plants and animals that has been discovered. Fig-flowers can be pollinated only by these tiny insects called fig-wasps (*Blastophaga*) so that the Fig-plants are absolutely dependant on them for their reproduction. If we prevent, for instance, the wasps from entering the young seed-figs by enclosing them in a



Text-Fig. 249. Fig-flowers and Fig-insects (magnified).

muslin bag, their flowers will never set seed though the figs may grow to their full size and ripen. Or, if we plant an exotic Fig-tree in a country where its special kind of fig-wasp is absent, that tree will never propagate itself by seed : such an example we have in the Singapore Botanic Gardens in the Burmese Banyan, *F. Kurzii*, at the foot of the Lake, because it ripens its figs normally but its female flowers never have seeds and its gall-flowers are always empty. The fig-wasps, in their turn, are absolutely dependant on the Fig-plants for their livelihood because their maggots develop inside the gall-flowers, the adults breed inside the figs and their only free existence is when the female wasps fly from the ripening figs on one plant to the young figs on another. The male wasps, which are almost or quite blind and wingless, live in the adult state for only a few hours (Text-Fig. 249). If the female wasps cannot find a suitable fig tree, they have nowhere to lay their eggs and of necessity die. There are many kinds of these fig-wasps each being restricted, it seems, to one kind of Fig-plant or to a few allied species. They are called wasps because they are distantly related with the true wasps, but they do not sting and their little black bodies are barely a millimetre long. To explain what they do, we will consider a species of Fig-plant which has both gall-figs and seed-figs.

When the figs on the gall-plant ripen, the adult wasps hatch from the ovaries of the gall-flowers by biting a hole through the wall of the ovary. The males and females mate inside the fig, and the males die shortly after. The females scramble out between the scales which close the mouth of the fig. The

male flowers are generally placed near the mouth and just when the fig is ripening the male flowers open so that they shed their pollen on the female wasps as they escape. The female wasps, powdered with pollen, then fly to another tree of the same kind which is developing a new crop of figs and which they probably find by their sense of smell; and they enter the young figs by working their bodies between the scales which close the mouths of the figs. This is a difficult process which may take an hour or more and during which the wings and often a leg are lost because the scales are stiff and closely set in such young figs: the escape from the ripe figs is fairly easy because the scales are loosened by the swelling up of the fig and softened in ripening, and in a few species as *F. glandulifera* and *F. diversifolia* the mouth gapes widely at maturity. Inside the young figs, the wasps try to lay their eggs in the ovaries of the flowers by pushing the ovipositor (a fine tube from the hinder end of the body) down the style: with what success depends on the kind of fig which they have entered and here arises an important point:—gall-flowers have short, funnel-shaped styles, female flowers have long narrow styles. If the wasp has entered a gall-flg, her ovipositor easily passes down the short style and reaches the ovule in which one egg is laid, by being passed through the ovipositor. The wasp moves from flower to flower until her stock of eggs is finished: she then dies exhausted without having eaten any food since she hatched. When she lays an egg, she injects into the ovule a little liquid which stimulates the ovule to develop as though it would become a seed, and her egg grows by absorbing the food which is passed into the ovule from the veins in the wall of the fig. From the egg hatches a little maggot which lies coiled in the ovule and lives by eating the inside of it. Then according to its sex, it turns into an adult winged female or wingless male and bites its way out of the enlarged ovary of the gall-flower to repeat its life-history.

But if the female wasp enters a seed-flg, she cannot pierce the styles of the female flowers, because of their shape, or reach the ovules because of their length. She wanders frustrated and in her efforts brushes the pollen from her body on to the stigmas of the female flowers. The pollen grows down the style and fertilises the ovule which develops into the seed, while the wasp dies of starvation. The seed-flgs ripen slowly, in about three months, and when mature they are eaten by birds, squirrels and monkeys and the tiny seeds pass through the body of the animal and are dropped on the ground where they sprout into new plants (gall- or seed-plants).

The pollen brought into the gall-flgs has no effect on the gall-flowers. The gall-flgs ripen in six to eight weeks, (quicker than the female), but they are not eaten by animals probably because the insects render them distasteful, and so the pollinating wasps are not destroyed. On breaking open a ripe gall-flg, therefore, we find a mass of crawling insects, but in a seed-flg we find only the slimy ripe seeds.

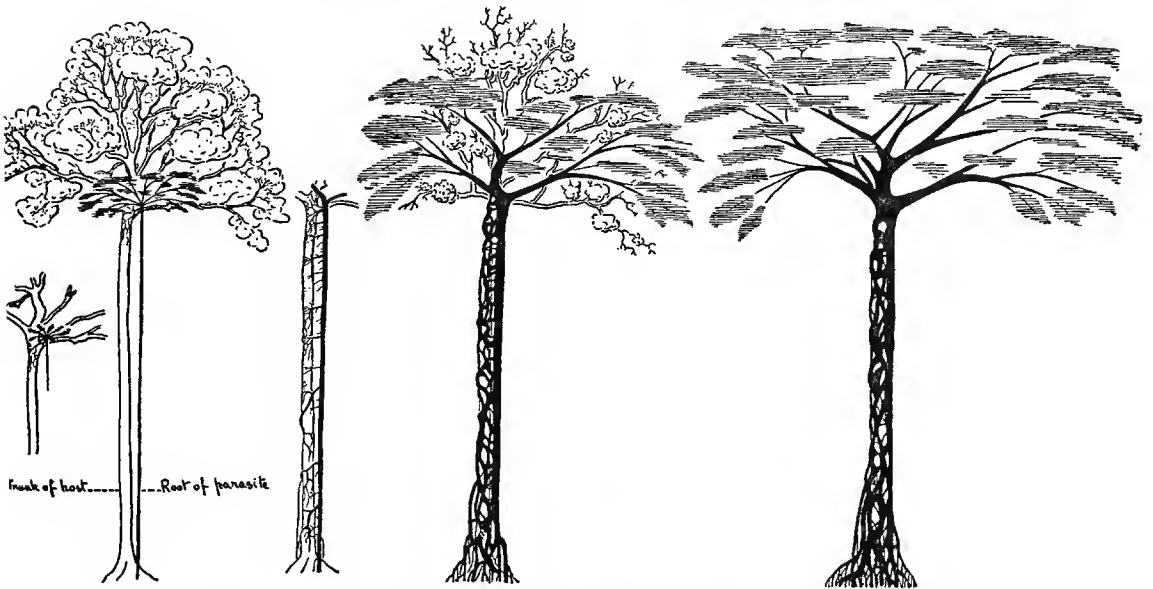
There are always gall-flowers and female flowers which do not develop because no egg is laid in them or they receive no pollen.

In the strangling Fig-trees, with all three kinds of flower in the same fig, the female wasp lays her eggs in the gall-flowers and accidentally pollinates the female flowers at the same time. As the figs ripen, the male flowers open and shed their pollen on the escaping wasps. Generally there are only a few gall-flowers and few insects in each fig so that they are not distasteful but are eaten by animals and the seeds are dispersed. A tree produces such immense numbers of figs that the wasps escape from many of them before they are eaten.

If we reflect for a moment on this chain of events, we find that several adjustments must have been made in the development of the inflorescence of the

Fig-ancestors with the design, as it were, to accommodate the wasps and to have the best use of them. Not only are the flowers boxed in so that the maggots are protected by the wall of the fig and by the scales closing its mouth, but certain flowers have been made into living cradles to nurture the wasps and the time of opening of the flowers has been changed. In those kinds which have two sorts of figs, we may say that the duty of the gall-plants is to breed wasps, to sprinkle them with pollen and to send them forth to find the seed-trees: and if the wasps that enter the seed-figs are merely trapped and prevented from reproducing, some of the seeds whose development they evoke become gall-plants and therefore these wasps are sacrificed for the good of their race. The gall-flowers have a structure which enables the wasps to lay their eggs in them; the female flowers have a structure which prevents that and so saves the fertile ovules from being galled as well as the sterile. The opening of the male flowers is delayed for several weeks, (as in Sloetia, p. 691), after that of the gall-flowers and female flowers in the same fig have opened, and thus the pollen is shed on the insects just at the right time when they are emerging. The wasps, too, are modified for their peculiar existence. The female has developed extraordinary instincts and powers by which she searches out the right tree among the myriad in the forest, wrenches and twists her body as she struggles into the young fig, lays her eggs in exactly the right place in the ovules of the gall-flowers, stimulates the ovary of the gall-flower to develop as though it would become a normal fruit, and then her daughters find their way unguided out of the ripe, dark fig. In contrast, nearly all the faculties of the male have degenerated save that of reproduction; he is born and dies in a living dungeon. How this relation between fig and wasp has been evolved, there is yet not the least explanation.

Now, another complication arises. Not every insect coming out of a gall-fig is a fig-wasp. There are many kinds of small wasp-like insects which are parasitic on the true fig-wasp. These parasites are called *inquilines* and they lay their eggs in the developing maggots of the fig-wasps by piercing with their



Text-Fig. 250. Diagram of the development of a Strangling Fig.

very long ovipositors *through* the wall of the half-grown fig into the ovaries of the gall-flowers (Text-Fig. 249). The maggots of the inquilines eat the maggots of the fig-wasps and the adult inquilines hatch out of the gall-flowers and escape from the ripe figs generally by biting a tunnel through the wall or through the scales that close the mouth. The inquilines are no use to the fig-plant because they never enter the young figs, always laying their eggs in them from the outside, and though they may carry pollen from the ripe figs they never bring it to the female flowers in the young figs. The inquilines can be distinguished from the true fig-wasps in the mass of insects in the ripe figs by the very long hair-like ovipositors from the ends of their bodies. If we look at the half grown figs of *F. fistulosa*, for instance, or *F. variegata*, on the tree, we may see the inquilines crawling over the outside and working their long ovipositors into the fig: how they manage to find the maggot of the fig-wasp inside, it is difficult to imagine but it may be a matter of "hit or miss". When a crop of gall-figs ripens, therefore, a generation of fig-wasps flies off with its parasites in search of a new home.

STRANGLING FIG-TREES

Fig-trees whose trunks are composed of a basket-work of interlacing and anastomosing roots are called strangling figs because normally they begin life on other trees and gradually squeeze them to death. Birds, squirrels and monkeys, which eat the fruits, drop the seeds on the branches of forest-trees where they grow into epiphytic bushes that hold on by strong roots encircling the branches. From thence their roots spread down the trunk of the supporting tree to the ground, where they grow vigorously (Plate 200). Side-roots encircle the trunk, joining up with other side-roots where they touch, and aerial roots grow straight down into the soil from various heights. In other cases, as that shown in Text Fig. 250, the epiphytic bush may send at an early stage an aerial root straight to the ground and from this root, which is like a perpendicular cable, side-roots grow towards the trunk, as though they were able to see it, encircling it and ramifying over it. In either case, the supporting trunk becomes enveloped in a basket of fig-roots, and the branches of the fig-bush begin to spread widely through the crown of its support. As the fig-roots and their supporting trunk increase in thickness they press upon each other but the fig-roots, being the stronger, slowly crush the bark of the support against its wood with the effect that the supporting tree is gradually ringed and its limbs begin to die back, its crown becoming stag-headed and uneven. A long struggle ensues between parasite and host, but if the fig-plant is vigorous it surely kills its support and finally stands in its place on a massive basket of roots. This "radical trunk" may reach a hundred feet high, according to height of the branch on which the seed germinated, and the initial cables that descend from the young epiphyte are commonly mistaken for the stems of climbers that have grown up from below. The dead trunk of the supporting tree rots away for many years in the basket of fig-roots. How long it takes to strangle a big forest-tree, we do not know but from the sprouting of the seed to the independence of the fig-tree can scarcely be less than a hundred years. Some kinds, like *F. indica*, *F. caulocarpa*, *F. benjamina* and, especially, *F. gibbosa*, are very destructive, yet others, like *F. annulata* and *F. consociata* appear seldom to kill their support, and, in fact, every transition to the ordinary climbing plant is displayed by our wild species. Considering how vigorous they are and how

easily their seeds are distributed, it is a problem why strangling figs do not occur on most big trees in the forest. In parks and "padangs" that are little cared for, they are generally common, occurring on every tree which is the roosting place of birds. Possibly ants carry off and eat many of the fig-seeds.

In addition to the basketing roots which encircle the support, some strangling figs develop aerial roots from their branches and even from their twigs. Such roots may hang in festoons. They remain fine and slender till they reach the ground and then one or more in a cluster thicken into a stout limb, like a trunk supporting the branch, and such is called a *pillar-root*. Trees with this habit we may term *banyan-trees* because it is the manner of growth of the famous Indian Banyan (*F. bengalensis*). By dropping new pillar-roots from their branches, as they continue to grow out, the crowns of banyans are extended far beyond the limits of ordinary trees and those of old specimens may cover vast areas. Only one Malayan species has this habit, namely the *Jejawi* or Malayan Banyan (*F. retusa*). The rest of our strangling figs have only basket-roots with, or without, tufts of aerial roots from the lower part of the branches or from their trunks.

Normally no strangling fig develops a main trunk from the top of its basket of roots. Instead, several twigs of the epiphytic bush grow out strongly and as they sag under their weight new twigs break from their uppersides to sag and branch in their turn, so that there is built up a many-limbed, wide-spreading and flat-topped crown with drooping lower branches from the characteristic shape of which a strangling fig can at once be distinguished in the canopy of the forest. But if they have been planted in the ground, as is generally the case with *F. religiosa* and *F. Rumphii*, or if their seeds have been dropped on a rocky cliff or sea-shore, then they stand on a short trunk of their own which, at a height of ten to twenty feet, breaks up into the typical, many-limbed crown. On the granite coasts and the limestone hills, the roots of these figs travel for extraordinary distances, up to several hundred feet, in the clefts between the rocks and, ramifying over their faces, bind them together as with so many cables. It is no exaggeration to say that some of the little islands on the East Coast, which are composed merely of enormous boulders, are held together by the strangling figs that grow on them, principally the species *F. superba* and *F. caulocarpa*.

A few other kinds of tree have evolved the strangling habit. The most notable is the American genus *Clusia* which is an ally of the Mangosteens (*Garcinia*). In Malayan towns the Australian Ivy Palm (*Brassaia*, p. 155) is apt to escape from cultivation and to develop as an epiphyte with basket roots, but it is doubtful if it kills its support. A few species of *Schefflera* (*Araliaceæ*) and, sometimes, our mountain Pear (*Pyrus* p. 529) begin as epiphytic bushes that send long aerial roots to the ground but these never form a basket-work round the supporting tree. The extraordinary forest-trees *Meraga* (*Adina* p. 532), with perforated trunks must not be confused with strangling figs.

EARTH-FIGS

By the edge of the forest, particularly in the middle of the country, there are commonly seen thickets of small bushy trees ten to twenty feet high, that have all the appearances of Fig-trees, though their latex may be scanty, and yet they never seem to bear any flowers or fruits. Such are the Earth-figs. And if we look at the base of their stems, slender, string-like or rope-like, runners can

be seen to emerge from various heights on the trunk, but mostly from the base, and pass into the ground. The shorter of these may bear figs above ground but the others appear to be sterile until, on gently pulling them, the bunches of figs come to the surface. These runners are leafless. They may stretch for several yards and commonly they proliferate new shoots which, taking root of themselves, grow into small trees beside their parent: hence the Earth-figs grow in thickets of a kind. But the main function of the runners is to bear the figs which they do in small bunches that are covered by the humus. How the figs are pollinated underground and whether they are uprooted by pigs, deer, musang and other animals, we do not know, but they are certainly spread by some creatures because they soon appear in places where the jungle has been thinned. In the virgin forest they are limited to streamsides, landslips and open rocky cliffs.

Their peculiar habit seems to be an extension of that in which the figs are borne on the trunk. Our Malayan species, in fact, show every stage from that in which the figs are borne in the leaf-axils to the geocarpic (Text-Fig. 248). The three most striking instances are *F. hispida*, *F. Scortechinii* and *F. cunia*. In the first, the ropes of figs that dangle from the lower part of the trunk may burrow into the ground at their tips. In the second, the figs are often borne on short, leafless twigs at the collar of the tree and these twigs take root but do not develop into runners. And, in *F. cunia*, while the lower runners may have all their figs underground, those arising from short heights up the trunk bear figs copiously on their aerial as well as underground parts and the runners from the lower branches are modified into hanging fruit-sprays as in *F. hispida*.

About seventeen species of Earth-fig are known from various parts of the Malay Archipelago. The same habit has been found in other kinds of plants, notably in the Malayan tree *Polyalthia hypogea*, belonging to the *Kenanga*-family (Annonoaceæ), in some bushes (*Cyrtandra*) of the *Didymocarp*-family (Gesneraceæ) and in some small trees belonging to *Saurauia*, which is a genus allied with the *Tea*-family (Ternstroemiaceæ). The habit is common, too, among the wild Gingers.

THE HABITS OF OUR FIG-TREES

Excepting the strangling figs, most of our wild species are small trees of secondary growth that in the original state of the country, when it was covered with virgin forest, must have lived a precarious existence on land-slides, rocky cliffs and temporary openings on sea-shores and riverbanks where trees had fallen down. With the clearing of the forest they have greatly increased their numbers, as their seeds are easily spread by birds and small mammals. Only three common species, namely *F. variegata*, *F. viridicarpa* and *F. glomerata*, have buttressed trunks of considerable size and they have also denser, more conical crowns than the other species whose manner of branching tends to be lax and irregular. All have soft wood and rapid growth. Some—perhaps many more than we suspect—are deciduous though others like the *Waringin* and *Jejawi* are certainly ever-green: what is known of their ways in Malaya we have stated under each species for our knowledge is too meagre to generalise.

In a few species like *F. alba* and *F. hirta*, the leaves of saplings and those of the lower branches or of coppice shoots are lobed with three to five fingers whereas the adult leaves are entire or merely toothed. Sapling-leaves, in general,

are bigger than those of full-grown trees but a difference in shape from the adult is exceptional *e.g.* Artocarpus, Campnosperma, Myrica, Pterospermum and Scaphium. The lobed leaves of these Figs recall those of the Mediterranean Fig, *F. carica*, which is in many ways an aberrant member of the genus (*c.f.* gall-and seed-figs on the same or different plants). All shapes and sizes of leaf, except the pinnate, are found in *Ficus*: the biggest, among our species, are the sapling leaves of *F. fulva*, the smallest those of the *Waringin*.

The buds of Fig-plants are covered by a conical pointed scale, which is a stipule (as in Artocarpus). When the buds of several kinds of strangling fig, especially the deciduous ones, open, they produce many large, pale green scales (stipules) between the leaves and they drop off and litter the ground under the tree. In the saplings such scales may be very large, even a foot long in *Ficus elastica*.

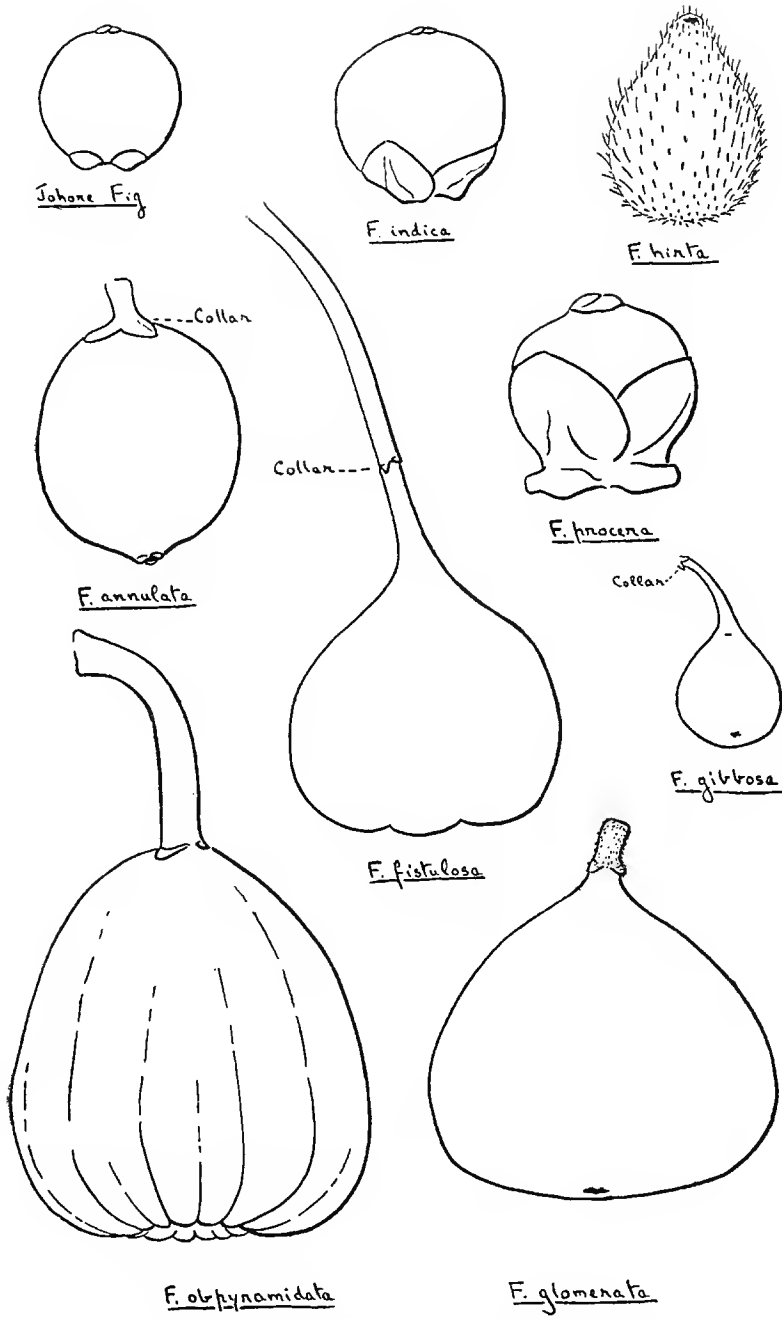
Whether they are deciduous or not, Fig-plants produce their figs in crops. On one tree, all the figs will be about the same stage in development. To find young, old and half-grown figs together is exceptional. The strangling fig-trees generally develop their first crop while they are small epiphytic bushes.

It is not easy, at first, to distinguish a sterile tree of Artocarpus from one of *Ficus*. We have noticed, however, that in the Malayan flora Artocarpus has rough, if not flaky or fissured, dark or richly coloured bark whereas *Ficus* nearly always has very smooth, pale bark. Only *F. glomerata* is an exception with rough bark.

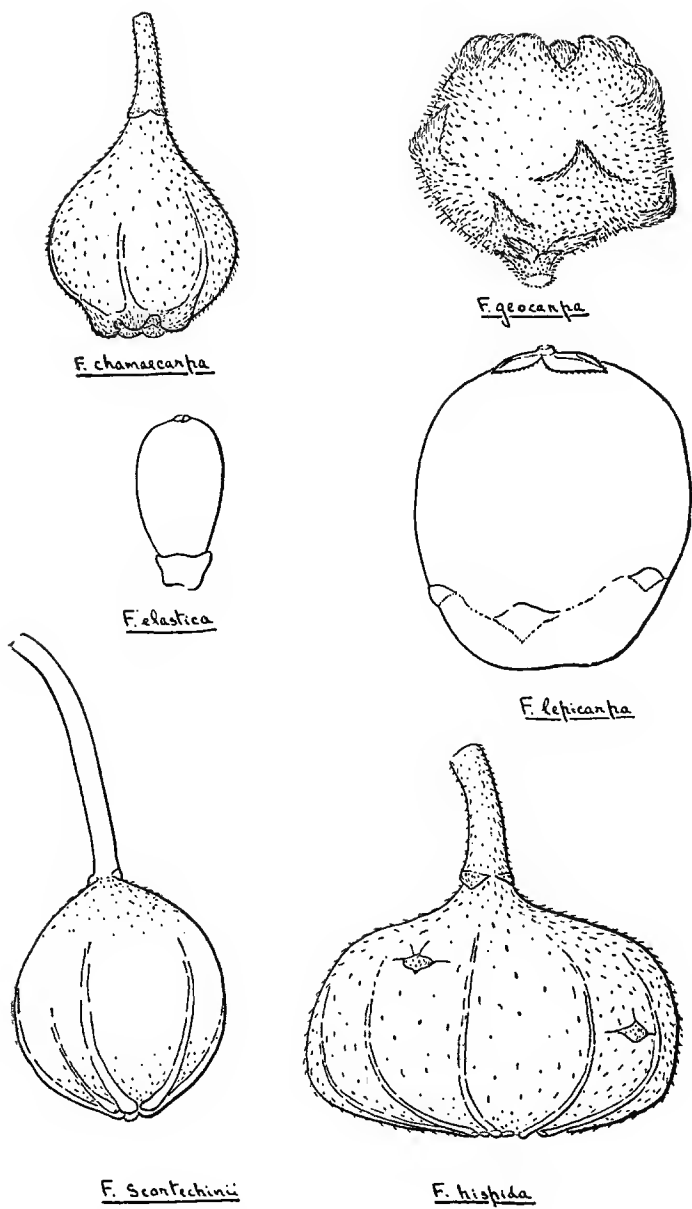
MALAY NAMES OF FIG-TREES

Ara is the usual Malay name for a species of *Ficus* whether it is a tree, a climber or an epiphyte. In some parts of the country the name is restricted to Figs with their own trunks and a different one is used for the strangling figs: in Perak the strangling figs are called *Jerei*, and in Kelantan and Trengganu they are called *Bunoh* or *Bunut*. The Stem-figs are commonly called *Ara Kelumpang*, *A. Kelepong*, *A. Lempong* and *A. Pom Pom*. The Earth-figs are called *Ara Tanah*. Several species have their own names as *Waringin* (*F. benjamina*), *Jejawi* (*F. retusa*), *Seniah*, (*F. hispida*) and *Chedon* (*F. cunia*). Such names as *Ara Laut*, *Ara Batu*, *Ara Bukit*, *Ara Jaya*, etc., merely signify the places where the Fig-trees are growing, without botanical accuracy. The Malay names are little assistance in the specific identification of Figs.

We offer no apology for describing so many species of *Ficus*. The genus is easy to recognise and the common species are readily distinguished by obvious characters. Once the search for wild figs is begun, the botanist will be surprised at their variety. For several quite common species we have not been able to discover the botanical names. One such is the Province Wellesley Fig (p. 680), another the Johore Fig (p. 680) and a third is a big tree on the padang at Ipoh, on the right of the entrance to the Railway Station. Rarities, real or apparent, can be discovered by all.



Text-Fig. 251. Fig-fruits (Ficus), nat size.



Text-Fig. 252. Fig-fruits (Ficus), nat. size.

Key to the Groups of Fig-species

- Bushes Group E, p. 674
 Trees
 Strangling figs, clasping the trunk of another tree with
 the roots, or with a trunk composed of a basket of
 descending and intertwining roots Group A
 Trunk normal, without aerial roots, not clasping another
 tree
 Earth-figs, fruiting on underground runners ... Group B, p. 672
 Stem-figs, with the figs on the trunk and main branches Group D, p. 673
 Figs in pairs on the leafy twigs or just behind ... Group C, p. 672

GROUP A

(p. 674)

Key to the Strangling Figs

- Figs mostly on the twigs and small branches
 behind the leaves
 Twigs stout: buds silky: leaf broad, the
 stalk 2-5" long: figs $\frac{1}{3}$ - $\frac{3}{4}$ " wide, stalked *F. superba* p. 679
 Twigs slender: buds glabrous: leaf narrow,
 stalk $\frac{3}{4}$ -2 $\frac{1}{2}$ " long: figs $\frac{1}{4}$ - $\frac{1}{3}$ " wide
 Figs stalked: leaves with 11-16 prs. of side-
 veins *F. caulocarpha* p. 675
 Figs sessile: leaves with 7-11 prs. of side-
 veins *F. glabella* p. 677
 Figs in pairs in the leaf-axils, sometimes singly
 Figs stalked
 Leaf-blade 6-14" long, strongly ribbed: figs
 yellowish *F. annulata* p. 674
 Blade 1 $\frac{1}{2}$ -6" long, faintly ribbed with rather
 few veins
 Fig-stalk $\frac{1}{3}$ " long or less: leaf-blade
 rather angular *F. gibbosa* p. 677
 Fig-stalk $\frac{1}{2}$ -1 $\frac{1}{4}$ " long: blade not angled
 Figs oblong *F. pruniformis* p. 678
 Figs rounded, pear-shaped *F. dubia* p. 676
 Figs sessile
 Leaves brown-hairy or brown-scurfy be-
 neath, at least when young
 Blade blunt, very leathery: figs round,
 orange-red *F. consociata* p. 676
 Blade pointed, thinly leathery: figs oblong
 yellow *F. pilosa* p. 678
 Leaves not so
 Trees with very many hanging aerial roots
 or pillar-roots from the branches
 Leaves large, leathery, with many fine
 veins: figs oblong, yellow *F. elastica* p. 677

- Leaves heart-shaped with few main veins: figs round, red ... *F. bengalensis* p. 675
- Leaves small, narrowed at each end: figs small, pinkish purple ... *F. retusa* p. 679
- Trees with basketing roots only, if at all, or with few aerial roots: no pillar-roots
- Twigs, figs and backs of leaves downy
- Leaves heart-shaped, blunt ... *F. bengalensis* p. 675
- Leaves elliptic, pointed
- Figs with conspicuous, overlapping basal scales ... *F. indica* p. 678
- Figs with tiny basal scales: (Prov. Wellesley, Kroh) ... *P. Wellesley* Fig. p. 680
- Twigs, etc. glabrous
- Leaf-blade heart-shaped or nearly so, not twice as long as broad
- Blade blunt: stalk stout and thick ... *F. bengalensis* p. 675
- Blade with a long tip: stalk slender, jointed to the blade
- Tip up to ½" long: stalk up to 3" long: N. Malaya ... *F. Rumphii* p. 683
- Tip up to 1½" long: stalk up to 5" long ... *F. religiosa* p. 683
- Leaf-blade elliptic, narrowed to the base, at least twice as long as broad
- Lower leaves large, leathery with many, very close, fine side-veins: buds long, pink ... *F. elastica* p. 677
- Leaves small or, if large, with the side-veins well-spaced
- Blade big, leathery, blunt: figs oblong, 1-2 ... *F. xylophylla* p. 680
- Blade pointed or thin: figs not 1" long
- Blade small, with many fine side-veins: basal scales of fig minute ... *F. benjamina* p. 675
- Blade medium-size, with well-spaced, distinct side-veins
- Figs ripening red, with conspicuous basal scales: leaf-blade with the lower pair of side-veins extending ¼-½ the length of the blade, making with the midrib a 3-veined base
- Bark grey-white: basal scales covering ⅓ of the fig ... *F. indica* p. 678

URTICACEÆ.

Bark pinkish brown : basal
 scales covering $\frac{1}{2}$ - $\frac{2}{3}$
 of the fig, resinous ... *F. procera* p. 678
 Figs ripening yellow to
 orange : basal scales in-
 conspicuous : lower pair
 of side-veins not ex-
 tended *Johore Fig.* p. 680

GROUP B

(p. 680)

Key to the Earth-Figs (geocarpic)

Leaf-blade equal-sided at the base, narrow $1-2\frac{1}{2}$ "
 wide, long-tipped *F. Beccarii* p. 680
 Leaf-blade very unequal-sided at the base, $2-5$ "
 wide
 Leaves, twigs and fruits with dark brown or
 blackish hairs *F. chamæcarpa* p. 680
 Hairs white or pale brownish
 Figs pink or reddish, not or scarcely hairy,
 often above ground *F. cunia* p. 681
 Figs densely bristly, nearly sessile, sub-
 terranean *F. geocarpha* p. 681

GROUP C

(p. 681)

Key to the Fig-trees with fruits on the twigs

Small trees or bushes : leaves thin, not leathery,
 often large and toothed
 Leaves white beneath : often lobed in saplings *F. alba* p. 681
 Not so
 Leaf-edge toothed : leaves, twigs and fruits
 very hairy
 Hairs whitish, bristly, irritating; blade $3-$
 12 " wide *F. fulva* p. 682
 Hairs yellowish, golden or brownish
 Blade $1-4$ " wide, never 3-lobed : low-
 lands *F. chrysocarpha* p. 682
 Blade of sapling or lower branches $3-5$
 lobed : mountains *F. hirta* p. 682
 Leaf-edge entire
 Leaf-stalk and twigs brown-hairy : ripe
 figs gaping *F. glandulifera* p. 682
 Leaves, twigs and fruits glabrous
 Leaves up to 7 " wide : figs $1 \times \frac{3}{4}$ "
 oblong, sessile : forest streams *F. lepocarpha* p. 683

- Leaves up to 3" wide: figs smaller or stalked
 Figs $\frac{1}{2}$ " wide or more, stalk $\frac{1}{4}$ - $\frac{2}{3}$ " long: side-veins of leaf 8-15 prs. *F. vasculosa* p. 684
 Figs $\frac{1}{4}$ - $\frac{1}{3}$ " wide, sessile or with a tiny stalk: side-veins 5-7 prs. ... *F. chartacea* p. 682
- Medium to large trees: leaves distinctly leathery, never very large, never toothed
 Twigs, fruits and undersides of leaves downy *Province Wellesley Fig* p. 680
- Glabrous
 Leaves oblong, 8-15 pairs of side-veins: figs stalked, orange to red ... *F. vasculosa* p. 684
 Blade nearly as broad as long, inclining to heart-shaped; figs sessile pink or purple
 Leaf-stalk 2-5" long: tip of blade $\frac{1}{2}$ -1 $\frac{1}{2}$ " long ... *F. religiosa* p. 683
 Stalk 1 $\frac{1}{2}$ -3" long: tip of blade $\frac{1}{4}$ - $\frac{1}{2}$ " long: north Malaya ... *F. Rumphii* p. 683

GROUP D

(p. 684)

Key to the Fig-trees with fruits on the trunk and branches (Cauliflorous)

- Base of leaf-blade very unequal-sided: leaves thin: rough hairy ... *see the Earth-Figs* p. 672
- Base of blade nearly or quite symmetrical about the midrib
 Blade coarsely toothed, large: figs 2" wide, red-brown ... *F. pomifera* p. 686
- Blade not toothed, or only in immature saplings
 Big trees becoming buttressed: figs 1" or more wide, red or green, in bunches on the massive trunks
 Leaf-blade elliptic-oblong: fig-stalks up to $\frac{1}{2}$ " long ... *F. glomerata* p. 684
- Blade more or less heart-shaped: fig-stalks 1-3" long
 Figs ripening rose-red: trunk brownish: blade with 4-8 prs. of veins ... *F. variegata* p. 686
 Figs ripening green: trunk whitish: blade with 8-12 prs. of veins ... *F. viridicarpa* p. 687
- Small sappy trees without big buttresses: figs yellow or brown, if red then less than 1" wide
 Leaves rough hairy, often opposite: figs hanging in strings ... *F. hispida* p. 685
 Not so: figs clustered
 Leaf-stalk short, less than 1" long: leaves never opposite

URTICACEÆ

- Figs 1-1½" wide, ripening russet-brown, in big branched clusters *F. Miquelii* p. 685
- Figs ½-1" wide, with 5 shoulders, ripening yellow to red, in compact cushions *F. Scortechinii* p. 686
- Leaf-stalks mostly 1" or more long: leaves often opposite
- Twigs and leaf-stalks hairy, at least when young: figs 1½-2" wide, with the mouth deeply sunken: always on riverbanks *F. obpyramidata* p. 685
- Twigs and leaf-stalks always glabrous: figs 1" wide, the mouth not sunken: belukar, hedges, etc., not common by rivers *F. fistulosa* p. 684

GROUP E

(p. 687)

Key to the Fig-bushes, with figs in the leaf-axils

- Leaves yellowish-olive or rusty beneath, glabrous, short stiff, blunt: figs stalked: sandy shores, mountain tops, bogs *F. diversifolia* p. 687
- Leaves very narrow, thin, pointed, glabrous: figs stalked, ribbed: forest streams of Perak and Pahang northward *F. pyriformis* p. 687
- Not so: leaves broad, toothed or hairy: figs sessile or hairy *Group C* p. 672

GROUP A

STRANGLING FIG-TREES

F. annulata Text-Fig. 251 *Kuap* (Negri Sembilan)
(Lat., furnished with a ring)

Generally rather small, though bushy and big-leaved, rarely killing its host but occasionally becoming independant and reaching 80 ft. high.

Leaf-blade 6-14 × 2½-5", oblong, tipped, *strongly ribbed with many* (12-20) pairs of *side-veins*: stalk ¾-1¼" long.

Figs 1-1¼" long, oblong, *greenish orange-yellow to pinkish yellow*, the stalk ¼-¾" long.

Burma, Malaysia: rather common in Malaya, in the middle and north.

The rather big, strongly ribbed leaves and large, stalked figs distinguish this species. There are several fine trees in the town of Kuala Pilah.

F. bengalensis Plate 206
(from Bengal)

Indian Banyan.

A large, spreading, evergreen tree usually with many aerial roots, some developing into short, massive pillar-roots: all parts softly hairy, at least when young.

Leaf-blade 4-8 × 2-5", heart-shaped, blunt: stalk $\frac{1}{2}$ -2" long.

Figs $\frac{1}{2}$ - $\frac{3}{4}$ " wide, round, sessile, ripening dull rose-red, with rather broad, yellow basal scales.

India: occasionally planted in Malaya.

This is the famous banyan that grows to such an enormous size in India. From its habit of dropping roots from its branches, like the Malayan Banyan (*F. retusa*), and from the way these roots develop into subsidiary trunks while retaining their connections through the branches with the rest of the tree, the Indian Banyan develops the biggest crown of any plant in the world. There was a specimen near Poona the crown of which measured 2,000 ft. in circumference. The big tree in the Calcutta Botanic Gardens measured, in 1900, 938 ft. in circumference, its height being 85 ft., and it had 464 pillar-roots dropped from the branches: this tree grew from a seed deposited in the crown of a date-palm in 1782. In Malaya the Indian Banyan is not common. Our biggest specimen occurs in Singapore in the Cathedral Close. There are smaller trees in Batu Gajah, planted in the market and by the road to the Post-Office.

F. benjamina Plate 207
(from 'banyan', Sanskrit—*baniḥ*)

Waringin, Beringin.

A medium-sized to lofty, evergreen tree with fine-leafed crown and very drooping ends to the branches: seldom dropping aerial roots from the branches and then only a few: bark light grey: twigs slender.

Leaf-blade $1\frac{1}{2}$ - $4\frac{1}{2}$ × $\frac{3}{4}$ -2", small, elliptic, with rather long tip, thinly leathery, shiny, with many fine, close side-veins: stalk $\frac{1}{2}$ - $\frac{3}{4}$ " long.

Figs $\frac{1}{2}$ - $\frac{3}{4}$ " wide, round or egg-shaped, sessile, ripening orange-red then dull purple-red on some trees, orange then cherry-red on others, and pale pink then mauve-purple on others, the basal scales tiny and apparently absent.

India, Malaysia: commonly planted throughout Malaya, scarce in the forest.

The geographical distribution of this well-known tree in the wild state is uncertain. On account of the old Malaysian custom of planting two trees before a royal dwelling, it has undoubtedly been distributed by man through many centuries. It is reported to be wild in N.E. India, Burma, Sumatra, Timor and Celebes. Recently we have found wild trees in the high forest in the East of Johore and also on the rocky coast at Pangkor. It must therefore be considered a true native of Malaya. A little care is sometimes needed to distinguish it from the Malayan Banyan (*F. retusa*): though the finely veined, long-tipped leaves, the absence of bunches of aerial roots and the orange-red figs are in most cases characteristic of the *Waringin*, some trees appear to be hybrids with the Malayan Banyan.

F. caulocarpa Plate 201
(Gr., *kaulos*—stem, *karpos*—fruit)

A deciduous tree, developing a vast crown of many equally large spreading limbs: ending in numerous slender twigs: generally with many aerial roots developing on the trunk or from the base of the lower limbs: bark pale pinkish brown: glabrous: young leaves pale green, the opening buds shedding many large, thin, pale green stipules.

Leaf-blade $2\frac{1}{2}$ -7 × $\frac{3}{4}$ -3", narrowly oblong, slightly and, generally, bluntly tipped, rather thin, with many (11-16) pairs of fine side-veins: stalk $\frac{3}{4}$ -2 $\frac{1}{2}$ " long, distinctly jointed to the blade.

URTICACEÆ

Figs about ¼" wide, small, round, with a short stalk .1-.2" long, whitish with dull pink spots and pinkish mouth, ripening dull greyish purple: arranged in clusters of 2-4 on the twigs behind the leaves, but not on the large branches.

India, Malaysia: frequent, both wild and cultivated, in Malaya.

Of this species, there are several large specimen in Singapore but that on Government Hill is undoubtedly the finest. Observations on a tree in the Botanic Gardens have shown that there is a remarkable rhythm in its leaf-change, which occurs three times a year at intervals comparable with those between the flowerings of the Sea Apple (*Eugenia grandis*), though the dates of leafing of the Fig are different from those of the flowering of the Eugenia. The Fig-tree develops new leaves about the end of January, the beginning of June and the beginning of November, the consecutive intervals between leaf-changes from January to January being roughly four, five and three and a half months. When the tree is about to change its leaves, it sheds the old ones rapidly, remains bare for a few days and then develops the new leaves over most of the crown simultaneously so that the renewal is completed within a fortnight from the opening of the buds. At such times the ground below the tree is littered with the pale green bud-scales (stipules) and fallen leaves. A similar habit probably occurs in the related species *F. superba* and, perhaps, *F. glabella*.

Compare the Johore-Fig (p. 680) which has a superficial resemblance to this species.

F. consociata

Brown-scurfy Fig

(Lat., consociatus—united)

An evergreen tree, rarely very large and seldom standing without its host: *young leaves and twigs densely woolly with lilac brown hairs*, the hairs soon becoming brown: *mature leaves finely brown scurfy on the underside.*

Leaf-blade 5-9 × 1½-4", elliptic or slightly obovate, the base tapered or slightly heart-shaped, *the apex blunt or very slightly tipped, stiff and leathery*, with 5-10 pairs of conspicuous veins: stalk ½-1½" long.

Fig ¾" wide, round, sessile, *ripening reddish orange, with 3 rather large scales at the base*; in pairs in the leaf-axils.

Western Malaysia: common in Malaya in lowland forest, riversides and sea-shores.

This is like *F. indica* but the leaves are brown scurfy beneath and they never have such points. Along with several other kinds of strangling figs, it is common at Tanjong Kling in Malacca. Compare *F. pilosa*.

Saplings produce their first crop of figs when 8-9 years old.

F. dubia

Cherry-Fig

A tree like *F. benjamina* but with larger leaves and figs.

Leaf-blade 3-6 × 1½-3", elliptic, shortly tipped, rather thin, with 7-11 pairs of side-veins, *dark green with whitish veins*: stalk ½-1½" long.

Figs large, singly or in pairs in the leaf-axils, ¾-1½" wide, round with a stalk ¼-¾" long, *pear-shaped, ripening orange streaked red then dark crimson* with pale spots.

Malaya, Sumatra: occasional in Penang and Singapore (Bukit Timah), probably in other parts.

This species, which is one of the most beautiful in the genus, deserves to be much better known. The fruiting twigs look as if they were decked with luscious cherries. These large figs are most distinctive but, when sterile, the species is not easy to recognise.

F. elastica Plates 202, 203, Text-Fig. 252India-rubber Tree
Bunoh Seteroh (Kel.), *Nyatus*

A vast evergreen tree developing abundance of aerial roots from the trunk and main limbs: *young parts with red leaf-stalks, midribs and stipules*: buds on lower branches 4-12" long.

Leaf-blade 3-6 × 1½-3", but much larger in saplings or on low branches (up to 14 × 7"), elliptic, tipped, *dark green, leathery, with very many pairs of fine veins*: stalk 1-3" long.

Figs about ½" long × ¼" wide, *oblong, sessile, ripening yellow*.

Eastern Himalaya to Java: commonly cultivated in villages, towns and by Indian coolie lines in Malaya, possibly wild in the north.

The abundance of this tree in the inhabited parts of Malaya is derived from the veneration in which it is held by Indians. The only records, to show that it may be wild, are a collection, in 1889, from a tree on a limestone hill near Ipoh and another, in 1941, from a small tree on Gunong Baling. But, from the way in which seedlings develop on roadside trees in the vicinity of Raub and Tras, it is certain that it can escape from cultivation and become wild. Before the advent of the Para-rubber tree, the India-rubber tree was one of the main sources of rubber in the East. Its cultivation is described in BURKILL'S Dictionary. The long red buds and large leathery leaves on the lower branches and the abundance of aerial roots near the trunk at once distinguish the species. By Temangan on the Kelantan River, several big tree mark the remains of a plantation.

F. gibbosa Text-Fig. 251
(Lat., gibbosus-humped)

Humped Fig-Tree

A big tree, developing many slender aerial roots from the trunk together with many basketing-roots.

Leaf-blade 1½-6 × ½-2¼", narrowly elliptic *generally unequally sided and distinctly angled* (like a long narrow diamond) or humped on one edge, tipped, often yellowish beneath: stalk 1-5" long.

Figs ½-¾" wide, *pear-shaped, with a short stalk 1-3" long, ripening greenish yellow then dull yellow or reddish orange*: basal scales minute.

India, Malaysia: common in Malaya from Tampin northward, often on rocky sea-coasts.

It seems that this species strangles its host early in its life, because independent trees with basket-trunks and, yet, without trace of their support are commonly found. It develops more aerial, basketing roots than any other Malayan species except, perhaps, *F. elastica*; but it does not drop pillar-roots like the banyans. The biggest specimen that we have seen was at Juara Bay on Pulau Tioman. There are many trees on the hill at Kuala Selangor and several by the roads in Pahang. Whether they are evergreen, deciduous or in any way seasonal we do not know. On the exposed rocks of the East Coast, this species may be dwarfed to a creeping bush with gnarled branches and a carpet of leaves, like the *Jejawi* (*F. retusa*).

F. glabella
(Lat., rather bald)

Grey Fig

A big tree remarkably like *F. caulocarpa* but:—

1. the leaf-blade rather obovate, with only 7-11 pairs of side-veins.
2. the figs larger, 3-4" wide, sessile, ripening greyish white with a pinkish or purplish tinge.

India, Malaysia: common in Malaya but generally mistaken for *F. caulocarpa*.

There is a tree by the police station on Penang Hill.

URTICACEÆ

F. indica Plate 208, Text-Fig. 251
(from Indian)

Indian Fig

A big *evergreen* tree, developing a vast spreading crown and enormous basket-trunk with stilt-roots in the lower part: no pillar-roots from the branches: *bark greyish white*: all parts glabrous or finely downy when young.

Leaf-blade 3-9 × 1½-4½, elliptic with a distinct long sharp tip, thinly or stiffly leathery, with 7-10 pairs of side-veins, the lowest pair reaching ¼-⅓ the length of the blade and making with the midrib a 3-veined base: stalk ½-1¼" long.

Figs ½-¾" wide, rather wider than long, sessile, with 3 large yellow basal scales, ripening orange then blood red.

India, Malaysia: common throughout Malaya, in the lowlands.

This is, perhaps, our commonest wild species of strangling fig. In height and spread of crown it is one of the biggest, yet, it begins to fruit as a small epiphytic bush only a few feet across the limbs. It has a variety (var. *Gelderi*) with oblong fruits ⅔" high. Compare the Johore Fig. p. 680, which is easily mistaken for it.

F. pilosa
(Lat., pilosus-hairy)

Brown-woolly Fig

A big tree like *F. indica*: the buds, twigs, leaf-stalks and undersides of the leaves brown woolly-hairy.

Leaf-blade 4½-9 × 1¾-4½" (up to 12 × 5" in saplings), oblong-elliptic, the apex shortly and acutely tipped, the base rounded or nearly heart-shaped, thinly leathery, with 8-12 pairs of side-veins: stalk ½-1¼" long.

Figs ¾-1¼" long × ¼-¾" wide, oblong, sessile, ripening ochre-yellow: basal scales tiny, brown silky.

India to Australia: common in Malaya from Kuala Kangsar northward and on the East Coast, not known in the south: frequent on Penang Hill.

This striking species may be confused with *F. consociata* which has much stiffer, very leathery, blunt leaves with fewer side-veins and only a fine brown scurfiness on the underside of the full-grown leaves: the figs in the two species are quite different. There are several trees on the padang at Grik and it is a frequent species in Penang, occurring even near the top of the hill.

F. procera Text-Fig. 251
(Lat., procerus-tall)

Collared Fig

A big tree like *F. indica* but:—*bark pinkish brown*: *leaf-blade* 4-10 × 1-3" long, narrowly oblong, tapered gradually to the base, the apex blunt or hardly tipped: the stalk longer, 1-3½": *figs* half-covered, or more, by the large, shiny, hard, resinous, yellow basal bracts.

W. Malaysia: common in Malaya, sporadic in towns and villages.

The relatively enormous, resin-coated basal scales, like a high cravat round the fig, distinguish this species.

F. pruniformis
(Lat., having the shape of a plum)

Prune-Fig

A tree like *F. benjamina* but with larger leaves and stalked figs like *F. annulata*, ? deciduous: young leaves pinkish brown.

Leaf-blade 3-7 × 1¼-2¾", narrowly elliptic, tipped, rather thin, with 7-10 pairs of side-veins: stalk ½-1" long.

Figs about ¾" wide, oblong, with a stalk ¼-1¼" long, prune-shaped, in pairs in the leaf-axils, ? colour.

W. Malaysia: not common in Malaya (Selangor, Perak, Pahang).

We include this species in our account of common fig-trees because the big tree opposite the entrance to the Ipoh Club belongs to it. The species may well be commoner in the north of the country than our collections lead us to suppose. Compare *F. annulata* with bigger-leaves and *F. dubia* with differently shaped figs.

F. religiosa (see Group C, p. 683)

F. retusa Plate 207
(Lat., retusus—blunt)

Malayan Banyan
Jawi Jawi, Jejawi

An evergreen tree much resembling *F. benjamina* but:—

1. developing numerous tassels of slender aerial roots from the branches, even from the twigs: these aerial roots commonly hanging like festoons: some of them developing into pillar-roots.

2. leaf-blade blunt or scarcely pointed, often asymmetric, with 7–9 pairs of distinct side-veins.

3. figs ripening pink to dull purple or purplish black, never orange or red, with 3 small, distinct yellow scales at the base.

India to New Guinea: common in Malaya especially in swampy ground and by the sea.

This is really a tree of lowland swampy forest with a preference for the muddy banks of tidal rivers where it may form, behind the mangrove, impassable thickets from the tangle of its sinuous limbs and aerial roots and where it often smothers all other vegetation. Village-trees are mostly relics of this original forest, preserved and venerated by the Chinese who make offerings to them and cut off the aerial roots for medicine. But the species grows also on rocky headlands and islands, particularly on the East Coast, where it shows itself possessed of remarkable adaptability for in exposed, wind-swept situations it is dwarfed to a creeping bush with gnarled branches, flat upon the rocks, like the *Mentigi* (Pemphis) or *Leptospermum* in the mountains. The biggest specimen that we have seen was in the forest south of Kuala Sedili on the East Coast of Johore, by the stream called Ru Reba. Its crown was 80 ft. high and 190 ft. in diameter. It was supported by huge limbs in vast spans from the central trunk and sustained by many pillar-roots, some being 40 ft. tall and a foot in thickness. Under the crown there was scarcely a living thing, in contrast with the normal exuberance of the forest, and as we groped our way beneath the arches we felt as if we were measuring some deathly colonnade.

F. Rumphii (see Group C, p. 683)

F. superba

Sea Fig

A big deciduous tree like *F. caulocarpa* but with larger leaves, longer leaf-stalks, larger figs and *very stout twigs with densely white silky or hoary buds.*

Leaf-blade 3–10 × 1½–5", elliptic, *the base rounded or slightly heart-shaped*, with 9–12 pairs of side-veins: the stalk 1½–7" long.

Figs ½–¾" wide, pear-shaped, with a stalk ¼–¾" long, *ripening white or pale yellow to pink and finally dull purple: set in bunches on small woody knobs on the twigs and branches behind the leaves.*

W. Malaysia: common on rocky coasts all round Malaya, occasionally a few miles inland and perhaps planted; never in inland forest.

This is a magnificent tree which should be brought into cultivation. The young leaves are pink but quickly turn a beautiful fresh green. There is a small specimen in the Cathedral Close in Singapore.

F. xylophylla

Wooden-leaf Fig

(Gr., xulon—wood, phullon—leaf)

A small to medium sized strangling fig, rarely if ever killing its host: *twigs stout: leaf-blade 6-12 × 2½-6", blunt, very leathery like cardboard, obovate, the stalks ½-1¼" long: figs 1-2" long, oblong, sessile, very massive, ripening orange then purple-red.*

W. Malaysia: frequent throughout Malaya, the big leaves and fruits very striking.

Ficus sp.

Province Wellesley Fig

(unidentified)

A big tree like *F. indica* but without aerial roots: bark pale pinkish-grey: *twigs, leaf-stalks, figs and undersides of leaves finely downy with soft white hairs.*

Leaf-blade 4-9 × 1½-4", elliptic, shortly tipped: the stalk ½-1½" long.

Figs 4-5" wide, round, sessile, ripening red then dark purple with tiny yellow basal scales.

Malaya: planted along the road between Parit Buntar and Butterworth, wild in the forest near Kroh.

Ficus sp. Text-Fig. 251

Johore Fig

(unidentified)

A magnificent tree, very like *F. indica* but:—*deciduous*, seldom fruiting: *bark pinkish brown: leaf-blade blunt or bluntly pointed, not or hardly tipped, with more numerous (8-12) pairs of side-veins, the lowest pair of side-veins not extended along the blade: figs ripening light yellow or orange, rarely red or purple, ½" wide, with two small, very inconspicuous basal scales, (the third minute and seemingly absent).*

Malaya, generally: lowlands and mountains.

This species is common throughout the country. We have not been able to attach a botanical name to it and suspect that it is new. In leaf and habit it closely resembles several species such as *F. indica*, *F. caulocarpa* and *F. glabella* and is probably mistaken for them but its light yellow or orange figs with inconspicuous basal scales are distinctive. Unfortunately it seldom fruits, though it sheds its leaves at least once a year. The fine specimen in the Lee Pineapple Estate, about the 15th mile on the Kota Tinggi road, has not fruited in six years (1931-1937). *F. indica*, in contrast, fruits once if not twice a year. In the sterile state, the Johore Fig may be distinguished from the Indian by the bark-colour, leaf-shape and arrangement of veins, and from *F. glabella* and *F. caulocarpa* by its stouter leaf-stalk not jointed to the blade.

GROUP B

EARTH-FIGS, FRUITING ON SUBTERRANEAN RUNNERS

F. Beccarii

Beccari's Fig

(the Italian botanist, O. Beccari, 1843-1920).

Very like *F. geocarpa* but with narrow leaves 1-2½" wide, with tapered symmetrical base and very long tip (1-3").

Malaya, Borneo: common by the edge of the forest.

F. chamæcarpa

Green Earth-Fig

(Gr., chamai—on the ground, karpos—fruit)

Like *F. geocarpa* but:—*hairs dark brown or blackish* on the leaves, twigs and fruits: the upperside of the leaf harsh: *figs ripening greenish black, pear-shaped with a stalk ¼-¾" long, with 5 ribs round the mouth, and without scales on the sides.*

Malaya, Sumatra: common by the edge of the forest.

F. cunia(? derived from the Ghurka *khunio*)

Red Earth-Fig, Gooseberry-Fig

Chëdon

A small tree up to 40 ft. high like *F. geocarpa* but:—the hairs much shorter, the *uppersides of the leaves very harsh*, the midribs often pink underneath: figs $\frac{1}{2}$ – $\frac{3}{4}$ " wide, round, *shortly stalked, thinly hairy or glabrous*, only a few scales on the sides, ripening pink, dull red-brown or dull scarlet with white speckles, the fruiting runners reddish brown, often hanging from the trunk or main branches from heights up to 15 ft., the upper ones in sprays 1–3 ft. long.

Eastern Himalayas, Malay Peninsula: common in the middle and north of Malaya in belukar and by streamsides.

This is the most spectacular of our Earth-Figs. The fruits are edible and remind one of gooseberries. BURKILL says that there is a variegated race cultivated in Malayan gardens. It is a Burmese species that does not reach into the the southern half of Malaya, c.f. *F. pomifera* and *F. pyriformis*.

F. geocarpa Text-Fig. 252

(Gr., ge—earth, karpos—fruit)

Common Earth-Fig

An evergreen small tree, 10–25 ft. high: *leaves, twigs and fruits densely hairy with white or pale brown stiff spreading hairs* .1" long; the uppersides of the leaves rather rough and thinly hairy: leaves drooping.

Leaf-blade 4–14 × 1 $\frac{3}{4}$ –5 $\frac{3}{4}$ " , oblong, with a tip $\frac{1}{2}$ –1" long, *the base very unequal with a broad round lobe on one side*, toothed, thin: stalk $\frac{1}{4}$ – $\frac{1}{2}$ " long.

Figs $\frac{1}{2}$ –1" wide, rounded, *nearly sessile, densely hairy with pale brown or reddish bristles, with numerous hairy scales* (bracts) on the sides and arching over the mouth at first white then pink and finally turning dark reddish brown: fruiting runners up to 30 ft. long, arising from the trunk up to a height of 4 ft.

Malaya, Borneo: common by the edge of the forest and streamsides in the forest.

GROUP C

ORDINARY FIG-TREES WITH FRUITS ON THE TWIGS

F. alba Plate 209

(Lat., white)

White-leaved Fig

An evergreen shrub or small tree to 30 ft. high: *the undersides of the leaves white and finely woolly*.

Sapling leaves 8–14 × 4–9", *varying heart-shaped to 3–5 lobed*.

Adult leaves 2–6 × 1–3", elliptic, *toothed*, thin, the base narrowed or slightly heart-shaped: stalk 1–4" long.

Figs $\frac{1}{2}$ " wide ($\frac{1}{4}$ " in old trees), *sessile*, round, *mostly on the twigs just below the leaves, ripening yellow then brownish ochre and finally dark red*.

W. Malaysia: very common in belukar, by the edge of the forest and by streams.

This very common little tree is one of the easiest wild plants to recognise because there is no other with latex and white undersides to the leaves except the *Sau* (Manilkara, p. 599), the small stiff blades of which are quite different. The White-leaved Fig is one of the few trees which have a different leaf-form in the sapling stage from the adult. The old trees with small leaves and figs, that one sometimes finds at the edge of the forest, look very different from the luscious saplings with their typical fig-leaves, but it is easy to discover the intermediate stages. We have noticed, however, that not all saplings have lobed leaves; some have merely bigger, heart-shaped leaves like those of the Stinging Fig (*F. fulva*). The exact relation between the forms of the leaves has still to be discovered. Compare also the Hairy Mountain Fig (*F. hirta*).

F. chartacea

Speckle-leafed Fig

(Lat., chartacea—papery)

A shrub or small tree to 30 ft. high, evergreen, with Terminalia-branching: the leaves occasionally opposite: *young twigs and leaf-stalks pink.*

Leaf-blade $2\frac{1}{2}$ –6 × 1–2 $\frac{3}{4}$ ", elliptic, with a tip $\frac{1}{2}$ –1" long, thin, *with cream-white or yellow dots on the upperside*; side-veins 5–7 pairs: stalk $\frac{1}{2}$ –1 $\frac{1}{2}$ " long.

Figs $\frac{1}{2}$ – $\frac{3}{4}$ " wide, round, *sessile or with a tiny stalk* .1–.2" long, *ripening yellow then orange-brown and finally scarlet: densely clustered on the twigs just below the leaves.*

Burma, Malay Peninsula: common in belukar in the lowlands and mountains.

This undistinguished little tree is recognised by its small leaves with yellowish dots and its small figs.

F. chrysocarpa

Yellow Hairy Fig

(Gr., chrusos—gold, karpos—fruit)

A bush or small tree to 30 ft. high, like *F. fulva* and *F. hirta* but:—*the twigs, leaves and figs with golden yellow hairs: leaf-blade* 3–12 × 1 $\frac{1}{4}$ –4", oblong or elliptic, the stalk $\frac{1}{2}$ –2" long, *the sapling leaves not lobed.*

W. Malaysia: common in belukar in Malaya.

F. fulva

Stinging Fig

(Lat., tawny)

A small tree to 30 ft. high, occasionally reaching 60 ft., with widespreading branches: *twigs, leaves and figs set with sort white bristles.*

Sapling leaves 10–20 × 8–12", *large, heart-shaped* or broadest in the middle and contracted to a heart-shaped base, not lobed: stalks 6–12" long.

Adult leaves 5–12 × 2 $\frac{1}{2}$ –7", elliptic, thin, toothed, *harsh on the upperside*, narrowed to the base: stalks 1–7" long.

Figs $\frac{1}{2}$ – $\frac{3}{4}$ " wide, round, sessile or shortly stalked, ripening yellow then red.

W. Malaysia: common in Malaya from Malacca northward *especially at the edge of the forest and by the passes in the mountains.*

The unpleasant bristles of this species will distinguish it: they sting slightly but their sharp points enter the flesh and may cause a rash. It can also be recognised, at the roadside, from its broad leaves and flat-topped crown with wide-spreading branches. It is deciduous but the twigs remain bare only for a short time. With ripe red fruit and fresh green leaves, it is striking plant.

F. glandulifera

Gaping Fig

(Lat., bearing little nuts, as acorns)

A small or medium-sized tree to 60 ft. high, *with the twigs and leaf-stalks brownish hairy.*

Leaf-blade $2\frac{1}{2}$ –6 × 1 $\frac{1}{4}$ –3 $\frac{1}{2}$ ", elliptic, rather obovate, tipped, the base tapered or, generally, rather heart-shaped, thin, with 5–8 pairs of side-veins: stalk $\frac{1}{2}$ –3 $\frac{1}{2}$ " long.

Figs $\frac{1}{2}$ " wide, or less, round, with a short hairy stalk .2–.4" long, *ripening rich orange-yellow and gaping widely at the mouth.*

W. Malaysia: fairly common in woods in Malaya.

F. hirta Text-Fig. 251

Hairy Mountain Fig

(Lat., hairy)

Very like *F. fulva* but: *leaves, twigs and figs with long yellow or brownish hairs*, bristly but hardly irritant: buds and young leaves densely hairy: *leaf-blade* 5–7 lobed in the sapling-stage and up to 18" long and wide, commonly 3 lobed or entire in the adult stage and considerably smaller, always more or less heart-shaped at the base: *figs* $\frac{3}{4}$ –1 $\frac{1}{4}$ × .6–.8" *sessile, pear-shaped or conical*, yellow then red, rather sparsely though stiffly hairy.

India, S. China, W. Malaysia: common in the mountains and the passes of the main-range, especially at Fraser's Hill and Cameron Highlands.

The lobed, heart-shaped leaves like those of *F. alba*, the sessile hairy conical figs and its mountain habitat distinguish this species. It is most likely to be confused with the Yellow Hairy Fig (*F. chrysocarpha*) which never has lobed leaves. In its two leaf-forms, it resembles *F. alba*, even comparatively large trees, 30 ft. high, having 3-lobed as well as simple leaves. Saplings have stout, brown hairy, hollow twigs which are distinctly swollen in the internodes.

F. lepicarpa Text-Fig. 252
(Gr. *lepis*—scale, *karpos*—fruit)

Saraca-Fig

A small, evergreen, spreading tree of Saraca-streams, generally leaning over the water: leaves sometimes opposite: more or less glabrous.

Leaf-blade 4-13 × 1½-7", obovate, tipped, thin, with 8-12 pairs of side-veins: stalk ½-2".

Figs about 1 × ¾", oblong, squat, sessile, often flattened, generally with a few scales on the sides, especially near the mouth, ripening pale yellow to brownish ochre.

W. Malaysia: at the edges of Saraca-streams (p. 42), common.

The habitat and the rather large, sessile figs distinguish this species.

F. religiosa Plates 204, 206

Bodh-Tree, Pipal-Tree

A more or less deciduous tree with fresh green new foliage, gradually yellowing: limbs wide-spreading: trunk often fluted or ribbed, grey or silvery: aerial roots few if any.

Leaf-blade 3-7 × 2¼-5", more or less heart-shaped with a long tip (½-1½" long), thinly leathery: stalk 2-5" long.

Figs ½" wide, sessile, rounded, ripening greenish yellow then purple.

Central and Eastern India: commonly planted in Malaya.

This is really a strangling fig, but as planted by roadsides it stands upon its own trunk. The seeds are distributed by birds, and young plants often develop in the roofs of houses, causing much annoyance, yet they do not escape and become wild. It is a common tree only in the south and middle of the Peninsula; in the north it is seldom seen, being replaced by the following species (*F. Rumphii*). The long-stalked, heart-shaped leaves with long tips are its chief characteristic, but one can soon learn to recognise it at a distance from the untidy and yellowish appearance of the crown, as the leaves are aging, and one can also identify it from the clatter which the leaves make when stirred by the wind. At no certain season, but perhaps after dry weather, the trees in Singapore begin to lose their yellow leaves and before they are quite bare, sometimes not till all the leaves have fallen, the pale pink new foliage develops: the crown is then fresh green but this soon changes into yellowish green.

The Bodh-Tree is sacred to Hindus and to Buddhists. The best trees in Malaya were in the Cathedral Close.

F. Rumphii

Mock Bodh-Tree

(the Dutch botanist of Amboina, G. E. Rumpf, 1628-1702).

Very like *F. religiosa* but with shorter leaf-stalks (1½-3½" long), much shorter leaf-tip (¼-¾" long), and the base of the blade narrowed or rounded but not truly heart-shaped.

India and Malaysia: doubtfully wild in Malaya, perhaps on rocky coasts in Langkawi and the far north, but commonly planted in the north.

The Mock Bodh is frequent in Perak, Penang, Province Wellesley, Kedah and Perlis where the true Bodh is curiously uncommon, and to the south it is the Mock Bodh that is seldom found.

F. vasculosa

(Lat., vasculum—a little vessel)

A small evergreen tree to 40 ft. high.

Leaf-blade $2-8 \times \frac{1}{2}-3$ ", rather narrowly elliptic, often oblong, more or less tipped, thinly leathery, with 8-15 pairs of side-veins (the base not 3-veined): stalk $\frac{1}{2}-1\frac{1}{4}$ " long.Figs $\frac{1}{2}-\frac{3}{4}$ " wide, pear-shaped with a stalk $\frac{1}{4}-\frac{1}{2}$ " long, ripening light yellow then deep rose-red, glabrous.

S.E. China, Burma, W. Malaysia: common in Malaya, often in gardens or hedges, especially in Singapore.

There is no other common fig-tree in Malaya with stalked, glabrous, pear-shaped, red figs on the leafy-twigs but there are several climbing and epiphytic species which resemble it superficially.

GROUP D

ORDINARY FIG-TREES WITH FRUITS ON THE TRUNK AND MAIN BRANCHES

F. fistulosa Plate 209, Text-Fig. 251

Common Yellow Stem-Fig

(Lat., full of holes)

An evergreen tree, 20-40 ft. high, with cream or buff-coloured latex: young twigs hollow, easily snapped: young leaves pale pink: leaves sometimes opposite.

Leaf-blade $3-13 \times 1-6$ ", elliptic to obovate, tipped, thin, 5-9 pairs of side-veins: stalk $1-2\frac{1}{2}$ " long.

Figs about 1" wide, pear-shaped, with a stalk 1-2" long, ripening pale yellow or greenish-yellow: borne in clusters on woody knobs or short, leafless twigs, on the trunk and main branches; a few borne on the leafy twigs.

India, S. China, Malaysia: very common in belukar, hedges and thickets in Malaya, occasional by streams in the forest, in lowlands and mountains.

This is the commonest stem-fig in Malaya. It is an ugly plant whose unwanted saplings abound in hedges. But it is useful for botany-classes because the fruits can be gathered at all times of the year and the ripe gall-figs teem with insects. In the mountains the leaves are considerably smaller than in the plains.

F. glomerata Text-Fig. 251

Red River Fig

(Lat., crowded)

A medium-sized or tall, deciduous tree up to 80 ft. with moderately spreading, rather open crown: the trunk breaking up at a height of 10-25 ft. into several large branches, becoming fluted at the base or buttressed in old trees: bark pinkish grey, pinkish buff or pale brown, smooth or rather rough and coarsely scaly when old: latex cream-buff, thick brown on exposure.

Leaf-blade $2\frac{1}{2}-6 \times 1\frac{1}{2}-3$ ", elliptic, bluntly tipped, narrowed to the base: stalk $\frac{1}{2}-2\frac{1}{2}$ " long.Figs $1\frac{1}{2}-2$ " wide, pear-shaped, with a short stalk 1-5" long, ripening rose-red, often streaked: arranged in big clusters on the trunk and main branches and borne on stout, woody, leafless twigs up to 10" long.

India, Indo-China, Siam, W. Malaysia: frequent by rivers in the middle and north of Malaya.

This is a notable tree of riverbanks in the northern half of the country. Big specimens occur at Segamat, Kuala Lipis, Grik and Baling. By the Tembeling, Trengganu and Kelantan are abundant saplings and middle-sized trees, which suggest that the Red River Fig was one of the first species to re-establish itself on their banks after the Great Flood of 1926. At certain times

of the year, apparently after pronounced dry weather, the leaves are shed more or less completely; then the new foliage appears. The ripe-figs smell pleasantly of cider-apples but are said to be inedible. The leaf-shape and short stalk of the fig distinguish the species from *F. variegata* and *F. pomifera*. Young trees seem not to bear fruit until twenty or more feet in height. Sapling-leaves are not toothed as they are in *F. pomifera*.

F. hispida Text-Fig. 252
(Lat., rough hairy)

Rough-leaved Stem-Fig.
Seniah

A small, evergreen tree up to 40 ft. high: *twigs, leaves and fruits set with short, rather bristly, white hairs: the leaves very rough, generally opposite.*

Leaf-blade $2\frac{1}{2}$ -14 × 1-7", oblong, tipped, thin, *more or less toothed*, with 5-8 pairs of side-veins: stalk $\frac{1}{2}$ -4" long.

Figs 1-1 $\frac{1}{2}$ " wide, stalked, *flattened on the underside, with a few scales on the sides and 7-9 deeper coloured, faint ribs radiating from the mouth, ripening pale yellow or greenish yellow*: stalk $\frac{1}{2}$ -1" long: *borne on leafless, hanging twigs from the trunk and main branches*, the ropes of figs up to 3 ft. long, the lower ones trailing on the ground.

S. E. Asia to Australia: common in the middle and north of Malaya, absent from the south.

This coarse little tree offers, when in fruit, one of the more remarkable botanical sights in the East for its trunk and branches are festooned with ropes of lumpy figs, like the ropes of Barrintonia-fruits yet much more bizarre. Those issuing from the lower part of the trunk trail upon the ground and even burrow into it like the runners of the Earth-figs so that they show how the geocarpic habit must have arisen. It is an abundant species on the lower slopes of Penang Hill and can be seen to advantage from the railway.

F. Miquelii
(the Dutch botanist, F. A. W. Miquel, 1811-1871)

Russet Stem-Fig

A small tree like *F. fistulosa* but:—*latex white: leaf-blade rather small and narrow, and long-tipped, 2-8 $\frac{1}{2}$ × $\frac{3}{4}$ -3"*, the tip $\frac{1}{2}$ -1" long: *leaf-stalk short, $\frac{1}{2}$ - $\frac{3}{4}$ " long: figs larger, 1-1 $\frac{1}{2}$ " wide, with stalk $\frac{1}{2}$ -2" long, ripening russet brown or bronze, the mouth set in a rosette of small knobby scales: the figs borne in massive clusters, 10-20" wide, composed of stout woody twigs, like bunches of enormous grapes.*

Western Malaysia: common in lowland forest in stream-valleys up to 4,000 ft., *not in the open.*

Compare *F. Scortechinii* and, particularly, *F. obpyramidata*.

F. obpyramidata Text-Fig. 251
(Lat., like an inverted pyramid)

Common River Fig

A shrub or small tree like *F. Miquelii* but with larger leaves, bigger and differently shaped figs and different habitat: *leaves sometimes opposite.*

Twigs and leaf-stalks set with stiff brownish hairs, but glabrous when old.

Leaf-blade 3-14 × 1 $\frac{1}{2}$ -7", obovate or nearly rhombic in outline, *narrowed to the more or less heart-shaped base*: stalk $\frac{1}{2}$ -3" long.

Figs 1 $\frac{1}{2}$ -2" wide, *pear-shaped, massive, stalked, the mouth sunk in the lower end, ripening yellow to dingy brownish ochre.*

W. Malaysia: *by streams and rivers in the forest and very abundant by rivers in open country as belukar and rice-fields*, from Johore to Kelantan, up to 4,000 ft. altitude.

The figs of this and the following allied species are larger than those of any other Malayan species, with the exception of a few climbers, and most like those of the Mediterranean Fig-tree. The seed-figs are edible but coarse with a slight nutty flavour. In Malacca, N. Sembilan and Pahang the species is very

common in the rice-fields. The big fruits fall into the river and so it seems their seeds are distributed as much by water as by animals. Compare the Apple-Fig. (*F. pomifera*).

F. pomifera

Apple-Fig

(Lat., apple-bearing)

A small tree up to 40 ft. high with *grey or greyish white bark* and copious white latex: young leaves pink.

Leaf-blade 5-16 × 3-9", *medium to large*, elliptic or ovate, narrowed to the base, broad, thin, *coarsely toothed*, pointed, with 5-8 pairs of side-veins: leaf-stalk 1-6" long, greenish yellow, or pink for a long time on the upperside.

Figs 1½-2¾" wide, *pear- or apple-shaped*, *very massive*, slightly ribbed, the apex more or less sunken, finely hairy or glabrous, the stalk 1-2½" long, *green ripening reddish brown with green spots*, arranged in *big clusters* 4-10" wide on the trunk and branches *on woody knobs or stout, leafless woody twigs up to 10" long*.

E. Himalaya, Burma, Siam, Malaya: frequent by rivers and streams in the lowlands and mountains from the middle of the country northward, not known in the south.

This striking species is known by its large, coarsely toothed leaves and very big reddish brown figs in clusters on the trunk. It closely resembles the Common River Fig (*F. obpyramidata*) in its appearance and its fruit and commonly grows with it in the north of the country. The fruit is also edible but tasteless. It is a frequent small tree about Kota Bahru and by the streams at Cameron Highlands. In distribution, it agrees with the Red Earth-Fig (*F. cunia*) and the Ribbed Bush-Fig (*F. pyriformis*), being a Burmese species that extends into the northern half of Malaya. The sapling leaves of the Common Red Stem-Fig (*F. variegata*) are coarsely toothed but long before this species has begun to fruit its leaves have become entire.

F. Scortechinii Text-Fig. 252

Cushion Fig

(the missionary and botanist, B. Scortechini, 1845-86)

A shrub or small tree in leaf and habit very like *F. Miquelii* but: figs smaller, ¾-1" wide, with 5 ribs or shoulders radiating from the tiny mouth, ripening yellow (? orange red or reddish brown), set in small compact clusters, 2-4" wide, on the trunk, the clusters often cushion-like.

Malaya, Sumatra: common in lowland forest.

F. variegata Plates 205,

Common Red Stem-Fig

A medium sized to large deciduous tree, up to 90 ft. high, with conical, then rounded fairly dense crown: *trunk developing conspicuous buttresses: bark* pale pinkish brown: all parts glabrous or very finely downy.

Leaf-blade 3-13 × 1½-6", *heart-shaped*, tipped, *thin*, with 4-8 pairs of side-veins: stalk 1-7½" long: sapling leaves larger and often coarsely toothed.

Figs ¾-1½" wide, *long-stalked*, *pear-shaped*, *green then rose-red*, *often streaked*, the stalk 1-2½" long: in dense clusters on the trunk and main branches, the clusters composed of short woody twigs up to 3" long.

India, S. China, W. Malaysia, Philippines: common in open country, by the edge of forest, and in towns and villages in Malaya.

This common tree is recognised immediately from the trunk and branches when they are plastered with fruits. A more prolific organism can hardly be imagined and it may well be taken as an emblem of tropical luxuriance. It does not begin to fruit until it is 25 ft., or so, high: that is to say, not until it has surpassed the average size of the Common Yellow Stem-fig (*F. fistulosa*).

The gall-trees then bear 4–5 crops of fruits a year and the seed-trees bear two, sometimes one. In Singapore the trees shed their leaves twice a year, generally between January and March and again between July and September, that is to say after each more regular dry spell, but the exact times are very uncertain and the behaviour of all the trees in a district is by no means simultaneous. The buds unfold as soon as the crown is bare or after a few days. No correspondence between leafing and the development of crops of figs has been detected. Young trees are not deciduous and we do not know at what age the habit begins nor do we know how rapidly the tree grows. Saplings may have coarsely toothed leaves and may be mistaken for *F. pomifera*. The seed-figs are edible.

F. viridicarpa

Green Stem-Fig

(Lat., viridis—green; Gr., karpos—fruit)

A big tree like *F. variegata* but:—*bark greyish white*: leaf-blade with 8–12 pairs of side-veins: figs larger, 1½–2" wide, with very thick walls, ripening green or very faintly streaked pink, the mouth sunken and surrounded by short, deep furrows: the fig-clusters much bigger and composed of much larger woody twigs up to 14" long.

Malaya, possibly endemic: frequent in open country and in the forest in Negri Sembilan, Pahang, Trengganu and Kelantan, probably in neighbouring States.

There is a fine specimen of this species shortly out of Jebebu on the road to Kuala Pilah. We have seen specimens in the forest with buttresses 12 ft. high.

GROUP E

BUSHES

F. diversifolia

Rusty-leafed Bush-Fig

An evergreen shrub (or epiphyte) up to 6 ft. high: glabrous.

Leaf-blade 1–3 × ½–2", elliptic or, commonly, delta-shaped, the apex blunt, cut-off straight or widely notched, leathery, white-spotted on the upperside, rusty- or yellow-olive on the underside, the midrib forked and generally with a black spot (gland) at the fork on the underside: stalk ½–¾" long.

Fruit either small and round ½–¾" wide, with a stalk ½" long; or larger and oblong, ¾" wide, with a stalk ¾–1" long: ripening yellow then orange or red and often gaping at the mouth: singly or in pairs in the leaf-axils.

W. Malaya: common in lowlands and mountains, generally as an epiphyte, but as a terrestrial bush on sandy shores and on mountain tops and bogs.

The curious blunt leaves, rusty-olive beneath, with the forked midrib will distinguish this very variable plant from any other Malayan bush, but seedlings and some varieties of full-grown plants have pointed leaves. The mountain form has the small fruits, the sea-shore form has the bigger fruits.

F. pyriformis

Ribbed Bush-Fig

(Lat., pear-shaped)

A straggling shrub up to 8 ft. high, with Terminalia-branching.

Leaf-blade 2–5½ × ½–1", narrow, lanceolate, dark green with white dots: stalk 1–3" long, red on the upperside.

URTICACEÆ

Figs $\frac{1}{4}$ " wide, *pear-shaped*, set with 5-10 longitudinal ribs, green flushed pink, ripening dark red or purple, the stalks $\frac{1}{4}$ - $\frac{3}{8}$ " long, dull red: in pairs in the leaf-axils. India, China, Malay Peninsula: common on the rocks and banks of Saracastreams (p. 42) from Lower Perak northward, not in the south, up to 3,500 ft. altitude.

Like the riverside *Ixora*, this fig may form low carpeting bushes on rocks in mid-stream. Its occurrence is strangely limited in Malaya.

GIRONNIERA

(Proust de la Gironnier, a prominent French citizen of Manila, c. 1840)

Buds long, pointed, covered by the long conical stipules: twigs rather jointed with the ring-like scars of the fallen stipules at each node.

Leaves alternate, entire, often asymmetric at the base.

Flowers $\cdot 2$ " wide, in slender racemes, simple or sparingly branched, in the leaf-axils, male and female on separate trees: sepals 4-5: stamens 4-5: ovary with two long slender styles.

Fruit a small, rather flattened, orange stone with 2 long whisker-like styles: 1-several fruits on a stalk from a leaf-axil: seed one, (fruits often empty): calyx persistent at the base of the fruit.

About 12 species, S.E. Asia: 4 spp. in Malaya.

To this genus belong three common kinds of small tree which are to be found in open country and belukar, as well as in the forest, and which are easily recognised from their curious little, orange, two-whiskered fruits with an appearance that is at once attractive and deceptive for, palatable as they look, they consist of little else than stone. It seems, however, that they are eaten by birds for the little rind that their gizzards can grind off, and hence their ready distribution. All three species have round, evergreen crowns, 30-50 ft. high, occasionally reaching 80 ft.: they develop new leaves and flowers seasonally but, at such times, the old leaves of *G. nervosa* may fall so profusely that it is almost deciduous. They are called *Medang Kasah*, *M. Hampas Tebu* and *Mesekam* but, as they are little use, Malays do not generally recognise them.

Key to the Species

- Main side-veins of the leaf more than 10 pairs; distinctly hairy *G. nervosa*
- Main side-veins less than 10 pairs
 - Blade 2-5" wide very leathery: twigs sparsely hairy: fruit beaked, $\frac{1}{2}$ " long *G. subæqualis*
 - Blade 1-2" wide: glabrous: fruit shortly beaked, $\frac{1}{3}$ " long *G. parvifolia*

G. nervosa Plate 210 Common Rough Laurel
(Lat., full of sinews)

Bark brownish grey, becoming cracked; twigs, leaf-stalks and undersides of leaves closely silky-hairy: buds $\frac{1}{2}$ -1" long, young leaves pale green.

Leaf-blade 3-9 x $1\frac{1}{2}$ -4", elliptic, tipped, the base often asymmetrical, the two halves of the blade often unequal, rather leathery, distinctly grooved by the veins on the upper side: stalk $\cdot 1$ - $\cdot 4$ " long: main side-veins 11-17 pairs.

Inflorescences $\frac{1}{2}$ -1 $\frac{1}{2}$ " long.

Fruits $\frac{1}{2}$ " long, without a beak, dull orange, the styles $\frac{1}{2}$ - $\frac{1}{3}$ " long: generally a pair of fruit-sprays, 1-1 $\frac{1}{2}$ " long, in each leaf-axil, each spray of a pair turned to opposite sides of the twig, 2-5 fruits on each.

W. Malaysia, except Java: common throughout Malaya.

G. parvifolia Text-Fig. 253
(Lat., parvum—small, folium—a leaf)

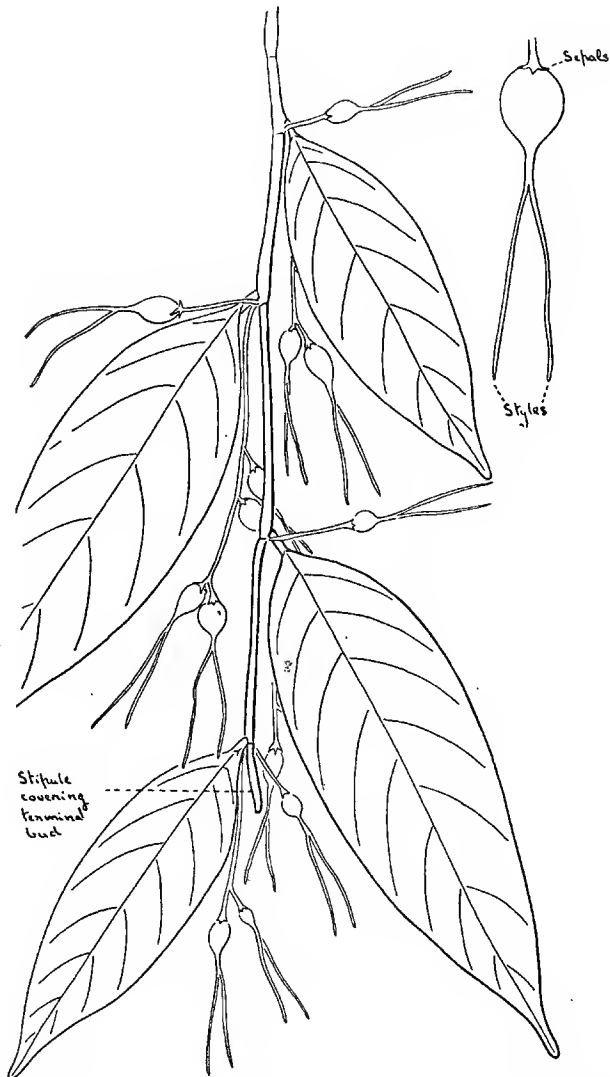
Lesser Rough Laurel

More or less glabrous, with slender twigs and fruiting sprays: young leaves pink: bark pale greyish.

Leaf-blade $1\frac{1}{2}$ –6 × 1–2", thinly leathery: stalk .2–.3" long.

Fruit-sprays 1–3" long, slender, with 1–3 (rarely 5) fruits $\frac{1}{4}$ " long, shortly beaked, light yellow, with the styles $\frac{3}{4}$ –1" long.

Malay Peninsula, Carimun IIs.: common in Malaya.



Text-Fig. 253. *Gironniera parvifolia*, × $\frac{1}{4}$: fruit, nat. size.

URTICACEÆ

G. subæqualis

Greater Rough Laurel

Like the preceding, but:—

Leaf-blade very leathery, often rather wide, *not or scarcely grooved by the veins on the upper side*: main side-veins 6-9 pairs.

Fruit-sprays 1½-3" long, several-fruited: fruits ½" long, with a distinct beak at the top.

S.E. Asia generally: frequent in Malaya.

PHYLLOCHLAMYS

(Gr., phullon—leaf, chlamys—a cloak)

Like *Taxotrophis* but:—

With white latex: leaf-edge not or scarcely spiny: *male flowers in little, shortly stalked clusters*: female flowers solitary on long stalks: *fruit with 4 persistent sepals lengthened into wings*, or vanes, *like a little shuttlecock*.

2 spp., India and Malaysia: both species in Malaya.

P. Wallichii

Fig-lime

(N. Wallich, the Danish botanist, 1786-1854)

Merlimau, Limau Limau

An evergreen tree to 30 ft. high with bushy crown of gnarled, profuse branches and *thorny twigs*: *trunk often set with short thorny twigs*: bark dark grey: wood hard and tough.

Leaf-blade 1-7 × ½-2½", rather narrowly elliptic, *often unequal-sided*, tipped and generally notched at the end, the edge entire or with a few small teeth near the tip, *leathery, fig-like*: stalk ½-¾" long.

Male flowers white, in clusters ¼-½" wide.

Fruit ½" wide, the 4 sepals about ¼" long and ½" wide.

Malaya, not uncommon throughout the country, in similar places to *Taxotrophis* but generally on firm soil or venturing into swamps: very abundant in E. Johore: always in the forest.

The other species, *P. taxoides*, belongs to the dry monsoon climate and in Malaya it is found only in Langkawi, some of the northerly islands of the East coast, and in Kedah, Perlis and Perak near the Siamese border. The two species are very similar but *P. taxoides* has smaller leaves, thinner and generally notched or toothed along the edge, and larger fruiting sepals (1" long, ¾" wide).

See the remarks under *Taxotrophis* (p. 692).

SLOETIA

(Baron Sloet van de Beele, 1806-1890, a Governor-General of the Netherlands Indies)

Latex in the twigs, leaves and bark, watery-white.

Leaves alternate, simple.

Flowers in hanging spikes or catkins, singly or 2-4 spikes together in the leaf-axils: *one side of the spike as a narrow strip without flowers*: *male flowers very numerous*, minute, *occupying most of the spike*, with 3 sepals and 3 stamens: *female flowers 1-3 on a spike, large and spaced along the spike* or only at its base, with 4 sepals and 2 long styles, opening long before the males on the same spike.

Fruit round, enclosed in the swollen, fleshy, 2-lobed, white base of the flower, itself wrapped round by the persistent, pale green, thin sepals: seed 1, relatively large.

1 sp., W. Malaysia: frequent in parts of Malaya in open country, not common in the forest.

S. elongata Text-Fig. 254
(Lat., lengthened)

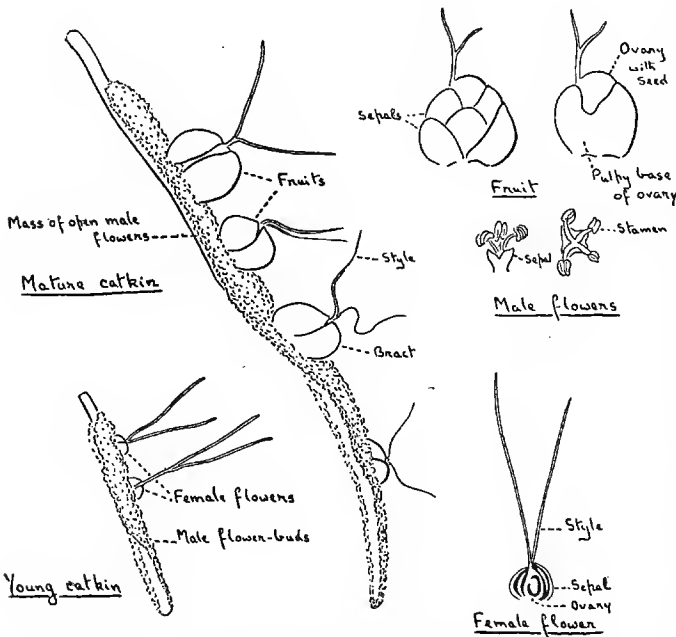
Tempinis

A bushy, evergreen tree to 40 ft. high with rounded crown, (reaching 100 ft. in the forest): bark greyish brown, rough: buds conical $\frac{1}{4}$ - $\frac{1}{2}$ " long: young leaves pinkish brown: glabrous.

Leaf-blade 4-15 × 1-5", oblong elliptic, tipped, very unequal-sided at the base with the broadest side foremost, thinly leathery, drooping, rather yellowish green, the side-veins 12-20 pairs: stalk .1-.5" long.

Spikes 3-8" long, with very short stalks .1-.3" long, greenish: stamens white: styles $\frac{3}{4}$ " long.

Fruit $\frac{3}{4}$ " wide: seed $\frac{1}{4}$ " wide, pale brown.



Text-Fig. 254. *Tempinis* (*Sloetia elongata*): catkins, nat size: flowers × 2: fruit, nat. size.

and birds: when the swollen white part of the ripe fruit is squeezed, it forcibly ejects the seed for some distance. The lower branches have bigger leaves than the upper branches, just as in the *Tampang* (*Artocarpus Gomeziana*, p. 654), and it is very easy to mistake these two kinds of tree in the absence of their characteristic flower-spikes or heads; but the leaves of the *Tempinis* are always flat, very unequal-sided at the base, and have yellowish veins on the underneath, whereas those of the *Tampang* are generally curved, the sides upcurled and the tip turned down, not or but slightly unequal-sided, and, commonly, with the veins on the underside pink.

The *Tempinis* is described and illustrated by FOXWORTHY under its incorrect name *S. sideroxyion* (7, p. 52). The timber is very valuable for which reason large trees are now scarce, though moderate-sized trees are still frequent on Bukit Timah in Singapore. But coppiced trees, repeatedly cut for the small limbs, are not uncommon in belukar in several parts of the country and, as they flower at a height of 6 ft., they are easily recognised from the curiously constructed spikes or catkins. The ripe fruits are sweet and are eaten by squirrels, monkeys

STREBLUS

(Gr., streblos—crooked)

*With white latex in the twigs.**Leaves* alternate, simple, *notched or toothed.*Inflorescences in the leaf-axils, male and female on the same tree: *male flowers tiny, in little stalked heads: female flowers singly or several together, each with a long stalk:* sepals 4: stamens 4: ovary with 2 long styles.

Fruit a small berry, wrapped in the persistent sepals until ripe and then the sepals spreading.

2 spp., Indo-Malaya: 1 sp. in Malaya.

S. asper Text-Fig. 255
(Lat., asper—rough)Siamese Rough Bush
*Kesinai, Kesinah*A small evergreen tree to 30 ft. high, with stocky trunk and drooping, spreading or straggling branches, giving a dense, twiggy, umbrella-crown (like *Bedara*, *Zizyphus* p. 519): *bark* grey, generally slightly cracked: inner bark whitish, thick: *twigs and leaves, especially rough-hairy.**Leaf-blade* 1-5 × ½-2½", elliptic, blunt or pointed, *stiff, harsh, dark green, notched or toothed* but not spiny: *stalk* 1" long, *very short.**Berry* ½" long and wide, *bright yellow* inclining to orange, pulpy, sweet, edible, crowned by the 2 withered styles, *seated on the persistent calyx with 4 green recurved sepals and containing one smooth, round, greyish white seed.*

India, S. China, Malay Peninsula, Philippines: Penang, Province Wellesley, Kedah, Perlis and Kelantan, abundant in villages, open country and ricefields.

Text-Fig. 255. *Streblus asper*: fruit, nat. size.

The *Kesinai* is a member of the monsoon vegetation of India. Like the *Mentalun* (*Terminalia pyrifolia*), the Wood Apple (*Feronia*) and the Kedah *Bungor* (*Lagerstræmia floribunda*), its distribution in Malaya shows where the monsoon-vegetation of the Peninsula has its southerly limit, that is about the latitude of Bukit Mertajam in Province Wellesley. In Kedah, Perlis and Kelantan, near Kota Bahru, it is a common, well-known little tree. It finds sundry medicinal uses, as mentioned by BURKILL, and cattle and goats browse on the leaves. In its rough leaves and the latex in the twigs, it much resembles a Fig-tree and, above all, in the early stages of its growth. It seems that the seedlings develop into sprawling shrubs the branches of which creep over the ground like the young stages of climbing Figs or the Ivy-fig that is grown on walls, and only later is an upright branch developed that will become the trunk. Such creeping plants of *Kesinai* are common on the bunds in abandoned rice-fields, at the edge of thickets and on the earth-banks of deep drains. We would like to know if such is truly its normal mode of development, because it seems most remarkable for a tree.

TAXOTROPHIS

(Taxus—the yew: Trophis—a genus of Urticaceæ)

Twigs spiny: *latex* none.*Leaves* alternate, simple, *generally with spiny teeth.*

Inflorescences axillary: male flowers minute, in little catkins: female flowers 2-5 together on a short spike: sepals 4: stamens 4: ovary with 2 styles.

Fruit a little berry wrapped in the 4 enlarged sepals.

About 7 spp., India and Malaysia: 1 sp. in Malaya.

To this and the genus *Phyllochlamys* belong two very similar kinds of little tree. They have gnarled, much branched, twiggy crowns with very tough thorny twigs, leathery leaves and hard heavy wood, so that they resemble Lime-trees and Malays often call them *Merlimau*, like the species of *Atalantia* and *Gelonium*. Both are forest trees, not liking the open. The leaves of the one which we call the Jungle Holly have generally prickly edges like those of the English Holly (*Ilex*, p. 328) and, indeed; it is sometimes used in Christmas decorations, for if red berries are tied to the twigs they will deceive most people on Christmas night. The other has no such virtue but we have included it in this book because sooner or later we shall meet a little tree looking like a Lime yet with the leaves and latex of a Fig-tree, wherefore we have called it the Fig-lime. The Jungle Holly is sometimes called *Kemuning Akar* on account of its yellow wood.

T. ilicifolia

(Ilex-holly tree, folium-leaf)

Jungle Holly

Merlimau, Limau Limau, Kemuning Akar, Semantan

A small evergreen tree, 15-30 ft. high, *with very tough, hard wood and branches: spines on the twigs up to 1½" long: bark grey.*

Leaf-blade ¾-8 × ¼-4", very variable in shape and size, narrowly to broadly elliptic, long-tipped or blunt with 3 minute teeth at the end, the edge generally more or less strongly spiny, varying to entire and smooth, leathery, dry: stalks 1-4" long.

Male catkins 1-2" long, pale pink: female spikes ½-1" long.

Fruit ½" wide, 2-3 on a short spray, (♀ black when ripe).

N.E. India throughout Malaysia except Java: very common in Malaya in dry, scrubby forest, on limestone hills, rocky ridges, steep hillsides, rocky valleys or rocky coasts: *in the forest, rarely in the open.*

(This species is called *T. macrophylla* is BURKILL'S Dictionary.)

TREMA

(Gr., a hole; from the pitted seeds)

Latex none.

Leaves alternate, toothed, often rough, with a conspicuous vein on either side of the midrib passing from the base of the blade to about the middle, and this vein giving off side-veins to the edge of the leaf: leaf-base often asymmetrical.

Flowers tiny, in small clusters in the leaf-axils, male and female in the same cluster: sepals 5: stamens 4-5, opposite the sepals.

Fruit a little 1-seeded berry, tipped by the two short styles, seated on the persistent, but not enlarged calyx: generally clustered.

About 20 spp., throughout the tropics: 2 spp. in Malaya, lowlands and mountains.

Our species of *Trema* are well-known to Malays as *Mendarong* (or *Menarong*) and *Mengkirai* (or *Mengkira*). The first name applies to the tough stringy bark. Both species are small, weedy trees or shrubs in waste-land, though the first (*T. orientalis*) may reach a fair size and becomes, indeed, in the middle of the country one of the biggest trees of belukar. They are often among the first trees to establish themselves in clearings by the forest or on the flood-damaged banks of rivers because their fruits are eaten by birds, which distribute the seeds. They are quick-growing, apparently short-lived, evergreen and flowering throughout the year. In contrast with the shabby look of old specimens, the saplings are elegant with beautifully veined leaves, especially those of *T. orientalis*. The very rough surface of the leaf and its toothed edge distinguish *T. orientalis* and typical *T. cannabina* from all other Malayan trees except *Streblus*, which has latex

URTICACEÆ

Trema can be mistaken for Callicarpa (soft, opposite leaves and pink or lilac flowers), the Cherry-tree (solitary, white flowers and soft, sticky leaves) or Commersonia (big, soft leaves, white beneath, big flower-clusters and woolly fruits).

Key to the Species

Leaves rough-hairy on both sides				
Blade 3-9" long :	stalk $\frac{1}{4}$ - $\frac{3}{4}$ " long :	berries blue-black	... ..	<i>T. orientalis</i>
Blade 1-3" long :	stalk $\frac{1}{4}$ " long or less :	berries yellow to orange	... ..	<i>T. cannabina</i>
Leaves finely hairy or practically smooth and glabrous, thin :				berries orange-red var. <i>glabrescens</i>

T. orientalis Plate 211

Rough Trema

Menarong, Mendarong; Bendarong, Narong Mengkirai, Menkira

A woody shrub or small tree to 25 ft. high, or developing into a fairly large tree, up to 60 ft. high, with a light, rather open crown composed of several, wide-spread, long limbs giving off rather few, long and often hanging, straggling twigs with the leaves in two rows: *bark* light grey, smooth: twigs hairy: *flowering and fruiting all along the twigs.*

Leaf-blade 1-3 $\frac{1}{2}$ " wide, *heart-shaped and generally asymmetrical at the base*, tapered to a long tip, dark green above, often rather glaucous beneath especially on large trees: stalk often purplish or pink: *sapling-leaves pink-veined.*

Flowers .1" wide, pale green: *clusters 1-2" wide* on stalks $\frac{1}{4}$ " long, in pairs in the leaf-axils, the stalks of the lower cluster curved down to put the flowers toward the underside of the twig.

Berries .1" wide, upright, slightly flattened, *green then blue-black* with green pulp and one brown seed: fruits copious.

Himalayas throughout Malaysia to the Pacific: common in waste-land and belukar.

This is a variable species with much larger leaves than the other. Some plants have hairier leaves and it seems that some never reach the size of the belukar-trees which are so abundant in parts of the Federated Malay States and which have such a characteristic shape, rather like that of the Willow (*Salix*, p. 580).

T. cannabina

Lesser Trema

(*Lat.*, angustum—narrow, *folium*—a leaf)

Like the preceding but:—*leaf-blade* much smaller and narrower, $\frac{1}{3}$ -1" wide, *not heart-shaped* at the base: stalk shorter: flower-clusters smaller, $\frac{1}{4}$ " wide, few-flowered: berries orange with a black seed.

W. Malaysia: common, especially on flood-damaged riverbanks in the middle of the country. (This was called *T. angustifolia* in our first edition).

var. **glabrescens**

Smooth Trema

Like *T. cannabina* but:—twigs and leaves finely hairy to more or less glabrous: *leaf-blade* 1-5 \times $\frac{1}{3}$ -2", varying heart-shaped to ovate, long tipped, *thin, light green*: stalk $\frac{1}{4}$ - $\frac{1}{2}$ " long: flower-clusters $\frac{1}{3}$ " wide, slender, few-flowered: berries orange to orange-red, seed blackish brown.

S.E. Asia and Malaysia: apparently not so common in Malaya as the two preceding species. (This was called *T. virgata* in our first edition).

VERBENA FAMILY

Verbenaceæ

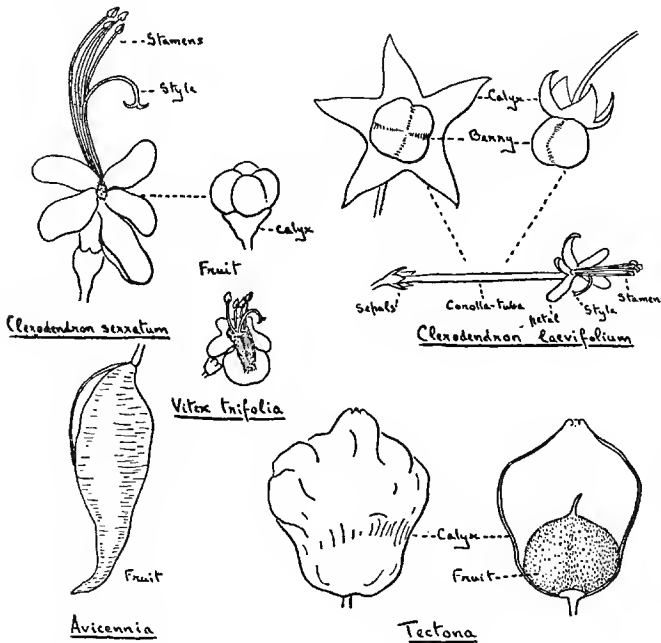
(from the genus *Verbena*)

Leaves opposite, (in a few cases whorled), simple, palmate, trifoliolate or pinnate.

Flowers small to medium-size, generally more or less bilaterally symmetrical, set in clusters or panicles: *calyx* generally shortly tubular with 4-5 teeth or lobes: *corolla* more or less funnel- or trumpet-shaped, with a short or long tube and 4-5 petals: *stamens* 5, 4 or 2: *ovary* superior, with one style and 2 or 4 cavities.

Fruit a small berry or capsule seated on or enclosed in the enlarged fruiting calyx: seeds 1-many, small, hard, not winged.

About 900 spp., throughout the world, few in temperate regions: 11 genera, 70 spp., in Malaya, chiefly in the lowlands, and several introduced species.



Text-Fig. 256. Flowers and fruits of the Verbenaceæ: nat. size.

mangrove-tree *Api Api* (*Avicennia*) may reach greater size: none, however, is a top-storey tree in the inland virgin forest. The Malayan trees, excepting the introduced Teak, are evergreen and many of them flower and fruit throughout the year.

The family differs from the Bignonia-family in the fruit, seeds and small flowers and, in most cases, the simple or palmate leaves. It is very closely allied

Among our common garden and village plants belonging to this varied family are the introduced species of *Lantana* (*Bunga Tai Ayam*), the *Rats' Tails* (*Stachytarpheta*), the *Golden Dew-Drop* (*Duranta*), and the climbers *Petræa*, *Holmskjœldia* (*Rubber-Flower*) and *Congea*. The most famous member of the family is the *Teak-tree* (*Tectona*). Most of the woody species in Malaya are shrubs, climbers or small trees reaching fifty to sixty feet in height, but a few like the *Leban* (*Vitex pubescens*) and the

VERBENACEÆ

with the Mint-family (Labiatae), to which the Salvias and Basil or *Selaseh* (*Ocinum*) belong: some botanists, indeed, unite them but the Verbena-family has flowers which are less specialised in their structure and its members are mostly woody in contrast with the herbaceous Labiates.

Key to the Genera

- Mangrove-tree with peg-like breathing roots ... *Avicennia*
- Not so
 - Leaves pinnate: flowers tiny, white, in big panicles *Peronema* p. 704
 - Leaves palmate or trifoliate, with 3-7 leaflets:
 - flowers blue or yellow *Vitex* p. 706
 - Leaves simple
 - Tree with very large leaves 1-2 ft. long: flowers small, white, in large panicles *Tectona* p. 705
 - Not so: leaves smaller
 - Garden shrub with blue or white flowers and strings of orange berries *Duranta* p. 702
 - Garden tree with hanging spikes of fragrant white flowers: leaves turning orange-ochre ... *Citharexylum* p. 699
 - Not so
 - Stamens projecting far out of the flower: flower $\frac{1}{2}$ " wide *Clerodendron* p. 699
 - Stamens not projecting or the flowers smaller
 - Flowers yellow or orange, 1" wide or long ... *Gmelina* p. 702
 - Flowers pink, lilac or violet, $\frac{1}{4}$ " wide or less *Callicarpa*
 - Flowers white, tiny: leaves foetid when crushed *Premna* p. 704

AVICENNIA

(*Avicenna*, 980-1037, the Arabian philosopher)

Mangrove-trees with slender peg-like breathing roots projecting 3-10" from the mud round the tree and set in rows along the lines of the roots.

Leaves simple, rather small, blunt, thinly fleshy, the undersides white, grey or pale brownish and generally thinly felted or even thinly woolly.

Flowers small, $\frac{1}{4}$ - $\frac{1}{2}$ " wide, yellow or orange, set in small panicles or in little heads arranged in panicles: corolla with 4 short petals and a short tube: stamens 4.

Fruit a greyish green pod-like capsule (Text-Fig. 256) containing one large seed with one large green seed-leaf folded round the other.

5 spp. in Malaya, on all muddy coasts and estuaries or sheltered bays, sometimes standing out to sea.

These Mangrove-trees, known to Malays as *Api Api*, are excellently described and figured by WATSON (22, p. 53). They can be recognised in the mangrove-forests from the hairy undersides of the leaves. In many parts of the country, where the other mangrove-trees with better quality of wood (the Rhizophoraceæ) have been cut out, the *Avicennias* become the dominant members of the swamps.

MALAYAN LILACS

CALLICARPA

(Gr., kallos—beauty, karpos—fruit)

Evergreen trees and shrubs generally with the twigs, inflorescences and undersides of the leaves white, rusty-white or rusty-grey woolly, scurfy or thickly hairy at least when young.

Leaves simple, pointed.

Flowers very small, $\frac{1}{4}$ " long and wide or less, pink, lilac or violet, regular, crowded in small rounded or large flat-topped stalked clusters in the leaf-axils: calyx with 4-5 teeth: corolla tube short with 4-5 lobes and as many stamens attached to it.

Fruit a small berry with a few small seeds (4-10), seated on the small calyx.

About 50 spp., throughout the tropics except W. Africa, chiefly in Asia: 7 spp. wild in Malaya in the lowlands.

The brownish white scurfy or woolly twigs, the tiny lilac flowers and clusters of little berries distinguish these plants which to Malays are usually known as *Tampang Besi*. The two shrubby species, *C. cana* and *C. longifolia*, are common in villages and open country. *C. Reevesii* is a much bigger, handsome shrub that is occasionally seen in gardens. *C. tomentosa* and *C. farinosa* are trees of moderate dimensions and are frequently met in open country as well as in the forest: neither is in cultivation, yet both have a bright, pleasant appearance with attractive clusters of small rather fragrant flowers and all the qualifications of a neat ornamental tree including that of rapid growth. In all the species but especially in *C. Reevesii*, the flower-buds are arranged so regularly that they appear to be drawn up in little square packets but, as the buds open, this regularity may disappear.

The Malayan species are used in village medicine, chiefly for poulticing as their Malay name indicates. This name may vary into *Tampah Besi*, *Tampal Besi*, *Tampoh Besi*, *Tampang Boteh* and *Chapah Besi*, and often there is an adjective to indicate the colour of the fruits, which is specific. *C. longifolia* is also known as *Chapoi* in Kedah.

Key to the Species

Wild trees: leaves entire or scarcely toothed

Young parts and undersides of the leaves brown-scurfy:
petals and stamens 5: berry red *C. farinosa*

Young parts and undersides of the leaves brownish white
woolly: petals and stamens 4: berry purple *C. tomentosa*

Shrubs: leaves toothed: petals and stamens 4

Large cultivated shrub: flower-clusters 2-5" wide, on
stalks 1-2½" long *C. Reevesii*

Small straggling shrubs: flower-clusters small, on stalks
¼-½" long

Flower-clusters 1-1¼" wide: leaves thickly downy
beneath: berries dark purple *C. cana*

Flower-clusters 1½-2½" wide: leaves thinly scurfy
beneath or glabrous: berries white *C. longifolia*

VERBENACEÆ

C. cana

Purple-berried Malayan Lilac

(Lat., hoary)

A shrub like *C. longifolia* but:—

Twigs, inflorescences and undersides of the leaves thickly white or greyish white downy.

Inflorescences smaller and generally turned below the leaf-stalk.

Berries ripening purple to blackish.

Malaysia: frequent from Malacca northward.

C. farinosa

Red-berried Malayan Lilac

(Lat., mealy)

A tree like *C. tomentosa* but:—

Twigs, inflorescences and undersides of the leaves brown-scurfy.

Leaf-blade $3\frac{1}{2}$ –9 × $1\frac{1}{2}$ –4" the leaves on the horizontal or inclined twigs alternately paired and unpaired, the paired leaves being in the horizontal plane, the unpaired leaf on the upperside of the twig being much smaller than the corresponding unpaired leaf on the lower side: stalk $\frac{1}{2}$ –1 $\frac{1}{2}$ " long.

Inflorescences $1\frac{1}{2}$ –3 $\frac{1}{2}$ " wide.

Berries 1–15" wide, ripening bright red.

W. Malaysia to the Philippines and Celebes: common from Johore to Penang, especially in lowlying, swampy jungle.

The arrangement of the leaves on the branches of this tree is most peculiar: the effect is to avoid shading of the leaf on the underside of the twig by that on the upperside.

C. longifolia

White-berried Malayan Lilac

(Lat., with long leaf)

A straggling shrub up to 15 ft. high: young parts brownish or brownish white scurfy-felted.

Leaf-blade 3–7 × $1\frac{1}{2}$ –3 $\frac{1}{2}$ ", elliptic, pointed, the underside green and thinly scurfy or nearly glabrous: stalk $\frac{1}{2}$ –1" long.

Flowers pink or pale lilac: calyx thinly hairy or nearly glabrous.

Berries 1" wide, ripening white.

Malaysia, Australia: common in villages and open country.

C. Reevesii Plate 212

Cultivated Malayan Lilac

(J. Reeves, 1774–1856, of the East India Co.)

A shrub to 15 ft. high: twigs, inflorescences and undersides of the leaves white or brownish white scurfy woolly.

Leaf-blade $4\frac{1}{2}$ –12 × $1\frac{1}{2}$ –4 $\frac{1}{2}$ ", elliptic, tapered to a point, narrowly heart-shaped at the base, the edge toothed all round, the veins very distinct as fine depressed lines on the upperside: stalk $\frac{1}{2}$ –1" long.

Berry $\frac{1}{4}$ " wide, pale pinkish purple then white, pithy-juicy, with the purple calyx at the base.

S. China: occasionally cultivated in gardens.

C. tomentosa

Great Woolly Malayan Lilac
Derdaḡ Daḡur, Tumah Daḡar

(Lat., woolly)

A tree up to 60 ft. high flowering at 15 ft.: twigs, inflorescences and undersides of the leaves thickly brownish white woolly.

Leaf-blade 5–12 × 2–6", elliptic, tapered to a long point and to a narrow base: stalk 1–2" long.

Flowers 1" wide, purple-lilac: inflorescence 3–5" wide, on a stalk 1–2 $\frac{1}{2}$ " long.

Berries 1" wide, dull purple when ripe.

India, Siam, Malay Peninsula, Sumatra: common in the middle of the country, not known south of Malacca.

Another species, called *C. Maingayi*, occurs occasionally in the middle of the country. It differs in having blunt leaves finely white scurfy or hairy beneath and not at all woolly.

CITHAREXYLUM

(Gr., kithara—a lyre, xulon—wood)

Leaves in pairs or in whorls of 3, simple, entire.

Flowers small, white, fragrant, in terminal hanging spikes: calyx 5 teeth: corolla with a short straight tube and 5 lobes, slightly bilaterally symmetrical: stamens 4, the anthers at the mouth of the corolla-tube.

Fruit pulpy, partly enclosed by the calyx, with 2 seeds.

About 20 spp., trop. America: 1 sp. introduced to Malaya.

C. quadrangulare

Fiddle-Wood

(Lat., 4-angled)

A small, rather conical, evergreen tree to 40 ft. high: bark light grey, rather finely fissured, slightly fibrous: old leaves turning light brownish orange or orange-ochre: glabrous.

Leaf-blade 2-7 × 1-3½", elliptic, tapered to each end, with upcurled sides, not tipped: stalk ¼-1" long, pinkish brown.

Flowers ¾" wide: spikes 4-15" long, the flowers all turned outward: corolla-tube ¼" long.

Occasional in gardens throughout Malaya.

The old leaves gradually discolour orange-ochre long before they fall so that the greater part of the crown has an orange colour and from this feature the tree can always be recognised. The English name is said to be a corruption of the French "Bois fidele" signifying the reliability of the timber.

CLERODENDRON

(Gr., kleros—a casting lot, dendron—a tree: from the magical properties ascribed to several species)

Leaves simple, entire or toothed, occasionally in whorls, usually opposite.

Flowers white, pink, yellow, red, green or bluish, small to medium size, set in panicles or heads: corolla more or less bilaterally symmetrical with 5 petals and a rather long tube: stamens 4, projecting with the style far out of the corolla-tube.

Fruit a small shiny berry with 1-4 hard seeds, in most cases seated on the enlarged, fleshy, star-like calyx.

About 120 spp., throughout the warmer regions of the earth: 17 spp. in Malaya, in the lowlands and mountains.

The simple leaves, the rather long corolla-tube with its projecting stamens and the several-seeded berry distinguish Clerodendron from Vitex. The two genera also differ in habit for, whereas the species of Vitex are generally trees, those of Clerodendron are mostly herbs, shrubs, and shrubby climbers, only a few being small bushy or spindly trees of inconsiderable size. Several kinds are cultivated in gardens, such as the Pagoda-flower (*C. paniculatum*), the Bleeding Heart (*C. Thomsonæ*) and *C. nutans* with its hanging flower-sprays.

Among Indian and Malay peoples magical properties are attributed to many of the species. Their Malay names *Panggil Panggil*, *Bunga Panggil*, *Sepanggil* and *Pepanggil*, indicate a power of summoning spirits, and another of their names *Setawar* has been defined as a "spiritual antiseptic" (WILKINSON'S Malay Dictionary). But whether Malays really distinguish the species by separate names and exactly why and how they have come to regard the plants in such

VERBENACEÆ

a light are problems needing further investigation. It is said that the projecting stamens suggest beckoning arms and that Malays use the plants for a magical summons when setting traps for animals like the mouse-deer. As many Clerodendrons are common and they are easily recognised as belonging to one affinity, yet are without English names, they may be called Witches' Tongues and Flowers of Magic.

The leaves of the shrubby or woody species, such as *C. lævifolium*, are often in unequal pairs, the leaves on the uppersides of the twig being much smaller than those on the underside: there is no twisting of the twig to set the pairs of leaves in the horizontal plane such as occurs in *Ixora*, coffee-bushes and many *Eugenias*, but a dwarfing of the upper leaves so as not to conceal the lower ones.

The flowers are pollinated by butterflies and bees which suck the honey from the base of the corolla-tube. In most species the stamens and style project from the lower side of the flower so that the pollen is carried on the underside of the insect. The flowers last more than one day: the stamens project first then curl back under the flower and leave the style in position. But in the Green Witch's Tongue (*C. serratum*) the stamens and style arch over the top of the flower and one of the petals is modified into a lower lip or landing platform.

The berries are eaten by birds. In most species the calyx develops into a most characteristic red, shiny, fleshy star on which the black berry is seated. In the No Good (*C. villosum*) this star is white: in the Green Witch's Tongue (*C. serratum*) it is not developed. The green berries, in ripening, often pass through metallic shades of green and purple before turning black.

Key to the Species

- Leaves velvety, heart-shaped: flowers and fruiting calyx white *C. villosum*
- Not so
 - Flowers and fruits in dense heads turned to the undersides of the twigs or stem *C. deflexum*
 - Not so
 - Leaves entire: flowers yellow, with long tube: fruiting calyx star-like *C. lævifolium*
 - Leaves toothed: flowers greenish white and lilac: fruiting calyx not star-like *C. serratum*

C. deflexum

(Lat., bent down)

Nodding Witch's Tongue

Setawar Bukit

A shrub or spindly tree to 20 ft. high, flowering at 1 ft.: twigs, inflorescences and veins on the underside of the leaves finely or thickly velvety hairy: twigs with hollow, slightly swollen internodes.

Leaf-blade 5-16 × 1½-6", large, thin, narrowly or rather broadly obovate-elliptic with a rather long tip, occasionally obscurely toothed on the edge, with 9-17 pairs of side-veins: stalk ½-2½" long.

Flowers ½" wide, in dense heads 1-2½" wide, on long stalks 1-6" long, bent down from the axils of the upper leaves, the stalk with 1-2 pairs of rather large bracts: calyx ½" long, divided nearly to the base into narrow pointed purple-pink or red sepals: corolla greenish white to cream, the tube ½-¾" long.

Fruit ¼" wide or more, round, purple then black, seated on the crimson, fleshy, star-like calyx ½-¾" wide, with crimson bracts in the head of fruits.

Sumatra, Malay: common in lowland and mountain forest to 4,000 ft.

This is a very variable plant in the size and hairiness of the leaf. It is recognised at once from the down-turned heads of flowers reddened by the bushy sepals. The Malay names attributed to it are many but none is generally known. It is said to have haunting properties.

C. laevifolium Plate 213, Text-Fig 256
(Lat., læve—smooth, folium—a leaf)

Swaddling Flower
Chekop Manis Gajah, Laping Budak
Lampin Budak

A shrub or slender, spindly tree to 30 ft. high, flowering at 4 ft.: bark grey, smooth: twigs slender: glabrous.

Leaf-blade 1-7 × $\frac{1}{2}$ -3 $\frac{1}{2}$ " , very variable in size, those on the upperside of the twig being small, those on the underside being large (hence every other node with a pair of unequal leaves) rather narrowly elliptic with a long tip, shiny, thin, rather crinkled, with 5-7 pairs of side-veins: stalk $\frac{1}{4}$ -3" long.

Flowers $\frac{1}{2}$ - $\frac{3}{4}$ " wide, in lax terminal panicles, 3-8" long, leafy at the base and with drooping, often reddish, branches all on the lower side: calyx $\frac{1}{4}$ " long, with tiny, pointed, often reddish lobes: corolla light yellow, the tube 6-9" long.

Fruit .4" wide, round, dull green, then blue, purple and finally black, seated on the crimson, fleshy, star-like calyx $\frac{3}{4}$ -1" wide, but occasionally with a white calyx-star.

W. Malaysia: common throughout Malaya in villages, open country and lowland and mountain woods to 4,000 ft.

The shoots wilt quickly when plucked.

C. serratum Text-Fig. 256
(with saw-like teeth)

Green Witch's Tongue
Lampin Budak, Mata Kesing (Kel.)

A rather bushy shrub or treelet to 15 ft. high, glabrous except the finely hairy inflorescences: leaves in pairs or in threes at a node.

Leaf-blade 4-12 × 1 $\frac{1}{2}$ -4", obovate-elliptic, tipped, toothed, dark shiny green, with 7-10 pairs of side-veins: stalk $\frac{1}{4}$ - $\frac{1}{2}$ " long, short.

Flowers working upside down, the stamens and style arched over the flower and the true upper petal modified into a lower lip, arranged in terminal erect panicles 6-12" long: calyx cup-shaped, without sepals, .1-1.5" long: corolla $\frac{1}{2}$ - $\frac{3}{4}$ " wide, greenish white with a lilac-blue lip, the tube short $\frac{1}{4}$ " long, curved at the top: stamens projecting 1" from the upperside of the flower.

Fruit .4" wide, green then black, seated on the small, cup-shaped greenish calyx.

India, W. Malaysia to Celebes: common in the middle and north of Malaya, in woods, open country and villages.

C. villosum Plate 213
(Lat., hairy)

No Good
Panggih, Panggil Panggil, Sepanggih
Pepanggih, Pakai Panggil

A bushy shrub or small tree to 25 ft. high, wholly softly and often thickly velvety white hairy.

Leaf-blade 3-9 × 2 $\frac{1}{4}$ -7", heart-shaped, shortly tipped, thin, light green: stalk $\frac{1}{4}$ -6" long.

Flowers $\frac{1}{2}$ " wide, white with pink eye, in long terminal panicles 4-12" long and wide: calyx $\frac{1}{2}$ " long, divided half-way into pointed sepals: corolla-tube short, $\frac{1}{4}$ - $\frac{1}{2}$ " long, concealed by the calyx.

Fruit $\frac{1}{2}$ " wide, black, seated on the white fleshy, star-like calyx $\frac{3}{4}$ -1 $\frac{1}{4}$ " wide.

India, W. Malaysia to the Philippines: common in open country and villages and at the edge of the forest throughout Malaya.

This seldom has a Malay name. In the East of Johore and Pahang it is sometimes called *Pakai Panggil* because it has a pleasant appearance and yet is without use!

DURANTA

(Castor Durantes, d. 1590, the Italian herbalist)

Leaves simple, small.

Flowers in drooping spikes from the axils of the upper leaves, the spikes forming a terminal leafy panicle up to 8" long: calyx-tube with 5 teeth: corolla slightly bilaterally symmetrical, with a short, slightly curved tube: stamens 4, concealed in the corolla-tube.

Fruit a berry completely enclosed by the thinly fleshy calyx and containing 2-4 relatively large seeds.

Trop. America, a few spp.: 1 spp. introduced to the East.

D. repens

Golden Dew-Drop

(Lat., creeping)

An evergreen shrub, 5-15 ft. high, with straggling drooping branches: flowering and fruiting throughout the year: almost glabrous.

Leaf-blade 1-3 × ½-1¾", rather small, elliptic, tapered to each end, pointed but not tipped, the edge entire or more or less toothed: stalk ¼-½" long.

Flowers ½" wide, lilac-blue with two violet stripes, or white, scentless: corolla-tube ½" long.

Berries ½" wide, orange-yellow with 5 twisted green calyx-teeth at the top, arranged in hanging trusses: slightly poisonous.

Commonly cultivated in gardens, the white-flowered variety being less common than the blue.

GMELINA

(J. G. Gmelin, 1709-1755, the German botanist)

Leaves simple, or more or less lobed.

Flowers rather large, bright yellow or orange: corolla hairy on the outside, rather compressed, bilaterally symmetrical, with a slender tube and trumpet- or bell-shaped mouth with 4 or 5 lobes: stamens 4.

Fruit rather large, pulpy, with 1-2 large stones.

12 spp., trop. Asia and Australia: 1 sp. wild in Malaya.

Key to the Species

- Tree, not thorny: leaves over 3" long, with long tip G. arborea
- Thorny bush or small tree: leaves 3" long or less
 - Leaves woolly felted beneath: bracts green G. elliptica
 - Leaves not woolly felted
 - Bracts large, purplish, 1-1¾" long: leaves up to 3" long G. philippinensis
 - Not so: leaves up to 1½" long, often 3-lobed G. asiatica

G. arborea

Yemane (India), Indian Bulang

Lat., tree-like)

A moderate-sized timber tree.

Leaf-blade 2-10 × 1½-7", more or less heart-shaped, tapered gradually to the long tip, velvety beneath: stalk 1-4" long.

Flowers 1" wide, orange-yellow, in short axillary and terminal racemes: calyx without glands: corolla with a short narrow tube and a wide 5-lobed mouth.

India: occasional in some Malayan towns as Georgetown, Taiping and Kuala Lumpur; planted by the Forestry Department (see Malayan Forester X, 1941, p. 89).

G. asiatica

Ivy-leaved *Bulang*
Bulangan, Bulongan, Bulang

Like *G. elliptica* but :—leaves not woolly-felted beneath, smaller, up to $1\frac{1}{2} \times 1''$, often 3-lobed.

India : occasional in gardens and villages in Malaya.

G. elliptica Text-Fig. 257
(from the leaf-shape)

Common *Bulang*
Bulangan, Bulongan, Bulang

A thorny, scrambling, evergreen shrub or small tree up to 25 ft. high : *the short axillary branches with thorny points up to $\frac{1}{2}''$ long* : bark light grey, becoming slightly fissured.

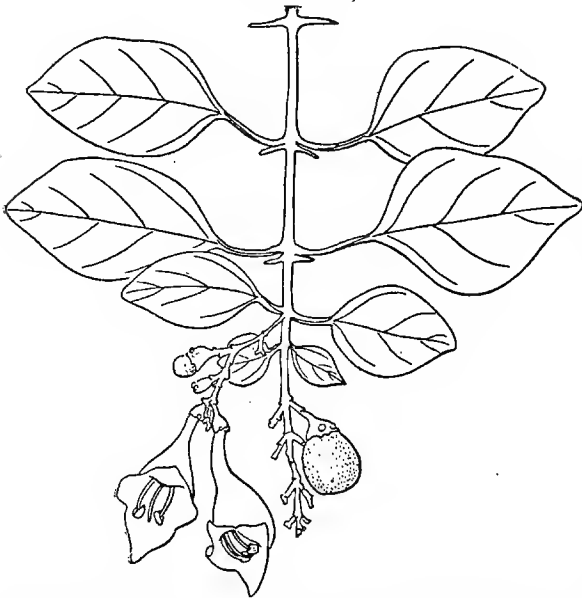
Leaf-blade $\frac{3}{4}$ - $3\frac{1}{2} \times \frac{1}{4}$ - $2\frac{3}{4}''$, small, elliptic or ovate, blunt or slightly pointed, on the underside woolly-felted or white hoary, with minute green glands at the base : stalk $\frac{1}{4}$ - $1\frac{1}{2}''$ long.

Flowers $1\frac{1}{2}''$ long, clear yellow, in terminal racemes up to $3''$ long, with rather large bracts : calyx with 5-6 flat green glands on one side : corolla with bell-shaped, 4-lobed mouth, sooty brown silky in the bud.

Fruit $\frac{3}{4}''$ wide, nearly round ripening yellow with watery fleshy.

Malaysia : common in villages and open country, especially by the sea, frequently grown as an irregular hedge.

This well-known little tree with Allamanda-like flowers is now considered a variety of *G. asiatica* but it is conveniently kept apart in Malaya because *G. asiatica* is here rather scarce and is certainly not wild. The *Bulangan* finds several uses in Malayan medicine. In shape and general appearance it resembles the *Bedara* (*Zizyphus*) which is also thorny and has yellow fruits. (In BURFILL'S Dictionary, this species is called *G. villosa*).



Text-Fig. 257. Common *Bulang* (*Gmelina elliptica*)
 $\times \frac{1}{2}$.

G. philippinensis
(from the Philippines)

Purple *Bulang*
Bulangan, Bulangan, Bulang, Pekan

Like *G. elliptica* but :—

Leaves oblong, glabrous beneath, the underside with whitish sheen and several small glands as green dots mostly near the midrib.

Flowers $2''$ long, partly concealed by the large speckled purplish bracts : the inflorescences like soft purplish cones.

W. Malaysia : occasional in the villages of Perlis, Kedah and Kelantan.

PERONEMA

(Gr., peros—disabled, nema—a thread; from the two missing stamens)

Leaves pinnate with a terminal leaflet, the leaf-stalk winged between the pairs of leaflets.

Flowers tiny, set in large terminal panicles: calyx with 5 teeth: corolla with 5 tiny lobes clasped over each other: stamens 2, projecting with the style.

Fruit a small, round, hairy capsule separating into 4 parts: seeds several.

1 sp., Malay Peninsula, Sumatra, Java, Borneo

P. canescens

(Lat., growing hoary)

False Elder

Sungkai, Sukai, Cherek

An evergreen shrub or moderate-sized tree up to 60 ft. high, flowering at 12 ft.: *bark* dingy greyish buff, rather fibrous and fissured: *twigs* 4-angled, finely hoary: *young leaves rich purple.*

Leaf-stalk 1-3 ft. long: *leaflets* 4-10 pairs, up to 12 × 3", the lowest leaflets being smallest, the others increasing in size to the apex of the leaf, *sessile, lanceolate, tapered to a long point*, narrowed and slightly asymmetric at the base, the margin entire (or toothed in saplings), inclined upward, *pale greenish white or hoary white beneath.*

Flowers .1" wide, greenish white, in panicles 1-2 ft. long and wide, finely hoary.

Fruits .15" wide, pale brownish or greyish.

Common in open country and secondary jungle, or by rivers and clearings in the forest, from Malacca northward.

This common and distinctive little tree with big Teak-like panicles of tiny flowers and pairs of pinnate leaves with winged stalks bears an extraordinary resemblance to the Elder of Europe, even to the Java Elder of Malayan gardens (*Sambucus*). Its leaves, however, are not foetid when crushed, its flowers are not fragrant and the big panicle of little dry hairy fruits and the winged leaf-stalks are different. Saplings of the *Sungkai* with their purple young leaves may be seen in crowds by the railway in many parts of the country. A rather similar tree is the Malay Rowan Tree (*Heynia*).

PREMNA

(Gr., premon—a tree-trunk)

Small trees or shrubs *with rather foetid tissues.*

Leaves simple.

Flowers very small, whitish, in terminal clusters: calyx with 3-5 teeth: corolla bilaterally symmetrical, 2-lipped with 4-5 lobes: stamens 4.

Fruit a small berry with one stone.

About 50 spp., in the warmer regions of the Old World: 13 spp. in Malaya in the lowlands.

Several climbers and a few kinds of shrub or small tree belong to this genus. They much resemble the Guelder (*Viburnum*) but they are distinguished by the 2-lipped corolla with only 4 stamens, the superior ovary ripening into a round berry which has the calyx persistent at the base, and the rank smell of the crushed leaves. The commonest species, *P. corymbosa*, is most likely to be confused with the Penang Guelder (*V. sambucinum*) but besides these distinctions the Penang Guelder has very fragrant flowers. The Malay names *Buas Buas*, *Bebuas* and *Bebuat* may be applied to either genus. Except on Penang Hill, the *Premna* is much commoner than the Guelder throughout the country and the one most likely to be met with.

Key to the Species

- Flowers in flat clusters: leaf-blade up to 6" long: shrub or
 small tree P. *corymbosa*
 Flowers in long panicles: leaf-blade 6-14" long: buds brown
 scurfy: tree P. *tomentosa*

P. corymbosa Plate 214
 (from the flower-clusters)

Bastard Guelder
Buas Buas, Bebuas, Bebuat

A straggling shrub, half climbing, or a small erect tree up to 30 ft. high, the twigs and leaf-stalks finely hairy.

Leaf-blade $2\frac{1}{2}$ -6 × $1\frac{1}{2}$ -4", elliptic, blunt or more or less tipped, narrowed or rounded or even almost heart-shaped at the base, in some cases toothed near the apex, with 5-8 pairs of side-veins: stalk $\frac{1}{2}$ -2" long.

Flowers $\frac{1}{2}$ " wide, white or greenish white, in flat, terminal, shortly stalked clusters 2-5" wide: corolla with a short tube and 4 petals.

Berries $\frac{1}{2}$ " wide, light green then shiny black, pulpy.

Mauritius, trop. Asia, Australia and Polynesia: common throughout Malaya, often by the sea.

This species is so variable that it is still undecided whether it does not consist of several species. The main differences are found in the habit of the plant and the shape of the leaves and calyx: like the *Mengambir* (*Mæsa*) it may be a small tree or climber! What is considered the typical form occurs on the rocky and sandy coasts: it begins its existence as a climber or straggling shrub but eventually develops a stout stocky trunk reaching 4" thick, and a bushy crown up to 15 ft. high: the leaves are rather leathery and light green and the flower-clusters are small (2-3" wide). The inland form, which is common in villages and open country especially in the neighbourhood of mangrove, has been called *P. fætida*: it is a bush or small tree with thin, darker green, shiny leaves and larger flower-cluster (3-5" wide).

P. tomentosa
 (Lat., woolly)

Bastard Teak
Sarang Burong, Piat, Kapiat

A tree up to 60 ft. high, with rounded crown: bark pale buff, greyish or pinkish, slightly fissured: young shoots and leaves thickly brown scurfy: sapling leaves toothed.

Leaf-blade 5-14 × 3-8", large, elliptic with rather long tip, rounded or shallowly heart-shaped at the base, in some cases tapered to the base: stalk 1-4" long.

Flowers $\frac{1}{2}$ " long, in large, terminal, long-stalked panicles 8-16" long, 6-10" wide, rather open: corolla white with yellowish buff upper lip, barely opening.

Berries $\frac{1}{2}$ " wide, purplish black.

India, W. Malaysia to the Philippines and Timor: frequent in open country in Malaya from Negri Sembilan northward, common in Upper Perak.

In its shape, rather large leaves, panicles of small flowers and very hard durable timber this tree resembles the Teak. It seldom grows large enough to be of commercial value. It abounds at Grik.

TECTONA

(Gr., tekton—a carpenter)

Leaves simple, very large.

Flowers small, white, regular, arranged in very large open terminal panicles: calyx-tube with 5, 6 or 7 teeth: corolla-tube shorter than the calyx, with the same number of lobes: stamens as many as the corolla-lobes.

Fruit dry, small surrounded by the inflated calyx.

India, Siam, W. Malaysia to the Philippines: not wild in Malaya.

T. grandis Plate 215, Text-Fig. 256
(Lat., large)

Teak
Jati

A large deciduous tree, the trunk becoming fluted at the base: *bark* light greyish buff, the old bark dark grey, scaling in thin, small, oblong flakes, shallowly fissured, the inner bark pale yellow but darkening on exposure to the air: *crown* rounded, with numerous steeply ascending limbs curving out at the ends and drooping, and with numerous more or less perpendicular twigs or side-branches arising from these limbs near the trunk: *inflorescences and young twigs* rather yellowish scur.y.

Leaf-blade 10-24 × 9-15", very large and broad, light green, elliptic, pointed, narrowed at the base, yellowish scurfy-felted beneath: stalks 1-2" long.

Panicles up to 18" long and wide: corolla $\frac{1}{2}$ " wide, purple-dotted on the outside.

Fruits 1" long, the inflated calyx pale green then brownish, the fruit itself (inside the calyx) $\frac{1}{2}$ " wide and densely hairy with a big stone containing 4 cavities each with a seed.

Burma, Siam, E. Java, the Philippines: introduced to Malaya.

Solitary specimens of the Teak occur in gardens in many parts of Malaya but particularly in the north. It has been planted round the *padang* at Ipoh and by several roads in Taiping. But the tallest specimens, which are 70-80 ft. high, occur along the main road between Kuala Kangsar and Taiping: they were planted in 1884 and are still in vigorous growth. Yet it is clear that neither the climate nor the soil of the country is suitable for the Teak which is a tree of the more open, monsoon-forest where a resting season is forced upon it by the dry weather. At such times the tree is bare of leaves and it flowers and fruits after the new leaves have opened in the ensuing wet season. It seems that not only does the lack of a dry season upset the growth of the Teak by compelling it to vegetate almost continuously but that the profusion of other trees suited to the Malayan climate would prevent the Teak from establishing itself in our rain-forest. For these reasons the Teak grows better in the open country of the north of Malaya where the climate partakes of the monsoon-character. There the Teak-trees are deciduous after the dry weather early in the year. In the south of Malaya, a marked dry spell in the beginning or the middle of the year may cause the trees to shed their leaves but, if there is no such spell, the trees remain evergreen.

Big leaves, like enormous tobacco-leaves, big panicles of small white flowers and little inflated fruits enable one to distinguish the Teak readily from any other tree in the country yet, in general shape and in the characters of the bark and wood, the *Leban* (*Vitex pubescens*) and the *Sarang Burong* (*Premna tomentosa*), belonging to the same family, resemble it closely. Though they may rival the Teak in size in Malaya, they do not by any means reach the dimensions of Teak-trees in monsoon-countries.

VITEX

(a Latin plant-name)

Leaves trifoliate or palmate with 3-7 leaflets, the middle one the largest.

Flowers rather small, bilaterally symmetrical, yellow or blue, in terminal panicles or in axillary clusters: calyx small, cup-shaped: corolla with a short tube, 2-lipped with 2 lobes on the upper lip and 3 on the much larger lower lip: stamens 4.

Fruit round or oblong, small or rather long, dry or pulpy, not opening, containing a stone with 1-4 seeds, and seated on the enlarged calyx.

About 140 spp., throughout the tropics and subtropics: 16 spp. in Malaya, mostly in the lowlands.

The very common tree of secondary jungle, called *Leban* or *Halban* (*V. pubescens*), belongs to this genus and it serves as a guide to the other species which may be found at the edge of forest-reserves or in the thickets that border rice-fields. The species of *Vitex* can be recognised at once from their opposite trifoliate or palmate leaves, their little blue or yellow *Clerodendron*-like flowers and their berries seated on the persistent calyx. The only other Malayan trees with such leaves are the species of *Evodia*, of the Orange-family (*Rutaceæ*), and they can be distinguished by their small, regular, white flowers and their little, capsular fruits with hard blackish seeds.

Leban, *Haleban* and *Halban* are the Malay names for the tree-species. Those with yellow flowers clustered in the leaf-axils, like the common *V. gamosepala*, are often called *Leban Pachat* or *L. Pelandok*. The shrubby species, found in gardens, villages and on the sea-coast, are called *Lagundi* and its variations (see under *V. trifolia*) and this name prevails throughout the Archipelago. Many species are used in native medicine, particularly as febrifuges and poultices.

The Malayan species of *Vitex* are evergreen. The *Lagundi*-kinds (*V. trifolia* and *V. negundo*), the *Leban* (*V. pubescens*) and, perhaps, *V. gamosepala* flower throughout the year. The others are distinctly seasonal. The young leaves of the *Leban*-trees may be pink, fawn-brown or purple according to the species.

Key to the Species

- | | |
|--|-----------------------|
| Leaf-stalk stout, with a broad wing or flange on each side | <i>V. peralata</i> |
| Leaf-stalk slender, without wings or flanges | |
| Flowers yellow in rather small axillary clusters | |
| Twigs and leaves glabrous: calyx with 3 teeth ... | <i>V. gamosepala</i> |
| Twigs, flower-clusters and undersides of the leaves hairy | |
| Sepals as minute teeth | <i>V. vestita</i> |
| Sepals oblong, $\frac{1}{4}$ - $\frac{2}{3}$ " long: flower 4" wide ... | <i>V. longisepala</i> |
| Flowers blue (sometimes white or yellow) in terminal panicles | |
| Shrubs: leaves greyish white felted beneath, resinous when crushed | |
| Leaflets 3, not toothed, the middle one sessile: panicle 1-2" wide | <i>V. trifolia</i> |
| Leaflets 3-5, often toothed, the middle one stalked: panicle much wider | <i>V. negundo</i> |
| Trees: leaves green beneath, not or slightly resinous | |
| Twigs and undersides of the leaves hairy: leaflets 3-5, sessile: fruit round, $\frac{1}{4}$ " wide ... | <i>V. pubescens</i> |
| Glabrous: leaflets distinctly stalked: fruit oblong, $\frac{1}{2}$ " long | |
| Leaflets 3: fruit elliptic: panicles to 8" long | <i>V. coriacea</i> |
| Leaflets 3-5: fruit pear-shaped: panicle to 14" long, stout | <i>V. quinata</i> |

VERBENACEÆ

V. coriacea

(Lat., leathery)

Penang Vitex

Like *V. pubescens* but:—

Twigs and leaves glabrous or nearly so.

Leaves with 3 stalked leaflets, the main leaf-stalk only $\frac{1}{2}$ –2" long: middle leaflet $1\frac{1}{2}$ –8 × $\frac{1}{2}$ –3", elliptic, shortly and often bluntly tipped, leathery, with 6–8 pairs of side-veins.

Flowers $\frac{1}{2}$ " long, violet, in rather open panicles up to 8" long.

Fruit $\frac{1}{2}$ " long, oblong, rather large, (? orange-pink), the calyx-cup $\frac{1}{2}$ " wide.

Malaya: frequent on Penang Hill, uncommon elsewhere.

The allied *V. siamica*, with pale blue lip and yellow throat to the flower, is common on limestone hills.

V. gamosepala

(Gr., with joined sepals, gamos—marriage)

Glabrous Yellow Vitex

Galang Dapur,

Leban Pachat, L. Pelandok

A shrub or small tree to 40 ft. high: twigs, leaves and inflorescences glabrous or nearly so: twigs and leaf-stalks light fawn brown: young leaves reddish pink.

Leaves with 3 stalked leaflets: middle leaflet 3–8 × $1\frac{1}{2}$ –3 $\frac{1}{2}$ ", elliptic, rather long-tipped, with 4–7 pairs of side-veins: leaf-stalk 1–4" long.

Flowers $\frac{1}{2}$ " long, $\frac{1}{4}$ " wide, clear yellow, in small stalked clusters up to 2" long, in the leaf-axils: calyx with 3 small teeth.

Fruit $\frac{1}{2}$ " wide, round, black.

Malay Peninsula, Sumatra, Borneo: common in open country and in the forest, especially by streams and on hillsides up to an altitude of 4,000 ft.

V. longisepala

(with long sepals)

Perak Yellow Vitex

A tree with the young leaves fawn-colour, like *V. vestita* but:—

Leaflets often broader, up to 4 $\frac{1}{2}$ " wide: leaf-stalk up to 5" long.

Flowers $\frac{3}{4}$ " long, $\frac{1}{4}$ " wide, considerably wider than in *V. gamosepala*: flower-clusters up to 3 $\frac{1}{2}$ " long, few-flowered: calyx with 5 long, pale green sepals $\frac{1}{4}$ – $\frac{1}{2}$ " long: corolla with rich yellow throat.

Fruit surrounded by the long sepals.

Malaya: Penang to Malacca, common in Perak with *V. gamosepala*.

V. negundo

(the Indian plant-name *nirgundi*)

Horse-shoe Vitex

Lagundi, Lenggundi, Lemuning etc.

Like *V. trifolia* but:—

Leaves with 3–5 leaflets, the middle leaflet distinctly stalked: leaflets with a long tip, the edge entire, notched, toothed or even deeply lobed (nearly pinnately lobed): leaf-stalk longer, 1–2 $\frac{1}{2}$ ".

Flowers smaller, $\frac{1}{4}$ – $\frac{3}{4}$ " long and wide: inflorescences as large branched terminal panicles 4–15" long and nearly as wide, the flowers closely set on short branches $\frac{1}{2}$ –2" long: corolla pale to rather deep blue, often speckled, generally with a yellow horse-shoe like mark on the lower lip.

Fruit $\frac{1}{5}$ " long, smaller, barely longer than the calyx.

Trop. Africa to the Pacific: occurring like *V. trifolia* in Malaya, but commoner in gardens and certainly introduced.

This species has a variety, called var. *bicolor*, which seems to be hybrid between it and *V. trifolia*, so mixed are its features. It has the leaves and flowers of *V. negundo* but the fruits and inflorescences of *V. trifolia*, though the inflorescences may be as much as 4" wide.

V. peralata Text-Fig. 258

(Lat., per-through, alata-winged)

Horse-Chestnut Teak

Gedabeh Lembu (Tr.), *Kayu Gah* (Joh.)

A moderate-sized tree of river-banks and swampy forest, up to 80 ft. high: twigs stout: young leaves violet.

Leaves very large, with 3-7 leaflets: middle leaflet 7-20 × 3-7", elliptic, *stiff and leathery*: leaf-stalk 4-8" long, with a broad wing, $\frac{3}{4}$ -2" wide, on each side.

Flowers $\frac{1}{2}$ " long and wide, lilac or lavender with a hairy yellow spot on the lip, faintly fragrant, in large, terminal, open violet panicles 1-2 ft. long and wide: stamens white with black anthers.

Fruits 1 $\frac{1}{2}$ " long, large, egg-shaped, very hard, faintly ribbed, with the small persistent calyx, $\frac{1}{2}$ " wide, at the base.

Malaya: not uncommon throughout the lowlands in suitable marshy places.

Text-Fig. 258. *Vitex peralata*, × $\frac{1}{2}$.

This remarkable and little known tree is included in our book because it has such extraordinary leaves, and when one begins to recognise trees from their leaves the Horse-Chestnut Teak is one of the easiest. The wings or flanges on the leaf-stalk are so large that leaves seem to be joined across the twig, and in the sheathing base, thus formed, small biting ants, apparently identical with those which inhabit the twigs of the *Mahang*-trees (*Macaranga*), make their nests so that this Vitex must be regarded as one of our ant-trees. When the Horse-Chestnut Teak is full-grown, it is a handsome tree with magnificent violet panicles of flowers and it is to be hoped that one day it will be added to our list of ornamentals. The fruits are as hard as billiard balls and bounce as readily. Trees in the south of the Peninsula flower between March and May.

V. pubescens Plate 216

(Lat., hairy)

Malayan Teak

Leban, Halban, Haleban

An evergreen tree up to 80 ft. high, flowering at 15 ft.: bark pale yellowish grey or ashen, somewhat fissured and flaky in long thin pieces, the inner bark light yellow, turning green on exposure to the air: crown shabby green, rounded but rather uneven,

VERBENACEÆ

with the limbs arching out and with many small branches standing stiffly up from them: *twigs, leaf-stalks, inflorescences and undersides of the leaves hairy.*

Leaves with 3-5 large, sessile, leaflets, the outer two often small: middle leaflets 3-11 × 1½-4", elliptic, long-tipped, rather dull shabby green, with 13-20 pairs of side-veins: leaf-stalk 1-4" long.

Flowers ⅜" long and wide, in large, conical or flattened, terminal panicles 3-10" long and wide, the greenish brown bracts conspicuous: *corolla violet blue*, the upper lobes bluish white.

Fruit ⅓" wide, *green, then dull purple and finally black*, surrounded by the calyx ⅓" wide.

S. E. Asia, Malaysia: common in villages, open country and by rivers and seashores throughout Malaya.

The *Leban* is one of the commonest trees of secondary jungle, its berries being sought after and distributed by birds. It is not a beautiful tree for the dull green leaves, which are often disfigured by galls or perforated by insects, and the untidy inflorescences with their dingy bracts give the crown a shabby, if unmistakable, look. It flowers and fruits through the year. In the open it has a short trunk that soon breaks up into branches but in moderate shade it becomes a fairly lofty tree which in shape and branching greatly resembles the Teak (*Tectona*). The fissured bark is evidently suitable for the roots of epiphytic orchids so that the *Leban* is well-known to the hunter of wild orchids who quickly learns to scan the branches in search of rarities. The timber is hard and heavy and is used in villages for ploughs and other agricultural implements. An intensely yellow dye can be extracted from the bark.

At Sepang, all the trees have white or yellowish white flowers.

V. *quinata*

(with five leaflets)

Orange-barked Vitex
Merboh (Upper Per.)

A tree with light grey, shallowly ridged and fissured bark and *bright orange inner bark*: like *V. coriacea* but:—

Leaflets 3-5, with 8-10 pairs of side-veins, scarcely leathery.

Panicles 6-14" long, larger with stout branches.

Fruit pear-shaped with a small point, dark green (? yellow when ripe).

India, W. Malaysia to the Philippines: not infrequent in the middle of Malaya.

(This species is also known as *V. heterophylla*).

V. *trifolia* Text-Fig. 356

(with three leaflets)

Common Blue Vitex
Lenggundi, Lagundi, Legundi,
Lemuning, Muning, Demundi

A *shrub* with drooping and sprawling branches, up to 8 ft. high, slowly developing a thick, stout trunk up to 4 ft. × 3": *twigs, inflorescences and undersides of the leaflets hoary white felted: leaves resinous aromatic when crushed.*

Leaves trifoliate, occasionally simple: leaflets 1¼-3 × ½-1¼", narrowly elliptic, pointed at each end, not tipped, *sessile*: leaf-stalk ½-1" long.

Flowers pale blue, about ⅓" long, in rather narrow, terminal inflorescences, 2-5" long, 1-2" wide, with short branches.

Fruit ¼" long, oblong, about half as long as the calyx cup when ripe.

Trop. Asia, Australia, Polynesia: fairly common in Malaya, generally in gardens and villages or on the coast, perhaps introduced though possibly wild in the north.

This dainty shrub is a well-known village plant and it finds various uses in native medicine. It is closely allied with a creeping, sea-shore shrub, *V. ovata*, which sends long runners over the sand and has smaller inflorescences,

deeper blue flowers and simple, blunt and hairer leaves. Closely allied, too, is the Horse-shoe Vitex (*V. negundo*) which can usually be distinguished from the flower, inflorescence and number of leaflets but what has been regarded as a variety of it, namely var. *bicolor*, seems to be a hybrid between the two species, and intermediate forms occur which are impossible to classify. The leaves of all three species are aromatic when crushed, those of *V. ovata* being the most pungent. The same Malay names are given to them without discrimination.

V. vestita
(Lat., clothed)

Common Yellow Vitex

A small tree like *V. gamosepala* but:—

Twigs, inflorescences and undersides of the leaves clothed with fine hairs: leaflets with 8-10 pairs of side-veins.

Flowers rather smaller: calyx with 5 minute teeth.

Burma, W. Malaysia: frequent in Malaya.

FLOWERLESS SEED-PLANTS

Gymnospermæ

(Gr., gymnos—naked, sperma—seed)

Trees (a few shrubs and climbers) *mostly evergreen, without flowers* (i.e. no sepals, petals, stamens or ovary): *the pollen borne in male cones, the ovules* (and seeds) *in female cones*: generally wind-pollinated: male and female cones on the same or different trees.

Male cones with 2-many pollen-sacs on the undersides of each cone-scale; falling off after opening and shedding the pollen.

Female cones larger and fewer than the male, persisting and enlarging into the ripe seed-cones after pollination: *ovules 1-several on the upperside of the cone-scale*, ripening into the naked seeds.

Examples:—pine, fir, spruce, larch, cedar, cypress, juniper, etc.: cycads: maidenhair-tree.

Trees, in the general sense of plants with big woody trunks, belong to three only of the seven main divisions of the vegetable kingdom, namely the Flowering Plants to which belong all those described in the preceding part of this book, the Ferns and the Gymnosperms or Flowerless Seed-plants. The Tree-Ferns together with the Palms, Dracænas, Pandans and Bamboos; which are flowering plants of the Class Monocotyledons, and the Cycads, which are palm-like Gymnosperms, have been left until a later work, not for any botanical reasons but because it is more convenient for description and identification. We turn now to a different kind of tree.

Whether we call this group by its botanical name or by its English equivalent, we must refer to the description which heads the chapter in order that we may know how to distinguish it and to discern its members in the vegetation of the world. The absence of flowers, the presence of pollen-cones and seed-cones, and the naked seeds not enclosed in an ovary are its marks. It is no artificial

group conceived by botanists in the mere complication of their science but one which is full of meaning and which may more than any other kind of living thing, be it animal or vegetable, assist us in discovering some of the lost history of the world. At that epoch called by geologists the Mesozoic or, popularly, the Age of Reptiles, some 200,000,000 years ago when, so far as we know, neither birds nor mammals nor flowering plants nor any acme of creation existed, the forests were composed of Gymnosperms. There are in many parts of the world enormous piles of rock packed with the remains of these plants, that wait only the skill of the palæobotanist to disclose their information. We can find their impressions even in Singapore if we visit, for instance, the cliffs at Labrador. Not only in abundance but in variety they far exceeded the modern Gymnosperms: and what survive to-day are, like lizards, snakes and crocodiles, only relics of an earlier stage of life. We know this not merely from their fossil record but from their present distribution, how they have been displaced by flowering plants and how so many occur in isolated and inhospitable parts of the world or show what is termed a broken distribution, dispersed, that is, in places far apart. The forests of Gymnosperms that remain are the coniferous forests of pine, fir, spruce, larch and cedar in the north temperate region, of Redwoods in California, of Araucaria in Brazil, and of Kauri pines (*Agathis*) in New Zealand, but even these are vanishing before the greedy steel. It was only in 1925 that the first botanical specimens of a new kind of Cypress (*Cupressus Dupreziana*) were brought to Europe, from the Hoggar Mountains in the middle of the Sahara Desert: in 1864 a French explorer had noted a great forest of conifers on the southern slopes, and now "only a very few living examples remain among many dead stumps, some of which reach as much as twelve feet in diameter a few feet above the ground": the forest furnished timber for building the neighbouring towns. The Maiden-Hair Tree (*Ginkgo*), which is to botanists a priceless relic because it combines the appearance and construction of an advanced type of tree with the archaic method of fertilisation found in ferns and seaweeds, became extinct as a wild plant perhaps only a thousand years ago but it was fortunately preserved in cultivation in some parts of China. The fossil record tells us that formerly there was a big family of Maiden-Hair Trees distributed throughout the world and that the Chinese tree is the sole descendant of their reign. In the last few years a living species of the fossil genus *Metasequoia* has been discovered in China. Such rarities we have also in Malaya, on G. Tahan, in a species of *Podocarpus* (*P. deflexus*) and a species of *Agathis* (*A. flavescens*). But in many countries Gymnosperms are rather scarce, particularly in the tropics where they abound only in the mountains and this we would ascribe not so much to an inability to grow in hot climates as to the old-fashioned construction of their timber and their archaic manner of branching, which are disadvantageous in competition with flowering plants and prevent all but a few kinds from maintaining themselves in the loft and seasonless, lowland forest.

Whereas it is easy to realise from such temperate examples as pines, firs and cedars, with their conical shape, whorled branches, needle-leaves, large cones and lack of internodes, that Gymnosperms are fundamentally different from Flowering Plants, such an idea cannot be gathered readily from our Malayan species because they belong to aberrant, unfamiliar genera whose headquarters are in the southern hemisphere, and only one of them has recognisable seed-cones, namely the Mountain *Agathis* or *Damar Minyak*, which is not familiar except to foresters. We have moreover, such plants as *Casuarinas* which so much resemble conifers in their switchy twigs and cone-like fruiting heads that we must carefully dissect their minute flowers before we can refer them

rightly to the Flowering Plants. The Mountain *Ru* (*Dacrydium*) and *Setada* (*Podocarpus*), for instance, which are our commonest Gymnosperms apart from the climbing species of *Gnetum*, have their seed-cones reduced to a single scale bearing one seed which, when ripe, looks like a stalked fruit. The *Gnetums*, too, have twigs, leaves, "flower-spikes" and "fruit-spikes" like pepper-plants; and the cypresses, junipers and *Araucarias*, of gardens, seldom if ever develop seed-cones in the plains.

Whether we look upon this as a misfortune or consider ourselves lucky to be in a land where such extraordinary plants grow, there can be no doubt that in the mountains we should be able to cultivate successfully nearly all kinds of Gymnosperm for the temperature is suitable and only such as need desert-conditions will be prevented. We look forward, in fact, to the establishment of a botanical garden in the mountains where a park for conifers and other Gymnosperms shall be laid out, than which there are few more elegant refinements in botanical practice: fifty years might see the establishment of as big a collection of Gymnosperms as anywhere in the world. Two such conifers have already been introduced to the mountains and have begun to bear cones, namely the Tenasserim Pine and the Japanese Cedar: we include descriptions of them because they will in time become characteristic plants.

In order that the interrelations of the Gymnosperms may be understood, we give a synopsis of the living families.

THE FAMILIES OF GYMNASPERMS

Cycadaceæ

Palm-like trees with large pinnate leaves: male cones very massive. 9 genera and about 80 spp., throughout the tropics and subtropics: 1 genus (*Cycas*) and 2 spp. in Malaya. (not described in this book)

Ginkgoaceæ

Flat, 2-lobed leaves with forking veins like those of fern-leaves: female cones without cone-scales but consisting of two or more ovules on a stalk. 1 genus, 1 sp.: *Ginkgo biloba* (occasionally grown as a pot-plant in Malaya, the cooked seeds from China often sold in shops).

Gnetaceæ (p. 725)

Leaves simple, broad, thin, with a midrib and network of side-veins: twigs with long internodes and swollen nodes: cones without scales, the "flowers" arranged on them in whorls: *the wood* of the stem containing large vessels.
1 genus, *Gnetum*.

Ephedraceæ and Welwitschiaceæ (p. 725)

Coniferæ (p. 715)

Resinous trees, rarely shrubs: the wood of the stem without vessels, very uniform in structure.

Leaves simple, variously shaped, *needle- or scale-like or, if flat, then with several longitudinal veins or one midrib, not net-veined*, always rather thick, tough and leathery: twigs with internodes only in a few cases.

Male cones always with scales: female cones generally large and with many scales.

GYMNOSPERMÆ

46 genera, 450-500 spp., mostly temperate or in the mountains in warmer climates, few in the tropical lowlands.

Pine, fir, spruce, larch, cedar, yew, cypress, juniper, Araucaria, etc.

Key to the Common Wild or Cultivated Gymnosperms

- Leaves flat, $\frac{1}{4}$ -4" wide, not needle-like
 - Leaves in pairs, $\frac{1}{2}$ -4" wide: twigs with distinct internodes
 - Leaves thin, 1-4" wide, with a midrib ... *Gnetum* p. 726
 - Leaves thick, stiff, no midrib but several faint longitudinal veins
 - Terminal buds blunt: resin copious ... *Agathis* p. 715
 - Terminal buds pointed: resin scant ... *Podocarpus* p. 723
 - Leaves spirally arranged or alternate: internodes none or indistinct
 - Leaves with sharp points, no midrib: branches whorled ... *Araucaria* p. 717
 - Leaves not prickly, with a distinct midrib
 - Leaf distinctly curved, $\frac{1}{2}$ -3 x 1-4": mountains, wild ... *Dacrydium falciforme* p. 722
 - Leaf straight, or nearly so ... *Podocarpus* p. 723
- Leaves needle- or scale-like, 1" wide or less
 - Needles 7-10" long, in pairs: mountains, cult. *Pinus* p. 722
 - Leaves at most 1" long, generally much less
 - Some twigs with minute scale-leaves, others with longer needle-leaves
 - Conical garden bush: leaves in 4 rows ... *Juniperus chinensis* p. 725
 - Trees with big trunks: mountains or cult.
 - Needles flat, in 2 rows: scale-leaves 1-2" long, with projecting points ... *Podocarpus imbricatus* p. 723
 - Needle-leaves not flat, spirally arranged: scale-leaves .05" long, not projecting ... *Dacrydium elatum* p. 721
 - Twigs with only one kind of leaf
 - Needles $\frac{1}{4}$ -1" long, arranged spirally, with projecting points
 - Branches whorled: mountain *Araucaria* p. 717
 - Branches not whorled: mountain
 - Bark red-brown, fibrous: leaves $\frac{1}{4}$ - $\frac{1}{2}$ " long: with seed-cones: cultivated ... *Cryptomeria* p. 719
 - Bark greyish brown, merely flaky: needles $\frac{1}{4}$ -1" long: no seed-cones: wild ... *Dacrydium* p. 720
 - Needles scale-like, 1" long or less, pressed flat in 4 rows on the twigs: small conical trees or bushes: cult.
 - Leafy sprays flattened vertically ... *Thuja orientalis* p. 724
 - Not so ... *Juniperus, Cupressus* p. 724

CONIFERÆ

3 genera, 10 spp. in Malaya: lowlands and mountains.

This, the main family of Gymnosperms, is poorly represented in Malaya and, as we have mentioned, our two commoner genera lack the typical female or seed-cone so that their connection with the family is not obvious. With the one exception of the Tenasserim Pine, no other pine, spruce, larch, fir, cedar, juniper or cypress has spread into the Malaysian region but all have been stopped at the S.E. extension of the Himalayas into Burma, Siam and Indo-China. Such Conifers, in fact, are members of the north temperate flora of Europe, Asia and America. The Malayan Conifers, *Dacrydium*, *Podocarpus* and *Agathis*, are derived from the flora of the lands bordering the Pacific Ocean in the southern hemisphere and they must have reached our country from Australia and New Guinea: in which respect the coastal *Setada* (*Podocarpus polystachyus*) is comparable to such other members of the Australian flora as the *Ru* (*Casuarina*), the False *Ru* (*Bæckia*), and the *Merambong* (*Scævola*) (p. 40). Why the Malaysian region should have been invaded by the southern Conifers and not the northern ones, while the Flowering Plants have travelled from both directions, particularly in the South Eastward retreat of the Indo-Malaysian flora, is a problem of great importance in considering the origin of the Malayan flora and the geological history of the country, but it is one which has attracted little notice and is unexplained.

The Malayan Conifers are evergreen like all other members of the family excepting the larches (*Larix*) and the Swamp-Cypress (*Taxodium*, N. America). They develop cones and new leaves seasonally but we have no accurate information concerning them. We assume that they are wind-pollinated.

The commonest species are the Mountain *Ru* (*Dacrydium elatum*) and the *Setada* (*Podocarpus polystachyus*).

We have included in this account such few exotic Conifers as are established in gardens or in the mountains. It is likely, however, that many more will be introduced.

AGATHIS

(Gr., *agathis*—a clew)

Lofty, monopodial trees with whorls of branches: *twigs with distinct internodes.*

Leaves in pairs, or nearly so, flat, rather broad, with many fine longitudinal veins.

Cones rather large and compact: *male cones* with several pollen-sacs on the underside of each scale: *female cones* erect, massive, much larger than the male, with a single seed on the upperside of each scale at its base.

Ripe female cones falling to pieces on the tree: seed with a wing.

About 12 spp., Indo-China, Malaysia, Australia, New Zealand: 2 spp. in Malaya.

Key to the Species

Leaves 2-5" long, flat: common mountain tree	...	<i>A. alba</i>
Leaves 1-2" long, thick, convex on the upperside: only on		
Gunong Tahan	... ..	<i>A. flavescens</i>

A. alba Text-Fig. 259

(Lat., white: from the pale resin)

Mountain Agathis, Amboina Pitch Tree

Damar Minyak, Sanum, Tsanum (Pahang)

Leaf-blade $1\frac{1}{2}$ -5 × $\frac{1}{2}$ -1 $\frac{1}{2}$, oblong elliptic, flat, rather bluntly pointed, the stalk $\frac{1}{4}$ - $\frac{1}{2}$ " long.

Male cones $1\frac{3}{4}$ -2 $\frac{1}{2}$ × $\frac{3}{4}$ -1", rich brown (falling entire).

CONIFERÆ

Seed-cones 4-5" wide, rather oblong, longer than broad, green then purplish.
Indo-China throughout Malaysia to New Guinea: common in mountain-forests of Malaya from 1,000-5,000 ft., from Negri Sembilan northward.



DAMAR MINYAK.
(*Agathis alba.*)

Text-Fig. 250. Mountain Agathis (*A. alba*), $\times \frac{1}{2}$, (by courtesy of the Conservator of Forests, Research, Kepong, F.M.S.).

This tree is described and illustrated by FOXWORTHY (7, p. 52) and, of its uses, there is a full account in BURKILL'S Dictionary. In the mountain-forests it is easily recognised by its great size, being one of the biggest trees where it

grows, by its massive trunk tapering to the top of the relatively small, narrow and unevenly conical crown, by its whorls of stiffly projecting branches, its grey brown bark scaling in large, flat, angular pieces that, in falling, expose pale patches of new bark, the copious resin, and by the fallen cone-scales round the base of the trunk. The only common tree with which it can be mistaken is the Malayan Yellow-Wood (*Podocarpus imbricatus*), which has a rather similar shape and bark, but which has small needle-leaves crowded on the twigs, and branches not in whorls. The much less abundant *Podocarpus Blumei* has broad, many-veined leaves set in pairs, as in Agathis, but is readily distinguished by the pointed buds (small, rounded, in Agathis), the more acute leaves, the slightly fissured and fibrous bark, scarcely flaky, and the scant resin: saplings are rather common in the forest, though the full-grown trees, up to 100 ft. high, are infrequent. The Mountain Agathis is common on the top of Penang Hill, but it has not been brought into cultivation in gardens: saplings are strangely rare so that it has been thought the species may be dying out.

The Kauri Pines of Australia and New Zealand are species of Agathis.

A. *flavescens*

(Lat., yellowing)

Tahan Agathis

A tree 15-100 ft. high, the foliage commonly yellowish green at high altitudes.

Leaf-blade 1-2½ × ½-1", thick, very leathery, blunt, the upperside convex, shiny.

Male cones 1-1.4 × .4", much smaller than in *A. alba*.

Seed-cones 3 × 2½".

Malaya: known only from *Gunong Tahan*, common on the mountain-sides from 3,000-6,800 ft., especially in the Upper Teku Valley.

ARAUCARIA

(*Araucanen*—a South Chilean name for the first-collected species)

Like Agathis but:—

Leaves set spirally and densely on the twigs, small and needle-like, or broader and sharp-pointed: twigs without internodes.

Seed-cones massive, each scale with a long point and one massive seed on its upper side.

About 12 spp., New Guinea, Australia, New Zealand, temperate S. America.

A few species of Araucaria have been introduced to Malaya and specimens, young and old, can be seen in most public gardens. In the mountains they have been planted rather extensively as ornamental trees. The Moreton Bay Pine (*A. Cunninghamii*) is the commonest and is grown also in private gardens. Araucarias have a very formal, upright habit resembling the Mountain Agathis, which is not a wayside tree. They grow as vigorously in the lowlands as they do in the mountains but it seems that they will not produce cones at low altitudes: the Bunya Bunya (*A. Bidwillii*) produces cones at Fraser's Hill. The Monkey Puzzle (*A. imbricata*, of Chile) has not been tried in Malaya.

The stout trunk reaching to the top of the crown, the rather short and slender branches set in whorls on the trunk and decreasing in size regularly from below upward so that the outline of the crown is conical, and the small densely crowded leaves enable one to distinguish an Araucaria at a glance. By variations in the distances at which the whorls of branches are set apart, the direction of the branches from the trunk and the arrangement of the leafy twigs on the branches, so each species has its own shape by which means it is most easily distinguished from the others. It is very difficult, in fact, to distinguish the

three species *A. Cookii*, *A. Cunninghamii* and *A. excelsa*, merely from their leafy twigs. The two species, *A. Bidwillii* and *A. Cunninghamii*, are illustrated in the M.A.H.A. Magazine 1933-1935, p. 341.

A peculiarity of the genus is the way that the trees shed whole leafy twigs, instead of single leaves, when they have finished growing. Another oddity of the species in Malaya, except *A. Bidwillii*, is the manner in which the trunk becomes curved and often kinked in one place: it seems that the trunk is not strong enough to support its upward growth and, as it leans, so the leading shoot re-adjusts itself to the vertical: or, it may be that the leading shoot is unable to grow strictly vertical and re-adjusts itself from time to time. In their native countries, however, the trees have columnar trunks as straight as telegraph-poles.

The genus is now strangely limited in its distribution to the countries bordering the southern part of the Pacific Ocean, and each species occurs wild only in a small portion of this area, the most restricted being the Norfolk Island Pine. From such facts we conclude that the living Araucarias are relics of a former greatness, and this the fossil record proves by revealing the remains of the genus and of closely allied plants in many parts of the world. Their maximum developments seems to have been about the time when the Flowering Plants were beginning to evolve in the late Mesozoic, a hundred million years ago.

Key to the Species

Leaves flat, very sharp-pointed	...	...	<i>A. Bidwillii</i>
Leaves like short stout needles			
Whorls of branches 2-6 ft. apart	...	...	<i>A. Cunninghamii</i>
Whorls of branches 1-2 ft. apart or less			
Leafy twigs set in two rows on the larger twigs	...		<i>A. excelsa</i>
Leafy twigs pointing in all directions			
Leaves not flattened, needle-like: common	...		<i>A. Cunninghamii</i>
Leaves distinctly flattened: scarce	...		<i>A. Cookii</i>

A. Bidwillii Plate 146 Bunya Bunya
(J. C. Bidwill, 1815-1853, the Australian botanist)

Up to 60 ft. high: *bark* silvery grey, breaking into curling pieces: *whorls of branches* close, 6-12" apart, generally 5 in a whorl: *branches* slender, drooping heavily with upturned ends: *twigs* set all round the branches, those on the undersides hanging, reaching 30" long and unbranched.

Leaves $\frac{1}{2}$ -2" long, $\frac{1}{4}$ - $\frac{1}{2}$ " wide, flat, stiff, hard, very sharp pointed, only $\frac{1}{4}$ - $\frac{1}{2}$ " long on the upper twigs.

Seed-cones up to 12 x 10", very massive: male cones 6-7 x $\frac{1}{4}$ ".

Queensland: rather commonly planted in the lowlands and mountains of Malaya.

A. Cookii Cook's Araucaria
(Captain J. Cook, 1728-1779, the explorer)

Like *A. Cunninghamii* but:—

Whorls of branches closer, 10-20" apart: branches slender, generally rather drooping: *leaves like flattened scales*, .15" long and .1" wide (up to $\frac{1}{2}$ " long, $\frac{1}{4}$ " wide on saplings or low shoots), the leafy twigs suggesting a neatly plaited cord.

New Caledonia, Polynesian Isles: little known in Malaya.

This species was discovered by the brother botanists J. R. and J. G. A. FORSTER, who accompanied Cook during his second voyage in the Pacific (1772-1775).

A. Cunninghamii

Moreton Bay Pine

(A. Cunningham, 1791-1839, and R. Cunningham, 1793-1835, the Australian brother botanists)

Up to 100 ft. high: *bark* silvery brownish, becoming cracked transversely: *whorls of branches* 2-6 ft. apart in some trees, but only 1-2 ft. apart in other trees, generally 5 in a whorl: *branches* stout, standing stiffly out and slightly upward from the trunk, with the dense, dark green main twigs turned to the upperside: *small twigs* pointing in all directions, congested at the ends of the main twigs.

Leaves of two kinds, those on the lower or sapling shoots $\frac{1}{2}$ - $\frac{3}{4}$ " long rather spiky, straight and outstanding, those on the uppershoots shorter and like thick, stout, slightly curved needles up to $\frac{1}{4}$ " long, with a tiny sharp bristle-like point: *always needle-like, not flattened.*

Seed-cones 4×3 ", ovoid: male cones 2-3" long.

New Guinea, N. Australia: commonly planted in the lowlands and mountains of Malaya.

This species may be mistaken for the Japanese Cedar (*Cryptomeria*), under which the differences are noted. Trees with distant whorls of branches have a broken and very characteristic crown: those with closer-set branches have denser crowns than any other species of the genus grown in Malaya. A large and striking specimen with interrupted crown grows by the padang at Kuala Trengganu. Specimens with glaucous leaves are distinguished as the variety *glauca*.

A. excelsa Plate 222

Norfolk Island Pine

(Lat., outstanding)

Like *A. Cunninghamii* but:—

The small twigs closely set in two rows along the main twigs, pointing upward and giving the branches a feathery appearance: the main branches more distinctly drooping, closely set at intervals of $\frac{1}{2}$ -2 ft., in whorls of 6-9: seeds—cones 3-4" wide, as broad as long or broader.

Norfolk Island: now planted in many parts of the world: rather commonly planted in the mountains of Malaya.

CRYPTOMERIA

(Gr., *kruptos*—hidden, *meros*—part; from the hidden seeds)

Leaves spirally arranged, needle-like, not prickly.

Male and female cones on the same tree: male cones in clusters of 20 or more, with 4-5 pollen-sacs on the underside of each scale: female cones solitary on short side-branches.

Ripe female cone composed of 20-30 scales each with one large and 2-4 small, spine-like projections at the apex: seeds flattened, hardly winged, 2-5 to each cone-scale.
1 sp., China and Japan.

C. japonica Plate 222

Japanese Cedar

A conical tree with rather narrow, uneven dark green crown and whorls of horizontal or drooping branches: *bark reddish brown, fibrous*, becoming detached in shreds, fissured-flaky: twigs commonly with downturned ends.

Leaves $\frac{1}{2}$ - $\frac{3}{4}$ " long, slightly curved, rather bluntly pointed, variable in length even on the same twig, commonly withering reddish orange.

Male cones $\frac{1}{2}$ - $\frac{1}{3}$ " long, orange or reddish when ripe, typically densely clustered at the ends of the twigs, often bunched beneath misshapen female cones.

Ripe female cone $\frac{1}{2}$ - $\frac{3}{4}$ " long, round, brown, remaining on the tree long after the seeds have fallen: seeds $\cdot 2$ " long, brown, slip-like.

The Japanese Cedar is grown at Fraser's Hill, Cameron Highlands and Penang Hill, where it will undoubtedly become a notable tree. How large

it will grow in Malaya one cannot say but in its native country it develops a big tapering trunk, strongly buttressed at the base, 25 ft. in girth and a total height of 150 ft. Some trees in Malaya are already old enough to seed and it is from their little round cones with several short spiky points to each scale, that the species is most easily recognised: sometimes the growing shoot is prolonged from the apex of the cone. When it has no cones, the Japanese Cedar may be mistaken for a *Dacrydium* (it is also called *Ru* by Malays) or for Cunningham's *Araucaria* but from both of these it differs at once in its bark and fluted or buttressed base to the trunk; from the *Dacrydiums* it differs in its narrow crown; and from the *Araucaria* by its drooping branches not in whorls, and by the fact that its leaves are merely bluntly pointed, whereas they have a fine, sharp bristle-like point in the *Araucaria*. At present, our mountain trees look like shaggy, unevenly conical cypresses.

DACRYDIUM

(Gr., dakru—a teardrop, from the drops of resin on the stem)

Leaves spirally arranged, or alternate on the horizontal twigs, scale-like, needle-like or with a narrow lanceolate blade, sessile.

Male and female cones on different trees: *male cones* tiny, as short slender catkins from the sides of the twigs, each cone-scale with two pollen-sacs on its underside: *female cones* reduced to a single scale at the end of a short twig and bearing a single ovule.

Seeds placed singly along the sides of the twigs or near the ends, small, upright or slanting, with the minute pore pointing out from the twig.

About 20 spp., Indo-Malaysia, Australia, New Zealand and one in Chile: 4 spp. in Malaya.

Key to the Species

Leaves flat, with a midrib, curved, 1-3" long	...	<i>D. falciforme</i>
Leaves needle-or scale-like, 1" long or less		
Lower twigs bushy with needle-leaves, upper twigs like thin upright green cords with minute scale-leaves without projecting leaf-points: often cultivated	... ..	<i>D. elatum</i>
Upper twigs bushy with short or long needles, always with projecting leaf-points: mountains, wild		
Needles on the upper twigs $\frac{1}{4}$ - $\frac{1}{2}$ " long	...	<i>D. Beccarii</i>
Needles on the upper twigs $\frac{1}{2}$ -1" long	...	<i>D. comosum</i>

D. Beccarii

(O. Beccari, 1843-1920, the Italian botanist)

Elfin *Ru*
Ru Bukit, Ekor Kuda

Very like *D. elatum* but:—

A smaller tree to 30 ft. high, or a bush, with dense, matted, uneven and often umbrella-shaped crown: all the twigs set with needle-leaves, never with cord-like twigs having scale-leaves: the lower shoots, or those of young plants, with longer needles up to $\frac{3}{4}$ " long: the needles on the upper shoots $\frac{1}{4}$ - $\frac{1}{2}$ " long.

W. Malaysia: only on mountain tops and ridges, common on most Malayan mountains: very abundant in the moorland of Gunong Tahan.

One of the five "Pine-trees" on Pine Tree Hill (that nearest the hut) belongs to this species.

D. comosum

Woolly Ru

(Lat., with long hairs)

Like *D. Beccarii* but *with much longer needles, giving the twigs a woolly appearance*: upper twigs with needles $\frac{1}{2}$ - $\frac{3}{4}$ " long: lower twigs and saplings with needles $\frac{3}{4}$ -1 $\frac{1}{4}$ " long.

Malaya: only in the mossy forest of wind-swept ridges at 4,000-6,000 ft.

Four of the five 'Pine-trees' of Pine Tree Hill belong to this species. It is distinctly rare or local, compared with our other species.

D. elatum Plates 223, 224

Mountain Ru

(Lat., raised up)

Ru Bukit

A medium-sized tree up to 40 ft. when growing in the open, but reaching nearly 100 ft. in the mountain forest: *trunk massive, without buttresses: bark dark greyish brown, rather fissured and distinctly scaly with thin, oblong flakes showing the paler, warm brown new bark underneath.*

Leaves, on the lower branches and drooping twigs, needle-like, .2-.4" long, making the twigs bushy.

Leaves, on the upper branches and upright twigs, tiny scale-like, .05" long, making the twigs like green cords.

Male cones .2-.4" long, yellowish brownish, like catkins from the sides of the cord-twigs.

Seeds .2" long, seated obliquely on a little cup at the end of a short cord-twig, ripening reddish then blackish.

Tenasserim, West Malaysia: common on mountains in Malaya.

This is one of our common mountain trees that has been brought into cultivation. Generally it is not found below an altitude of 2,000 ft., but on Penang Hill it grows even on the lower slopes just above the Waterfall Garden. It is planted in the plains and, though not common, there are specimens in the parks and big gardens of most towns. On Penang Hill it is planted and encouraged in great abundance and nowhere is it more picturesque than in the grounds of Bel Retiro. On looking down on the forest, whether from the Crag Hotel or from the mountain slopes of Cameron Highlands and Fraser's Hill, it is distinguishable from other trees by its conical, grey green crown without foliage leaves but with posses of short, upright, green twigs.

Saplings of the Mountain Ru have dense, conical crowns with wide base that are supported by numerous, obliquely upright branches: they are bushy because they bear only twigs with needle-leaves. Mature trees have thinner crowns because their twigs are less crowded and have adopted the cord-like form with tiny scale-leaves: most of the branches stand upright on the steeply ascending limbs and have posses of cord-twigs at their ends but the lower branches may sag and have drooping twigs with upturned ends. Old trees have ragged crowns as they die back. Even on full-grown trees, especially those in the open, the lower branches may continue to produce the drooping bushy twigs with needle-leaves; and such trees have crowns that are bushier at the base than at the top.

In its bark and sapling shape the Mountain Ru resembles the genuine Ru (*Casuarina equisetifolia*) and in its mature state it resembles the Sumatran Ru (*Casuarina sumatrana*) which also has posses of upright twigs on its ascending branches and longer drooping twigs on its lower, horizontal branches. Casuarinas resemble the Mountain Ru also in their grey green crowns with switchy twigs and lack of foliage leaves, but they have not even needle- or scale-leaves so that there are no leaf-scars on their old twigs: their seeds, moreover, are borne in woody cones.

The Mountain *Ru* may be mistaken for the Malayan Yellow-Wood (*Podocarpus imbricatus*). But the Yellow-Wood has a darker green, irregular crown more like that of the Mountain Agathis (*Agathis alba*) and it always has, on some branches, a few short comb-like twigs on which the flat needle-leaves are set in two rows: it never has cord-twigs.

The two kinds of twig, characteristic of each tree, can generally be found fallen underneath them and so one may easily distinguish the species. The bark of the Yellow-Wood is also rather different and has smaller, rounded scales, like that of the Agathis figured by FOXWORTHY, and it is not fissured.

Compare also the Japanese Cedar (*Cryptomeria*), the False *Ru* (*Bæckia*) and the preceding species of *Dacrydium*.

D. falciforme

Malayan Yew

(Lat., falx—a sickle, forma—shape)

A tree up to 70 ft. high: young leaves pink or pale green: *leaf-blade* $\frac{1}{2}$ –3 × .1–4", lanceolate, flat, curved, pointed, sickle-shaped, leathery, with distinct midrib, alternate on the side-twigs but spirally arranged on the upright twigs: *male cones* 1–2" long, .1" wide, dangling.

W. Malaysia: common in the mountains of Malaya.

Though this species is just as common in the mountains as the preceding, very little is known about it, and it has not been brought into cultivation. The flat, curved, pointed, leathery leaves with a midrib distinguish it at once from our other Conifers.

PINUS

(Lat., a pine-tree)

Leaves like long, slender, flexuous green needles, set in bunches of 2–5 on the main twigs.

Male and female cones on the same tree, the male smaller than the female, male cones with 2 pollen-sacs on the underside of each scale.

Ripe cones woody, the scales separating and disclosing the two winged seeds on the upperside of each scale.

About 80 spp., Northern Hemisphere, crossing the Equator only in Sumatra and Java: none wild in Malaya.

P. Merkusii

Tenasserim Pine

(P. Merkus, 1787–1844, Governor in the Netherlands Indies, patron of botany)

Needles 5–10" long, in pairs.

Ripe female cones 2–3" long, rather narrowly elliptic or cylindrical until opening, then broader and egg-shaped, the unripe green cones standing out stiffly from the twigs, the ripe brown cones pointing down: young female cones purple, clustered at the ends of the new shoots.

Siam, Burma, Indo-China, Java, Sumatra, Borneo, Philippine Islands, in the mountains.

This is the most southerly and tropical of all true Pines, and the only one that has crossed the Equator by its own wanderings. Why it should not occur in Malaya, when it is found at moderate altitudes in all neighbouring lands, is a problem yet unsolved. It has, however, been introduced recently to our hill-stations on the mainland and to Penang Hill, where it grows well but it is too early to say how large it will become. Trees, 30 ft. high, and bearing cones, occur on Ginting Simpah. In Sumatra, it reaches 100 ft. high. It is possible, too, that it may succeed in the plains, for a sapling in the Singapore Botanical Gardens has grown strongly and produced cones with seeds. The needles are much longer than those of the Scots Pine (*P. sylvestris*) but the cones are similar.

PODOCARPUS

(Gr., pous, podos—foot, karpos—fruit: from the stalked seed)

Like *Dacrydium* but *the seed placed sideways on a distinct stalk* and with its minute pore at its base: *ripe seeds blackish or greyish with a bluish white bloom*, seated on the swollen, often pulpy or fleshy, conical or cylindrical top of the stalk.

About 70 spp., throughout the tropics and the warmer parts of the Southern Hemisphere mostly in Australasia: 6 spp. in Malaya, in lowlands and mountain forest.

Key to the Species

- Leaves in pairs, broad: forest trees *P. Blumei* p. 717.
- Leaves not in pairs, narrow
 - Leaves needle-like, $\frac{1}{2}$ " long or less, of two kinds ... *P. imbricatus*
 - Leaves 1" long or more, flat, with a midrib
 - Blade 1-3 \times $\frac{1}{4}$ - $\frac{1}{3}$ " : seashore or cult ... *P. polystachyus*
 - Blade 3-8 \times $\frac{1}{3}$ -1" : forest tree ... *P. neriifolius*
 - Blade 4-11 \times $\frac{1}{3}$ - $\frac{1}{2}$ " , drooping: G. Tahan ... *P. deflexus*

P. deflexus

Teku Teak

(Lat., bent down)

A straggling shrub or moderate-sized tree to 40 ft., the crown open and uneven: bark greyish brownish, slightly fissured.

Leaves all strongly bent down, almost vertically: blade 4-11 \times $\frac{1}{3}$ - $\frac{1}{2}$ " , with a stalk $\frac{1}{4}$ - $\frac{1}{2}$ " long, tapered to each end.

Seeds $\frac{1}{2}$ " long, in pairs on a fleshy stalked head.

Malaya: *known only from Gunong Tahan*, in the woods of the Upper Teku Valley, 4,500-6,500 ft., common locally.

P. imbricatus

Plate 225

Malayan Yellow-Wood

A tree up to 100 ft. high, in the forest, seldom more than 40 ft. in the open: the crown conical or cylindrical, dark green, rather straggling and untidy: bark chocolate brown, scaly in large, thin, roundish pieces, not fissured.

Leaves viny, of two kinds: either needle-like, 1-2" long, and set spirally on the twigs: or like the teeth of comb, flat, pointed, slightly curved, 2-5" long, and set in two rows on short comb-like twigs 1-1 $\frac{1}{2}$ " long.

Male cones $\frac{1}{2}$ - $\frac{3}{4}$ " long, on the needle-leaved twigs.

Ripe seeds 2" long, round, at the ends of short needle-leaved twigs.

Burma and S. China through Malaysia to N. Guinea: frequent in mountain-forest in Malaya, occasionally planted in the lowlands.

A few trees of the Malayan Yellow-Wood occur on Penang Hill but it is more usually found at higher elevations. The comb-like twigs occur mainly on the lower branches, the upper-most having only needle-like leaves or leaves of an intermediate form. Compare the Mountain Ru (*Dacrydium elatum*).

P. neriifolius

Mountain Teak

(Lat., Nerium—the Oleander, folium—a leaf)

Jati Bukit, Setada, Sentada
Kayu China

Very like *P. polystachyus* but:—

Leaf-blade 2-8 \times $\frac{1}{3}$ -1" wide, tapered gradually to the point and often with a rather long tip.

Himalayas and S. China throughout Malaysia to New Guinea: common in the mountains of Malaya, especially on ridges or in mossy forest, but also in coastal and lowland swampy forest and often by rivers.

This is often a larger tree than the Sea Teak and is said to reach 100 ft. A few specimens can be found by the paths on Penang Hill. On exposed ridges, it becomes a scrubby bush with rather small leaves and such plants resemble very closely the stunted forms of the Sea Teak. We should like to observe

CONIFERÆ

specimens of both species grown together in the mountains and in the plains in order to discover how they really differ.

The Mountain Teak grows in as great a variety of situations as any plant in Malaya, even as the *Memboyon* (*Rhodamnia*, p. 507).

P. polystachyus Plate 226 Sea Teak
(Gk., polu—many, stachus—an ear of corn) *Jati Laut, Setada, Sentada*

A coastal tree up to 60 ft. high, the crown broadly conical or dome-like, often with long, horizontal, straggling branches curving up at the ends; becoming a scrubby bush on very exposed sea-coasts: bark greyish brown to warm brown, fissured and flaky.

Leaf-blade $1-3\frac{1}{2} \times \frac{1}{4}-\frac{1}{3}$ " , but up to $5 \times \frac{1}{2}$ " in saplings or low shoots, strap-shaped, leathery, narrowed suddenly to the short point, not tapered, dark green: stalk $\cdot 1$ " long.

Male cones 1-2" long, in groups of 2-5 in the leaf-axils.

Ripe seed $\frac{3}{4}$ " long, the swollen part of the stalk $\frac{1}{4}$ " long; placed in the leaf-axils.

W. Malaysia: common on rocky and sandy coasts and in mangrove swamps in Malaya, occasionally planted inland: also on some limestone hills.

This is our commonest wild Conifer and one that flourishes at sea-level. Like the *Buta Buta* (*Excoccaria*) and the *Dungun* (*Heritiera*), it grows as well on rocky places just above the high tide as in the mangrove swamps, which is a faculty of few kinds of plant. It makes a shapely, though slowly growing, tree when planted inland and the outstretched, horizontal limbs set with clusters of narrow leaves give it a distinctive appearance that, at times, recalls a Yew.

THUJA, CUPRESSUS, JUNIPERUS

These genera are distinguished by the arrangement of their tiny leaves which are set very closely in alternating pairs so as to make four rows on the twigs, and by the similar arrangement of the scales in their small cones. In most cases their leaves are overlapping scales, like those on the cord-twigs of the *Ru Bukit* (*Dacrydium*), but some kinds may produce also longer, needle-like leaves on certain shoots: (in the *Ru Bukit* the scale-leaves are spirally arranged). No species of any genus is wild in Malaya but several have been introduced and are frequently grown in gardens as formal, conical, evergreen bushes or small trees. Although they thrive vegetatively in our lowlands, they seldom fruit; and without fruits they are very difficult to identify. In fact, one can recognise easily only the Chinese Arbor-Vitæ (*Thuja orientalis*) which has vertical branch-sprays.

Thuja Arbor-Vitæ
(Gr., thua—a resinous wood)

Branch systems flattened, forming vertical sprays.

Cones oblong, woody, opening: cone-scales oblong, attached at the base, overlapping, generally with a short, often recurved, horn at the end.

6 spp., E. Asia and N. America.

The Chinese Arbor-Vitæ (*Thuja orientalis*) reaches a height of 15-20 ft. in Malayan gardens. Its twigs branch in a vertical plane and the green twigs, bearing the scale-leaves, are flattened in the same direction so that the conical crown consists of more or less vertical, green sprays of rather switchy twigs. The bark is brown and spirally fissured.

Cupressus Cypress
(Lat., cypress)

Branch systems not flattened.

Cones round, woody, opening: cone-scales with angular, rounded ends, stalked in the middle and fitting together, not overlapping.

12 spp., Eastern Mediterranean, Asia, W. Coast of N. America.

Several kinds of Cypress have been introduced to Malaya. They make conical bushes so like the Junipers that they cannot be distinguished without cones. The most notable is the Monterey Cypress (*C. macrocarpa*) which has been planted in the grounds of Bel Retiro, on Penang Hill, and which forms a small tree like a young *Dacrydium*: it occurs wild only at Monterey in California and on the Island of Guadeloupe off Lower California, so that its distribution is almost as restricted as that of the Norfolk Island Pine (*Araucaria*).

Juniperus

(Lat., juniper)

Juniper

Like *Cupressus*, but the cones more or less pulpy or fleshy, when ripe, and not opening.

About 60 spp., N. Hemisphere, mostly temperate or mountain.

Perhaps the commonest species in Malaya is the Chinese Juniper (*Juniperus chinensis*) which has needle-leaves as well as scale-leaves on most of its shoots.

MENINJAU FAMILY

Gnetaceæ

Twigs swollen at the nodes.

Leaves opposite, broadly elliptic with a midrib, side-veins and a network of veinlets, leathery, with entire edges.

Male cones and female cones on different plants, set in the leaf-axils; upright, slender, without cone-scales: male cones having a slender axis and whorls of minute 'flowers', each whorl consisting of a circle of male 'flowers' and a circle of sterile female 'flowers' immediately above: *male 'flowers'* consisting of a stalk, a tiny calyx of two lobes and a tiny stamen: *female 'flowers'* consisting only of a tiny, egg-shaped, pointed ovule.

Seeds rather large, oblong, with a more or less pulpy rind, arranged a few in each whorl on the female cones.

1 genus and about 30 spp., tropical S. America, tropical W. Africa and, mainly, tropical Asia.

This family contains only the genus *Gnetum* to which the village-tree known as *Meninjau* or *Belinjau* belongs. With the exception of this and another species of tree that is found in New Guinea, the genus consists entirely of climbers, commonly of large size, and it is remarkable for possessing features some of which are those of Flowering Plants and others are those of Conifers. Thus, the broad net-veined leaves, the long internodes of the twigs, the male flowers with a little stamen, and the wide vessels (water-pipes) in the wood are features of Flowering Plants, but the naked seeds on the female cones show that the genus must be classed with the Gymnosperms. Allied with *Gnetum* are two other families. One of these contains that strange plant of the deserts of S.W. Africa, called *Welwitschia* (after the botanist, Welwitsch): it consists mainly of two long, leathery, strap-like leaves and a stout root. The other contains the Casuarina-like plants called *Ephedra*, which have switchy green twigs with tiny circles of scale-leaves and which occur in most subtropical countries but are absent from the Malaysian and Australian regions. The botanical position of these three families is most problematical. They appear more nearly related to what, one imagines, may have been the ancestors of Flowering Plants than to any living Flowering Plants or other Gymnosperms and, yet, each possesses so many oddities of its own as to suggest that there existed in the Age of Reptiles, before the

evolution of Flowering Plants and Mammals, a big and varied group of plants of which the fossil record has given us but little idea and of which these three families are the surviving relics. It seems, for instance, that their 'flowers' are insect-pollinated unlike all other Gymnosperms, but in the case of Gnetum we have as yet no certain evidence, though the male 'flowers' of some of our climbers are very fragrant. According to our disposition, therefore, we reverence Gnetum as an ancient type of plant or deem it a freak of Nature: in either case, we are in a favourable position to study if for Malaya lies in the midst of its abundance.

GNETUM

(from the name Gnemon)

The characters of the family.

G. gnemon Plates 227, 228 Gnemon Tree
 (from the Moluccan name for the tree, *ganemæ*) *Meninjau*, *Belinjau*, *Songkok*

An evergreen tree to 40 ft. high, seldom reaching 60 ft., monopodial with narrow conical crown and rather short drooping branches, or breaking into several upright, narrowly conical stems, bushy only when coppiced: the short branches slightly pendent: *trunk grey, marked with conspicuous, or faint, rings* (leaf-scars at the nodes).

Leaf-blade 3-8 × 1-4", broadly elliptic: stalk $\frac{1}{4}$ - $\frac{3}{8}$ " long.

Male-cones 1-3" long: female cones 2-5" long.

Seeds $\frac{3}{4}$ -1 $\frac{1}{2}$ " long, ellipsoid, pointed at one end, ripening yellow then orange-red.

Cultivated throughout the East Indies: wild on some rocky islands and headlands on the East coast of Malaya and, probably, in similar places from Siam to New Guinea: occasional in villages in Malaya, very abundant at K. Trengganu.

The trunk of the *Meninjau* suggests that of a Coconut-Palm, the persistent ring-like thickenings at the nodes of the sapling stem resembling the leaf-scars of the palm. The remarks in BURKILL's Dictionary concerning the origin and occurrence of the *Meninjau* in Malaya are inaccurate (*see* Gardens Bulletin vol. X, 1939).

The *Meninjau* is an uncommon tree in most parts of Malaya, with the exception of K. Trengganu where it occurs in nearly every kampong and is so thickly planted in some parts of the town that it lines the streets like rows of short poplars. Among the trees at K. Trengganu are many varieties which differ chiefly in the size of the fruit. Some have small fruits, measuring $\frac{3}{4}$ × $\frac{1}{2}$ " or less, others have fruits $1\frac{1}{3}$ × $\frac{2}{3}$ " on the average, and others have fruits of intermediate size. One such variety with plump fruits, 1 × $\frac{2}{3}$ ", is called *Songkok*, and the name *Meninjau* is reserved for those with the largest fruits. For use, the orange or red pulp is removed and the kernel is pounded flat in the form of a disc with irregular outline. It is then dried in the sun and can be kept for several months. The discs are fried with flour when they swell slightly to make a kind of biscuit, insipid and rather bitter.

var. **Brunonianum** Dwarf Gnemon Tree
 (Lat., R. Brown, the Scotch botanist, 1773-1858) *Cheperai* (Johore)
Meliling (Raub)

A forest shrub or spindly treelet 2-10 ft. tall, with more slender stem, twigs, leaves and cones, and smaller seeds: leaf-blade $\frac{3}{4}$ -2 $\frac{1}{4}$ " wide: seed $\frac{1}{2}$ - $\frac{3}{8}$ " long.

W. Malaysia: frequent in lowland and mountain forest in Malaya, never cultivated: seeds edible.

This variety is treated as a species, *G. Brunonianum*, in BURKILL's Dictionary.

LEGUMINOSÆ (PAPILIONACEÆ)

CASTANOSPERMUM

(Castanea—the chestnut: sperma—a seed)

A large tree with dark brown heartwood: leaves pinnate with 5-7 pairs of opposite leaflets and a terminal leaflet, *spirally arranged*: twigs stout, steeply ascending.

Flowers large, papilionaceous, with free petals and stamens, *in erect racemes from the bare twigs below the leaves*.

Pod large, almost woody, with 3-5 large seeds embedded in the spongy interior. 1 sp., North East Australia.

C. australe

Moreton Bay Chestnut

Leaves 1-1½ ft. long: leaflets 3-5 × 1-1½", large, drooping.

Flowers 2" long, the racemes 2-6" long: calyx yellow: *petals orange red*.

Pod 8-9 × 2": seeds round, chestnut-like.

This tree was planted long ago at Taiping, where several fine specimens exist by Old Club Road, Walker Road, and in the Military Hospital compound off New Club Road. The largest is nearly 100 ft. high. Whether fruit is produced in Malaya is uncertain, but the tree may well be added to our ornamentals. It is figured in M.A.H.A. Magazine vol. XI, 1941, p. 75. The seeds are poisonous.

LEGUMINOSÆ (CÆSALPINIACEÆ)

CASSIA

C. spectabilis

(Lat., notable)

A small evergreen tree with long, sprawling, leafy branches ending in large inflorescences up to 2 ft. long: softly hairy.

Leaves 6-14" long: leaflets 6-15 pairs, elliptic, acute, 1-2" long: without glands.

Flowers 1½-2" wide, bright yellow, the lower petals incurved.

Pod 8-10 × ½", *cylindric*, somewhat constricted between the seeds.

Tropical America: recently introduced to Malaya.

PETALING FAMILY

Olacaceæ

(from the genus Olax)

Trees, shrubs or climbers: leaves simple, entire, spirally arranged or alternate, without stipules.

Flowers small, white or green, in axillary, clusters: calyx cup-like with 3-6 points or teeth: petals 3-6: stamens usually twice as many: ovary superior or inferior, 2-5 cavities each with one ovule: style simple.

Fruit indehiscent, often large, fleshy or leathery, with a hard stone enclosing one seed.

23 genera, 230 spp., tropical: 7 gen., 10 spp., Malaya.

This difficult family has been added because of the sea-shore shrub *Ximenea*. Though the flowers of the family are inconspicuous, the fruits are generally large and striking. The family includes the timber trees *Ketaling* or *Petaling* (*Ochanostachys*) and *Kulim* (*Scorodocarpus*), all parts of which reek of garlic.

APPENDIX

The family is related with the Opiliaceæ, Santalaceæ (sandal-wood trees) and Loranthaceæ (mistletoes), and some members, as *Ximenes*, tend toward the parasitic state of the last two.

XIMENIA

(Francisco Ximenes, seventeenth century Spanish apothecary)

Thorny shrubs or small trees, more or less parasitic on the roots of other trees: leaves spirally arranged.

Flowers small, greenish white in shortly stalked axillary clusters or panicles: calyx with 4-5 points: petals 4, thickly hairy on the inside: stamens 8.

Fruit pulpy, with hard stone.

10 spp., tropical: 1 sp. in Malaya.

X. americana

Tallow-Wood

Bedara Laut

Sea-shore shrub or sprawling treelet, with thorns in the leaf-axils: leaves 1-2 × $\frac{1}{2}$ -1", elliptic, with short stalk .2".

Fruit $\frac{3}{4}$ " long, plum-like, yellow to orange with green flesh.

Pantropical: frequent on sandy shores of Malaya.

This plant, as the Malay name shows, is very similar to the Indian Jujube (*Zizyphus jujuba*, p. 519), especially in the acid plum-like fruit. The leaves of *Ximenes*, however, are neither toothed nor three-veined nor hairy, and its loose flower-clusters with hairy petals are different. On what roots *Ximenes* is parasitic has not been discovered in Malaya: it is said to parasitise even the roots of individuals of its own kind.

PART IV

INDEX TO ENGLISH NAMES

Acacia-tree	..	<i>Acacia auriculiformis</i> p. 406
Acanthus-family	..	Acanthaceæ p. 95
African Mallow	..	<i>Dombeya</i> p. 609
African Sausage Tree	..	<i>Kigelia</i> p. 161
African Tulip Tree	..	<i>Spathodea</i> p. 169
Agathis	..	<i>Agathis</i> p. 715
Albizzia	..	<i>Albizzia falcata</i> p. 409
Ali's Umbrella	..	<i>Eurycoma</i> p. 604
Alligator Pear	..	<i>Persea</i> p. 343
Aloe wood	..	<i>Aquilaria</i> p. 632
Alum Tree	..	<i>Symplocos fasciculata</i> p. 623
Alum Tree family	..	Symplocaceæ p. 622
Amboina Pitch Tree	..	<i>Agathis alba</i> p. 715
Amherstia	..	<i>Amherstia nobilis</i> p. 377
Anatto	..	<i>Bixa</i> p. 173
Anatto-family	..	Bixaceæ p. 173
Angels' Trumpets	..	<i>Randia macrantha</i> pp. 554, 556
Angsana	..	<i>Pterocarpus indicus</i> p. 375
Ant Laurel	..	<i>Actinodaphne sesquipedalis</i> p. 345
Ant- <i>Mahang</i>	..	<i>Macaranga</i> p. 263
Apple	..	<i>Pyrus malus</i> p. 529
Apple Fig	..	<i>Ficus pomifera</i> p. 686
Apple- <i>Kandis</i>	..	<i>Garcinia Griffithii</i> p. 317
Arabian Coffee	..	<i>Coffea arabica</i> p. 537
Arbor-Vita	..	<i>Thuja</i> p. 724
Ardisia-family	..	Myrsinaceæ p. 478
Argus Pheasant Tree	..	<i>Dracontomelum</i> p. 104
Ariza	..	<i>Brownea ariza</i> p. 384
Asclepiad-family	..	Asclepiadaceæ p. 159
Asclepiad Tree	..	<i>Calotropis</i> p. 159
Asoka Tree	..	<i>Saraca indica</i> p. 402
Australian Ivy Palm	..	<i>Brassaia</i> p. 155
Australian Silky Oak	..	<i>Grevillea</i> p. 518
Australian Swamp <i>Ru</i>	..	<i>Casuarina glauca</i> p. 188
Avocado Pear	..	<i>Persea</i> p. 343
Banana <i>Putat</i>	..	<i>Barringtonia musiformis</i> p. 355
Banana-Tree	..	<i>Alphonsea elliptica</i> p. 128
Banca Mangosteen	..	<i>Garcinia bancana</i> p. 314
Banyan-Trees	..	<i>Ficus</i> p. 658
Baobab	..	<i>Adansonia</i> p. 435
Barking Deer's Mango	..	<i>Irvingia</i> p. 604
Bastard Guelder	..	<i>Premna corymbosa</i> p. 705
Bastard Oak	..	<i>Aporosa aurita</i> p. 235
Bastard <i>Rukam</i>	..	<i>Aporosa frutescens</i> p. 237
Bastard Teak	..	<i>Premna tomentosa</i> p. 705
Bat's Apple	..	<i>Pyrenaria</i> p. 630
Bat's Laurel	..	<i>Pygeum polystachyum</i> p. 528
Bauhinia	..	<i>Bauhinia</i> p. 378
Bean-family	..	Leguminosæ p. 358
Bean-subfamily	..	Papilionaceæ pp. 361, 365
Beccari's Fig	..	<i>Ficus Beccarii</i> p. 680
<i>Bekoi</i> -family	..	Crypteroniaceæ p. 197
Bel-Fruit	..	<i>Aegle</i> p. 567
<i>Belimbing</i> -family	..	Oxalidaceæ p. 516
Bennett's Oak	..	<i>Quercus Bennetii</i> p. 301
Benzoin Oil-Fruit	..	<i>Etæocarpus stipularis</i> p. 641

INDEX TO ENGLISH NAMES

- | | |
|--------------------------------|--|
| Big-leaved Oak .. | <i>Quercus grandifrons</i> p. 303 |
| Bignonia-family .. | Bignoniaceæ p. 160 |
| Bird's <i>Durian</i> .. | <i>Durio Oaxleyanus</i> p. 439 |
| Black Currant Tree .. | <i>Antidesma ghaesembilla</i> p. 233 |
| Black <i>Durian</i> .. | <i>Cælostegia Griffithiana</i> p. 437 |
| Black <i>Kelat</i> .. | <i>Eugenia cymosa</i> p. 496 |
| Black Morinda .. | <i>Morinda elliptica</i> p. 549 |
| Blake's Bauhinia .. | <i>Bauhinia Blakeana</i> p. 379 |
| Blind-your-Eyes .. | Excœcaria p. 254 |
| Blue Blade .. | <i>Mallotus floribundus</i> p. 271 |
| Blue Laurel .. | <i>Litsea firma</i> p. 347 |
| Blue-leaved Pin-Flower Tree .. | <i>Glochidion lævigatum</i> p. 286 |
| Blue <i>Mahang</i> .. | <i>Macaranga javanica</i> p. 266 |
| Blue <i>Rambai</i> .. | <i>Baccaurea brevipes</i> p. 239 |
| Blume's Oak .. | <i>Quercus Blumeana</i> p. 301 |
| Blunt-leaved Eugenia .. | <i>Eugenia venulosa</i> p. 504 |
| Blunt-leaved Oil Fruit .. | <i>Elæocarpus pedunculatus</i> p. 640 |
| Bodh Tree .. | <i>Ficus religiosa</i> p. 683 |
| Bornean Camphor Tree .. | <i>Dryobalanops aromatica</i> p. 211 |
| Bornean <i>Jenjulong</i> .. | <i>Agrostistachys borneensis</i> p. 229 |
| Bougainvillea-family .. | Nyctaginaceæ p. 510 |
| Braided Chestnut .. | <i>Castanopsis inermis</i> p. 292 |
| Brazilian Ironwood .. | <i>Cæsalpinia ferrea</i> p. 385 |
| Brazilian <i>Sendudok</i> .. | <i>Tibouchina</i> p. 452 |
| Brazil Nut .. | Bertholletia p. 356 |
| Brazil Nut family .. | Lecythidaceæ p. 349 |
| Breadfruit Tree .. | <i>Artocarpus incisus</i> p. 655 |
| Bristly Tree-Hibiscus .. | <i>Hibiscus macrophyllus</i> p. 441 |
| Broad-leaved Mahogany .. | <i>Swietenia macrophylla</i> p. 469 |
| Broad-leaved Oil-Fruit .. | <i>Elæocarpus petiolatus</i> p. 640 |
| Broad-leaved <i>Pulai</i> .. | <i>Alstonia macrophylla</i> p. 142 |
| Broad-leaved Sterculia .. | <i>Sterculia macrophylla</i> p. 620 |
| Broad Oak .. | <i>Quercus cyclophora</i> p. 302 |
| Brownea .. | Brownea p. 383 |
| Brown Malay Beam .. | <i>Engelhardtia nudiflora</i> p. 333 |
| Brown Scurfy Fig .. | <i>Ficus consociata</i> p. 676 |
| Brown Woolly Fig .. | <i>Ficus pilosa</i> p. 678 |
| Bulang .. | Gmelina p. 702 |
| Bullate Eugenia .. | <i>Eugenia microcalyx</i> p. 500 |
| Bullock's Eyes .. | Firmiana p. 610 |
| Bullock's Heart .. | <i>Annona reticulata</i> p. 130 |
| Bunya Bunya .. | <i>Araucaria Bidwillii</i> p. 718 |
| Burkill's Oak .. | <i>Quercus Burkilii</i> p. 301 |
| Burma <i>Simpoh</i> .. | <i>Dillenia aurea</i> p. 203 |
| Burmese Cassia .. | <i>Cassia renigera</i> p. 390 |
| Burmese <i>Dalur</i> .. | <i>Cratœva lophosperma</i> p. 181 |
| Burmese Grape .. | <i>Baccaurea sapida</i> p. 241 |
| Bur Beam .. | <i>Chatocarpus castaneicarpus</i> p. 244 |
| Bur-Flower Bush .. | <i>Nauclea subdita</i> p. 551 |
| Bur-Flower Trees .. | Anthocephalus p. 532 |
| | Nauclea p. 550 |
| | Neonauclea p. 551 |
| Bur <i>Mahang</i> .. | <i>Macaranga trichocarpa</i> p. 268 |
| Bush-Figs .. | Ficus pp. 674, 687 |
| Bushy Cassia .. | <i>Cassia biflora</i> p. 388 |
| Buttercup Tree .. | Cochlospermum p. 174 |
| Butterfly Trees .. | Bauhinia p. 378 |
| Butter Fruit .. | <i>Diospyros discolor</i> p. 216 |
| Button Mangosteen .. | <i>Garcinia Prainiana</i> p. 320 |
|
 | |
| Cabbage-leaved Nutmeg .. | <i>Horsfieldia superba</i> p. 476 |
| Cabbage-Tree .. | <i>Fagraea crenulata</i> p. 423 |
| Cacao-family .. | Sterculiaceæ p. 606 |
| Cacao Tree .. | Theobroma p. 607 |
| Cæsalpinia subfamily .. | Cæsalpiniaceæ pp. 361, 377 |
| Caimito .. | Chrysophyllum p. 599 |

INDEX TO ENGLISH NAMES

Cajeput	..	Melaleuca p. 506
Calabash	..	Crescentia p. 161
Camphor-trees	..	<i>Cinnamomum camphora</i> p. 340
		Dryobalanops p. 211
Candle Nut Tree	..	<i>Aleurites moluccana</i> p. 231
Cannon-Ball Tree	..	Couroupita p. 350
Cantley's Nutmeg	..	<i>Knema Canleyi</i> p. 476
Caper-Thorn	..	<i>Capparis micracantha</i> p. 180
Carambola	..	<i>Averrhoa carambola</i> p. 516
Carapa	..	<i>Carapa guyanensis</i> p. 458
Cardinal Tree	..	Trigonachras p. 596
Caricature Plant	..	Graptophyllum p. 96
Cashew Nut	..	Anacardium p. 100
Cassava	..	Manihot p. 273
Castor Oil Plant	..	Ricinus p. 274 (<i>see also</i> Wild Castor Oil)
Casuarina	..	Casuarinaceæ p. 184
		Casuarina p. 186
Cat-berry	..	Lepionurus p. 515
Cat's Eyes	..	<i>Nephelium malaiense</i> p. 592
Cat's Whiskers	..	Gynandropsis (<i>see</i> Capparidaceæ p. 179)
Cat's Whisker-family	..	Capparidaceæ p. 179
Cayenne Cherry	..	<i>Eugenia Michellii</i> p. 499
Cedar	..	Gymnospermæ p. 711
Cemetery Tree	..	<i>Polyalthia longifolia</i> p. 135
Cerbera	..	Cerbera p. 143
Ceylon Ebony	..	<i>Diospyros ebenum</i> p. 216
Ceylon Rosewood	..	<i>Albizzia odoratissima</i> p. 411
Changi tree	..	Sindora p. 403
<i>Chempaka</i> -family	..	Magnoliaceæ p. 432
<i>Chemperei</i> -family	..	Opiliaceæ p. 514
Cherry Fig	..	<i>Ficus dubia</i> p. 676
Cherry Tree	..	Muntingia p. 644 (<i>see</i> Rosaceæ p. 525)
Chestnut (Malayan)	..	Castanopsis p. 291
Chiku	..	Achras p. 598
Chiku-family	..	Sapotaceæ p. 597
Chilli Rosebay	..	<i>Tabernaemontana capsicoides</i> p. 149
Chinese Arbor-Vitæ	..	<i>Thuja orientalis</i> p. 724
Chinese Date	..	<i>Zizyphus jujuba</i> p. 519
Chinese Ixora	..	<i>Ixora chinensis</i> p. 544
Chinese Juniper	..	<i>Juniperus chinensis</i> p. 725
Chinese Lantern Tree	..	<i>Baccaurea Scortechinii</i> p. 242
Chinese Pear	..	<i>Pyrus Lindleyi</i> p. 529
Chinese Privet	..	<i>Ligustrum sinense</i> p. 512
Chinese Tree of Heaven	..	<i>Ailanthus</i> p. 602
Cicada Tree	..	<i>Archytæa</i> p. 627
Cinnamon Nutmeg	..	<i>Myristica cinnamomea</i> p. 477
Cinnamon Tree	..	Cinnamomum pp. 339, 342
Citron	..	<i>Citrus medica</i> pp. 568, 570
Clementi's Oak	..	<i>Quercus Clementiana</i> p. 301
Clove Tree	..	<i>Eugenia aromatica</i> p. 488
Clustered Oak	..	<i>Quercus lampadaria</i> p. 303
Clustered Pin-Flower Tree	..	<i>Glochidion glomerulatum</i> p. 286
Cocaine Bush	..	<i>Erythroxylon novo-gramatense</i> p. 220
Cocaine-family	..	Erythroxylaceæ p. 220
Cockscomb Tree	..	<i>Erythrina crista-galli</i> p. 369
Cocoa Tree	..	Theobroma p. 607
Coffee Bushes	..	Coffea p. 536
Collared Fig	..	<i>Ficus procera</i> p. 678
Common Blue Vitex	..	<i>Vitex trifolia</i> p. 710
Common <i>Bulang</i>	..	<i>Gmelina elliptica</i> p. 703
Common Bur-Flower Tree	..	Anthocephalus p. 533
Common Earth-Fig	..	<i>Ficus geocarpa</i> p. 681
Common Frangipanni	..	<i>Plumeria acuminata</i> p. 147
Common Hog-Plum	..	<i>Spondias pinnata</i> p. 116
Common Ivy Palm	..	Arthrophyllum p. 155
Common <i>Kelat</i>	..	<i>Eugenia longiflora</i> p. 499
Common Laurel	..	<i>Litsea umbellata</i> p. 348

INDEX TO ENGLISH NAMES

Common <i>Mahang</i> ..	<i>Macaranga triloba</i> p. 268
Common Malayan Ebony ..	<i>Diospyros lanceifolia</i> p. 216
Common Oak ..	<i>Quercus lamponga</i> p. 303
Common Pom-Pom Tree ..	<i>Mallotus macrostachyus</i> p. 271
Common <i>Pulai</i> ..	<i>Alstonia angustiloba</i> p. 142
Common <i>Putat</i> ..	<i>Barringtonia racemosa</i> p. 355
Common <i>Rambai</i> ..	<i>Baccaurea Motleyana</i> p. 240
Common Red Ixora ..	<i>Ixora javanica</i> p. 546
Common Red Stem-Fig ..	<i>Ficus variegata</i> p. 686
Common <i>Rengas</i> ..	<i>Melanorrhæa Woodsiana</i> p. 121
Common <i>Ru</i> ..	<i>Casuarina equisetifolia</i> p. 187
Common River-Fig ..	<i>Ficus obpyramidata</i> p. 685
Common Rough Laurel ..	<i>Gironniera nervosa</i> p. 688
Common <i>Sendudok</i> ..	<i>Melastoma malabathricum</i> p. 447
Common Sterculia ..	<i>Sterculia parviflora</i> p. 620
Common <i>Tembusu</i> ..	<i>Fagraea fragrans</i> p. 424
Common Tree-Vine ..	<i>Leea indica</i> p. 97
Common Yellow Stem-Fig ..	<i>Ficus fistulosa</i> p. 684
Common Yellow Vitex ..	<i>Vitex vestita</i> p. 711
Conifers ..	Coniferæ pp. 711, 713, 715
Cook's Araucaria ..	<i>Araucaria Cookii</i> p. 718
Coral Hibiscus ..	<i>Hibiscus schizopetalus</i> p. 442
Coral-Trees ..	<i>Erythrina</i> p. 367
Cordia Tree ..	<i>Cordia dichotoma</i> p. 176
Cotton-leafed Physic-Nut ..	<i>Jatropha gossypifolia</i> p. 260
Cotton Plant ..	<i>Gossypium</i> p. 434
Covered Laurel ..	<i>Cryptocarya Griffithiana</i> p. 342
Covered Oak ..	<i>Quercus encleisacarpa</i> p. 302
Cowa Mangosteen ..	<i>Garcinia Cowa</i> p. 315
Crab- <i>Kandis</i> ..	<i>Garcinia Gaudichaudii</i> p. 317
Crabwood ..	<i>Carapa guyanensis</i> p. 458
Crepe Flower ..	<i>Lagerstræmia flos-reginæ</i> p. 430
Crescent Tree ..	<i>Aporosa Benthamiana</i> p. 237
Crimson-flowered <i>Kelat</i> ..	<i>Eugenia chlorantha</i> p. 494
Croton ..	Croton p. 246 (see also Garden Croton p. 246)
Crow's Mallet Tree ..	<i>Randia exaltata</i> p. 556
Cultivated Malayan Lilac ..	<i>Callicarpa Reevesii</i> p. 698
Currant Laurel ..	<i>Pygeum parviflorum</i> p. 528
Curry Bush ..	<i>Murraya Koenigii</i> p. 576
Cursed Shade ..	<i>Pternandra</i> p. 451
Curtis <i>Rengas</i> ..	<i>Melanorrhæa Curtisii</i> p. 120
Cushion Fig ..	<i>Ficus Scortechinii</i> p. 686
Custard Apple ..	<i>Annona reticulata</i> p. 130
Cycads ..	Cycadaceæ p. 713
Cypress ..	Cupressus p. 724
Dagger Tree ..	<i>Pajanelia longifolia</i> p. 167
<i>Dalur</i> Trees ..	<i>Cratæva</i> p. 179
Daphne-family ..	Thymelæaceæ p. 632
December Tree ..	<i>Erythrina subumbrans</i> p. 371
Demerara Mahogany ..	<i>Carapa guyanensis</i> p. 458
Devil's Laurel ..	<i>Alseodaphne</i> p. 338
Devil's <i>Mahang</i> ..	<i>Dehaasia</i> p. 343
Diepenhorst's <i>Mahang</i> ..	<i>Macaranga Kingii</i> p. 266
Drooping Cassia ..	<i>Macaranga Diepenhorstii</i> p. 265
Dwarf Chempaka ..	<i>Cassia fruticosa</i> p. 388
Dwarf Gnemon Tree ..	<i>Michelia figo</i> p. 434
Dwarf Mountain Laurel ..	<i>Gnetum gnemon</i> var. <i>Brunonianum</i> p. 726
Dwarf Oak ..	<i>Lindera rufa</i> p. 347
<i>Durian</i> ..	<i>Quercus rassa</i> p. 304
	<i>Durio</i> pp. 437, 439
Eaglewood ..	<i>Aquilaria</i> p. 632
Earth-Figs ..	<i>Ficus</i> pp. 665, 672, 680
East Coast <i>Rengas</i> ..	<i>Gluta renghas</i> p. 118
East Indian Rosebay ..	<i>Tabernæmontana divaricata</i> p. 151

INDEX TO ENGLISH NAMES

Ebony-family ..	Ebenaceæ p. 213
Ebony Tree ..	<i>Diospyros ebenum</i> p. 216
Elder tree ..	<i>Sambucus</i> p. 182
Elephant Apple ..	<i>Dillenia indica</i> p. 204
Elephant Laurel ..	<i>Litsea megacarpa</i> p. 347
Elephant's Ear ..	<i>Macaranga gigantea</i> p. 265
Elfin <i>Ru</i> ..	<i>Dacrydium Beccarii</i> p. 720
Emblic ..	<i>Emblica officinalis</i> p. 282
Epacris-family ..	<i>Epacridaceæ</i> p. 218
Eranthemum ..	<i>Pseuderanthemum</i> p. 96
Eucalyptus Trees ..	<i>Eucalyptus</i> p. 485
Eugenia ..	<i>Eugenia</i> p. 486
False Coffee-Tree ..	<i>Fagraea racemosa</i> p. 425
False Elder ..	<i>Peronema canescens</i> p. 704
False Ivy Palm ..	<i>Aralidium</i> p. 154
False Jack ..	<i>Artocarpus Lowii</i> p. 656
False <i>Kelat</i> ..	<i>Carallia</i> p. 522
False Lime ..	<i>Gelonium glomerulatum</i> p. 255
False Olive ..	<i>Champereia</i> p. 515
False <i>Ru</i> ..	<i>Bæckia</i> p. 484
False Shaddock ..	<i>Citrus macroptera</i> p. 569
False Thorn <i>Randa</i> ..	<i>Vangueria</i> p. 564
Fiddle-Wood ..	<i>Citharexylum</i> p. 699
Fig-family ..	<i>Urticaceæ</i> p. 646
Fig Lime ..	<i>Phyllochlamys Wallichii</i> p. 690
Fig Pear ..	<i>Pyrus granulosa</i> p. 529
Fig <i>Tampoi</i> ..	<i>Baccaurea pyriformis</i> p. 241
Fig Trees ..	<i>Ficus</i> p. 658
Fill-a-cup ..	<i>Scaphium</i> p. 616
Finger Tree ..	<i>Euphorbia tirucalli</i> p. 254
Fir ..	<i>Gymnospermæ</i> p. 711
Fish Eyes ..	<i>Gynotroches avillararis</i> p. 522
Flamboyant ..	<i>Delonix</i> p. 392
Flame of the Forest ..	<i>Delonix</i> p. 392
Flaming Coral-Tree ..	<i>Erythrina Paepigiana</i> p. 371
Flowerless Seed-plants ..	<i>Gymnospermæ</i> p. 711
Flowers of Magic ..	<i>Clerodendron</i> p. 700
Fœtid Coffee ..	<i>Saprosma</i> p. 558
Forest Albizzia ..	<i>Albizzia pedicellata</i> p. 411
Fox-Glove trees ..	<i>Radermachera</i> p. 168
Frangipanni ..	<i>Plumeria</i> p. 147
Gale-family ..	<i>Myricaceæ</i> p. 470
Gaping Fig ..	<i>Ficus glandulifera</i> p. 682
Garden Croton ..	<i>Codiaeum</i> p. 246
Garden Elder ..	<i>Sambucus mexicana</i> p. 182
Garden Hibiscus ..	<i>Hibiscus rosa-sinensis</i> p. 442
Gardenia ..	<i>Gardenia</i> p. 538
Genitri ..	<i>Elæocarpus sphaericus</i> p. 641
Ghost's Foot ..	<i>Trevesia</i> p. 158
Giant <i>Ixora</i> ..	<i>Ixora javanica</i> p. 546
Giant <i>Mahang</i> ..	<i>Macaranga gigantea</i> p. 265
Giant Mimosa ..	<i>Mimosa scepiaria</i> p. 414
Giant <i>Tembusu</i> ..	<i>Fagraea gigantea</i> p. 425
Glabrous Yellow Vitex ..	<i>Vitex gamosepala</i> p. 708
Glaucous Acacia ..	<i>Acacia podalyricifolia</i> p. 406
Glaucous Cassia ..	<i>Cassia surattensis</i> p. 390
Glaucous Holly ..	<i>Ilex Maingayi</i> p. 329
Glossy <i>Ixora</i> ..	<i>Ixora Lobbii</i> p. 546
Gnemon Tree ..	<i>Gnetum gnemon</i> p. 726
Golden Dew Drop ..	<i>Duranta</i> p. 702
Golden Malay Beam ..	<i>Engelhardtia chrysolepis</i> p. 333
Golden Shower ..	<i>Cassia fistula</i> p. 388
Gold Mohur ..	<i>Cesalpinia pulcherrima</i> p. 386
Gooseberry Fig ..	<i>Delonix</i> p. 392
	<i>Ficus cunia</i> p. 681

INDEX TO ENGLISH NAMES

Gordonia	..	Gordonia p. 629
Gouty Ardisia	..	<i>Ardisia colorata</i> p. 480
Grains of Rice	..	Chasalia p. 536
Grape-fruit	..	<i>Citrus paridisi</i> p. 568
Grape-Vine family	..	Ampelidaceæ p. 96
Grasshopper Trees	..	Pithecellobium p. 417
Great Ardisia	..	<i>Ardisia lanceolata</i> p. 481
Great Bur-Flower Tree	..	<i>Nauclea Maingayi</i> p. 551
Greater Devil's Laurel	..	Dehaasia p. 343
Greater Grasshopper Tree	..	<i>Pithecellobium clypearia</i> p. 419
Greater <i>Krekup</i>	..	<i>Flacourtia jangomas</i> p. 307
Greater Malayan Chestnut	..	<i>Castanopsis megacarpa</i> p. 293.
Greater Mountain <i>Mahang</i>	..	<i>Macaranga perakensis</i> p. 269
Greater Mountain <i>Sendudok</i>	..	<i>Melastoma muticum</i> p. 447
Greater Rough Laurel	..	<i>Gironniera subæqualis</i> p. 690
Greater <i>Tampoi</i>	..	<i>Baccaurea Griffithii</i> p. 240
Great Frangipanni	..	<i>Plumeria obtusa</i> p. 148
Great Gardenia	..	<i>Gardenia Griffithii</i> p. 540
Great Hog-Plum	..	<i>Spondias cytherea</i> p. 115
Great Laurel	..	<i>Litsea grandis</i> p. 347
Great-leafed Ivy Palm	..	<i>Schefflera heterophylla</i> p. 157
Great-leafed Pin-Flower Tree	..	<i>Glochidion superbum</i> p. 289
Great Malay Beam	..	<i>Engelhardtia spicata</i> p. 333
Great Morinda	..	<i>Morinda citrifolia</i> p. 549
Great Oak	..	<i>Quercus craterophora</i> p. 302
Great Oil-Fruit	..	<i>Elæocarpus robustus</i> p. 641
Great Rosebay	..	<i>Tabernaemontana corymbosa</i> p. 151
Great <i>Sendudok</i>	..	<i>Melastoma sanguineum</i> p. 447
Great Sterculia	..	<i>Sterculia foetida</i> p. 619
Great Woolly Malayan Lilac	..	<i>Callicarpa tomentosa</i> p. 698
Great Woolly Nutmeg	..	<i>Knema Hookeriana</i> p. 476
Green Cockscomb	..	Epiprinus p. 252
Green Coffee	..	Canthium p. 535
		Diplospora p. 537
Green Earth-Fig	..	<i>Ficus chamecarpa</i> p. 680
Green <i>Rambai</i>	..	<i>Baccaurea lanceolata</i> p. 240
Green Stem-Fig	..	<i>Ficus viridicarpa</i> p. 687
Green <i>Tampang</i>	..	<i>Artocarpus dadah</i> p. 653
Green Tarenna	..	<i>Tarenna costata</i> p. 560
Green-Tipped Tarenna	..	<i>Tarenna appressa</i> p. 560
Green Witch's Tongue	..	<i>Clerodendron serratum</i> p. 701
Grey Fig	..	<i>Ficus glabella</i> p. 677
Griffith's Cordia	..	<i>Cordia Griffithii</i> p. 176
Griffith's Leechwood	..	<i>Anisophyllea Griffithii</i> p. 124
Griffith's <i>Mahang</i>	..	<i>Macaranga Griffithii</i> p. 265
Griffith's Oil-Fruit	..	<i>Elæocarpus Griffithii</i> p. 639
Guava	..	Psidium p. 507
Guelder Rose	..	Viburnum p. 183
Guest Tree	..	Kleimhovia p. 613
Gul Mohur	..	Delonix p. 392
		<i>Cesalpinia pulcherrima</i> p. 386
Gum Trees	..	Eucalyptus p. 485
<i>Gutta Percha</i>	..	<i>Palaquium gutta</i> p. 600
		Sapotaceæ p. 597
Hairy <i>Mahang</i>	..	<i>Macaranga tanaria</i> p. 268
Hairy Mountain Fig	..	<i>Ficus hirta</i> p. 682
Hairy <i>Sendudok</i>	..	<i>Melastoma molle</i> p. 447
Hairy Tarenna	..	<i>Tarenna mollis</i> p. 562
Hairy Tree-Vine	..	<i>Leea æquata</i> p. 97
Heather-family	..	Ericaceæ p. 218
Heliotrope-family	..	Boraginaceæ p. 175
Henna-family	..	Lythraceæ p. 426
Henna-Tree	..	Lawsonia p. 428
Hibiscus	..	Hibiscus p. 440
		<i>H. rosa-sinensis</i> p. 442
Hill Cassia	..	<i>Cassia levigata</i> p. 389

INDEX TO ENGLISH NAMES

Hill Fox-Glove Tree	..	<i>Radermachera glandulosa</i> p. 168
Hill <i>Simpoh</i>	..	<i>Dillenia meliosmæfolia</i> p. 204
Hill Tristania	..	<i>Tristania merguensis</i> p. 509
Hog Plum	..	Spondias p. 114
Holly-family	..	Ilicaceæ p. 327
Holly Tree	..	Ilex p. 328
Honeysuckle-family	..	Caprifoliaceæ p. 182
Hooded Bur-Flower Tree	..	Neonauclea p. 552
Hop Tree	..	Arfeuillea p. 585
Horned Ant- <i>Mahang</i>	..	<i>Macaranga cornuta</i> p. 264
Horse Cassia	..	<i>Cassia grandis</i> p. 389
Horse-Chestnut	..	Aesculus p. 582
Horse-Chestnut Teak	..	<i>Vitex peralata</i> p. 709
Horse Mango	..	<i>Mangifera foetida</i> p. 109
Horse Radish Tree	..	Moringa p. 470
Horse-Shoe Vitex	..	<i>Vitex negundo</i> p. 708
Hose's Mahang	..	<i>Macaranga Hosei</i> p. 266
Humped Fig-Tree	..	<i>Ficus gibbosa</i> p. 677
Indian Almond	..	<i>Terminalia catappa</i> p. 193
Indian Banyan	..	<i>Ficus bengalensis</i> p. 675
Indian <i>Bulang</i>	..	<i>Gmelina arborea</i> p. 702
Indian Coral-Tree	..	<i>Erythrina indica</i> p. 370
Indian Cork Tree	..	Millingtonia p. 165
Indian <i>Dalur</i>	..	<i>Cratœva Roxburghii</i> p. 181
Indian Fig	..	<i>Ficus indica</i> p. 678
Indian Ivy-Rue	..	<i>Zanthoxylum rhetsa</i> p. 579
Indian Ixora	..	<i>Ixora coccinea</i> p. 545
Indian Jujube	..	<i>Zizyphus jujuba</i> p. 519
Indian Laburnum	..	<i>Cassia fistula</i> p. 388
Indian Mango	..	<i>Mangifera indica</i> p. 109
Indian Oil-Fruit	..	<i>Eleocarpus sphaericus</i> p. 641
Indian Prune	..	<i>Flacourtia rukam</i> p. 307
Indian <i>Pulai</i>	..	<i>Alstonia scholaris</i> p. 142
Indian <i>Putat</i>	..	<i>Barringtonia acutangula</i> p. 353
Indian <i>Simpoh</i>	..	<i>Dillenia indica</i> p. 204
Indian Spurge Tree	..	<i>Euphorbia nerifolia</i> p. 254
Indian Walnut	..	<i>Aleurites moluccana</i> p. 231
Indian Willow	..	<i>Salix tetrasperma</i> p. 581
India-rubber Tree	..	<i>Ficus elastica</i> p. 677
Ironwood Tree	..	Mesua p. 320
Isora	..	Helicteres p. 610
Ivy-family	..	Araliaceæ p. 152
Ivy-leafed <i>Bulang</i>	..	<i>Gmelina asiatica</i> p. 703
Ivy-Palm	..	see Araliaceæ p. 153
Ivy-Rue	..	<i>Zanthoxylum</i> p. 579
Ixora	..	Ixora p. 542
Ixora-family	..	Rubiaceæ p. 530
Jacaranda	..	Jacaranda p. 164
Jack, Jak	..	<i>Artocarpus heterophyllus</i> p. 654
Jambolan	..	<i>Eugenia cumini</i> p. 496
Japanese Camphor Tree	..	<i>Cinnamomum camphora</i> p. 340
Japanese Cedar	..	Cryptomeria p. 719
Japanese Cherry-Tree	..	Muntingia p. 644
Java Apple	..	<i>Eugenia javanica</i> p. 499
Javanese Cassia	..	<i>Cassia javanica</i> p. 389
Javanese Elder	..	<i>Sambucus javanica</i> p. 182
Javanese Ixora	..	<i>Ixora javanica</i> p. 546
Java Olives	..	<i>Sterculia foetida</i> p. 619
<i>Jelutong</i>	..	Dyera p. 144
Johore Fig	..	<i>Ficus</i> sp. p. 680
Jujube-family	..	Rhamnaceæ p. 519
Jungle Holly	..	Taxotrophis p. 693
Juniper	..	Juniperus p. 725
Jute-family	..	Tiliaceæ p. 634

INDEX TO ENGLISH NAMES

Kaddam	..	<i>Anthocephalus</i> p. 533
Kapok Tree	..	<i>Ceiba</i> p. 436
Kassod Tree	..	<i>Cassia siamea</i> p. 390
Kauri	..	Agathis p. 717
Kedah <i>Bungor</i>	..	<i>Lagerstrœmia floribunda</i> p. 430
Kedah Bush	..	Holarrhena p. 145
Kedah Gardenia	..	<i>Gardenia carinata</i> p. 539
Kedah Oak	..	<i>Quercus Falconeri</i> p. 303
Kedah <i>Simpoh</i>	..	<i>Dillenia ovata</i> p. 204
Kedah Tree	..	<i>Terminalia pyrifolia</i> p. 194
<i>Kedondong</i> -family	..	Burseraceæ p. 177
Kelantan Laurel	..	<i>Litsea</i> sp. p. 348
<i>Kenanga</i> -family	..	Ammonaceæ p. 125
<i>Kenari</i> -Nut Tree	..	<i>Canarium commune</i> p. 178
Kola-Nut	..	<i>Cola nitida</i> p. 608
Kopsia	..	Kopsia p. 145
Kumquat	..	<i>Citrus japonica</i> p. 568
Kunstler's Oak	..	<i>Quercus Kunstleri</i> p. 303
Kunstler's Saraca	..	<i>Saraca Kunstleri</i> p. 402
Lalang Tree	..	<i>Morinda elliptica</i> p. 549
Lantern Brownea	..	<i>Brownea capitella</i> p. 384
Laurel-family	..	Lauraceæ p. 334
Leafy Cassia	..	<i>Cassia multijuga</i> p. 389
Leather-leafed Eugenia	..	<i>Eugenia subdecussata</i> p. 503
Lebbek	..	<i>Albizia lebbek</i> p. 410
Leechwood	..	<i>Anisophyllea</i> p. 122
		<i>A. disticha</i> p. 122
Lemon	..	<i>Citrus limon</i> p. 568
Lesser Bur-Flower Tree	..	<i>Nauclea Junghuhnii</i> p. 551
Lesser Devil's Laurel	..	<i>Alseodaphne peduncularis</i> p. 339
Lesser Grasshopper Tree	..	<i>Pithecellobium contortum</i> p. 419
Lesser <i>Krekup</i>	..	<i>Flacourtia indica</i> p. 307
Lesser Malayan Chestnut	..	<i>Castanopsis malaccensis</i> p. 293
Lesser Morinda	..	<i>Morinda elliptica</i> p. 549
Lesser Mountain <i>Mahang</i>	..	<i>Macaranga aff. puncticulata</i> p. 269
Lesser Mountain <i>Sendudok</i>	..	<i>Melastoma imbricatum</i> p. 447
Lesser Nutmeg	..	<i>Knema intermedia</i> p. 477
Lesser Pin-Flower Tree	..	<i>Glochidion microbotrys</i> p. 287
Lesser, Rosebay	..	<i>Tabernaemontana peduncularis</i> p. 151
Lesser Rough Laurel	..	<i>Gironniera parvifolia</i> p. 689
Lesser <i>Tampoi</i>	..	<i>Baccaurea reticulata</i> p. 241
Lesser Trema	..	<i>Trema cannabina</i> p. 694
Lettuce Tree	..	<i>Pisonia alba</i> p. 511
Liberian Coffee	..	<i>Coffea liberica</i> p. 537
Lilac	..	Syringa p. 511 (see Malayan Lilac)
Lilac Berry	..	<i>Rennellia speciosa</i> p. 558
Lime	..	<i>Citrus aurantifolia</i> p. 569
Limeberry	..	Triphasia p. 578 (see also Clausena p. 571, Micromelum p. 575)
Limestone Cassia	..	<i>Cassia timoriensis</i> p. 390
Linden-leaf Turn-in-the-Wind	..	<i>Mallotus tiliaefolius</i> p. 273
Litchi	..	<i>Nephelium litchi</i> p. 592
Long-stalked Pavetta	..	<i>Pavetta naucleiflora</i> p. 553
Loquat	..	Eriobotrya p. 525
Lowland Fox-Glove Tree	..	<i>Radermachera Lobbi</i> p. 168
Madras Thorn	..	<i>Pithecellobium dulce</i> p. 419
Magnolia	..	see Magnoliaceæ p. 432
Mañogany	..	Cedrela p. 459
		Swietenia p. 468
Maiden-Hair Tree	..	Ginkgo pp. 712, 713
Maingay's <i>Mahang</i>	..	<i>Macaranga Maingayi</i> p. 267
Maingay's Mountain Laurel	..	<i>Actinodaphne Maingayi</i> p. 345
Maingay's Nutmeg	..	<i>Myristica Maingayi</i> p. 478
Maingay's Oak	..	<i>Quercus Maingayi</i> p. 304

INDEX TO ENGLISH NAMES

Maingay's Tree	..	<i>Aporosa Maingayi</i> p. 237
Malabar Bauhinia	..	<i>Bauhinia malabarica</i> p. 380
Malabar Ebony	..	<i>Diospyros malabarica</i> p. 217
Malacca Teak	..	<i>Intsia Bakeri</i> p. 396
Malacca Tree	..	<i>Emblica</i> p. 282
Malayan Aspen	..	<i>Bucklandia</i> p. 323
Malayan Banyan	..	<i>Ficus retusa</i> p. 679
Malayan Chestnut	..	<i>Castanopsis</i> p. 291
Malayan Eaglewood	..	<i>Aquilaria</i> p. 632
Malayan Heath	..	<i>Leucopogon</i> p. 218
Malayan Ixora	..	<i>Ixora congesta</i> p. 546
Malayan Lettuce Tree	..	<i>Pisonia excelsa</i> p. 511
Malayan Lilac	..	<i>Callicarpa</i> p. 697
Malayan Mountain Ash	..	<i>Weinmannia</i> p. 201
Malayan Pin-Flower Tree	..	<i>Glochidion brunneum</i> p. 286
Malayan <i>Rengas</i>	..	<i>Melanorrhœa malayana</i> p. 120
Malayan Rosebay	..	<i>Tabernaemontana malaccensis</i> p. 151
Malayan Rowan-Tree	..	<i>Heynea</i> p. 462
Malayan Saraca	..	<i>Saraca bijuga</i> p. 401
Malayan Spindle Tree	..	<i>Kurrimia paniculata</i> p. 190
Malayan Spurge Tree	..	<i>Euphorbia antiquorum</i> p. 254
Malayan Terminalia	..	<i>Terminalia subspatulata</i> p. 195
Malayan Teak	..	<i>Vitex pubescens</i> p. 709
Malayan White Ixora	..	<i>Ixora umbellata</i> p. 547
Malayan Yellow Wood	..	<i>Podocarpus imbricatus</i> p. 723
Malayan Yew	..	<i>Dacrydium falcatiforme</i> p. 722
Malay Apple	..	<i>Eugenia malaccensis</i> p. 499
Malay Beam	..	<i>Engelhardtia</i> p. 331
Malay Gale	..	<i>Myrica</i> p. 471
Malay Gooseberry	..	<i>Cicca acida</i> p. 282
Malay Holly	..	<i>Ilex macrophylla</i> p. 329
Malay <i>Jenjulong</i>	..	<i>Agrostistachys sessiliflora</i> p. 229
Malay Lemon	..	<i>Merrillia</i> p. 575
Malay Olive	..	<i>Linociera</i> p. 513
Mallow-family	..	Malvaceæ p. 434
Mandarine Orange	..	<i>Citrus nobilis</i> p. 568
Mango	..	<i>Mangifera</i> p. 106, <i>M. indica</i> p. 109
Mango-family	..	Anacardiaceæ p. 98
Mangosteen	..	<i>Garcinia mangostana</i> p. 318
Mangosteen-family	..	Guttiferæ p. 310
Mangrove-family	..	Rhizophoraceæ p. 520
Mangrove Lime	..	Paramignya p. 578
Mangrove Thorn	..	<i>Scolopia</i> p. 309
Mangrove Trees	..	see p. 43
Mangrove Trumpet-Tree	..	<i>Dolichandrone</i> p. 163
Maple	..	<i>Acer</i> p. 582
Margosa Tree	..	<i>Melia indica</i> p. 466
Marsh <i>Dalur</i>	..	<i>Cratœva membranifolia</i> p. 181
Marsh Holly	..	<i>Ilex cymosa</i> p. 328
Marsh <i>Pulai</i>	..	<i>Alstonia spathulata</i> p. 142
Marsh <i>Rukam</i>	..	<i>Scolopia</i> p. 309
Mason Bee Tree	..	<i>Commersonia</i> p. 609
Meloch	..	<i>Melochia</i> p. 613
<i>Meninjau</i> -family	..	Gnetaceæ p. 725
<i>Meranti</i> -family	..	Dipterocarpaceæ p. 208
Mexican Lilac	..	<i>Gliricidia sepium</i> p. 371
Midnight Horror	..	<i>Oroxylum</i> p. 166
Mildew <i>Mahang</i>	..	<i>Macaranga denticulata</i> p. 265
Millettia	..	<i>Millettia</i> p. 372
Mimosa subfamily	..	Mimosaceæ pp. 362, 405
Mock Bodh Tree	..	<i>Ficus Rumphii</i> p. 683
Mock Coffee	..	<i>Fagraea racemosa</i> p. 425
Mock Lime	..	<i>Aglaia odorata</i> p. 456
Mock Orange	..	<i>Murraya paniculata</i> p. 577
Mock Willow	..	<i>Sapium indicum</i> p. 277
Monkey Apple	..	<i>Glochidion littorale</i> p. 287
Monkey Jack	..	<i>Artocarpus rigidus</i> p. 657

INDEX TO ENGLISH NAMES

Monkey Puzzle	..	<i>Araucaria</i> p. 717
Monkey's <i>Tampoi</i>	..	<i>Baccaurea bracteata</i> p. 239
Monterey Cypress	..	<i>Cupressus macrocarpa</i> p. 725
Moon Tree	..	<i>Endospermum</i> p. 251
Morado	..	<i>Graptophyllum</i> p. 96
Moreton Bay Chestnut	..	<i>Castanospermum</i> p. 727
Moreton Bay Pine	..	<i>Araucaria Cunninghamhamii</i> p. 719
Morinda	..	<i>Morinda</i> p. 549
Mountain Agathis	..	<i>Agathis alba</i> p. 715
Mountain <i>Chempaka</i>	..	<i>Michelia montana</i> p. 434
Mountain <i>Gelam</i>	..	<i>Leptospermum</i> p. 505
Mountain Holly	..	<i>Ilex triflora</i> p. 330
Mountain Ivy Palm	..	<i>Schefflera</i> sp. p. 157
Mountain Ixora	..	<i>Ixora micrantha</i> p. 547
Mountain Malay Beam	..	<i>Engelhardtia</i> sp. p. 333
Mountain Monkey Apple	..	<i>Glochidion</i> sp. p. 289
Mountain Oil-Fruit	..	<i>Elæocarpus pseudopaniculatus</i> p. 641
Mountain Rosebay	..	<i>Tabernaemontana polyneura</i> p. 152
Mountain <i>Ru</i>	..	<i>Casuarina Junghuhviana</i> p. 188
		<i>Dacrydium elatum</i> p. 721
Mountain Sterculia	..	<i>Sterculia rostrata</i> p. 621
Mountain Teak	..	<i>Podocarpus nerifolius</i> p. 723
Mouse Deer's Delight	..	<i>Sapium discolor</i> p. 276
Mouse Deer's Poplar	..	<i>Homalanthus</i> pp. 257, 275
Mouse Deer's Rubber Tree	..	<i>Sapium baccatum</i> p. 276
Mulberry	..	<i>Morus</i> p. 646
Musk Lime	..	<i>Citrus microcarpa</i> p. 570
Myrtle Bush	..	<i>Myrtus communis</i> p. 482
Myrtle-family	..	Myrtaceæ p. 482
Nam Nam	..	<i>Cynometra cauliflora</i> p. 391
Naseberry	..	<i>Achras</i> p. 598
Nile Tulip Tree	..	<i>Spathodea nilotica</i> p. 170
Nim Tree	..	<i>Melia indica</i> p. 466
Nodding Daphne	..	<i>Daphne composita</i> p. 633
Nodding Witch's Tongue	..	<i>Clerodendron deflexum</i> p. 700
No Good	..	<i>Clerodendron villosum</i> p. 701
Norfolk Island Pine	..	<i>Araucaria excelsa</i> p. 719
Nutmeg-family	..	Myristicaceæ p. 472
Nutmeg Laurel	..	<i>Litsea myristicæfolia</i> p. 348
Nutmeg-tree	..	<i>Myristica fragrans</i> p. 474
Oak-family	..	Fagaceæ p. 290
Oak-Trees	..	<i>Quercus</i> p. 293
Oil-Fruits	..	<i>Elæocarpus</i> p. 635
Oleander	..	<i>Nerium</i> p. 146
		<i>Thevetia</i> p. 152
Olive-family	..	Oleaceæ p. 511
One-flowered <i>Simpoh</i>	..	<i>Wormia pulchella</i> p. 206
Orange	..	<i>Citrus sinensis</i> p. 568
Orange-barked <i>Tampang</i>	..	<i>Artocarpus</i> sp. p. 658
Orange-barked Vitex	..	<i>Vitex quinata</i> p. 710
Orange Cassia	..	<i>Cassia splendida</i> p. 390
Orange <i>Chempaka</i>	..	<i>Michelia champaca</i> p. 434
Orange-family	..	Rutaceæ p. 565
Orange Tree-Hibiscus	..	<i>Hibiscus floccosus</i> p. 441
Pacific Rosewood	..	<i>Thespesia</i> p. 444
Pahang <i>Bungor</i>	..	<i>Lagerstræmia ovalifolia</i> p. 430
Pahang <i>Putat</i>	..	<i>Barringtonia spicata</i> p. 355
Panax	..	<i>Nothopanax</i> p. 156
Panicled Oil-Fruit	..	<i>Elæocarpus paniculatus</i> p. 640
Papaya, Papaw	..	<i>Carica</i> p. 184
Papaya-family	..	Caricaceæ p. 183
Paper-bark Tree	..	<i>Melaleuca</i> p. 506
Peacock Flower	..	<i>Cæsalpinia pulcherrima</i> p. 386

INDEX TO ENGLISH NAMES

Pear	..	<i>Pyrus</i> p. 529
Pear-Mangosteen	..	<i>Garcinia nervosa</i> p. 318
<i>Pelong</i> trees	..	Pentaspadon p. 113
Penang Eugenia	..	<i>Eugenia penangiana</i> p. 501
Penang Guelder Rose	..	<i>Viburnum sambucinum</i> p. 183
Penang Holly Tree	..	<i>Longetia malayana</i> p. 260
Penang Pear	..	<i>Anisophyllea grandis</i> p. 124
Penang Pin-Flower Tree	..	<i>Glochidion coronatum</i> p. 286
Penang <i>Pulai</i>	..	<i>Alstonia latifolia</i> p. 142
Penang <i>Kengas</i>	..	<i>Gluta elegans</i> p. 118
Penang Sloe	..	<i>Kopsia flavida</i> p. 145
Penang <i>Tembusu</i>	..	<i>Fagraea Wallichiana</i> p. 426
Penang Vitex	..	<i>Vitex coriacea</i> p. 708
Pendant Tarenna	..	<i>Tarenna longifolia</i> p. 561
Peppercorn Laurel	..	<i>Lindera pipericarpa</i> p. 346
Perak Ivy Palm	..	Brassaiopsis p. 156
Perak Leechwood	..	<i>Anisophyllea</i> sp. p. 125
Perak Pin-Flower Tree	..	<i>Glochidion perakense</i> p. 288
Perak Yellow Vitex	..	<i>Vitex longisepala</i> p. 708
Periwinkle-family	..	Apocynaceæ p. 137
Perlis Ebony	..	<i>Diospyros oblonga</i> p. 217
Persian Lilac	..	<i>Melia azedarach</i> p. 464
Persimmon	..	<i>Diospyros kaki</i> p. 213
<i>Petaling</i> -Family	..	Olacaceæ p. 727
Physic-Nut	..	<i>Jatropha curcas</i> p. 259
Pick-a-back Tree	..	<i>Phyllanthus frondosus</i> p. 290
Pigeon Plums	..	Elæocarpus p. 635
Pig's Mango	..	<i>Terminalia phellocarpa</i> p. 194
Pine Trees	..	see Pinus p. 722, Dacrydium p. 720
Pin-Flower Trees	..	Glochidion p. 283
Pink Bauhinia	..	<i>Bauhinia monandra</i> p. 380
Pink Beam	..	Parastemon p. 526
Pink-berried Pin-Flower Tree	..	<i>Glochidion rubrum</i> p. 288
Pink Cassia	..	<i>Cassia nodosa</i> p. 389
Pink Coral-Tree	..	<i>Erythrina corallo-dendron</i> p. 369
Pink-Eyed Cerbera	..	<i>Cerbera manghas</i> p. 143
Pink Isora	..	<i>Helicteres hirsuta</i> p. 611
Pink Kopsia	..	<i>Kopsia fruticosa</i> p. 146
Pink Lime-Berry	..	<i>Clausena excavatum</i> p. 571
Pink <i>Mempat</i>	..	<i>Cratoxylon formosum</i> p. 326
Pink Needles	..	<i>Ixora pendula</i> p. 547
Pink <i>Pelong</i> -Tree	..	Pentaspadon velutinum p. 113
Pink River Ixora	..	<i>Ixora grandifolia</i> p. 546
Pink Saraca	..	<i>Saraca palembanica</i> p. 402
Pink Shower	..	<i>Cassia javanica</i> p. 389
		<i>C. nodosa</i> p. 389
		<i>C. renigera</i> p. 390
Pipal Tree	..	<i>Ficus religiosa</i> p. 683
Poinsettia	..	<i>Euphorbia pulcherrima</i> p. 252
Pointed Rosebay	..	<i>Tabernaemontana cylindrocarpa</i> p. 151
Poison Ivy	..	see Anacardiaceæ pp. 98, 116
Polished Eugenia	..	<i>Eugenia polita</i> p. 501
Pomegranate	..	Punica p. 427
Pomelo	..	<i>Citrus grandis</i> p. 569
Pom-Pom Trees	..	Mallotus p. 269
Poplar	..	Populus p. 580
Poplar <i>Mahang</i>	..	<i>Macaranga populifolia</i> p. 267
Porcupine Oak	..	<i>Quercus hystrix</i> p. 303
Portia Tree	..	Thespesia p. 444
Potato-family	..	Solanaceæ p. 605
Potato-Tree	..	<i>Solanum Wrightii</i> p. 606
Pride of Barbados	..	<i>Cæsalpinia pulcherrima</i> p. 386
Province Wellesley Fig	..	<i>Ficus</i> sp. p. 680
Prune-Fig	..	<i>Ficus pruniformis</i> p. 678
<i>Pulai</i> -Trees	..	Alstonia pp. 32, 140
Pumelo	..	<i>Citrus grandis</i> p. 569
Purple Bauhinia	..	<i>Bauhinia purpurea</i> p. 380

INDEX TO ENGLISH NAMES

Purple-berried Malayan Lilac	<i>Callicarpa cana</i> p. 698
Purple <i>Bulang</i>	<i>Gmelina philippinensis</i> p. 703
Purple Coral-Tree	<i>Erythrina fusca</i> p. 370
Purple <i>Mahang</i>	<i>Macaranga tenuifolia</i> p. 269
Purple Millettia	<i>Millettia atropurpurea</i> p. 372
Purple <i>Simpoh</i>	<i>Wormia excelsa</i> p. 206
Purple Trumpet <i>Randa</i>	<i>Randia macrophylla</i> p. 556
Purple-veined Timon	<i>Timonius flavescens</i> p. 564
<i>Putat</i> -trees	Barringtonia p. 350
P.W.D. Tree	Ceiba p. 436
Queen Flower	<i>Lagerstrœmia flos-regince</i> p. 430
Rain-Tree	Enterolobium p. 412
<i>Rambutan</i> Oak	<i>Quercus lappacea</i> p. 303
Rat-tailed Croton	<i>Croton heterocarpum</i> p. 247
Red Beam	Angelesia p. 526
Red-berried Malayan Lilac	<i>Callicarpa farinosa</i> p. 698
Red-berried Pin-Flower Tree	<i>Glochidion leiostylum</i> p. 287
Red Berry	<i>Mallotus philippinensis</i> p. 272
Red Dhup	<i>Parishia insignis</i> p. 112
Red Earth-Fig	<i>Ficus cunia</i> p. 681
Red-flowered <i>Durian</i>	<i>Durio zibethinus</i> var. <i>roseiflorus</i> p. 439
Red-flowered Malayan Spindle-Tree	<i>Kurrimia robusta</i> p. 190
Red Frangipanni	<i>Plumeria rubra</i> p. 148
Red Isora	<i>Helicteres isora</i> p. 611
Red-leafed <i>Pulai</i>	<i>Alstonia angustifolia</i> p. 141
Red Pepper Tree	<i>Pithecellobium microcarpum</i> p. 421
Red <i>Putat</i>	<i>Barringtonia macrostachya</i> p. 355
Red Rain	Breynia p. 279
Red Lime-Berry	Micromelum p. 576
Red River-Fig	<i>Ficus glomerata</i> p. 684
Red Saraca	<i>Saraca declinata</i> p. 402
Red <i>Sentol</i>	Sandoricum p. 467
Red Tea-Tree	Leptospermum p. 505
Red <i>Teruntum</i>	<i>Lumnitzera littorea</i> p. 191
Red-tipped <i>Ru</i>	<i>Casuarina Junghuhniana</i> p. 188
Red Tree-Vine	<i>Leea rubra</i> p. 98
Red Waterberry	<i>Antidesma salicinum</i> p. 234
<i>Rengas</i> Trees	pp. 116, 118
Rhinoceros' Ear	<i>Crypteronia Griffithii</i> p. 199
Ribbed Bush-Fig	<i>Ficus pyriformis</i> p. 687
Ribbed Sea Apple	<i>Eugenia palembanica</i> p. 500
Rib-leafed Eugenia	<i>Eugenia valdevenosa</i> p. 504
Rice-weed	Rauwolfia p. 148
Ridley's Eugenia	<i>Eugenia Ridleyi</i> p. 503
River Aglaia	<i>Aglaia salicifolia</i> p. 457
River Dysoxylon	<i>Dysoxylon angustifolium</i> p. 461
River <i>Mempari</i>	<i>Pongamia pinnata</i> var. <i>xerocarpa</i> p. 375
River Millettia	<i>Millettia Hemsleyana</i> p. 373
River <i>Putat</i>	<i>Barringtonia conoidea</i> p. 354
River Rose Apple	<i>Eugenia densiflora</i> var. <i>angustifolia</i> p. 497
River Tarenna	<i>Tarenna fragrans</i> p. 560
River Tristania	<i>Tristania sumatrana</i> p. 510
Robin's Coffee	Prismatomeris p. 553
Rose Apple	<i>Eugenia jambos</i> p. 499
Rose Bauhinia	<i>Bauhinia rosea</i> p. 381
Rosebay	<i>Tabernaemontana</i> p. 148
Rose-family	Rosaceæ p. 524
Rose- <i>Kandis</i>	<i>Garcinia Forbesii</i> p. 316
Rose Myrtle	Rhodomyrtus p. 508
Rose of India	<i>Lagerstrœmia flos-regince</i> p. 430
Rose of Sharon	<i>Hibiscus mutabilis</i> p. 441
Rose of the Mountain	<i>Brownia grandiceps</i> p. 385
Rough Laurel	Gironniera p. 688

INDEX TO ENGLISH NAMES

Rough-leaved Stem-Fig ..	<i>Ficus hispida</i> p. 685
Rough Trema ..	<i>Trema orientalis</i> p. 694
Rubber Tree ..	Hevea p. 256
Rubber-Tree family ..	Euphorbiacæ p. 222
Rue ..	Ruta p. 565
Rugged Oil-Fruit ..	<i>Elæocarpus floribundus</i> p. 639
<i>Rukam</i> -family ..	Flacourtiacæ p. 305
Russet Stem-Fig ..	<i>Ficus Miquelii</i> p. 685
Rusty-leaved Bush-Fig ..	<i>Ficus diversifolia</i> p. 687
Rusty Oil-Fruit ..	<i>Elæocarpus ferrugineus</i> p. 638
Rusty Sterculia ..	<i>Sterculia rubiginosa</i> p. 621
Sabre Leaf ..	Drypetes p. 248
Saffrol Laurel ..	<i>Cinnamomum parthenoxyylon</i> p. 341
Sapodilla ..	Achras p. 598
Sappan Tree ..	<i>Cæsalpinia sappan</i> p. 386
Sapucaia Nut ..	Lecythis p. 350
Saraca ..	Saraca p. 399
Saraca-Fig ..	<i>Ficus lepicarpa</i> p. 683
Satinwood Tree ..	Chloroxylon p. 460
Saus. ge Tree ..	Kigelia p. 161
Scaly <i>Rengas</i> ..	<i>Melanorrhæa</i> sp. p. 121
Scarlet Brownea ..	<i>Brownea coccinea</i> p. 385
Scented Oleander ..	<i>Nerium indicum</i> p. 146
Schima ..	Schima p. 630
Scortechini's Leechwood ..	<i>Anisophyllea Scortechinii</i> p. 125
Scortechini's Oak ..	<i>Quercus Scortechinii</i> p. 304
Scortechini's <i>Putat</i> ..	<i>Barringtonia Scortechinii</i> p. 355
Scurfy Nutmeg ..	<i>Knema furfuracea</i> p. 476
Scurfy <i>Putat</i> ..	<i>Barringtonia fusiformis</i> p. 354
Sea Albizzia ..	<i>Albizzia retusa</i> p. 411
Sea Almond ..	<i>Terminalia catappa</i> p. 193
Sea Apple ..	<i>Eugenia grandis</i> p. 498
Sea Beam ..	<i>Parinarium corymbosum</i> p. 527
Sea Bilberry ..	Vaccinium p. 219
Sea Ebony ..	<i>Diospyros ferrea</i> p. 216
Sea Fig ..	<i>Ficus superba</i> p. 679
Sea <i>Gutta</i> ..	Planchonella p. 602
Sea Hearse ..	Hernandia p. 323
Sea Hibiscus ..	<i>Hibiscus ilicæus</i> p. 442
Sea-Lettuce family ..	Goodeniacæ p. 309
Sea-Lettuce Tree ..	Scævola p. 310
Sea Lime ..	Atalantia p. 567
Sea Olive ..	<i>Olea brachiata</i> p. 514
Sea <i>Putat</i> ..	<i>Barringtonia asiatica</i> p. 353
Sea <i>Randa</i> ..	Guettarda p. 542
Seashore Ardisia ..	<i>Ardisia elliptica</i> p. 480
Seashore Mangosteen ..	<i>Garcinia Hombrowiana</i> p. 318
Seashore <i>Mempari</i> ..	Pongamia p. 375
Seashore Nutmeg ..	<i>Myristica quatterifolia</i> p. 478
Seashore Timon ..	<i>Timonius compressicaulis</i> p. 563
Sea Teak ..	<i>Podocarpus polystachyus</i> p. 724
Sea Tristania ..	<i>Tristania obovata</i> p. 509
Sea Trumpet ..	<i>Gordia subcordata</i> p. 176
Sea Vetch-Tree ..	Desmodium p. 367
<i>Sena</i> ..	Pterocarpus p. 375
<i>Sendudok</i> -family ..	Melastomacæ p. 445
Senna ..	Cassia p. 386
<i>Sentol</i> -family ..	Meliacæ p. 453
Sesban ..	Sesbania p. 376
Seven Golden Candlesticks ..	<i>Cassia alata</i> p. 388
Shabby <i>Mahang</i> ..	<i>Macaranga aff. populifolia</i> p. 269
Shaddock ..	<i>Citrus grandis</i> p. 569
Shaggy-barked Eugenia ..	<i>Eugenia punctulata</i> p. 502
Shining Oak ..	<i>Quercus lucida</i> p. 304

INDEX TO ENGLISH NAMES

Shiny Laurel	..	<i>Lindera lucida</i> p. 346
Shiny <i>Tampang</i>	..	<i>Artocarpus Gomezianus</i> p. 654
Shoe Flower	..	<i>Hibiscus rosa-sinensis</i> p. 442
Shore Eugenia	..	<i>Eugenia grata</i> p. 498
Shore Laurel	..	<i>Neolitsea</i> p. 349
Shrub-Sterculia	..	<i>Sterculia levis</i> p. 620
		<i>S. parvifolia</i> p. 621
Shrubby <i>Simpoh</i>	..	<i>Wormia suffruticosa</i> p. 207
Siamese Pom-Pom Tree	..	<i>Mallotus barbatus</i> p. 270
Siamese <i>Putat</i>	..	<i>Barringtonia edaphocarpa</i> p. 354
Siamese Rough Bush	..	<i>Streblus</i> p. 692
Siamese Terminalia	..	<i>Terminalia bellerica</i> p. 193
Siamese White <i>Ixora</i>	..	<i>Ixora Finlaysonianana</i> p. 546
Silky Oak	..	Grevillea p. 518
Silky Oil-Fruit	..	<i>Elaeocarpus polystachyus</i> p. 640
Silver Back	..	Rhodamnia p. 507
Silver Bush	..	Sophora p. 377
Silver Croton	..	<i>Croton argyратum</i> p. 247
Silver-leafed Ebony	..	<i>Diospyros argentea</i> p. 215
Silver Timon	..	<i>Timonius Wallichianus</i> p. 564
<i>Simpoh</i> -family	..	Dilleniaceæ p. 201
Singapore Oak	..	<i>Quercus conocarpa</i> p. 302
Singapore Pin-Flower Tree	..	<i>Glochidion singaporense</i> p. 288
Singapore Rhododendron	..	<i>Melastoma malabathricum</i> p. 447
Siris Tree	..	<i>Albizzia lebbek</i> p. 410
Small-leafed Nutmeg	..	<i>Knema missionis</i> p. 477
Small-leafed Oil-Fruit	..	<i>Elaeocarpus Mastersii</i> p. 639
Smooth-barked <i>Mempat</i>	..	<i>Cratoxylon ligustrinum</i> p. 327
Smooth Trema	..	<i>Trema cannabina</i> var. <i>glabrescens</i> p. 694
Snake Tree	..	<i>Stereospermum fimbriatum</i> p. 172
Soap Nut	..	<i>Sapindus</i> p. 595
Soap Nut family	..	Sapindaceæ p. 581
Sooty Ebony	..	<i>Diospyros dictyonoura</i> p. 215
Sorrowless Tree	..	<i>Saraca indica</i> p. 402
Sour <i>Kelat</i>	..	<i>Eugenia Cumingiana</i> p. 496
Soursop	..	<i>Annona muricata</i> p. 130
Spanish Plum	..	Spondias p. 115
Sparrow's Mango	..	Buchanania p. 102
Speckled Eranthemum	..	<i>Pseuderanthemum reticulatum</i> p. 96
Speckled-leafed Fig	..	<i>Ficus chartacea</i> p. 682
Spicate Eugenia	..	<i>Eugenia spicata</i> p. 503
Spike Oak	..	<i>Quercus spicata</i> p. 304
Spindle Tree	..	see Celastraceæ p. 189
		Kurrimia p. 189
Spiny Oak	..	<i>Quercus discocarpa</i> p. 302
Splay-Berry Tree	..	Pittosporum p. 517
Spoon Tree	..	Endospermum p. 250
Spurge Trees	..	Euphorbia p. 252
Squirrel's <i>Durian</i>	..	<i>Durio Griffithii</i> p. 438
Squirrel's Jack	..	<i>Artocarpus kemando</i> p. 656
		<i>A. Maingayi</i> p. 657
Squirrel's Jujube	..	<i>Zizyphus cœnopia</i> p. 520
Squirrel's Oak	..	<i>Quercus costata</i> p. 302
Star Apple	..	Chrysophyllum p. 599
Star Tarenna	..	<i>Tarenna stellulata</i> p. 562
Stem <i>Durian</i>	..	<i>Durio testudinarum</i> p. 439
Stem Dysoxylon	..	<i>Dysoxylon cauliflorum</i> p. 462
Stem Ebony	..	<i>Diospyros cauliflora</i> p. 215
Stem-Figs	..	see <i>Ficus</i> pp. 659, 673, 684
Sterculia	..	<i>Sterculia</i> p. 618
Stilted <i>Antoi</i>	..	Xylopia p. 136
Stilted Eugenia	..	<i>Eugenia papillosa</i> p. 501
Stilted Oil-Fruit	..	<i>Elaeocarpus littoralis</i> p. 639
Stilted <i>Simpoh</i>	..	<i>Dillenia reticulata</i> p. 205
		<i>D. grandifolia</i> p. 203
Stinging Fig	..	<i>Ficus fulva</i> p. 682

INDEX TO ENGLISH NAMES

Stinking Mahogany	..	Cedrela p. 459
St. John's Wort family	..	Hypericaceæ p. 324
Strangling Figs	..	Ficus pp. 664, 670, 674
String Bush	..	<i>Cordia cylindristachya</i> p. 176
Strychnine-family	..	Loganiaceæ p. 422
Strychnine Plant	..	<i>Strychnos nux-vomica</i> p. 422
Sugar Apple	..	<i>Annona squamosa</i> p. 131
Sumatran <i>Putat</i>	..	<i>Barringtonia sumatrana</i> p. 356
Sumatran <i>Ru</i>	..	<i>Casuarina sumatrana</i> p. 189
Sunda Oak	..	<i>Quercus sundaca</i> p. 305
Sunflower-family	..	Compositæ p. 195
Sun Laurel	..	Phœbe p. 343
Swaddling Flower	..	<i>Clerodendron lævifolium</i> p. 701
Swallow Tail Bush	..	Alchornea p. 230
Swamp Ant- <i>Mahang</i>	..	<i>Macaranga punctulata</i> p. 267
Swamp <i>Mahang</i>	..	<i>Macaranga recurvata</i> p. 267
Swamp Nutmeg	..	<i>Myristica elliptica</i> p. 477
Swamp <i>Rengas</i>	..	<i>Melanocchyla auriculata</i> p. 119
Sweet Rue-tree	..	<i>Glycosmis chlorosperma</i> p. 575
Sweet Sop	..	<i>Annona squamosa</i> p. 131
Swollen <i>Kelat</i>	..	<i>Eugenia tumida</i> p. 504
Sycamore	..	Acer p. 582
Tahan Agathis	..	<i>Agathis flavescens</i> p. 717
Tahitian Chestnut	..	Inocarpus p. 394
Tailor Tree	..	Decaspermum p. 485
Tallow-Wood	..	<i>Ximelia</i> p. 728
Tamalan	..	<i>Dalbergia Oliveri</i> p. 366
Tamarind	..	Tamarindus p. 404
Tangerine	..	<i>Citrus nobilis</i> p. 568
Tanjong Tree	..	Mimusops p. 600
Tapioca plant	..	Manihot p. 273
Tarennia	..	Tarennia p. 559
Tea Bush	..	Camellia p. 624
Tea-family	..	Ternstroemiaceæ p. 624
Tea Tree	..	Leptospermum p. 505
Teak	..	Tectona p. 705
Tecoma	..	Stenolobium p. 170
Teku Teak	..	<i>Podocarpus deflexus</i> p. 723
Temple Flower	..	Plumeria p. 147
Temple Tree	..	Plumeria p. 147
Tenasserim Pine	..	<i>Pinus Merkusii</i> p. 722
Ten Men	..	<i>Ixonanthes reticulata</i> p. 222
Terminalia-family	..	Combretaceæ p. 191
Thick-leafed Eugenia	..	<i>Eugenia pachyphylla</i> p. 500
Thorn <i>Randa</i>	..	<i>Randia spinosa</i> p. 557
Thornless Rukam	..	<i>Flacourtia inermis</i> p. 307
Thorny Hog-Plum	..	<i>Spondias lutea</i> p. 115
Thorny Ivy-Rue	..	<i>Zanthoxylum myriacanthum</i> p. 579
Thorny Tree-Vine	..	<i>Leea angulata</i> p. 97
Thread Eugenia	..	<i>Eugenia filiformis</i> p. 497
Tiger's Claw	..	<i>Erythrina indica</i> p. 370
Tiger Flower	..	Melastoma p. 445
Timon	..	Timonius p. 562
Tit-Berry	..	Allophylus p. 584
Toothed Guelder Rose	..	<i>Viburnum lutescens</i> p. 183
Tree-Avens	..	<i>Cratoxylon cochinchinense</i> p. 325
Tree-Crinum	..	<i>Randia stenopetala</i> p. 557
Tree-Daisy	..	Montanoa p. 196
Tree-Hibiscus	..	Hibiscus p. 441
Tree of Glory	..	<i>Artocarpus anisophyllus</i> p. 652
Tree of Heaven family	..	Simarubaceæ p. 602
Tree of Sadness	..	Nyctanthes p. 513
Tree Tomate	..	Cyphomandra p. 605
Tree Vernonia	..	Vernonia p. 196

INDEX TO ENGLISH NAMES

Tree Vines	..	Leea p. 97
Trema	..	Trema p. 693
Tristania	..	Tristania p. 508
Trogon Ixora	..	<i>Ixora coccinea</i> p. 546
True Croton	..	<i>Croton tiglium</i> p. 248
Trumpet Eugenia	..	<i>Eugenia claviflora</i> p. 495
Trumpet Flower	..	Thevetia p. 152
Tulip Tree	..	Spathodea p. 169
Tung Oil	..	Aleurites p. 230
Turn-in-the-Wind	..	Mallotus p. 270, <i>M. paniculatus</i> p. 272
Twenty Men	..	<i>Ixonanthes icosandra</i> p. 221
Twin-Apple	..	Ochrosia p. 147
Twin-seed	..	Anaxagorea p. 129
Upas Tree	..	Antiaris p. 648
Variegated Bauhinia	..	<i>Bauhinia variegata</i> p. 382
Variegated Coral-Tree	..	<i>Erythrina Parcellii</i> p. 370
Variegated Eranthemum	..	<i>Pseuderanthemum acuminatissimum</i> p. 96
Vegetable Humming Bird	..	<i>Sesbania</i> p. 376
Verbena-family	..	Verbenaceae p. 695
Vetch-Tree	..	<i>Derris dalbergioides</i> p. 366
Village Ardisia	..	<i>Ardisia crispa</i> p. 480
Village <i>Kandis</i>	..	<i>Garcinia cowa</i> p. 315
Village Rue	..	<i>Glycosmis pentaphylla</i> p. 574
Violet Bauhinia	..	<i>Bauhinia violacea</i> p. 383
Vitex	..	Vitex p. 706
Wallich's Chestnut	..	<i>Castanopsis Wallichii</i> p. 293
Wallich's Ebony	..	<i>Diospyros Wallichii</i> p. 217
Wallich's Oak	..	<i>Quercus Wallichiana</i> p. 305
Wallich's Pin-Flower Tree	..	<i>Glochidion Wallichianum</i> p. 289
Wallich's <i>Rengas</i>	..	<i>Melanorrhoea Wallichii</i> p. 120
Walnut-family	..	Juglandaceae p. 330
Walnut Oil-Fruit	..	<i>Elaeocarpus nitidus</i> p. 640
Wampi, Wampoi	..	<i>Clausena lansium</i> p. 571
Water Apple	..	<i>Eugenia aquea</i> p. 494
Water Gardenia	..	<i>Gardenia tubifera</i> p. 541
Water <i>Rengas</i>	..	<i>Gluta velutina</i> p. 118
Wax Apple	..	<i>Eugenia javanica</i> p. 499
Weeping <i>Ru</i>	..	<i>Casuarina Rumphiana</i> p. 188
Weeping Willow	..	<i>Salix</i> sp. p. 581
Wenzig's Oak	..	<i>Quercus Wenzigiana</i> p. 305
West Indian Bauhinia	..	<i>Bauhinia megalandra</i> p. 380
West Indian Locust Tree	..	<i>Hymenoclea</i> p. 394
West Indian Mahogany	..	<i>Savietenia mahogani</i> p. 469
White Bauhinia	..	<i>Bauhinia acuminata</i> p. 379
White-berried Malayan Lilac	..	<i>Callicarpa longifolia</i> p. 698
White <i>Chempaka</i>	..	<i>Michelia alba</i> p. 433
White Gardenia	..	<i>Gardenia augusta</i> p. 539
White Gutta	..	<i>Palaquium obovatum</i> p. 601
White Isora	..	<i>Helicteres viscida</i> p. 612
White <i>Kelat</i>	..	<i>Eugenia verecunda</i> p. 504
White Kopsia	..	<i>Kopsia singapurensis</i> p. 146
White-leafed Fig	..	<i>Ficus alba</i> p. 681
White <i>Mahang</i>	..	<i>Macaranga hypoleuca</i> p. 266
White <i>Mempat</i>	..	<i>Cratoxylon Maingayi</i> p. 327
White Millettia	..	<i>Millettia albiflora</i> p. 373
White Needles	..	<i>Ixora nigricans</i> p. 547
White Pavetta	..	<i>Pavetta indica</i> p. 552
White <i>Pelong-Tree</i>	..	<i>Pentaspadon officinale</i> p. 113
White Silk Cotton Tree	..	<i>Ceiba</i> p. 436
White <i>Simpoh</i>	..	<i>Wormia Beccariana</i> p. 205
White <i>Teruntum</i>	..	<i>Lumnitzera racemosa</i> p. 191
White Thorn- <i>Randa</i>	..	<i>Randia tomentosa</i> p. 557
White Waterberry	..	Flueggea p. 255
White Wood	..	Melaleuca p. 506
Wicked Heart	..	<i>Adenantha bicolor</i> p. 408

INDEX TO ENGLISH NAMES

Widjet Wood	..	<i>Erythrina indica</i> p. 370
Wild Beaked <i>Kandis</i>	..	<i>Garcinia nigrolimeata</i> p. 319
Wild Castor Oil	..	<i>Mallotus peltatus</i> p. 272
		<i>M. Porterianus</i> p. 273
Wild Cinnamon	..	Cinnamomum p: 339
		<i>C. iners</i> p. 340
Wild Cocaine	..	<i>Erythroxylon cuneatum</i> p. 220
Wild <i>Durian</i>	..	Durio p. 437
		<i>D. oblongus</i> p. 438
Wild <i>Kapok</i>	..	Salmalia p. 443
Wild Nutmeg-trees	..	see Myristicaceæ p. 472
Wild <i>Randa</i>	..	<i>Randia anisophylla</i> p. 555
		<i>R. densiflora</i> p. 555
		<i>R. Scortechinii</i> p. 556
Wild Rose Apple	..	<i>Eugenia densiflora</i> p. 497
Wild Yellow <i>Kandis</i>	..	<i>Garcinia parvifolia</i> p. 319
Willow	..	Salix p. 580
Willow-leaved Oil-Fruit	..	<i>Elaeocarpus salicifolius</i> p. 641
Willow Spurge	..	Homonoia p. 258
Witches' Tongues	..	Clerodendron p. 700
Witch-Hazel family	..	Hamamelidaceæ p. 320
Wodier Tree	..	Lanea p. 105
Wood Apple	..	Feronia p. 573
Wooden-leaved Fig	..	<i>Ficus xylophylla</i> p. 680
Woodland Croton	..	<i>Croton laevifolium</i> p. 247
Woolly Pin-Flower Tree	..	<i>Glochidion sericeum</i> p. 288
Woolly <i>Ru</i>	..	<i>Dacrydium comosum</i> p. 721
Yellow <i>Batai</i>	..	<i>Peltophorum dasyrachis</i> p. 399
Yellow Bauhinia	..	<i>Bauhinia tomentosa</i> p. 382
Yellow Bells	..	<i>Stenolobium</i> p. 170
Yellow Cotton-Tree	..	Cochlospermum p. 174
Yellow-Eyed Cerbera	..	<i>Cerbera odollam</i> p. 144
Yellow Flame	..	<i>Peltophorum pterocarpum</i> p. 398
Yellow Hairy Fig	..	<i>Ficus chrysocarpa</i> p. 682
Yellow-leaved Pin-Flower Tree	..	<i>Glochidion obscurum</i> p. 287
Yellow Oleander	..	Thevetia p. 152
Yellow Pagoda Flower Tree	..	Deplanchea p. 163
Yellow Peacock-Flower	..	<i>Casalpinia pulcherrima</i> p. 386
Yellow Saraca	..	<i>Saraca thaipingensis</i> p. 403
Yellow <i>Sentol</i>	..	Sandoricum p. 468
Yellow Snake Tree	..	<i>Stereospermum chelonoides</i> p. 172
Yellow Silk Cotton-Tree	..	Cochlospermum p. 174
Yellow Vitex	..	<i>Vitex gamosepala</i> p. 708
		<i>V. longisepala</i> p. 708
		<i>V. vestita</i> p. 711
Yemane	..	<i>Gmelina arborea</i> p. 702
Yew	..	Gymnospermæ p. 711
Ylang-Ylang	..	Canangium p. 131

INDEX TO MALAY NAMES

(the words *Pohon*, *Pokok*, *Kayu*, *Akar*, *Dunn*, *Kulit*, *Bunga*, *Buah*, *Biji* are omitted unless habitually part of the Malay name)

<i>Acheh</i>	..	<i>Mangifera</i> p. 110
<i>Ambong Ambong</i>	..	<i>Scavola frutescens</i> p. 310
<i>Angkut Angkut, Angkut Besi</i>	..	<i>Commersonia</i> p. 609
<i>Angsana</i>	..	<i>Pterocarpus indicus</i> p. 375
<i>Antoi</i>	..	<i>Drepananthus</i> p. 133, <i>Xylopia</i> p. 136
<i>Apa Apa</i>	..	<i>Neesia</i> p. 443
<i>Api Api</i>	..	<i>Avioennia</i> p. 696
<i>Ara</i>	..	<i>Ficus</i> p. 667
<i>Ara Batu</i>	..	<i>Ficus</i> p. 667
<i>Ara Bukit</i>	..	<i>Ficus</i> p. 667
<i>Ara Kelepong</i>	..	<i>Ficus</i> p. 667 (Stem-Fig)
<i>Ara Kelumpang</i>	..	<i>Ficus</i> p. 667 (Stem-Fig)
<i>Ara Laut</i>	..	<i>Ficus</i> p. 667, <i>F. superba</i> p. 679
<i>Ara Lempong</i>	..	<i>Ficus</i> p. 667 (Stem-Fig)
<i>Ara Paya</i>	..	<i>Ficus</i> p. 667
<i>Ara Pom Pom</i>	..	<i>Ficus</i> p. 667 (Stem-Fig)
<i>Ara Tanah</i>	..	<i>Ficus</i> p. 667 (Earth-Fig)
<i>Arang</i>	..	<i>Diospyros</i> p. 213, <i>Cratoxylon</i> p. 325
<i>Aru</i>	..	<i>Casuarina</i> p. 185
<i>Asam</i>	..	<i>Tamarindus</i> p. 404
<i>Asam Damat</i>	..	<i>Grewia fibrocarpa</i> p. 643
<i>Asam Garam</i>	..	<i>Garcinia nervosa</i> p. 318
<i>Asam Gelugor</i>	..	<i>Garcinia atroviridis</i> p. 314
<i>Asam Kumbang</i>	..	<i>Mangifera quadrifida</i> p. 111
<i>Asam Jawa</i>	..	<i>Tamarindus</i> p. 404
<i>Asam Melaka</i>	..	<i>Emblca officinalis</i> p. 282
<i>Ayer</i>	..	<i>Mangifera</i> p. 110
<i>Bachang</i>	..	<i>Mangifera foetida</i> p. 109
<i>Baka</i>	..	<i>Erythroxylon</i> p. 220
<i>Bakau</i>	..	<i>Rhizophora</i> p. 520
<i>Balai, Balai Balai</i>	..	<i>Aralidium pinnatifidum</i> p. 154
<i>Balau</i>	..	<i>Shorea</i> p. 212
<i>Balek Angin</i>	..	<i>Mallotus</i> p. 269, <i>Macaranga</i> p. 261
<i>Balong Hijau</i>	..	<i>Epiprinus malayanus</i> p. 252
<i>Bangau</i>	..	<i>Glochidion</i> p. 283
<i>Bangkeh</i>	..	<i>Eugenia claviflora</i> p. 495
<i>Bangkoh</i>	..	<i>Eugenia claviflora</i> p. 495
<i>Bangkong</i>	..	<i>Artocarpus integer</i> p. 655
<i>Baroh</i>	..	<i>Artocarpus integer</i> p. 655
<i>Baru, Baru Baru</i>	..	<i>Hibiscus macrophyllus</i> p. 441
		<i>Hibiscus tiliaceus</i> p. 442, <i>Thespesia</i> p. 444
<i>Baru Laut</i>	..	<i>Hibiscus tiliaceus</i> p. 442
		<i>Thespesia</i> p. 444
<i>Basong</i>	..	<i>Alstonia spathulata</i> p. 142
<i>Batai</i>	..	<i>Albizzia falcata</i> p. 409, <i>Cassia timoriensis</i> p. 390
		<i>Derris dalbergioides</i> p. 366
		<i>Peltophorum</i> p. 398
<i>Batai Laut</i>	..	<i>Peltophorum ferrugineum</i> p. 398
<i>Batalong</i>	..	<i>Terminalia pyrifolia</i> p. 194
<i>Batoh</i>	..	(see <i>Batu</i>)
<i>Batu</i>	..	<i>Angelesia</i> p. 526
		<i>Chaetocarpus</i> p. 244
		<i>Parinariium corymbosum</i> p. 527
<i>Bayu, Bayur</i>	..	<i>Pterospermum</i> p. 615
<i>Bayur Bukit</i>	..	<i>Schoutenia acrescens</i> p. 645
<i>Bebaru</i>	..	<i>Hibiscus macrophyllus</i> p. 441
		<i>Hibiscus tiliaceus</i> p. 442, <i>Thespesia</i> p. 444

INDEX TO MALAY NAMES

<i>Beberah</i>	..	<i>Fagraea crenulata</i> p. 423
<i>Beberas</i>	..	<i>Antidesma</i> p. 231, <i>Chasalia</i> p. 536
		<i>Eurya</i> p. 628, <i>Rauwolfia</i> p. 148
<i>Bebeti</i>	..	<i>Flueggea</i> p. 255
<i>Bebirah</i>	..	<i>Fagraea crenulata</i> p. 423
<i>Bebulan</i>	..	<i>Endospermum</i> p. 251
<i>Bebuloh</i>	..	<i>Pellacalyx</i> p. 523
<i>Bebuas</i>	..	<i>Premna corymbosa</i> p. 705
<i>Bebuas Bukit</i>	..	<i>Viburnum sambucinum</i> p. 183
<i>Bebuat</i>	..	<i>Premna</i> p. 704
<i>Bebuta</i>	..	<i>Cerbera</i> p. 143, <i>Excoecaria</i> p. 254
<i>Bedara</i>	..	<i>Zizyphus jujuba</i> p. 519
		<i>Nephelium malaiense</i> p. 592
<i>Bedara China</i>	..	<i>Zizyphus jujuba</i> p. 519
<i>Bedara Laut</i>	..	<i>Ximenia</i> p. 728
<i>Bedara Pahit</i>	..	<i>Eurycoma</i> p. 604
<i>Bedil Nyamok</i>	..	<i>Diospyros argentea</i> p. 215
<i>Begandai</i>	..	<i>Diospyros dictyoneura</i> p. 215
<i>Beka</i>	..	<i>Oroxylum</i> p. 166, <i>Pajanelia</i> p. 167
<i>Beka Grian</i>	..	<i>Pajanelia</i> p. 167
<i>Beka Kampong</i>	..	<i>Oroxylum</i> p. 166
<i>Beka Utan</i>	..	<i>Pajanelia</i> p. 167
<i>Bekoi, Bekwoi</i>	..	<i>Crypteronia paniculata</i> p. 199
<i>Bel</i>	..	<i>Aegle</i> p. 567
<i>Belalang Puak</i>	..	<i>Pittosporum</i> p. 517
<i>Belangan</i>	..	<i>Cynometra inaequifolia</i> p. 392
<i>Belian</i>	..	see <i>Sapotaceae</i> p. 597
<i>Belimbing</i>	..	<i>Averrhoa</i> p. 516
<i>Belimbing Buloh</i>	..	<i>Averrhoa bilimbi</i> p. 516
<i>Belimbing Manis, B. Sagi</i>	..	<i>Averrhoa carambola</i> p. 516
<i>Belinggai</i>	..	<i>Feronia</i> p. 573
<i>Belinjau</i>	..	<i>Gnetum</i> p. 726
<i>Beluchus</i>	..	<i>Cratoxylum</i> p. 324, <i>C. ligustrinum</i> p. 327
<i>Beluntas</i>	..	<i>Pluchea</i> p. 196
<i>Bendara</i>	..	<i>Nephelium malaiense</i> p. 592
<i>Bendarong</i>	..	<i>Trema</i> p. 694
<i>Bengkai, Bengkal</i>	..	<i>Nauclea</i> p. 551
<i>Bengkal Batu</i>	..	<i>Neonauclea</i> p. 551
<i>Bengkudru</i>	..	<i>Morinda</i> p. 549
<i>Bengkulang</i>	..	<i>Tarrietia</i> p. 622
<i>Berah</i>	..	<i>Fagraea crenulata</i> p. 423
<i>Berangan</i>	..	<i>Castanopsis</i> p. 292
<i>Berangan Babi</i>	..	<i>Quercus</i> p. 299
<i>Berangan Duri</i>	..	<i>Castanopsis</i> p. 292
<i>Beras, Beras Beras</i>	..	<i>Chasalia</i> p. 536, <i>Antidesma</i> p. 232
		<i>Eurya</i> p. 628, <i>Rauwolfia</i> p. 148
<i>Beras Hitam</i>	..	<i>Chasalia</i> p. 536
<i>Bereh</i>	..	<i>Quercus</i> p. 299
<i>Bereksa</i>	..	<i>Cassia nodosa</i> p. 389
<i>Berembang</i>	..	<i>Sonneratia</i> p. 431
<i>Berembang Bukit</i>	..	<i>Duabanga</i> p. 427
<i>Berembang Darat</i>	..	<i>Duabanga</i> p. 427
<i>Beresah</i>	..	<i>Cassia nodosa</i> p. 389
<i>Bergolak</i>	..	<i>Saraca</i> p. 400
<i>Berih</i>	..	<i>Quercus</i> p. 299
<i>Beringin</i>	..	<i>Ficus benjamina</i> p. 675
<i>Bermah</i>	..	<i>Duabanga</i> p. 427
<i>Bernam</i>	..	<i>Glochidion sericeum</i> p. 288
<i>Berombong</i>	..	<i>Adina</i> p. 532, <i>Timonius</i> p. 562
<i>Berubong</i>	..	<i>Adina</i> p. 532, <i>Timonius</i> p. 562
<i>Berunat</i>	..	<i>Antidesma</i> p. 232, <i>A. bunius</i> p. 233
<i>Berus</i>	..	<i>Bruguiera</i> p. 520
<i>Berus Berus</i>	..	<i>Kandelia</i> p. 520
<i>Betek</i>	..	<i>Carica</i> p. 184, <i>Derris</i> p. 366
<i>Beti, Beti Beti</i>	..	<i>Flueggea</i> p. 255
<i>Beti Ayer</i>	..	<i>Flueggea</i> p. 255
<i>Betis</i>	..	see <i>Sapotaceae</i> p. 597

INDEX TO MALAY NAMES

<i>Bidara</i>	..	<i>Nephelium malaiense</i> p. 592
<i>Bila</i>	..	<i>Aegle</i> p. 567
<i>Binjau</i>	..	<i>Mangifera cœsia</i> p. 108
<i>Bintangor, B. Batu</i>	..	<i>Calophyllum</i> p. 311
<i>Birah</i>	..	<i>Fagraea crenulata</i> p. 423
<i>Bitis</i>	..	see <i>Sapotaceæ</i> p. 597
<i>Bonglai, B. Kayu</i>	..	<i>Oroxylum</i> p. 166
<i>Bruas</i>	..	<i>Garcinia Hombroniana</i> p. 318
<i>Brunai</i>	..	see <i>Berunai</i>
<i>Buah Ca-na</i>	..	<i>Canarium album</i> p. 178
<i>Buah Cheri</i>	..	<i>Muntingia</i> p. 644
<i>Buah Kenari</i>	..	<i>Canarium commune</i> p. 178
<i>Buah Keras</i>	..	<i>Aleurites</i> p. 231
<i>Buah Keras Laut</i>	..	<i>Hernandia</i> p. 323
<i>Buah Lerak</i>	..	<i>Sapindus mukorossi</i> p. 595
<i>Buah Meniega</i>	..	<i>Diospyros discolor</i> p. 216
<i>Buah Saklat</i>	..	<i>Diospyros discolor</i> p. 216
<i>Buah Sakor</i>	..	<i>Xerospermum</i> p. 597
<i>Buah Saminyak</i>	..	<i>Sapium indicum</i> p. 277
<i>Buah Tampayang</i>	..	<i>Scaphium</i> p. 616
<i>Buas Buas</i>	..	<i>Premna corymbosa</i> p. 705
<i>Buas Buas Bukit</i>	..	<i>Viburnum sambucinum</i> p. 183
<i>Buey, Bui</i>	..	<i>Diospyros</i> p. 214
<i>Bujang Semalam</i>	..	<i>Tarenna fragrans</i> p. 560
<i>Bulai, B. Kayu</i>	..	<i>Oroxylum</i> p. 166
<i>Bulan Bulan</i>	..	<i>Endospermum</i> p. 251
<i>Bulang, Bulangan</i>	..	<i>Gmelina</i> p. 702
<i>Buloh, Buloh Buloh</i>	..	<i>Pellacalyx</i> p. 523
<i>Bulongan</i>	..	<i>Gmelina</i> p. 702
<i>Bunga China</i>	..	<i>Gardenia augusta</i> p. 539
<i>Bunga Jarum</i>	..	<i>Ixora</i> p. 543, <i>Pavetta</i> p. 552
<i>Bunga Jepon</i>	..	<i>Thevetia</i> p. 152
<i>Bunga Kubor</i>	..	<i>Plumeria</i> p. 147
<i>Bunga Panggil</i>	..	<i>Clerodendron</i> p. 699
<i>Bunga Pepulut</i>	..	<i>Hibiscus rosa-sinensis</i> p. 442
<i>Bunga Pompun</i>	..	<i>Anaxagorea</i> p. 129
<i>Bunga Raya</i>	..	<i>Hibiscus rosa-sinensis</i> p. 442
<i>Bunga Siam</i>	..	<i>Acacia Farnesiana</i> p. 406
<i>Bunga Tujok Susun</i>	..	<i>Tabernaemontana divaricata</i> p. 151
<i>Bungor</i>	..	<i>Lagerstrœmia</i> p. 429
<i>Bungor Melukut</i>	..	<i>Lagerstrœmia ovalifolia</i> p. 430
<i>Bungor Raya</i>	..	<i>Lagerstrœmia flos-reginæ</i> p. 430
<i>Buni</i>	..	<i>Antidesma bunius</i> p. 233
<i>Bunoh</i>	..	<i>Ficus</i> p. 667
<i>Bunoh Seteroh</i>	..	<i>Ficus elastica</i> p. 677
<i>Bunut</i>	..	<i>Ficus</i> p. 667
<i>Busok Busok</i>	..	<i>Cassia nodosa</i> p. 389
<i>Buta Buta</i>	..	<i>Cerbera</i> p. 143, <i>Excoecaria</i> p. 254
<i>Butong</i>	..	<i>Barringtonia asiatica</i> p. 353
<i>Butun</i>	..	<i>Barringtonia asiatica</i> p. 353
<i>Ca-na</i>	..	<i>Canarium album</i> p. 178
<i>Cha</i>	..	<i>Camellia</i> p. 624
<i>Cha Antan</i>	..	<i>Schima</i> p. 630
<i>Chachah</i>	..	<i>Stereospermum fimbriatum</i> p. 172
<i>Chahar</i>	..	<i>Pithecellobium clypearia</i> p. 419
<i>Chama</i>	..	<i>Clausena excavata</i> p. 571, <i>Micromelum</i> p. 575
<i>Champenai</i>	..	<i>Homonoia</i> p. 258
<i>Changgal Petri</i>	..	<i>Antidesma salicinum</i> p. 234
<i>Changkoh</i>	..	<i>Engelhardtia nudiflora</i> p. 333
<i>Chapak</i>	..	<i>Schima</i> p. 630
<i>Chapak Besi</i>	..	<i>Melochia</i> p. 613, <i>Callicarpa</i> p. 697, <i>Blumea</i> p. 196
<i>Chapai</i>	..	<i>Callicarpa</i> p. 697
<i>Chapok</i>	..	<i>Callicarpa</i> p. 697
<i>Chawan</i>	..	<i>Antidesma salicinum</i> p. 234
	..	<i>Melanolepis</i> p. 274

<i>Chedon</i>	..	<i>Ficus cunia</i> p. 681
<i>Chekop Manis Gajah</i>	..	<i>Clerodendron laevifolium</i> p. 701
<i>Chekring</i>	..	<i>Erythrina fusca</i> p. 370
		<i>Zanthoxylum myriacanthum</i> p. 579
<i>Chelagi</i>	..	<i>Tamarindus</i> p. 404
<i>Chemama</i>	..	<i>Clausena excavata</i> p. 571
		<i>Micromelum</i> p. 575
<i>Chemekian</i>	..	<i>Croton tiglium</i> p. 248
<i>Chempaka</i>	..	<i>Gardenia</i> p. 538, <i>Michelia</i> p. 433
		<i>Plumeria</i> p. 147
<i>Chempaka Ambon</i>	..	<i>Michelia figo</i> p. 434
<i>Chempaka Biru</i>	..	<i>Gardenia</i> p. 538, <i>Michelia</i> p. 433
		<i>Plumeria</i> p. 147
<i>Chempaka Merah</i>	..	<i>Michelia champaca</i> p. 434
<i>Chempaka Puteh</i>	..	<i>Michelia alba</i> p. 433
<i>Chempaka Puteh Utan</i>	..	<i>Randia anisophylla</i> p. 555
<i>Chempaka Utan</i>	..	<i>Gardenia</i> p. 538, <i>Randia</i> p. 554
<i>Chempedak</i>	..	<i>Artocarpus integer</i> p. 655
<i>Chempedak Ayer</i>	..	<i>Artocarpus dadah</i> p. 653
		<i>Artocarpus kemando</i> p. 656
		<i>A. Maingayi</i> p. 657
<i>Chempedak Utan</i>	..	<i>Artocarpus integer</i> p. 655
<i>Chemperai</i>	..	<i>Champereia</i> p. 515
<i>Chempurah</i>	..	<i>Garcinia bancana</i> p. 314
<i>Chenam Bulan</i>	..	<i>Rauwolfia</i> p. 148
<i>Chenanga</i>	..	<i>Canangium</i> p. 131
<i>Chenderai</i>	..	<i>Grewia tomentosa</i> p. 643
<i>Chenerah, Chenerai</i>	..	<i>Grewia tomentosa</i> p. 643
<i>Chengai, Chengal</i>	..	<i>Balanocarpus Heimii</i> p. 210
<i>Chengal Kampong</i>	..	<i>Hopea odorata</i> p. 212
<i>Chengal Pasir</i>	..	<i>Hopea odorata</i> p. 212
<i>Chengam</i>	..	<i>Scyphiphora</i> p. 559
<i>Chengpok</i>	..	<i>Aralidium</i> p. 154
<i>Chenarah, Chenirai</i>	..	<i>Grewia tomentosa</i> p. 643
<i>Chenkian</i>	..	<i>Croton tiglium</i> p. 248
<i>Chenkring</i>	..	<i>Erythrina fusca</i> p. 370
		<i>Zanthoxylum myriacanthum</i> p. 579
<i>Cheong</i>	..	<i>Hibiscus macrophyllus</i> p. 441
<i>Cheong Kumai</i>	..	<i>Hibiscus stoccosus</i> p. 441
<i>Chepakoh</i>	..	see <i>Chempaka</i>
<i>Cheperai</i>	..	<i>Gnetum gnemon</i> var. <i>Brunonianum</i> p. 726
<i>Chepri</i>	..	<i>Champereia</i> p. 515
<i>Chepurah</i>	..	<i>Garcinia bancana</i> p. 314
<i>Cherek</i>	..	<i>Clausena excavata</i> p. 571
		<i>Micromelum</i> p. 575
		<i>Peronema</i> p. 704
<i>Cheri</i>	..	<i>Muntingia</i> p. 644
<i>Chermai</i>	..	<i>Cicca</i> p. 282
<i>Chermai Belanda</i>	..	<i>Eugenia Michellii</i> p. 499
<i>Chermela</i>	..	<i>Cicca</i> p. 282
<i>Chetti</i>	..	<i>Mangifera indica</i> p. 110
<i>Chichah, Chichan</i>	..	<i>Stereospermum fimbriatum</i> p. 172
<i>Chiku</i>	..	<i>Achras</i> p. 598
<i>Chimpoh</i>	..	<i>Dilleniaceæ</i> p. 201
<i>China Maki</i>	..	<i>Bæckia</i> p. 484, <i>Leucopogon</i> p. 218
		<i>Leptospermum</i> p. 505
<i>Chingam</i>	..	<i>Scyphiphora</i> p. 559
<i>Chinkeh</i>	..	<i>Eugenia aromatica</i> p. 488
<i>Choklat</i>	..	<i>Theobroma</i> p. 607
<i>Choreng Atap</i>	..	<i>Leucopogon</i> p. 218
<i>Chuchur Atap</i>	..	<i>Bæckia</i> p. 484, <i>Leucopogon</i> p. 218
<i>Chukelan</i>	..	<i>Glochidion</i> p. 283
<i>Chulan</i>	..	<i>Aglaiia odorata</i> p. 456
<i>Dadap</i>	..	<i>Erythrina</i> p. 367
<i>Dadap Srep</i>	..	<i>Erythrina subumbrans</i> p. 371
<i>Dadap Utan</i>	..	<i>Erythrina</i> p. 367, <i>Firmiana</i> p. 610

INDEX TO MALAY NAMES

<i>Da Eng</i>	..	<i>Bæckia</i> p. 484
<i>Dala</i>	..	<i>Cratexa lophosperma</i> p. 181
<i>Dalu Dalu</i>	..	<i>Salix tetrasperma</i> p. 581
<i>Dalur</i>	..	<i>Cratexa lophosperma</i> p. 181
<i>Damar</i>	..	<i>Mangifera</i> p. 110
<i>Damar Hitam</i>	..	<i>Shorea</i> pp. 208, 212
<i>Damar Laut Merah</i>	..	<i>Shorea</i> pp. 208, 212
<i>Damar Minyak</i>	..	<i>Agathis alba</i> p. 715
<i>Dawn Kurap</i>	..	<i>Cassia alata</i> p. 388
<i>Dawn Tapah Badak</i>	..	<i>Trevesia</i> p. 158
<i>Dawn Tapah Hantu</i>	..	<i>Trevesia</i> p. 158
<i>Dawn Tapah Rimau</i>	..	<i>Trevesia</i> p. 158
<i>Dedabruang</i>	..	<i>Myrsine Portieriana</i> p. 482
<i>Dedalu</i>	..	<i>Salix tetrasperma</i> p. 581
<i>Dedap</i>	..	<i>Erythrina</i> p. 367
<i>Delek</i>	..	<i>Memecylon</i> p. 448
<i>Delima</i>	..	<i>Punica</i> p. 427
<i>Demundi</i>	..	<i>Vitex negundo</i> p. 708
		<i>V. trifolia</i> p. 710
<i>Dendulang</i>	..	see <i>Dulang</i>
<i>Derdap</i>	..	<i>Erythrina</i> p. 367
<i>Derdap Dapur</i>	..	<i>Callicarpa tomentosa</i> p. 698
<i>Derum</i>	..	<i>Cratoxylon</i> p. 324
<i>Derumun</i>	..	<i>Elæocarpus</i> p. 637
		<i>E. Griffithii</i> p. 639
<i>Di Au</i>	..	<i>Durio zibethinus</i> var. <i>roseiflorus</i> p. 439
<i>Dokong Anak</i>	..	<i>Phyllanthus</i> p. 290
<i>Drok</i>	..	<i>Bucklandia</i> p. 323
<i>Duak</i>	..	<i>Heynea</i> p. 462
<i>Duku</i>	..	<i>Lansium</i> p. 463
<i>Dulang, Dulang Dulang</i>	..	<i>Eugenia punctulata</i> p. 502
		<i>Glochidion obscurum</i> p. 287
<i>Dungun</i>	..	<i>Brownlowia</i> p. 635
		<i>Heritiera</i> p. 612
<i>Durian</i>	..	<i>Durio zibethinus</i> p. 439
<i>Durian Au</i>	..	<i>Durio zibethinus</i> var. <i>roseiflorus</i> p. 439
<i>Durian Belanda</i>	..	<i>Annona muricata</i> p. 130
<i>Durian Burong</i>	..	<i>Durio Oxleyanus</i> p. 439
<i>Durian Dawn</i>	..	<i>Durio</i> p. 439
		<i>D. oblongus</i> p. 438, <i>D. testudinarius</i> p. 439
<i>Durian Europa</i>	..	<i>Annona muricata</i> p. 130
<i>Durian Laut</i>	..	<i>Brownlowia</i> p. 635
<i>Durian Makka</i>	..	<i>Annona muricata</i> p. 130
<i>Durian Sepek</i>	..	<i>Durio zibethinus</i> var. <i>roseiflorus</i> p. 439
<i>Durian Tanah</i>	..	<i>Durio testudinarius</i> p. 439
<i>Durian Tupai</i>	..	<i>Durio Griffithii</i> p. 438
<i>Duri Sakah</i>	..	<i>Zizyphus cenopia</i> p. 520
<i>Duri Timbang Tahil</i>	..	<i>Randia spinosa</i> p. 557
		<i>R. tomentosa</i> p. 557
		<i>Vangueria</i> p. 564
<i>Duri Timun Tahil</i>	..	(as the preceding)
<i>Ekor Kuda</i>	..	<i>Dacrydium Beccarii</i> p. 720
<i>Embalau</i>	..	<i>Brucea</i> p. 603
<i>Embrah</i>	..	<i>Spondias pinnata</i> p. 116
<i>Emmunggai</i>	..	<i>Moringa</i> p. 470
<i>Empoyan</i>	..	<i>Rhodamnia</i> p. 507
<i>Emrah</i>	..	<i>Spondias pinnata</i> p. 116
<i>Gading Gading</i>	..	<i>Pavetta</i> p. 552, <i>Ixora</i> p. 543
<i>Gah</i>	..	<i>Vitex peralata</i> p. 709
<i>Gaha</i>	..	<i>Paranephelium</i> p. 594
<i>Gaharu</i>	..	<i>Aquilaria</i> p. 632
<i>Gayus</i>	..	<i>Anacardium</i> p. 100
<i>Galang Dapur</i>	..	<i>Vitex gamosepala</i> p. 708
<i>Gambir Gambir</i>	..	<i>Mæsa</i> p. 481

INDEX TO MALAY NAMES

<i>Gapis</i>	..	<i>Saraca</i> p. 400
<i>Garupillai</i>	..	<i>Murraya Koenigii</i> p. 576
<i>Gayan</i>	..	<i>Sapium indicum</i> p. 277
<i>Gedabeh Lembu</i>	..	<i>Vitex peralata</i> p. 709
<i>Gedabu</i>	..	<i>Sonneratia</i> p. 431
<i>Gedembah</i>	..	<i>Nauclea subdita</i> p. 551
<i>Gegambir</i>	..	<i>Mæsa</i> p. 481
<i>Gelam</i>	..	<i>Melaleuca</i> p. 506, <i>Eugenia</i> p. 488
<i>Gelam Bukit</i>	..	<i>Leptospermum</i> p. 505
<i>Gelam Tikus</i>	..	<i>Eugenia</i> p. 488
<i>Gelenggang</i>	..	<i>Cassia alata</i> p. 388
<i>Gelinggai</i>	..	<i>Feronia</i> p. 573
<i>Gelugor</i>	..	<i>Garcinia atroviridis</i> p. 314
<i>Gelugor Salak</i>	..	<i>Drypetes pendula</i> p. 248
<i>Gemiah</i>	..	<i>Bouea microphylla</i> p. 101
<i>Gemunggai</i>	..	<i>Moringa</i> p. 470
<i>Genitri</i>	..	<i>Elæocarpus sphaericus</i> p. 641
<i>Geringgong</i>	..	<i>Nephelium rubescens</i> p. 593
<i>Geronggang, Geronggong</i>	..	<i>Cratoxylon arborescens</i> p. 325
<i>Getah</i>	..	<i>Hevea</i> p. 256
<i>Getih</i>	..	<i>Sesbania</i> p. 377
<i>Gias</i>	..	<i>Artocarpus rigidus</i> p. 657
<i>Gigi Buntal</i>	..	<i>Xerosepermum muricatum</i> p. 596
<i>Gohor</i>	..	<i>Paranephelium</i> p. 594
<i>Golak</i>	..	<i>Saraca</i> p. 400
<i>Grak</i>	..	<i>Nephelium mutabile</i> p. 593
<i>Grik</i>	..	<i>Nephelium</i> p. 590, <i>N. eriopetalum</i> p. 591
<i>Groh</i>	..	<i>Bucklandia</i> p. 323
<i>Guchak, Guchek</i>	..	<i>Antidesma ghaesembilla</i> p. 233
<i>Gunchak, Gunchek</i>	..	<i>Antidesma ghaesembilla</i> p. 233
<i>Gunchian, Gunchin</i>	..	<i>Antidesma ghaesembilla</i> p. 233
<i>Gurah</i>	..	<i>Sapium indicum</i> p. 277
<i>Guri</i>	..	<i>Mangifera</i> p. 110
<i>Guring</i>	..	<i>Sapium indicum</i> p. 277
<i>Ha Ha</i>	..	<i>Neesia</i> p. 443
<i>Haleban, Halban</i>	..	<i>Vitex pubescens</i> p. 709
<i>Hantar Duri</i>	..	<i>Zanthoxylum rhetsa</i> p. 579
<i>Hantu Duri</i>	..	<i>Zanthoxylum rhetsa</i> p. 579
<i>Hati Hati</i>	..	<i>Desmodium</i> p. 367
<i>Hempedal Ayam</i>	..	<i>Mangifera indica</i> p. 110
<i>Himai</i>	..	<i>Lawsonia</i> p. 428
<i>Hujan Atap</i>	..	<i>Bæckia</i> p. 484
<i>Hujan Panas</i>	..	<i>Breynia</i> p. 281
<i>Inai</i>	..	<i>Lawsonia</i> p. 428
<i>Inai Inai</i>	..	<i>Erythroxylon</i> p. 220
<i>Inggek Burong, Inggi Burong</i>	..	<i>Evodia</i> p. 572
<i>Ipil</i>	..	<i>Ixonanthes reticulata</i> p. 222
<i>Ipoh</i>	..	<i>Intsia bijuga</i> p. 396
<i>Isop Nanah</i>	..	<i>Antiaris</i> p. 648
<i>Itai Setapoh</i>	..	<i>Litsea umbellata</i> p. 348
<i>Jada</i>	..	<i>Alstonia macrophylla</i> p. 142
<i>Jada</i>	..	<i>Milletia Hemsleyana</i> p. 373
<i>Jambolan</i>	..	<i>Eugenia cumini</i> p. 496
<i>Jambu</i>	..	<i>Eugenia</i> p. 488
<i>Jambu Arang</i>	..	<i>Eugenia claviflora</i> p. 495
<i>Jambu Ayer</i>	..	<i>Eugenia aquea</i> p. 494, <i>E. javanica</i> p. 499
<i>Jambu Ayer Laut</i>	..	<i>Eugenia grandis</i> p. 498
<i>Jambu Ayer Maswar</i>	..	<i>Eugenia jambos</i> p. 499
<i>Jambu Ayer Rhio</i>	..	<i>Eugenia javanica</i> p. 499
<i>Jambu Batu</i>	..	<i>Psidium</i> p. 507

INDEX TO MALAY NAMES

<i>Jambu Biji</i>	..	<i>Psidium</i> p. 507
<i>Jambu Bol</i>	..	<i>Eugenia malaccensis</i> p. 499
<i>Jambu Chili</i>	..	<i>Eugenia aquea</i> p. 494
<i>Jambu Gajus</i>	..	<i>Anacardium</i> p. 100
<i>Jambu Golok</i>	..	<i>Anacardium</i> p. 100
<i>Jambu Jembah</i>	..	<i>Eugenia grandis</i> p. 498
<i>Jambu Kera</i>	..	<i>Glochidion littorale</i> p. 287
<i>Jambu Kling</i>	..	<i>Eugenia malaccensis</i> p. 499
<i>Jambu Laut</i>	..	<i>Eugenia grandis</i> p. 498
<i>Jambu Mawar</i>	..	<i>Eugenia jambos</i> p. 499
<i>Jambu Merah</i>	..	<i>Eugenia malaccensis</i> p. 499
<i>Jambul Merak</i>	..	<i>Cesalpinia pulcherrima</i> p. 386
		<i>Jacaranda</i> p. 164
<i>Janggus</i>	..	<i>Anacardium</i> p. 100
<i>Jangkang</i>	..	<i>Dillenia</i> p. 203
		<i>Xylopia</i> p. 136, <i>see also</i> p. 11
<i>Jarak</i>	..	<i>Ricinus</i> p. 274
		<i>Jatropha</i> p. 258
<i>Jarak Belanda</i>	..	<i>Jatropha curcas</i> p. 259
<i>Jarak Beremah</i>	..	<i>Jatropha gossypifolia</i> p. 260
<i>Jarak Hitam</i>	..	<i>Jatropha gossypifolia</i> p. 260
<i>Jarak Kayu</i>	..	<i>Melanolepis</i> p. 274
<i>Jarak Kling</i>	..	<i>Jatropha gossypifolia</i> p. 260
<i>Jarak Merak</i>	..	<i>Jatropha gossypifolia</i> p. 260
<i>Jarak Pagar</i>	..	<i>Jatropha curcas</i> p. 259
<i>Jarak Utan</i>	..	<i>Mallotus peltatus</i> p. 272
		<i>M. Porterianus</i> p. 273
<i>Jarum, Jarum Jarum</i>	..	<i>Ixora</i> p. 543
		<i>Pavetta</i> p. 552
		<i>Randia densiflora</i> p. 555
		<i>Tectona</i> p. 706
<i>Jati</i>	..	<i>Podocarpus neriifolius</i> p. 723
<i>Jati Bukit</i>	..	<i>Podocarpus polystachyus</i> p. 724
<i>Jati Laut</i>	..	<i>Ficus retusa</i> p. 679
<i>Jawi Jawi</i>	..	<i>Ficus retusa</i> p. 679
<i>Jegawi</i>	..	<i>Laportea</i> p. 646
<i>Jelatang</i>	..	<i>Artocarpus rigidus</i> p. 657
<i>Jelatoh</i>	..	<i>Terminalia</i> p. 192
<i>Jelawei</i>	..	(<i>T. belerica</i> , <i>T. phellocarpa</i> , <i>T. subspathulata</i>)
		<i>Tristania</i> p. 509
<i>Jelujur</i>	..	<i>Dyera</i> p. 144
<i>Jelutung</i>	..	<i>Tabernaemontana</i> p. 149
<i>Jelutung Badak</i>	..	<i>Eugenia grandis</i> p. 498
<i>Jembah</i>	..	<i>Peltophorum dasyrrachis</i> p. 399
<i>Jemerelang</i>	..	<i>Millettia atropurpurea</i> p. 372
<i>Jenaris</i>	..	<i>Grewia tomentosa</i> p. 643
<i>Jenerai</i>	..	<i>Millettia atropurpurea</i> p. 372
<i>Jenerek</i>	..	<i>Ixora</i> p. 543
<i>Jenjarum</i>	..	<i>Pavetta</i> p. 552
		<i>Randia densiflora</i> p. 555
<i>Jenzulong</i>	..	<i>Agrostistachys</i> p. 229
<i>Jepon</i>	..	<i>Thevetia</i> p. 152
<i>Jerei</i>	..	<i>Ficus</i> p. 667
<i>Jerumun</i>	..	<i>Elæocarpus</i> p. 637 (c.f. <i>E. Griffithii</i>)
<i>Jintek Jintek</i>	..	<i>Baccaurea</i> p. 238 (c.f. <i>B. bracteata</i> , <i>B. pyri-</i> <i>formis</i>)
<i>Jintun</i>	..	<i>Gluta renghas</i> p. 118
<i>Jirak</i>	..	<i>Eurya</i> p. 628
<i>Jiremong</i>	..	<i>Elæocarpus</i> p. 637 (c.f. <i>E. Griffithii</i>)
<i>Jiring</i>	..	<i>Pithecellobium jiringa</i> p. 420
<i>Jiring Tumpai</i>	..	<i>Pithecellobium ellipticum</i> p. 420
<i>Jitong</i>	..	<i>Thevetia</i> p. 152
<i>Jiwat</i>	..	<i>Eugenia cumini</i> p. 496
<i>Johar, Johor</i>	..	<i>Cassia siamea</i> p. 390
<i>Joran</i>	..	<i>Dolichandrone</i> p. 163
<i>Juak</i>	..	<i>Heynea</i> p. 462
<i>Julong Julong</i>	..	<i>Agrostistachys</i> p. 229

INDEX TO MALAY NAMES

<i>Kabu, Kabu Kabu</i> ..	<i>Ceiba</i> p. 436
<i>Kabu Utan, Kabu Kabu Utan</i> ..	<i>Salmalia</i> p. 443
	<i>Zanthoxylum myriacanthum</i> p. 579
<i>Kachang Kachang</i> ..	<i>Aegiceras</i> p. 479
<i>Kachang Kelur</i> ..	<i>Moringa</i> p. 470
<i>Kachang Turi</i> ..	<i>Sesbania</i> p. 377
<i>Kahwa</i> ..	<i>Coffea</i> p. 536
<i>Kahwa Utan</i> ..	<i>Canthium</i> p. 534
	<i>Diplospora</i> p. 537
	<i>Fagraea racemosa</i> p. 425
	<i>Prismatomeris</i> p. 553
<i>Kamboja</i> ..	<i>Plumeria</i> p. 147
<i>Kanchil</i> ..	<i>Anisophyllea disticha</i> p. 122
<i>Kandis</i> ..	<i>Garcinia</i> p. 313
<i>Kandis Gajah</i> ..	<i>Garcinia Griffithii</i> p. 317
	<i>G. nervosa</i> p. 318
	<i>Hibiscus floccosus</i> p. 441
<i>Kangsar</i> ..	<i>Cynometra inaequifolia</i> p. 392
<i>Kankatong</i> ..	<i>Gossypium</i> p. 434
<i>Kapas</i> ..	<i>Premna tomentosa</i> p. 705
<i>Kapiat</i> ..	<i>Ceiba</i> p. 436
<i>Kapok</i> ..	<i>Dryobalanops aromatica</i> p. 211
<i>Kapur</i> ..	<i>Aquilaria</i> p. 632
<i>Karas</i> ..	<i>Murraya Koenigii</i> p. 576
<i>Karwa Pale</i> ..	<i>Stereulia alata</i> p. 619
<i>Kasah</i> ..	<i>Agalia</i> p. 456
<i>Kasai</i> ..	<i>Pometia</i> p. 594
	<i>Mallotus philippinensis</i> p. 272
<i>Kasirau</i> ..	<i>Buchanania</i> p. 102
<i>Katak Udang</i> ..	<i>Cynometra inaequifolia</i> p. 392
<i>Katong</i> ..	<i>Cynometra ramiflora</i> p. 392
<i>Katong Laut</i> ..	<i>Diospyros</i> p. 214
<i>Kayu Arang</i> ..	<i>Cratoxylon cochinchinense</i> p. 325
	<i>Diplospora</i> p. 537
<i>Kayu Baki</i> ..	<i>Podocarpus nerifolius</i> p. 723
<i>Kayu China</i> ..	<i>Vitex peralata</i> p. 709
<i>Kayu Gah</i> ..	<i>Aquilaria</i> p. 632
<i>Kayu Gaharu</i> ..	<i>Archytæa</i> p. 627
<i>Kayu Kuat</i> ..	<i>Lannea</i> p. 105
<i>Kayu Kudah</i> ..	<i>Cinnamomum</i> p. 339
<i>Kayu Manis</i> ..	<i>Anisophyllea disticha</i> p. 122
<i>Kayu Pachat</i> ..	<i>Melaleuca</i> p. 506
<i>Kayu Puteh</i> ..	<i>Anisophyllea disticha</i> p. 122
<i>Kayu Ribu Ribu</i> ..	<i>Millettia albiflora</i> p. 373
<i>Kayu Rindu</i> ..	<i>Diospyros</i> p. 214
<i>Kayu Sihangus</i> ..	<i>Homonoia</i> p. 258
<i>Kayu Suarah</i> ..	<i>Mæsa</i> p. 481
<i>Kecham Utan</i> ..	<i>Sandoricum</i> p. 466
<i>Kechapi</i> ..	<i>Garcinia Prainiana</i> p. 320
<i>Kechupu</i> ..	<i>Parkia javanica</i> p. 415
<i>Kedawong</i> ..	<i>Nauclea subdita</i> p. 551
<i>Kedembai</i> ..	<i>Engelhardtia nudiflora</i> p. 333
<i>Kedi</i> ..	<i>Amoora</i> p. 460, <i>Burseraceæ</i> p. 177
<i>Kedondong</i> ..	<i>Canarium</i> p. 178
	<i>Chisocheton</i> p. 460
	<i>Dysoxylon</i> p. 460
	<i>Lannea</i> p. 105, <i>Santiria</i> p. 178
	<i>Spondias</i> p. 114
<i>Kedudok</i> ..	<i>Melastoma</i> p. 445
<i>Kekabu</i> ..	<i>Ceiba</i> p. 436
<i>Kekabu Utan</i> ..	<i>Salmalia</i> p. 443,
	<i>Zanthoxylum myriacanthum</i> p. 579
<i>Kekapur</i> ..	<i>Anaxagorea</i> p. 129
<i>Kekaras</i> ..	<i>Aquilaria</i> p. 632
<i>Kekatong</i> ..	<i>Cynometra inaequifolia</i> p. 392
<i>Keladan</i> ..	<i>Dryobalanops oblongifolia</i> p. 212

INDEX TO MALAY NAMES

<i>Kelampadang</i>	..	<i>Vaccinium</i> p. 219
<i>Kelampai</i>	..	<i>Antocephalus</i> p. 533
<i>Kelampayan</i>	..	<i>Antocephalus</i> p. 533
<i>Kelampojan</i>	..	<i>Antocephalus</i> p. 533
<i>Kelat</i>	..	<i>Eugenia</i> p. 488
<i>Kelat Asam</i>	..	<i>Eugenia Cumingiana</i> p. 496
<i>Kelat Belian</i>	..	<i>Eugenia</i> p. 488
<i>Kelat Betis</i>	..	<i>Eugenia</i> p. 488
<i>Kelat Gelam</i>	..	<i>Eugenia</i> p. 488
		<i>E. grata</i> p. 488, <i>E. penangiana</i> p. 501
		<i>E. punctulata</i> p. 502
<i>Kelat Gelam Tikus</i>	..	<i>Eugenia grata</i> p. 498
<i>Kelat Hitam</i>	..	<i>Eugenia cymosa</i> p. 496
<i>Kelat Jambu</i>	..	<i>Eugenia densiflora</i> p. 497
		<i>E. valdevenosa</i> p. 504
<i>Kelat Jambu Ayer</i>	..	<i>Eugenia densiflora</i> var. <i>angustifolia</i> p. 497
<i>Kelat Jangkang</i>	..	<i>Eugenia papillosa</i> p. 501
<i>Kelat Layu</i>	..	<i>Erioglossum</i> p. 587
<i>Kelat Merah</i>	..	<i>Eugenia chlorantha</i> p. 494
		<i>E. claviflora</i> p. 495
<i>Kelat Nasi Nasi, Kelat Nenas</i>	..	<i>Eugenia grata</i> p. 498
		<i>E. polita</i> p. 501, <i>E. spicata</i> p. 503
<i>Kelat Paya</i>	..	<i>Eugenia papillosa</i> p. 501
<i>Kelat Puteh</i>	..	<i>Eugenia verecunda</i> p. 504
		<i>Parastemon</i> p. 526
<i>Kelat Samak</i>	..	<i>Eugenia</i> p. 488
		<i>E. palembanica</i> p. 500
<i>Kelat Tikus</i>	..	<i>Eugenia</i> p. 488
		<i>E. grata</i> p. 498
<i>Keledang</i>	..	<i>Artocarpus lanceifolius</i> p. 656
<i>Keledang Babi</i>	..	<i>Artocarpus anisophyllus</i> p. 652
<i>Kelek</i>	..	<i>Olea</i> p. 514
<i>Kelempayan, Kelepayang</i>	..	<i>Antocephalus</i> p. 533
<i>Kelempong</i>	..	<i>Ficus</i> p. 667
<i>Kelereh</i>	..	<i>Homonoia</i> p. 258
<i>Kelisai</i>	..	<i>Pometia</i> p. 594
<i>Kelisar</i>	..	<i>Pometia</i> p. 594
<i>Kelompang Gagah</i>	..	<i>Randia exaltata</i> p. 556
<i>Kelumpang</i>	..	<i>Sterculia</i> p. 618
<i>Kelumpong</i>	..	<i>Sterculia</i> p. 618
<i>Kelumpong Burong</i>	..	<i>Sterculia parviflora</i> p. 620
<i>Kelupang</i>	..	<i>Sterculia</i> p. 618
<i>Kemang</i>	..	<i>Mangifera kemanga</i> p. 109
<i>Kemang Palas, K. Putar</i>	..	<i>Mangifera Maingayi</i> p. 109
<i>Kematu</i>	..	<i>Clausena excavata</i> p. 572
<i>Kembang Samangkok</i>	..	<i>Scaphium</i> p. 616
<i>Kembiri</i>	..	<i>Aleurites</i> p. 231
<i>Kemiri</i>	..	<i>Aleurites</i> p. 231
<i>Kempas</i>	..	<i>Kocompassia malaccensis</i> p. 397
<i>Kempoyan</i>	..	<i>Antocephalus</i> p. 533
<i>Kemudu</i>	..	<i>Morinda</i> p. 549
		<i>Pisonia</i> p. 511
<i>Kemudu Besar</i>	..	<i>Morinda citrifolia</i> p. 550
<i>Kemudu Jantan</i>	..	<i>Morinda elliptica</i> p. 550
<i>Kemudu Kechil</i>	..	<i>Morinda elliptica</i> p. 550
<i>Kemudu Selat</i>	..	<i>Pisonia excelsa</i> p. 511
<i>Kemudu Siam</i>	..	<i>Pisonia excelsa</i> p. 511
<i>Kemuning</i>	..	<i>Murraya paniculata</i> p. 577
<i>Kemuning Akar</i>	..	<i>Taxotrophis</i> p. 693
<i>Kemuning Gajah</i>	..	<i>Merrillia</i> p. 575
<i>Kemunting</i>	..	<i>Rhodomyrtus</i> p. 508
<i>Kemutong</i>	..	<i>Cratoxylon cochinchinense</i> p. 325
<i>Kenanga</i>	..	<i>Canarium</i> p. 131
<i>Kenapeh</i>	..	<i>Glycosmis pentaphylla</i> p. 574
<i>Kenarak</i>	..	<i>Goniothalamus</i> p. 134
<i>Kenari</i>	..	<i>Canarium commune</i> p. 178

INDEX TO MALAY NAMES

<i>Kendong</i>	..	<i>Symplocos laurina</i> p. 623
<i>Kenerak</i>	..	<i>Goniothalamus</i> p. 134
<i>Kenidai</i>	..	<i>Bridelia</i> p. 243
<i>Kenoah</i>	..	<i>Pithecellobium ellipticum</i> p. 420
<i>Kentut Kentut</i>	..	<i>Saprosma</i> p. 558
<i>Kepayang</i>	..	<i>Pangium</i> p. 308
<i>Kepayang Ayer</i>	..	<i>Cratæva</i> p. 181
<i>Kepayang Kayu</i>	..	<i>Anthocephalus</i> p. 533
<i>Kerangi</i>	..	<i>Dialium</i> p. 394
<i>Kerantai</i>	..	<i>Santiria</i> p. 178
<i>Kerayong</i>	..	<i>Parkia javanica</i> p. 415
<i>Kerbau Jalang</i>	..	see <i>Rengas</i> trees p. 116
<i>Keredas</i>	..	<i>Pithecellobium</i> p. 417
<i>Kerepit</i>	..	<i>Inocarpus</i> p. 395
<i>Kerip Buntal</i>	..	<i>Nephelium rubescens</i> p. 593
<i>Kernam</i>	..	<i>Bridelia</i> p. 243
<i>Kernong</i>	..	<i>Bridelia</i> p. 243
<i>Kerompang</i>	..	<i>Sterculia</i> p. 618
<i>Kertak Tangga</i>	..	<i>Castanopsis</i> p. 292, <i>Quercus</i> p. 299
<i>Keruing</i>	..	<i>Dipterocarpus</i> p. 211
<i>Keruntum</i>	..	<i>Tristania merguensis</i> p. 509
<i>Kerupulai</i>	..	<i>Murraya Koenigii</i> p. 576
<i>Kesinah</i>	..	<i>Streblus</i> p. 692
<i>Kesinai</i>	..	<i>Streblus</i> p. 692
<i>Kesinga</i>	..	<i>Carallia</i> p. 522
<i>Kesumba, K. Kling</i>	..	<i>Bixa</i> p. 173
<i>Ketaling</i>	..	<i>Ochanostachys</i> p. 728
<i>Ketak Udang</i>	..	<i>Buchanania</i> p. 102
<i>Ketapang</i>	..	<i>Terminalia catappa</i> p. 193
<i>Ketelah</i>	..	<i>Carica</i> p. 184
<i>Ketenggah</i>	..	<i>Merrillia</i> p. 575
<i>Keterek</i>	..	<i>Anacardium</i> p. 100
<i>Ketil</i>	..	<i>Sindora</i> p. 403
<i>Kikir Buntal</i>	..	<i>Xerospermum muricatum</i> p. 596
<i>Kobin</i>	..	<i>Macaranga</i> p. 261
<i>Kolah</i>	..	<i>Mangifera longipetiolata</i> p. 110
<i>Komoi</i>	..	<i>Diospyros dictyoneura</i> p. 215
		<i>D. malabarica</i> p. 217, <i>D. oblonga</i> p. 217
<i>Kopi</i>	..	<i>Coffea</i> p. 536
<i>Kopit</i>	..	<i>Inocarpus</i> p. 395
<i>Kopi Utan</i>	..	<i>Canthium</i> p. 534, <i>Diplospora</i> p. 537
		<i>Fagraea racemosa</i> p. 425
		<i>Prismatomeris</i> p. 553
<i>Kotek, K. Mamak</i>	..	<i>Cassia grandis</i> p. 389
<i>Kranji</i>	..	<i>Dialium</i> p. 394
<i>Krekup</i>	..	<i>Flacourtia</i> p. 306
<i>Krekup Bakoh</i>	..	<i>Flacourtia jangomas</i> p. 307
<i>Krepal</i>	..	<i>Cælostegia</i> sp. p. 437
<i>Krepau</i>	..	<i>Cælostegia</i> sp. p. 437
<i>Kriah</i>	..	<i>Aglaia</i> sp. p. 457
<i>Krian, Kriang, Krian Batu</i>	..	<i>Eugenia pseudosubtilis</i> p. 502
<i>Krian Duat</i>	..	<i>Eugenia cumini</i> p. 496
<i>Kruing</i>	..	<i>Dipterocarpus</i> p. 211
<i>Kuap</i>	..	<i>Ficus annulata</i> p. 674
<i>Kuat Kuat</i>	..	<i>Archytæa</i> p. 627
<i>Kubang Kubin</i>	..	<i>Macaranga</i> p. 261
<i>Kubor</i>	..	<i>Plumeria</i> p. 147
<i>Kuching Kuching</i>	..	<i>Lepionurus</i> p. 515
<i>Kuing</i>	..	<i>Dipterocarpus</i> p. 211
<i>Kuku Lang</i>	..	<i>Zizyphus cœnophia</i> p. 520
<i>Kulim</i>	..	<i>Chisocheton</i> p. 460, <i>Dysoxylon</i> p. 460, <i>Scorodocarpus</i> p. 728
<i>Kulit Lawang</i>	..	<i>Cinnamomum</i> p. 339
<i>Kulur</i>	..	<i>Artocarpus incisus</i> p. 655

INDEX TO MALAY NAMES

<i>Kumun</i>	..	<i>Diospyros dictyoneura</i> p. 215
		<i>D. malabarica</i> p. 217
		<i>D. oblonga</i> p. 217
<i>Kumus</i>	..	<i>Shorea</i> p. 212
<i>Kundang, Kundangan</i>	..	<i>Bouea macrophylla</i> p. 101
<i>Kungkor</i>	..	<i>Pithecellobium splendens</i> p. 421
<i>Kuran</i>	..	<i>Dialium</i> p. 394
<i>Kuras</i>	..	<i>Dryobalanops oblongifolia</i> p. 212
<i>Kwini, Kwining</i>	..	<i>Mangifera odorata</i> p. 111
<i>Lada Lada</i>	..	<i>Tabernæmontana</i> p. 149
<i>Lada Pakit</i>	..	<i>Brucea</i> p. 603
<i>Lagundi</i>	..	see <i>Lenggundi</i>
<i>Laka, Laka Laka</i>	..	<i>Emblica</i> p. 282
<i>Lampin Budak</i>	..	<i>Claoxylon indicum</i> p. 245
		<i>Clerodendron laevifolium</i> p. 701
		<i>C. serratum</i> p. 701
<i>Langga Ayer</i>	..	<i>Dysoxylon angustifolium</i> p. 461
<i>Langsat</i>	..	<i>Lansium</i> p. 463
<i>Langsir</i>	..	<i>Pometia</i> p. 594
<i>Langut</i>	..	<i>Mangifera lagenifera</i> p. 110
<i>Lapan Tauin</i>	..	<i>Garcinia nervosa</i> p. 318
<i>Laping Budak</i>	..	see <i>Lampin Budak</i>
<i>Larak</i>	..	<i>Baccaurea Griffithii</i> p. 240, <i>B. reticulata</i> p. 241
<i>Lasana</i>	..	<i>Acacia Farnesiana</i> p. 406
<i>Leban</i>	..	<i>Vitex pubescens</i> p. 709
<i>Leban Chondong</i>	..	<i>Engelhardtia nudiflora</i> p. 333
<i>Leban Pachat</i>	..	<i>Vitex gamosepala</i> p. 708
<i>Leban Pelandok</i>	..	<i>Vitex gamosepala</i> p. 708
<i>Legundi</i>	..	<i>Vitex negundo</i> p. 708
		<i>V. trifolia</i> p. 710
<i>Lekub</i>	..	<i>Mangifera ? Maingayi</i> p. 109
<i>Lelada</i>	..	<i>Tabernæmontana</i> p. 149
<i>Lelang</i>	..	<i>Paramignya</i> p. 577
<i>Lemak Ketam</i>	..	<i>Desmodium</i> p. 367
<i>Lempayang, Lempoyan</i>	..	<i>Anthocephalus</i> p. 533
<i>Lemunggai</i>	..	<i>Moringa</i> p. 470
<i>Lemuning</i>	..	<i>Vitex negundo</i> p. 708
		<i>V. trifolia</i> p. 710
<i>Lenggadi</i>	..	<i>Bruguiera</i> p. 520
<i>Lenggapus</i>	..	<i>Mesua</i> p. 320
<i>Lenggundi</i>	..	<i>Vitex negundo</i> p. 708
		<i>V. trifolia</i> p. 710
<i>Lenkenang</i>	..	<i>Elæocarpus</i> p. 637
<i>Lerak</i>	..	<i>Sapindus</i> p. 595
<i>Letop Letop</i>	..	<i>Pterospermum javanicum</i> p. 615
<i>Lidah Katah</i>	..	<i>Pternandra</i> p. 451
<i>Lidah Kerbau</i>	..	<i>Pyrenaria</i> p. 630
<i>Lidah Lembu</i>	..	<i>Pyrenaria</i> p. 630
<i>Lilang</i>	..	<i>Paramignya</i> p. 577
<i>Lima</i>	..	<i>Gelonium</i> p. 255
<i>Limau</i>	..	<i>Atalantia</i> p. 567
		<i>Citrus</i> p. 568
		<i>Gelonium</i> p. 255
<i>Limau Besar</i>	..	<i>Citrus grandis</i> p. 569
<i>Limau Chuwit</i>	..	<i>Citrus microcarpa</i> p. 570
<i>Limau Hantu</i>	..	<i>Atalantia</i> p. 567
		<i>Citrus macroptera</i> p. 569
		<i>Gelonium</i> p. 255
<i>Limau Hijau</i>	..	<i>Citrus suhuiensis</i> p. 570
<i>Limau Kapas</i>	..	<i>Citrus aurantifolia</i> p. 569
<i>Limau Kelingket</i>	..	<i>Triphasia</i> p. 578
<i>Limau Kesturi</i>	..	<i>Citrus microcarpa</i> p. 570
<i>Limau Kesturi Bukit</i>	..	<i>Citrus Swinglei</i> p. 570
<i>Limau Kiah</i>	..	<i>Triphasia</i> p. 578
<i>Limau Kikir</i>	..	<i>Triphasia</i> p. 578
<i>Limau Koppe</i>	..	<i>Citrus suhuiensis</i> p. 570

INDEX TO MALAY NAMES

<i>Limau Lelang, L. Lelang</i>	..	Paramignya p. 577
<i>Limau Limau</i>	..	Gelonium p. 255
		Phyllochlamys p. 690
		Taxotrophis p. 693
<i>Limau Manis</i>	..	<i>Citrus suhuiensis</i> p. 570
<i>Limau Mata Kerbau</i>	..	<i>Citrus medica</i> p. 570
<i>Limau Nipis</i>	..	<i>Citrus aurantifolia</i> p. 569
<i>Limau Pagar</i>	..	<i>Citrus Swinglei</i> p. 570
<i>Limau Purut</i>	..	<i>Citrus hystrix</i> p. 569
<i>Limau Susu</i>	..	<i>Citrus medica</i> p. 570
<i>Lingtak</i>	..	<i>Terminalia catappa</i> p. 193
<i>Lobeh-Lobeh</i>	..	<i>Flacourtia inermis</i> p. 307
<i>Lonang</i>	..	<i>Annona reticulata</i> p. 130
<i>Lonnek</i>	..	<i>Annona reticulata</i> p. 130
<i>Lotong</i>	..	<i>Nephelium eriopetalum</i> p. 591
<i>Ludai, L. Pelandok</i>	..	<i>Sapium baccatum</i> p. 276, <i>S. discolor</i> p. 276
<i>Machai</i>	..	<i>Mangifera foetida</i> p. 109
<i>Machang</i>	..	<i>Mangifera foetida</i> p. 109
<i>Machang Pulasan</i>	..	<i>Mangifera ? Maingayi</i> p. 109
<i>Machang Utan</i>	..	<i>Mangifera</i> (wild) p. 109
<i>Mahang</i>	..	Macaranga p. 261
<i>Mahang Puteh</i>	..	<i>Macaranga hypoleuca</i> p. 266
<i>Maja</i>	..	Aegle p. 567
<i>Maki China</i>	..	Bæckea p. 484
		Leptospermum p. 505
		Leucopogon p. 218
<i>Malabira</i>	..	<i>Fagraea crenulata</i> p. 423
<i>Malapari</i>	..	Pongamia p. 374
<i>Mali, Mali Mali</i>	..	Leea p. 97
<i>Mamak</i>	..	Heynea p. 462
<i>Mambu</i>	..	<i>Melia indica</i> p. 466
<i>Manek</i>	..	<i>Aglais</i> sp. p. 457
<i>Mangas</i>	..	Memecylon p. 448
<i>Mangga</i>	..	<i>Mangifera indica</i> p. 109
<i>Manggis</i>	..	<i>Garcinia mangostana</i> p. 318
<i>Maris</i>	..	<i>Dysoxylon angustifolium</i> p. 461
<i>Mata Ayam</i>	..	Ardisia p. 479
<i>Mata Buaya</i>	..	Bruguiera p. 520
<i>Mata Itek</i>	..	Ardisia p. 479
<i>Mata Keli</i>	..	Gynotroches p. 522
<i>Mata Kesting</i>	..	<i>Clerodendron serratum</i> p. 701
<i>Mata Kuching</i>	..	<i>Nephelium malaiense</i> p. 592
<i>Mata Lembu</i>	..	Firmiana p. 610
<i>Mata Pelandok</i>	..	Ardisia p. 479
<i>Mati Sedang</i>	..	Trevesia p. 158
<i>Maya Maya</i>	..	Homalanthus p. 257
		<i>Sapium baccatum</i> p. 276
		<i>S. discolor</i> p. 276
<i>Medalu</i>	..	<i>Salix tetrasperma</i> p. 581
<i>Medang</i>	..	Elæocarpus p. 637
		Gironniera p. 688
		Lauraceæ p. 334
		Pygeum p. 528
		Schima p. 630
<i>Medang Bulu Merah</i>	..	Cryptocarya p. 342
<i>Medang Gambong</i>	..	Vernonia p. 196
<i>Medang Hampas Tebu</i>	..	Gironniera p. 688
<i>Medang Jangkang</i>	..	<i>Elæocarpus littoralis</i> p. 639
<i>Medang Kasap</i>	..	Gironniera p. 688
<i>Medang Keladi</i>	..	<i>Litsea megacarpa</i> p. 347
<i>Medang Kelawar</i>	..	<i>Elæocarpus robustus</i> p. 641
		Pygeum polystachyum p. 528
<i>Medang Kemangi</i>	..	<i>Cinnamomum parthenoxylon</i> p. 341 (see p. 339)
<i>Medang Ketanah</i>	..	Phœbe p. 343
<i>Medang Losoh</i>	..	<i>Cinnamomum parthenoxylon</i> p. 341
<i>Medang Miang</i>	..	Lauraceæ p. 335

INDEX TO MALAY NAMES

<i>Medang Pasir</i>	..	<i>Neolitsea</i> p. 349
<i>Medang Serai</i>	..	<i>Lindera pipericarpa</i> p. 346
<i>Medang Tanah</i>	..	<i>Phoebe</i> p. 343
<i>Medang Tandok</i>	..	<i>Alseodaphne</i> p. 338
		<i>Dehaasia</i> p. 343
<i>Medang Wangi</i>	..	<i>Cinnamomum javanicum</i> p. 341
		<i>C. mollissimum</i> p. 341
<i>Mehe</i>	..	<i>Macaranga</i> p. 261
<i>Meketil</i>	..	<i>Sindora</i> p. 403
<i>Melada</i>	..	<i>Capparis</i> p. 180, <i>Tabernæmontana</i> p. 149
<i>Melada Pahit</i>	..	<i>Brucea</i> p. 603
<i>Melaka</i>	..	<i>Embllica</i> p. 282
<i>Melampai Bukit</i>	..	<i>Engelhardtia nudiflora</i> p. 333
<i>Melemoh</i>	..	<i>Elæocarpus robustus</i> p. 641
<i>Melerang</i>	..	<i>Pterospermum javanicum</i> p. 615
<i>Meliling</i>	..	<i>Gnetum gnemon</i> var. <i>Brunonianum</i> p. 726
<i>Melima</i>	..	<i>Gelonium</i> p. 255, <i>Tarrietia</i> p. 622
<i>Melimanu</i>	..	<i>Gelonium</i> p. 255
<i>Melokan</i>	..	<i>Croton</i> p. 246, <i>Macaranga</i> p. 261
<i>Memali</i>	..	<i>Leea</i> p. 97
<i>Memaya</i>	..	see <i>Maya Maya</i>
<i>Membachang</i>	..	<i>Mangifera foetida</i> p. 109
<i>Membatu</i>	..	see <i>Batu</i>
<i>Membatu Laut</i>	..	<i>Parinarium corymbosum</i> p. 527
<i>Membeti</i>	..	<i>Flueggea</i> p. 255
<i>Membrah</i>	..	<i>Spondias pinnata</i> p. 116
<i>Membulan</i>	..	<i>Endospermum</i> p. 251
<i>Membuloh</i>	..	<i>Pellacalyx</i> p. 523
<i>Memeti</i>	..	<i>Flueggea</i> p. 255
<i>Mempadang</i>	..	<i>Vaccinium</i> p. 219
<i>Mempadi</i>	..	<i>Eurya</i> p. 628
<i>Mempari</i>	..	<i>Pongamia</i> p. 394
<i>Mempat</i>	..	<i>Cratogeomys</i> p. 324, <i>C. formosum</i> p. 326
<i>Mempuang</i>	..	<i>Baccaurea lanceolata</i> p. 240
<i>Mempelam</i>	..	<i>Mangifera indica</i> p. 109
<i>Mempelam Babi</i>	..	<i>Terminalia phellocarpa</i> p. 194
<i>Mempelam Bemban</i>	..	<i>Mangifera pentandra</i> p. 111
<i>Mempelam Telor</i>	..	<i>Mangifera indica</i> p. 110
<i>Mempenai, M. Ayer</i>	..	<i>Antidesma salicinum</i> p. 234
		<i>Homonoia</i> p. 258
<i>Mempening</i>	..	<i>Quercus</i> p. 299
<i>Mempisang</i>	..	<i>Annonaceæ</i> p. 126, <i>Polyalthia</i> p. 135
<i>Mempoyan</i>	..	<i>Rhodamnia</i> p. 507
<i>Menarong</i>	..	<i>Trema</i> p. 693
<i>Menarong Gajah</i>	..	<i>Commersonia</i> p. 609
<i>Menasi</i>	..	<i>Planchonella</i> p. 602
		<i>Symplocos fasciculata</i> p. 623
<i>Menchupu</i>	..	<i>Garcinia Prainiana</i> p. 320
<i>Mendalu</i>	..	<i>Salix tetrasperma</i> p. 581
<i>Mendarong</i>	..	<i>Trema</i> p. 693
<i>Mengambir</i>	..	<i>Mæsa</i> p. 481
<i>Mengkal</i>	..	<i>Nauclea Junghuhnii</i> p. 551
		<i>N. Maingayi</i> p. 551
<i>Mengkal Batu</i>	..	<i>Neonauclea</i> p. 551
<i>Mengkatong</i>	..	<i>Cynometra inaequifolia</i> p. 392
<i>Mengkei</i>	..	<i>Engelhardtia nudiflora</i> p. 333
<i>Mengkira, Mengkirai</i>	..	<i>Trema</i> p. 693
<i>Mengkoyan</i>	..	<i>Rhodamnia</i> p. 507
<i>Mengkubang</i>	..	<i>Macaranga</i> pp. 261, 265
<i>Mengkudu</i>	..	<i>Morinda</i> p. 549
		<i>Pisonia</i> p. 511
		<i>Rennellia</i> p. 558
<i>Mengkudu Besar</i>	..	<i>Morinda citrifolia</i> p. 550
<i>Mengkudu Jantan</i>	..	<i>Morinda elliptica</i> p. 550
<i>Mengkudu Kechil</i>	..	<i>Morinda elliptica</i> p. 550
<i>Mengkudu Rimba</i>	..	<i>Rennellia</i> p. 558
<i>Mengkudu Selat</i>	..	<i>Pisonia excelsa</i> p. 511

INDEX TO MALAY NAMES

- | | | |
|-------------------|----|--|
| Mengkudu Siam | .. | Pisonia excelsa p. 511 |
| Mengkudu Utan | .. | Pagræa racemosa p. 425 |
| Mengkuloh | .. | Mimusops p. 600 |
| Mengkulang | .. | Mimusops p. 600, Tarrietia p. 622 |
| Meninjau | .. | Gnetum gnemon p. 726 |
| Menjarum | .. | see Jarum Jarum |
| Menkenang | .. | Elæocarpus p. 637 |
| Menkiri | .. | Commersonia p. 609 |
| Menkuah | .. | Crypteronia paniculata p. 199 |
| Mensirah | .. | Ilex cymosa p. 328 |
| Mentalun, M. batu | .. | Terminalia pyrifolia p. 194 |
| Mentega | .. | Diospyros discolor p. 216 |
| Mentigi | .. | Pemphis p. 431 |
| Merambong | .. | Scævola p. 310, Vernonia p. 196 |
| Meraga | .. | Adina p. 532 |
| Meransi | .. | Carallia p. 522 |
| Meranti | .. | Shorea pp. 208, 212 |
| Merawan | .. | Hopea p. 212 |
| Merbau | .. | Intsia Bakeri p. 396 |
| Merbau Katong | .. | Cynometra inæquifolia p. 392 |
| Merbatu | .. | see Batu |
| Merbatu Kechil | .. | Angelesia p. 526 |
| Merbatu Laut | .. | Parinarium corymbosum p. 527 |
| Merboh | .. | Vitex quinata p. 710 |
| Merbuloh Merah | .. | Jackia p. 548 |
| Mercha Bolong | .. | Melaleuca p. 506 |
| Mergolak | .. | Saraca p. 400 |
| Merigu | .. | Calotropis p. 159 |
| Meringgai | .. | Moringa p. 470 |
| Merkeh | .. | Baccaurea Griffithii p. 240, B. reticulata p. 241 |
| Merlai | .. | Oroxylum p. 166 |
| Merlimau | .. | Atalantia p. 567, Gelonium p. 255,
Phyllochlamys p. 690
Taxotrophis p. 693 |
| Merombong | .. | Adina p. 532, Timonius p. 562 |
| Mersawa | .. | Anisoptera p. 210 |
| Mertajam | .. | Erioglossum p. 587 |
| Merunggai | .. | Moringa p. 470 |
| Mesekam | .. | Gironniera p. 688 |
| Mesepat | .. | Macaranga p. 261, Mallotus p. 269 |
| Mesetor | .. | Garcinia mangostana p. 318 |
| Mesinga | .. | Carallia lucida p. 522 |
| Mesirah | .. | Ilex cymosa p. 328 |
| Miku | .. | Artocarpus Lowii p. 656 |
| Mindi Kechil | .. | Melia azedarach p. 464 |
| Minyak Madja | .. | Mallotus philippinensis p. 272 |
| Misi | .. | Planchonella p. 602 |
| Morunggai | .. | Moringa p. 470 |
| Mundu | .. | Garcinia dulcis p. 316 |
| Muning | .. | Vitex negundo p. 708, V. trifolia p. 710 |
| Munu | .. | Garcinia dulcis p. 316 |
| | | |
| Nam Nam | .. | Cynometra cauliflora p. 391 |
| Nangka | .. | Artocarpus heterophyllus p. 654 |
| Nangka Pipit | .. | Artocarpus Scortechinii p. 657 |
| Narong | .. | Trema p. 694 |
| Nasi Dingi | .. | Xerospermum sp. p. 597 |
| Nasi Nasi | .. | Eugenia grata p. 498, E. spicata p. 503
Symplocos fasciculata p. 623 |
| Na S'tuka | .. | Decaspermum p. 485 |
| Nemesu | .. | Shorea p. 213 |
| Nenasi | .. | Eugenia grata p. 498
E. spicata p. 503
Symplocos fasciculata p. 623 |
| Neneri, Nenering | .. | Parkia biglandulosa p. 415 |
| Neram | .. | Dipterocarpus oblongifolius p. 211 |

INDEX TO MALAY NAMES

<i>Neri</i>	..	<i>Parkia biglandulosa</i> p. 415
<i>Nerian</i>	..	Canangium p. 131
<i>Nering</i>	..	<i>Parkia biglandulosa</i> p. 415
<i>Nessang Burong</i>	..	Heynea p. 462
<i>Nipis Kulit</i>	..	Memeceylon p. 448
<i>Nona</i>	..	<i>Annona reticulata</i> p. 130
		<i>A. squamosa</i> p. 131
<i>Nona Burong</i>	..	<i>Cordia dichotoma</i> p. 176
<i>Nulong</i>	..	Agrostistachys p. 229
<i>Nyai</i>	..	Canangium p. 131
<i>Nyalas</i>	..	<i>Parastemon urophyllum</i> p. 526
<i>Nyamok</i>	..	Guioa p. 587
<i>Nyan</i>	..	<i>Cerbera manghas</i> p. 143
<i>Nyarong</i>	..	<i>Ixora</i> p. 543, <i>Pavetta</i> p. 552
		<i>Randia densiflora</i> p. 555
<i>Nyarum Nyarum</i>	..	<i>Ixora</i> p. 543, <i>Pavetta</i> p. 552
		<i>Randia densiflora</i> p. 555
<i>Nyatoh</i>	..	Palaquium p. 600
<i>Nyatus</i>	..	<i>Ficus elastica</i> p. 667
<i>Nyerapeh</i>	..	<i>Glycosmis pentaphylla</i> p. 574
<i>Nyiran Burong</i>	..	<i>Ixonanthes reticulata</i> p. 222
<i>Nyireh</i>	..	Carapa p. 458
<i>Nyireh Batu</i>	..	<i>Carapa moluccensis</i> p. 459
<i>Nyireh Bunga</i>	..	<i>Carapa granatum</i> p. 458
<i>Nyireh Undang</i>	..	<i>Carapa granatum</i> p. 458
<i>Nyiring</i>	..	<i>Parkia speciosa</i> p. 415
<i>Nyunyulong</i>	..	Agrostistachys p. 229
<i>Otak Udang</i>	..	<i>Buchanania</i> p. 102
<i>Pa'ang</i>	..	Weinmannia p. 201
<i>Pagar Anak</i>	..	<i>Ixonanthes</i> p. 221
<i>Pakik</i>	..	<i>Nephelium mutabile</i> p. 593
<i>Pakai Panggil</i>	..	<i>Clerodendron villosum</i> p. 701
<i>Paku Achu</i>	..	<i>Calophyllum inophyllum</i> p. 311
<i>Pala</i>	..	<i>Myristica fragrans</i> pp. 472, 474
<i>Pala Utan</i>	..	Myristicaceæ p. 473
<i>Panggil, Panggil Panggil</i>	..	<i>Clerodendron villosum</i> p. 701
<i>Parak</i>	..	<i>Amoora rubiginosa</i> p. 453
<i>Pasah</i>	..	<i>Aglaia</i> p. 456
<i>Passu, Passu Passu</i>	..	<i>Mallotus floribundus</i> p. 271
<i>Pauh</i>	..	<i>Mangifera indica</i> p. 109
		<i>M. pentandra</i> p. 111
<i>Pauh Damar</i>	..	<i>Mangifera pentandra</i> p. 111
<i>Pauh Kijang</i>	..	Irvingia p. 604
<i>Pauh Pauh</i>	..	Evodia p. 572
<i>Pauh Pipit</i>	..	<i>Buchanania</i> p. 102
<i>Pauh Rengan</i>	..	<i>Mangifera indica</i> p. 110
<i>Pauh Siam</i>	..	<i>Mangifera indica</i> p. 110
<i>Payang</i>	..	Pangium p. 308
<i>Payong Ali</i>	..	Eurycoma p. 604
<i>Pechak Passu</i>	..	<i>Ixora</i> p. 543
<i>Pechak Piring</i>	..	<i>Ixora</i> p. 543
<i>Pechak Priok</i>	..	<i>Ixora</i> p. 543
<i>Pedada</i>	..	<i>Sonneratia</i> p. 431
<i>Pedada Bukit, P. Darat</i>	..	Duabanga p. 427
<i>Perepat</i>	..	<i>Sonneratia</i> p. 431
<i>Pekan</i>	..	<i>Gmelina philippinensis</i> p. 703
<i>Pekan Heran</i>	..	<i>Gardenia tubifera</i> p. 541
<i>Pelajau</i>	..	Pentaspadon p. 113
<i>Pelampong</i>	..	Scævola p. 310
<i>Pelanga, Pelangas</i>	..	<i>Aporosa aurita</i> p. 235
<i>Pelangi</i>	..	<i>Aporosa aurita</i> p. 235
<i>Pelawan</i>	..	<i>Tristania</i> p. 509
<i>Pelawei</i>	..	see <i>Jelawei</i>
<i>Pelir Pelandok</i>	..	<i>Aglaia salicifolia</i> p. 457
<i>Pelong</i>	..	Pentaspadon p. 113

INDEX TO MALAY NAMES

<i>Pempisang</i>	..	Annonaceae p. 126
<i>Penaga</i>	..	Calophyllum p. 311, Mesua p. 320
<i>Penaga Laut</i>	..	Calophyllum p. 311
<i>Penaga Lilin</i>	..	Mesua p. 320
<i>Penah</i>	..	<i>Ardisia elliptica</i> p. 480
	..	<i>Balanocarpus Heimii</i> p. 210
<i>Penak</i>	..	<i>Balanocarpus Heimii</i> p. 210
<i>Penara, Penarahan</i>	..	Myristicaceae p. 472
<i>Penawa Pahit</i>	..	Eurycoma p. 604
<i>Penawa Puteh</i>	..	Gelonium p. 255
<i>Pendara, Pendarahan</i>	..	Myristicaceae p. 472
<i>Penggu</i>	..	<i>Horsfieldia irya</i> p. 476
<i>Penyamok</i>	..	Guioa p. 588
<i>Pepanggul</i>	..	<i>Clerodendron villosum</i> p. 701
<i>Pepassu</i>	..	<i>Mallotus floribundus</i> p. 271
<i>Peradun</i>	..	<i>Dillenia indica</i> p. 204
<i>Perah</i>	..	Elaterospermum p. 249
<i>Periah</i>	..	<i>Ardisia elliptica</i> p. 480
<i>Perian</i>	..	<i>Artocarpus rigidus</i> p. 657
<i>Pertun</i>	..	<i>Barringtonia asiatica</i> p. 353
<i>Petai</i>	..	<i>Parkia speciosa</i> p. 415
<i>Petai Belalang</i>	..	Pithecellobium p. 417
<i>Petai Belanda</i>	..	Leucæna p. 413
<i>Petai Jawa</i>	..	Leucæna p. 413
<i>Petai Kerayong</i>	..	<i>Albizia pedicellata</i> p. 411
<i>Petai Laut</i>	..	Desmodium p. 367
<i>Petai Tiga Bulan</i>	..	Leucæna p. 413
<i>Petaling</i>	..	Ochanostachys p. 728
<i>Petekat</i>	..	<i>Cordia dichotoma</i> p. 176
<i>Pianggu</i>	..	<i>Horsfieldia irya</i> p. 476
<i>Piat</i>	..	<i>Premna tomentosa</i> p. 705
<i>Pinang Pergam, P. Punai</i>	..	Elæocarpus p. 637
<i>Pisang</i>	..	Alphonsea p. 128, <i>Mangifera</i> p. 110
<i>Pisang Pisang</i>	..	Annonaceae p. 126
<i>Pokok Cha</i>	..	Camellia p. 624
<i>Pokok Choklat</i>	..	Theobroma p. 607
<i>Pokok Kanchil</i>	..	<i>Anisophyllea disticha</i> p. 122
<i>Pokok Kubor</i>	..	Plumeria p. 147
<i>Pokok Lasana</i>	..	<i>Acacia Farnesiana</i> p. 406
<i>Pokok Restong</i>	..	Tabernaemontana p. 149
<i>Pokok Teh</i>	..	Camellia p. 624
<i>Pompun</i>	..	Anaxagorea p. 129
<i>Pong Pong</i>	..	Cerbera p. 143
<i>Poyan</i>	..	Rhodamnia p. 507
<i>Puah Pungah</i>	..	Aralidium p. 153
<i>Puan</i>	..	Buchanania p. 102
<i>Puding</i>	..	Codiaeum p. 246
	..	Pseuderanthemum p. 96, Graptohyllum p. 96
	..	Nothopanax p. 156
<i>Pudu</i>	..	<i>Artocarpus kemando</i> p. 656, <i>A. Maingayi</i> p. 657
<i>Pukul Lima</i>	..	Enterolobium p. 412
<i>Pulai</i>	..	Alstonia pp. 32, 140
<i>Pulai Paya</i>	..	<i>Alstonia spathulata</i> p. 142
<i>Pulasan</i>	..	<i>Nephelium mutabile</i> p. 593
<i>Punggai</i>	..	Cœlostegia p. 437
<i>Pungtalai</i>	..	Scaphium p. 616
<i>Pupor</i>	..	<i>Baccaurea sapida</i> p. 241
<i>Putat</i>	..	Barringtonia p. 352
<i>Putat Ayam</i>	..	<i>Barringtonia racemosa</i> p. 355
<i>Putat Ayer</i>	..	<i>Barringtonia conoidea</i> p. 354
<i>Putat Bukit</i>	..	<i>Barringtonia macrostachya</i> p. 355
<i>Putat Gajah</i>	..	<i>Barringtonia Scortechinii</i> p. 355
<i>Putat Laut</i>	..	<i>Barringtonia asiatica</i> p. 353
<i>Putat Sawa</i>	..	<i>Barringtonia edaphocarpa</i> p. 354
<i>Putat Tuba</i>	..	Barringtonia p. 352

INDEX TO MALAY NAMES

<i>Raja Berangkat</i>	..	<i>Anisophyllea disticha</i> p. 122
<i>Rambai</i>	..	<i>Baccaurea</i> p. 238
		<i>B. Motleyana</i> p. 240
<i>Rambai Ayam</i>	..	<i>Baccaurea brevipes</i> p. 239
<i>Rambai Burong</i>	..	<i>Baccaurea brevipes</i> p. 239
<i>Rambai Kuching</i>	..	<i>Mallotus philippinensis</i> p. 272
<i>Rambai Tikus</i>	..	<i>Baccaurea brevipes</i> p. 239
		<i>B. Scortechinii</i> p. 242
<i>Rambai Utan</i>	..	<i>Baccaurea brevipes</i> p. 239
		<i>B. lanceolata</i> p. 240
<i>Rambutan</i>	..	<i>Nephelium lappaceum</i> p. 592
<i>Rambutan Pachat</i>	..	<i>Nephelium</i> p. 590
		<i>Xerospermum muricatum</i> p. 596
<i>Rambutan Utan</i>	..	<i>Nephelium</i> p. 590
<i>Rami Utan</i>	..	<i>Alchornea</i> p. 230
<i>Randa</i>	..	<i>Gardenia carinata</i> p. 539
		<i>Randia</i> p. 544
<i>Randa Utan</i>	..	<i>Randia anisophylla</i> p. 555
		<i>R. Scortechinii</i> p. 556
<i>Rawa</i>	..	<i>Mangifera microphylla</i> p. 111
<i>Redan</i>	..	<i>Nephelium glabrum</i> p. 591
<i>Remiga, Remigu</i>	..	<i>Calotropis</i> p. 159
<i>Rempah Gunung</i>	..	<i>Baccaia</i> p. 484
<i>Remunggal</i>	..	<i>Moringa</i> p. 470
<i>Rengas</i>	..	see <i>Rengas-trees</i> pp. 116, 118
<i>Rengas Ayer</i>	..	<i>Gluta velutina</i> p. 118
<i>Reriang</i>	..	<i>Archytæa</i> p. 627
<i>Resak</i>	..	<i>Shorea, Vatica</i> p. 208
<i>Restong</i>	..	<i>Tabernæmontana</i> p. 149
<i>Riang Riang</i>	..	<i>Archytæa</i> p. 627
<i>Rindu</i>	..	<i>Millettia albiflora</i> p. 373
<i>Ru</i>	..	<i>Casuarina</i> p. 185
<i>Ruas Ruas</i>	..	<i>Gelonium</i> p. 255
<i>Ru Bukit</i>	..	<i>Dacrydium elatum</i> p. 720
<i>Rukam</i>	..	<i>Flacourtia</i> p. 306, <i>Scolopia</i> p. 309
<i>Rukam Utan</i>	..	<i>Aporosa frutescens</i> p. 237
<i>Rumenia</i>	..	<i>Bouea microphylla</i> p. 101
<i>Rumia</i>	..	<i>Bouea microphylla</i> p. 101
<i>Rumuyu</i>	..	<i>Eugenia claviflora</i> p. 495
<i>Sadu</i>	..	<i>Melia indica</i> p. 466
<i>Saga</i>	..	<i>Adenanthera</i> p. 407, <i>Pithecellobium</i> p. 417
<i>Saga Gajah</i>	..	<i>Pithecellobium ellipticum</i> p. 420
<i>Saga Utan</i>	..	<i>Ormosia parvifolia</i> p. 374
<i>Sakit Restong</i>	..	<i>Tabernæmontana</i> p. 149
<i>Saklat</i>	..	<i>Diospyros discolor</i> p. 216
<i>Sakor</i>	..	<i>Xerospermum sp.</i> p. 597
<i>Salam</i>	..	<i>Eugenia cumini</i> p. 496
		<i>E. polyantha</i> p. 501
<i>Salang</i>	..	<i>Claoxylon longifolium</i> p. 245
<i>Samak</i>	..	<i>Eugenia</i> p. 488
		<i>E. palembanica</i> p. 500
<i>Saminyak</i>	..	<i>Sapium indicum</i> p. 277
<i>Sanaï</i>	..	<i>Anisoptera</i> p. 210
<i>Sangah</i>	..	<i>Elæocarpus</i> p. 637
		<i>E. robustus</i> p. 641
<i>Sanggul Lotong</i>	..	<i>Nephelium</i> p. 590
<i>Sanglong</i>	..	<i>Claoxylon longifolium</i> p. 245
<i>Sanum</i>	..	<i>Agathis alba</i> p. 715
<i>Sapang</i>	..	<i>Cesalpinia sappan</i> p. 386
<i>Sarang Burong</i>	..	<i>Premna tomentosa</i> p. 705
<i>Sasah</i>	..	<i>Aporosa frutescens</i> p. 237
<i>Sau, S. Burong</i>	..	<i>Manilkara</i> p. 599
<i>Sau Menila</i>	..	<i>Achras</i> p. 598
<i>Sawah, Sawai, Sawoh</i>	..	<i>Manilkara</i> p. 599
<i>Sebalai</i>	..	<i>Aralidium</i> p. 154
<i>Sebangau</i>	..	<i>Glochidion</i> p. 283

INDEX TO MALAY NAMES

<i>Sebasa</i>	..	<i>Antidesma</i> p. 232
		<i>Aporosa</i> p. 235
<i>Sebusok</i>	..	<i>Cassia nodosa</i> p. 389
<i>Secherek</i>	..	<i>Micromelum</i> p. 575, <i>Clausena excavata</i> p. 571
<i>Sechirik Laut</i>	..	<i>Diospyros ferrea</i> p. 216
<i>Sedangar</i>	..	<i>Mallotus barbatus</i> p. 270
<i>Sedudok</i>	..	<i>Melastoma</i> p. 445
<i>Segun</i>	..	<i>Diospyros lanceifolia</i> p. 216]
<i>Sekelek</i>	..	<i>Olea</i> p. 514
<i>Sekendai, Sekendal</i>	..	<i>Cordia dichotoma</i> p. 176
<i>Sekriah</i>	..	<i>Aglaia sp.</i> p. 457
<i>Sekuang</i>	..	<i>Dracontomelum</i> p. 104
<i>Sekuntut</i>	..	<i>Saprosma</i> p. 558
<i>Selar Makan</i>	..	<i>Gnettarda</i> p. 542
<i>Selensur</i>	..	<i>Glochidion littorale</i> p. 287, <i>Tristania</i> p. 509
<i>Selimbar</i>	..	<i>Jackia</i> p. 548
<i>Seluma, Selumar</i>	..	<i>Antidesma</i> p. 232
		<i>Jackia</i> p. 548
<i>Selunchor</i>	..	<i>Cratoxylon</i> p. 325
		<i>C. ligustrinum</i> p. 327, <i>Emblica</i> p. 282
		<i>Tristania</i> p. 509
		<i>see Selunchor</i>
<i>Selunsor</i>	..	<i>Taxotrophis</i> p. 693
<i>Semanian</i>	..	<i>see Sapotaceæ</i> p. 597
<i>Semaram</i>	..	<i>Blumea</i> p. 196
<i>Sembong</i>	..	<i>Garcinia mangostana</i> p. 318
<i>Sementah, Semetah</i>	..	<i>Clausena excavata</i> p. 571
<i>Semeru</i>	..	<i>Fagraea fragrans</i> p. 424
<i>Semesu</i>	..	<i>Clausena excavata</i> p. 571
<i>Semura</i>	..	<i>Pterocarpus</i> p. 375
<i>Sena</i>	..	<i>Breynia coronata</i> p. 281
<i>Sendok Dua</i>	..	<i>Endospermum</i> p. 251
<i>Sendok, Sendok Sendok</i>	..	
<i>Sendudok, S. Ayer, S. Gajah,</i>		
<i>S. Putih</i>	..	<i>Melastoma</i> p. 445
<i>Seniah</i>	..	<i>Ficus hispida</i> p. 685
<i>Senkam</i>	..	<i>Glochidion laevigatum</i> p. 286
		<i>G. leiostylum</i> p. 287
<i>Senkuang</i>	..	<i>Dracontomelum</i> p. 104
<i>Sentada</i>	..	<i>Podocarpus neriifolius</i> p. 723
		<i>P. polystachyus</i> p. 724
<i>Sentang</i>	..	<i>Melia excelsa</i> p. 465
<i>Sentoi, Sentol</i>	..	<i>Sandoricum</i> p. 466
<i>Senyamok</i>	..	<i>Guioa</i> p. 587
<i>Sepah Petri</i>	..	<i>Engelhardtia nudiflora</i> p. 333
<i>Sepal</i>	..	<i>Parishia</i> p. 112, <i>Cedrela</i> p. 459
<i>Sepam</i>	..	<i>Mangifera longipetiolata</i> p. 110
<i>Sepan</i>	..	<i>Dialium</i> p. 394
<i>Sepang</i>	..	<i>Cæsalpinia sappan</i> p. 386
<i>Sepanggih</i>	..	<i>Clerodendron villosum</i> p. 701
<i>Sepau</i>	..	<i>Dialium</i> p. 394
<i>Sepetir</i>	..	<i>Sindora</i> p. 403
<i>Sepuleh</i>	..	<i>Fagraea racemosa</i> p. 425
		<i>Rauwolfia</i> p. 148
<i>Sepulis</i>	..	<i>Fagraea racemosa</i> p. 425
<i>Serah</i>	..	<i>Eugenia polyantha</i> p. 501
<i>Seraya</i>	..	<i>Shorea Curtisii</i> p. 213
<i>Serba Jaman</i>	..	<i>Mangifera ? microphylla</i> p. 111
<i>Seremkan</i>	..	<i>Trigonachras</i> p. 596
<i>Serentang</i>	..	<i>Campnosperma</i> pp. 102, 104
<i>Seri Gading</i>	..	<i>Nyctanthes</i> p. 513
<i>Seri Kaya</i>	..	<i>Annona squamosa</i> p. 131, <i>Mangifera</i> p. 110
<i>Seringan, S. Laut</i>	..	<i>Dodonæa viscosa</i> p. 586
<i>Sertak Tangga</i>	..	<i>Castanopsis</i> p. 292
		<i>Quercus</i> p. 299
<i>Sesendok</i>	..	<i>Endospermum</i> p. 251

INDEX TO MALAY NAMES

<i>Sesudu</i>	..	Euphorbia p. 254
<i>Setada</i>	..	<i>Podocarpus nerifolius</i> p. 723
		<i>P. polystachyus</i> p. 724
<i>Setambun</i>	..	<i>Baccaurea parviflora</i> p. 241
<i>Setambun Antan</i>	..	<i>Baccaurea Scortechinii</i> p. 242
<i>Setan, Setang</i>	..	<i>Melia excelsa</i> p. 465
<i>Setapu</i>	..	Macaranga p. 261
		Mallotus p. 269
<i>Setawar</i>	..	Clerodendron p. 699
<i>Setawar Bukit</i>	..	<i>Clerodendron deflexum</i> p. 700
<i>Seteh</i>	..	Sandoricum p. 466
<i>Setenggek Burong</i>	..	Evodia p. 572
<i>Setia, Setieh</i>	..	Sandoricum p. 466
<i>Setinggi</i>	..	Alstonia p. 142
<i>Setoi</i>	..	Sandoricum p. 466
<i>Setoi Tupai</i>	..	<i>Blasocarpus robustus</i> p. 641
<i>Setol</i>	..	Sandoricum p. 466
<i>Setui</i>	..	Sandoricum p. 466
<i>Setukai Benai</i>	..	Decaspermum p. 485
<i>Setul</i>	..	Sandoricum p. 466
<i>Setulang</i>	..	Prismatomeris p. 553
<i>Sialang</i>	..	<i>Koompassia excelsa</i> p. 397
<i>Sial Menahun</i>	..	Pternandra p. 451
<i>Siantan</i>	..	Ixora p. 543
<i>Siku</i>	..	<i>Mangifera indica</i> p. 110
<i>Simpoh</i>	..	Dilleniaceæ p. 201
<i>Simpoh Ayer</i>	..	<i>Wormia suffruticosa</i> p. 207
<i>Simpoh Bukit</i>	..	<i>Dillenia meliosmæfolia</i> p. 204
<i>Simpoh Daun Merah</i>	..	<i>Dillenia grandifolia</i> p. 203
<i>Simpoh Gajah</i>	..	<i>Dillenia reticulata</i> p. 205
<i>Simpoh Jangkang</i>	..	<i>Dillenia reticulata</i> p. 205
		<i>D. grandifolia</i> p. 203
<i>Singah</i>	..	Melochia p. 613
<i>Sisek Puyoh</i>	..	<i>Carallia lucida</i> p. 522
<i>Songkok</i>	..	<i>Gnetum gnemon</i> p. 726
<i>Sourabaya</i>	..	Mangifera p. 110
<i>Star</i>	..	<i>Bouea macrophylla</i> p. 101
<i>S'ukai Benai</i>	..	Decaspermum p. 485
<i>Sudu, Sudu Sudu</i>	..	Euphorbia p. 254
<i>Suga</i>	..	Adenantha p. 407
<i>Sugi</i>	..	Mischocarpus p. 589
<i>Sugi Damar</i>	..	Guioa p. 588
<i>Sukai</i>	..	Peronema p. 704
<i>Suku, Sukun</i>	..	<i>Artocarpus incisus</i> p. 655
<i>Sundek</i>	..	see <i>Sapotaceæ</i> p. 597
<i>Sungga</i>	..	<i>Albizzia pedicellata</i> p. 411
<i>Sungkai</i>	..	Peronema p. 704
<i>Suntek</i>	..	Palaquium p. 600
<i>Surian</i>	..	Parishia p. 112, Cedrela p. 459
<i>Susoh Ayam</i>	..	Tabernæmontana p. 149
		<i>T. divaricata</i> p. 151
<i>Susun Kelapa</i>	..	Tabernæmontana p. 149
		<i>T. divaricata</i> p. 151
<i>Tabah</i>	..	<i>Myristica elliptica</i> p. 477
<i>Tabai</i>	..	<i>Baccaurea Griffithii</i> p. 240
		<i>B. reticulata</i> p. 241
<i>Taban</i>	..	<i>Baccaurea Griffithii</i> p. 240
		<i>B. reticulata</i> p. 241
		Palaquium p. 600
<i>Taban Merah</i>	..	<i>Palaquium gutta</i> p. 600
<i>Taban Putih</i>	..	<i>Palaquium obovatum</i> p. 601
<i>Tabau</i>	..	see <i>Taban</i>
<i>Tajam Penggal</i>	..	<i>Myristica elliptica</i> p. 447
<i>Talan</i>	..	Saraca p. 400

<i>Tampah Besi</i>	..	<i>Callicarpa</i> p. 697
<i>Tampal Besi</i>	..	<i>Callicarpa</i> p. 697
<i>Tampang</i>	..	<i>Artocarpus</i> sp. p. 658 <i>A. dadah</i> p. 653, <i>A. Gomezianus</i> p. 654
<i>Tampang Besi</i>	..	<i>Callicarpa</i> p. 697
<i>Tampang Boteh</i>	..	<i>Callicarpa</i> p. 697
<i>Tampayang</i>	..	<i>Scaphium</i> p. 616
<i>Tamping</i>	..	<i>Mallotus floribundus</i> p. 271
<i>Tampoh Besi</i>	..	<i>Callicarpa</i> p. 697
<i>Tampoi</i>	..	<i>Baccaurea Griffithii</i> p. 240 <i>B. reticulata</i> p. 241
<i>Tampoi Burong, T. Kra</i>	..	<i>Baccaurca bracteata</i> p. 239
<i>T. Tunggan, T. Tupai</i>	..	<i>B. pyriformis</i> p. 241
<i>Tampu</i>	..	<i>Melochia</i> p. 613
<i>Tangisong Burong</i>	..	<i>Amoora</i> p. 460 <i>Chisocheton</i> p. 460 <i>Dysoxylon</i> p. 460 <i>Heynea</i> p. 462 <i>Sterculia</i> p. 618 <i>Trigonachras</i> p. 596
<i>Tanglin</i>	..	<i>Saraca</i> p. 400
<i>Tanjong</i>	..	<i>Mimusops</i> p. 600
<i>Taping</i>	..	<i>Mallotus floribundus</i> p. 271
<i>Tapu</i>	..	<i>Macaranga</i> p. 261 <i>Mallotus</i> p. 269 <i>Melochia</i> p. 613
<i>Tapu Hitam</i>	..	<i>Macaranga javanica</i> p. 266
<i>Tasek</i>	..	<i>Glochidion obscurum</i> p. 287 <i>G. sericeum</i> p. 288
<i>Tasek Tembul</i>	..	<i>Leucopogon</i> p. 218
<i>Tebangar, Tebanga</i>	..	<i>Glochidion</i> p. 283
<i>Tebanga Gajah</i>	..	<i>Glochidion superbum</i> p. 289
<i>Tebanga Kelasur</i>	..	<i>Glochidion Wallichianum</i> p. 289
<i>Tedok Priok</i>	..	<i>Ixora</i> p. 543
<i>Teh</i>	..	<i>Camellia</i> p. 624
<i>Tejah, Tejur</i>	..	<i>Lauraceae</i> p. 334 <i>Neolitsea</i> p. 349 <i>Cinnamomum</i> p. 339
<i>Tejur Pasir</i>	..	<i>Neolitsea</i> p. 349
<i>Telawi</i>	..	<i>Artocarpus incisus</i> p. 655
<i>Telingga Badak</i>	..	<i>Crypteronia Griffithii</i> p. 199
<i>Telingga Gajah</i>	..	<i>Macaranga gigantea</i> p. 265
<i>Telur Belangkas</i>	..	<i>Aglaiia odorata</i> p. 456
<i>Telur Belangkas Utan</i>	..	<i>Aglaiia odoratissima</i> p. 457
<i>Telur Chichak</i>	..	<i>Myrica</i> p. 471
<i>Temahau</i>	..	<i>Kleinhovia</i> p. 613
<i>Temak</i>	..	<i>Shorea cochinchinensis</i> p. 213
<i>Temangau</i>	..	<i>Glochidion</i> p. 283
<i>Tembusu</i>	..	<i>Fagraea fragrans</i> p. 424
<i>Temesu, Temensu</i>	..	<i>Fagraea fragrans</i> p. 424
<i>Tempinis</i>	..	<i>Slœtia</i> p. 691
<i>Tempoyai</i>	..	<i>Rhodammia</i> p. 507
<i>Tempunai, Tempuni</i>	..	<i>Artocarpus rigidus</i> p. 657
<i>Temusu</i>	..	<i>Fagraea fragrans</i> p. 424
<i>Tengar</i>	..	<i>Cerriops</i> p. 520
<i>Tengek</i>	..	<i>Mangifera? microphylla</i> p. 111
<i>Tengkaras</i>	..	<i>Aquilaria</i> p. 632
<i>Tentulang</i>	..	<i>Euphorbia tirucalli</i> p. 254
<i>Terejah, Terajan</i>	..	<i>Erioglossum</i> p. 587
<i>Terap</i>	..	<i>Artocarpus elasticus</i> p. 653 <i>A. Scortechinii</i> p. 657
<i>Terapeh, Terapai</i>	..	<i>Glycosmis pentaphylla</i> p. 574
<i>Terasek</i>	..	<i>Glochidion obscurum</i> p. 287 <i>G. sericeum</i> p. 288
<i>Terbak</i>	..	<i>Anisoptera</i> sp. p. 210
<i>Terentang</i>	..	<i>Campnosperma</i> pp. 102, 104

INDEX TO MALAY NAMES

<i>Terentang Jantan</i>	..	<i>Campnosperma minor</i> p. 104
<i>Terentang Tikus</i>	..	<i>Buchanania</i> p. 102
<i>Terong</i>	..	<i>Solanum</i> p. 606
<i>Teruntum</i>	..	<i>Lumnitzera</i> p. 191
<i>Tetapai, Tetapi, Tetaping,</i> <i>Tetapu</i>	..	<i>Mallotus</i> p. 269 <i>M. floribundus</i> p. 271 <i>Macaranga</i> p. 261 <i>Glochidion leiostylum</i> p. 287 <i>Adinandra</i> p. 625 <i>A. dumosa</i> p. 626 <i>Bucklandia</i> p. 323 <i>Bæckia</i> p. 484 <i>Mangifera</i> p. 110 <i>Evodia</i> p. 572 <i>Alstonia</i> p. 142 <i>Greenea</i> p. 541 <i>Randia</i> p. 553 <i>Dillenia indica</i> p. 204 <i>Adinandra</i> p. 625, <i>A. dumosa</i> p. 626 <i>Ixora</i> p. 543 <i>Eurycoma</i> p. 604 <i>Mangifera ? longipetiolata</i> p. 110 <i>Agathis alba</i> p. 715 <i>Dolichandrone</i> p. 163 <i>Koompassia excelsa</i> p. 397 <i>Diospyros</i> p. 214 <i>D. Wallichii</i> p. 217 <i>Dolichandrone</i> p. 162 <i>Alstonia macrophylla</i> p. 142 <i>Decaspermum</i> p. 485 <i>Decaspermum</i> p. 485 <i>Milletia atropurpurea</i> p. 372 <i>Euphorbia tirucalli</i> p. 254 <i>Callicarpa tomentosa</i> p. 698 <i>Arthrophyllum</i> p. 155 <i>Bruguiera</i> p. 520 <i>Sesbania</i> p. 377 <i>Hibiscus floccosus</i> p. 441 <i>H. macrophyllus</i> p. 441 <i>Hibiscus floccosus</i> p. 441 <i>H. macrophyllus</i> p. 441 <i>Eugenia</i> p. 488 <i>Eugenia grandis</i> p. 498 <i>Glochidion</i> p. 283 <i>Manihot</i> p. 273 <i>Bæckia</i> p. 484 <i>Breynia</i> p. 281 <i>Terminalia belerica</i> p. 193 <i>Greenea</i> p. 541 <i>Randia anisophylla</i> p. 555 <i>R. Scortechinii</i> p. 556 <i>Sapium baccatum</i> p. 276 <i>S. discolor</i> p. 276
<i>Tetimah, Timah Timah</i>	..	
<i>Tetiup</i>	..	
<i>Tiga Sagi</i>	..	
<i>Timor Tasek</i>	..	
<i>Timun</i>	..	
<i>Tinggek Burong</i>	..	
<i>Tinjau Belukar</i>	..	
<i>Tipor</i>	..	
<i>Tiup Tiup</i>	..	
<i>Todong Priok</i>	..	
<i>Tongkat Ali</i>	..	
<i>Topah</i>	..	
<i>Tsanum</i>	..	
<i>Tuai</i>	..	
<i>Tualang</i>	..	
<i>Tuba Buah</i>	..	
<i>Tui</i>	..	
<i>Tujok Setapoh</i>	..	
<i>Tuka Benang</i>	..	
<i>Tukai Benang</i>	..	
<i>Tulang Dain</i>	..	
<i>Tulang Tulang</i>	..	
<i>Tumah Dapur</i>	..	
<i>Tumbuh Kelapa, T. Nyior</i>	..	
<i>Tumu</i>	..	
<i>Turi</i>	..	
<i>Tutok</i>	..	
<i>Tutur</i>	..	
<i>Ubah</i>	..	
<i>Ubi, Ubi Kayu</i>	..	
<i>Ujan Atap</i>	..	
<i>Ujan Panas</i>	..	
<i>Uji</i>	..	
<i>Ulai Ulai</i>	..	
<i>Ulam Pelandok</i>	..	
<i>Wampai, Wampoi</i>	..	<i>Clausena lansium</i> p. 571
<i>Wang Pei</i>	..	<i>Clausena lansium</i> p. 571
<i>Waringin</i>	..	<i>Ficus benjamina</i> p. 675
<i>Zetun</i>	..	<i>Thevetia</i> p. 152

INDEX TO BOTANICAL NAMES

<p>Acacia .. p. 405</p> <p>Acanthaceæ .. p. 95</p> <p>Achras .. p. 598</p> <p>Actinodaphne .. p. 345</p> <p>Adansonia .. p. 435</p> <p>Adenanthera .. p. 407</p> <p>Adina .. p. 532</p> <p>Adinandra .. p. 625</p> <p>Aegiceras .. p. 479</p> <p>Aegle .. p. 567</p> <p>Agathis .. p. 715</p> <p>Aglaia .. p. 455</p> <p>Agrostistachys .. p. 228</p> <p>Ailanthus .. p. 602</p> <p>Albizzia .. p. 408</p> <p>Alchornea .. p. 230</p> <p>Aleurites .. p. 230</p> <p>Allophylus .. p. 584</p> <p>Alphonsea .. p. 127</p> <p>Alseodaphne .. p. 338</p> <p>Alstonia .. p. 140</p> <p>Amherstia .. p. 377</p> <p>Amoora .. p. 460</p> <p>Ampelidaceæ .. p. 96</p> <p>Anacardiaceæ .. p. 98</p> <p>Anacardium .. p. 100</p> <p>Anaxagorea .. p. 129</p> <p>Angelesia .. p. 526</p> <p>Anisophyllea .. p. 122</p> <p>Anisophylleaceæ .. p. 122</p> <p>Anisoptera .. p. 210</p> <p>Annona .. p. 130</p> <p>Annonaceæ .. p. 125</p> <p>Anthocephalus .. p. 533</p> <p>Antiaris .. p. 647</p> <p>Antidesma .. p. 231</p> <p>Apocynaceæ .. p. 137</p> <p>Aporosa .. p. 235</p> <p>Aquilaria .. p. 632</p> <p>Araliaceæ .. p. 152</p> <p>Aralidium .. p. 153</p> <p>Araucaria .. p. 717</p> <p>Archytæa .. p. 627</p> <p>Ardisia .. p. 479</p> <p>Arfeuillea .. p. 585</p> <p>Arthrophyllum .. p. 154</p> <p>Artocarpus .. p. 649</p> <p>Asclepiadaceæ .. p. 159</p> <p>Atalantia .. p. 567</p> <p>Averrhoa .. p. 516</p> <p>Avicennia .. p. 696</p> <p>Baccaurea .. p. 238</p> <p>Bæckia .. p. 484</p> <p>Balanocarpus .. p. 210</p> <p>Barringtonia .. p. 350</p> <p>Bauhinia .. p. 378</p> <p>Bertholletia .. p. 356</p> <p>Bignoniaceæ .. p. 160</p> <p>Bixa .. p. 173</p> <p>Bixaceæ .. p. 173</p>	<p>Blumea .. p. 196</p> <p>Boraginaceæ .. p. 175</p> <p>Bouea .. p. 100</p> <p>Brassaia .. p. 155</p> <p>Brassaiopsis .. p. 155</p> <p>Breynia .. p. 278, 279</p> <p>Bridelia .. p. 242</p> <p>Brownea .. p. 383</p> <p>Brownlowia .. p. 634</p> <p>Brucea .. p. 603</p> <p>Bruguiera .. p. 521</p> <p>Buchanania .. p. 101</p> <p>Bucklandia .. p. 321</p> <p>Burseraeæ .. p. 177</p> <p>Cæsalpinia .. p. 385</p> <p>Cæsalpiniaceæ .. p. 361, 377</p> <p>Callicarpa .. p. 697</p> <p>Calophyllum .. p. 311</p> <p>Calotropis .. p. 159</p> <p>Camellia .. p. 624</p> <p>Camptosperma .. p. 102</p> <p>Canarium .. p. 131</p> <p>Canarium .. p. 178</p> <p>Canthium .. p. 534</p> <p>Capparidaceæ .. p. 179</p> <p>Capparis .. p. 179</p> <p>Caprifoliaceæ .. p. 182</p> <p>Carallia .. p. 521</p> <p>Carapa .. p. 458</p> <p>Carica .. p. 184</p> <p>Caricaceæ .. p. 183</p> <p>Cassia .. p. 386</p> <p>Castanopsis .. p. 291</p> <p>Castanospermum .. p. 727</p> <p>Casuarina .. p. 186</p> <p>Casuarinaceæ .. p. 184</p> <p>Cedrela .. p. 459</p> <p>Ceiba .. p. 436</p> <p>Celastraceæ .. p. 189</p> <p>Cerbera .. p. 143</p> <p>Ceriops .. p. 521</p> <p>Cinætocarpus .. p. 244</p> <p>Champereia .. p. 515</p> <p>Chasalia .. p. 536</p> <p>Chisocheton .. p. 460</p> <p>Chloroxylon .. p. 460</p> <p>Chrysophyllum .. p. 599</p> <p>Cicca .. p. 278, 281</p> <p>Cinnamomum .. p. 339</p> <p>Citharexylum .. p. 699</p> <p>Citrus .. p. 568</p> <p>Claóxylon .. p. 244</p> <p>Clausena .. p. 570</p> <p>Clerodendron .. p. 699</p> <p>Clidemia .. p. 446</p> <p>Cochlospermum .. p. 174</p> <p>Codiaeum .. p. 245</p> <p>Cœlostegia .. p. 436</p> <p>Coffea .. p. 536</p> <p>Cola .. p. 608</p>
---	--

INDEX TO BOTANICAL NAMES

Combretaceæ	..	p. 191	Eugenia	..	p. 486
Commersonia	..	p. 608	Euphorbia	..	p. 252
Compositæ	..	p. 195	Euphorbiaceæ	..	p. 222
Coniferæ	..	p. 713, 715	Eurya	..	p. 628
Cordia	..	p. 175	Eurycoma	..	p. 604
Couroupita	..	p. 356	Evodia	..	p. 571
Cratava	..	p. 180	Excœcaria	..	p. 254
Cratoxylon	..	p. 325			
Crescentia	..	p. 161	Fagaceæ	..	p. 290
Croton	..	p. 246	Fagraea	..	p. 422
Crypteronia	..	p. 197	Feronia	..	p. 573
Crypteroniaceæ	..	p. 197	Ficus	..	p. 658
Cryptocarya	..	p. 342	Firmiana	..	p. 610
Cryptomeria	..	p. 719	Flacourtia	..	p. 306
Cunoniaceæ	..	p. 199	Flacourtiaceæ	..	p. 305
Cupressus	..	p. 724	Flueggea	..	p. 255
Cycadaceæ	..	p. 711			
Cynometra	..	p. 391	Garcinia	..	p. 312
Cyphomandra	..	p. 605	Gardenia	..	p. 538
			Gelonium	..	p. 255
Dacrydium	..	p. 720	Ginkgoaceæ	..	p. 713
Dalbergia	..	p. 365	Gironniera	..	p. 688
Daphne	..	p. 633	Gliricidia	..	p. 371
Decaspermum	..	p. 484	Glochidion	..	p. 278, 283
Dehaasia	..	p. 343	Gluta	..	p. 116, 117
Delonix	..	p. 392	Glycosmis	..	p. 574
Deplanchea	..	p. 163	Gmelina	..	p. 702
Derris	..	p. 366	Gnetaceæ	..	p. 713, 725
Desmodium	..	p. 367	Gnetum	..	p. 726
Dialium	..	p. 393	Goniothalamus	..	p. 134
Dillenia	..	p. 203	Goodeniaceæ	..	p. 309
Dilleniaceæ	..	p. 201	Gordonia	..	p. 629
Diospyros	..	p. 213	Graptophyllum	..	p. 96
Diplospora	..	p. 537	Greenea	..	p. 541
Dipterocarpaceæ	..	p. 208	Grevillea	..	p. 518
Dipterocarpus	..	p. 211	Grewia	..	p. 642
Dodonæa	..	p. 586	Guettarda	..	p. 541
Dolichandrone	..	p. 163	Guioa	..	p. 587
Dombeya	..	p. 609	Gustavia	..	p. 357
Dracontomelum	..	p. 104	Guttiferæ	..	p. 310
Drepananthus	..	p. 132	Gymnospermæ	..	p. 711
Dryobalanops	..	p. 211	Gynotroches	..	p. 522
Drypetes	..	p. 248			
Duabanga	..	p. 427	Hamamelidaceæ	..	p. 321
Duranta	..	p. 702	Helicteres	..	p. 610
Durio	..	p. 437	Heritiera	..	p. 612
Dyera	..	p. 144	Hernandia	..	p. 323
Dysoxylon	..	p. 460	Hernandiaceæ	..	p. 323
			Hevea	..	p. 256
Ebenaceæ	..	p. 213	Heynea	..	p. 462
Elæocarpus	..	p. 635	Hibiscus	..	p. 440
Elaterospermum	..	p. 249	Holarrhena	..	p. 145
Emblia	..	p. 278, 282	Homalanthus	..	p. 257
Endospermum	..	p. 250	Homoncia	..	p. 258
Engelhardtia	..	p. 331	Hopea	..	p. 212
Enterolobium	..	p. 412	Horsfieldia	..	p. 475
Epacridaceæ	..	p. 218	Hymenæa	..	p. 394
Ephedraceæ	..	p. 713	Hypericaceæ	..	p. 324
Epiprinus	..	p. 251			
Ericaceæ	..	p. 218	Ilex	..	p. 328
Erioglossum	..	p. 586	Ilicaceæ	..	p. 327
Ervatamia	..	p. 149	Inocarpus	..	p. 395
Erythrina	..	p. 367	Intsia	..	p. 396
Erythroxylaceæ	..	p. 220	Irvingia	..	p. 604
Erythroxyton	..	p. 220	Ixonanthes	..	p. 221
Eucalyptus	..	p. 485	Ixora	..	p. 542

INDEX TO BOTANICAL NAMES:

Jacaranda	..	p. 164	Montanoa	..	p. 196
Jackia	..	p. 547	Moraceæ	..	p. 646
Jatropha	..	p. 258	Morinda	..	p. 549
Juglandaceæ	..	p. 330	Moringa	..	p. 470
Juniperus	..	p. 724	Moringaceæ	..	p. 470
			Morus	..	p. 646
Kandelia	..	p. 521	Muntingia	..	p. 644
Kigelia	..	p. 161	Murraya	..	p. 576
Kleinhovia	..	p. 612	Myrica	..	p. 471
Knema	..	p. 476	Myricaceæ	..	p. 470
Koompassia	..	p. 396	Myristica	..	p. 477
Kopsia	..	p. 145	Myristicaceæ	..	p. 472
Kurrimia	..	p. 189	Myrsinaceæ	..	p. 478
			Myrsine	..	p. 481
Lagerstroemia	..	p. 428	Myrtaceæ	..	p. 482
Lanœa	..	p. 105			
Lansium	..	p. 463	Nauclea	..	p. 550
Laportea	..	p. 646	Neesia	..	p. 443
Lasianthus	..	p. 534	Neolitsea	..	p. 349
Lauraceæ	..	p. 334	Neonauclea	..	p. 551
Lawsonia	..	p. 428	Nephelium	..	p. 589
Lecythidaceæ	..	p. 349	Nerium	..	p. 146
Lecythis	..	p. 349	Nothopanax	..	p. 156
Leea	..	p. 97	Nyctaginaceæ	..	p. 510
Leguminosæ	..	p. 358	Nyctanthes	..	p. 513
Lepionurus	..	p. 515			
Leptospermum	..	p. 505	Ochanostachys	..	p. 728
Leucœna	..	p. 413	Ochrosia	..	p. 147
Leucopogon	..	p. 218	Olacaceæ	..	p. 728
Ligustrum	..	p. 512	Olea	..	p. 513
Lindera	..	p. 346	Oleaceæ	..	p. 511
Linociera	..	p. 512	Opiliaceæ	..	p. 514
Litsea	..	p. 347	Ormosia	..	p. 374
Loganiaceæ	..	p. 422	Oroxylum	..	p. 166
Longetia	..	p. 260	Oxalidaceæ	..	p. 516
Lumnitzera	..	p. 191			
Lythraceæ	..	p. 426	Pajanelia	..	p. 167
			Palaquium	..	p. 600
Macaranga	..	p. 261	Panax	..	p. 156
Mæsa	..	p. 481	Pangium	..	p. 308
Magnoliaceæ	..	p. 432	Papilionaceæ	..	p. 361, 365
Mallotus	..	p. 269	Paramignya	..	p. 577
Malvaceæ	..	p. 434	Paranephelium	..	p. 593
Mangifera	..	p. 106	Parastemon	..	p. 526
Manihot	..	p. 273	Parinarium	..	p. 527
Manilkara	..	p. 599	Parishia	..	p. 112
Melaleuca	..	p. 506	Parkia	..	p. 414
Melanochyla	..	p. 116, 119	Pavetta	..	p. 552
Melanolepis	..	p. 273	Pellacalyx	..	p. 523
Melanorrhœa	..	p. 116, 119	Peltophorum	..	p. 398
Melastoma	..	p. 445	Pemphis	..	p. 431
Melastomaceæ	..	p. 445	Pentaspadon	..	p. 113
Melia	..	p. 464	Peronema	..	p. 704
Meliaceæ	..	p. 453	Persea	..	p. 343
Melochia	..	p. 613	Phyllanthus	..	p. 278, 290
Memecylon	..	p. 448	Phyllochlamys	..	p. 690
Merrillia	..	p. 575	Phœbe	..	p. 343
Mesua	..	p. 320	Pinus	..	p. 722
Michelia	..	p. 433	Pisonia	..	p. 510
Micromelum	..	p. 575	Pithecellobium	..	p. 416
Millettia	..	p. 372	Pittosporaceæ	..	p. 517
Millingtonia	..	p. 165	Pittosporum	..	p. 517
Mimosa	..	p. 413	Planchonella	..	p. 601
Mimosaceæ	..	p. 362, 405	Pluchea	..	p. 196
Mimusops	..	p. 600	Plumeria	..	p. 147
Mischocarpus	..	p. 588	Podocarpus	..	p. 723
			Polyalthia	..	p. 135

INDEX TO BOTANICAL NAMES

Pometia	..	p. 594	Sloetia	..	p. 690
Pongamia	..	p. 374	Solanaceæ	..	p. 605
Premna	..	p. 704	Solanum	..	p. 606
Prismatomeris	..	p. 553	Sonneratia	..	p. 431
Proteaceæ	..	p. 518	Sophora	..	p. 377
Pseuderanthemum	..	p. 96	Spathodea	..	p. 169
Psidium	..	p. 507	Spondias	..	p. 114
Psychotria	..	p. 534	Stenolobium	..	p. 170
Pternandra	..	p. 451	Sterculia	..	p. 618
Pterocarpus	..	p. 375	Sterculiaceæ	..	p. 606
Pterospermum	..	p. 614	Stereospermum	..	p. 172
Punica	..	p. 427	Streblus	..	p. 692
Pygeum	..	p. 528	Symplocaceæ	..	p. 622
Pyrenaria	..	p. 629	Symplocos	..	p. 622
Pyrus	..	p. 529	Swietenia	..	p. 468
			Swintonia	..	p. 116, 119
Quassia	..	p. 602	Tabernæmontana	..	p. 148
Quercus	..	p. 293	Tamarindus	..	p. 404
			Tarenna	..	p. 559
Radermachera	..	p. 168	Tarrietia	..	p. 621
Randia	..	p. 553	Taxotrophis	..	p. 692
Rauwolfia	..	p. 148	Tecoma	..	p. 170
Rennellia	..	p. 558	Tectona	..	p. 705
Rhamnaceæ	..	p. 519	Terminalia	..	p. 192
Rhizophora	..	p. 521	Ternstroemiaceæ	..	p. 624
Rhizophoraceæ	..	p. 520	Theobroma	..	p. 607
Rhodamnia	..	p. 507	Thespesia	..	p. 444
Rhododendron	..	p. 219	Thevetia	..	p. 152
Rhodomyrtus	..	p. 508	Thuja	..	p. 724
Rhus	..	p. 99	Thymelæaceæ	..	p. 632
Ricinus	..	p. 274	Tibouchina	..	p. 452
Rosaceæ	..	p. 524	Tiliaceæ	..	p. 634
Rubiaceæ	..	p. 530	Timonius	..	p. 562
Rutaceæ	..	p. 565	Trema	..	p. 693
			Trevesia	..	p. 157
Salicaceæ	..	p. 580	Trigonachras	..	p. 596
Salix	..	p. 580	Triphasia	..	p. 578
Salmalia	..	p. 443	Tristania	..	p. 508
Sambucus	..	p. 182	Urophyllum	..	p. 534
Sandoricum	..	p. 466	Urticaceæ	..	p. 646
Santiria	..	p. 178			
Sapindaceæ	..	p. 581	Vaccinium	..	p. 219
Sapindus	..	p. 595	Vangueria	..	p. 564
Sapium	..	p. 275	Verbenaceæ	..	p. 695
Sapotaceæ	..	p. 597	Vernonia	..	p. 196
Saprosma	..	p. 558	Viburnum	..	p. 183
Saraca	..	p. 399	Vitex	..	p. 706
Scævola	..	p. 310			
Scaphium	..	p. 616	Weinmannia	..	p. 200
Schefflera	..	p. 156	Welwitschiaceæ	..	p. 713
Schima	..	p. 630	Wendlandia	..	p. 565
Schoutenia	..	p. 645	Wormia	..	p. 205
Scolopia	..	p. 309			
Scorodocarpus	..	p. 728	Xerospermum	..	p. 596
Scyphiphora	..	p. 559	Ximenia	..	p. 728
Semecarpus	..	p. 116, 121	Xylopia	..	p. 136
Sesbania	..	p. 376			
Shorea	..	p. 212	Zanthoxylum	..	p. 578
Simarubaceæ	..	p. 602	Zizyphus	..	p. 519
Sindora	..	p. 403			

INDEX TO BOTANICAL AND DESCRIPTIVE TERMS

Age of trees .. p. 24		Glabrous .. p. 10
Alternate .. p. 18, 82		Glaucous .. p. 10
Anther .. p. 21		Hairy .. p. 10
Ant-trees .. p. 33		Head .. p. 20
Aril .. p. 24		Heart-shaped .. p. 17
Armed .. p. 10		Height (of trees) .. p. 24
Asymmetric .. p. 17		High forest .. p. 41
Australian element .. p. 40		Himalayan element .. p. 40
Axillary .. p. 10		
		Indehiscent .. p. 24
Bark .. p. 11		Indigenous .. p. 40
Basal veins .. p. 19		Inflorescence .. p. 19
Belukar .. p. 41		Internode .. p. 12
Berry .. p. 24		Interpetiolar stipule .. p. 18
Bilaterally symmetrical .. p. 21		
Bisexual .. p. 21		Knee, Knee-ed .. p. 18
Blade .. p. 14		
Bract .. p. 20		Lanceolate .. p. 17
Branch .. p. 12		Lateral .. p. 10
Breathing roots .. p. 11		Latex .. p. 10
Bud .. p. 13		Leader-shoot .. p. 13
Burmese monsoon element .. p. 40		Leaf .. p. 13
Buttresses .. p. 33		Leaf-arrangement .. p. 18
		Leaf-scale .. p. 17
Calyx .. p. 21		Leaf-shape .. p. 14
Calyx-tube .. p. 21		Leaf-venation .. p. 19
Capsule .. p. 23		Leaflet .. p. 14
Cassia-habit .. p. 26		Lenticel .. p. 11, 13
Catkin .. p. 20		Limb .. p. 12
Cauliflorous .. p. 20		Lobed .. p. 17
Climate (of Malaya) .. p. 35		Longitudinal veins .. p. 19
Cluster .. p. 20		
Compound leaf .. p. 14		Male .. p. 21
Corolla .. p. 21		Mangrove .. p. 43
Corolla-tube .. p. 21, 23		Marginal vein .. p. 19
Cracked (bark) .. p. 12		Midrib .. p. 19
Crown .. p. 10		Monopodial .. p. 27
		Monsoon element .. p. 40
Dehiscent .. p. 23		Nectary .. p. 21
Dendron .. p. 26		Neram-rivers .. p. 42
Dippled-scaly .. p. 12		Node .. p. 12
Distribution .. p. 7		Numerous .. p. 21
Doubly pinnate .. p. 14		Nut .. p. 24
Dry (fruit) .. p. 24		
		Oblong .. p. 17
Elliptic .. p. 17		Obovate .. p. 17, 27
Endemic .. p. 40		Opposite .. p. 18, 28
Entire .. p. 17		Ovary .. p. 21, 22
Ever-flowering trees .. p. 37		Ovate .. p. 17, 27
Exotic .. p. 40		Ovule .. p. 21
Female .. p. 21		Pagoda trees .. p. 28, 30
Fissured (bark) .. p. 12		Palmate .. p. 14
Flaky (bark) .. p. 12		Palmately lobed .. p. 17
Fleshy (fruit) .. p. 24		Panicle .. p. 20
Flower-head .. p. 20		Peeling (bark) .. p. 12
Flowers .. p. 19		Peltate .. p. 17
Free .. p. 21		Petal .. p. 21
Fruits .. p. 23		Petiole .. p. 18

INDEX TO BOTANICAL AND DESCRIPTIVE TERMS

Phyllode	.. p. 18	Staminal tube	.. p. 21
Pinnate leaf	.. p. 14	Stilt-root	.. p. 11
Pinnately lobed	.. p. 17	Stipule	.. p. 14
Pod	.. p. 23	Stipule, interpetiolar	.. p. 18
Pollen	.. p. 21, 23	Stripping (bark)	.. p. 12
Pollen-grains	.. p. 21, 23	Stigma	.. p. 22
Primitive shape of trees	.. p. 27	Style	.. p. 22
		Symmetry (of flowers)	.. p. 21, 23
Raceme	.. p. 20	Sympodial	.. p. 27
Radially symmetrical	.. p. 21	Sundanese flora	.. p. 40
Ramiflorous	.. p. 20		
<i>Rassau-river</i>	.. p. 42	Tap-root	.. p. 11
Regular	.. p. 21	Temperature-trees	.. p. 38
Resinous	.. p. 10	Terminal	.. p. 10
Rings (in trees)	.. p. 24	Terminalia-Barringtonia	
Roots	.. p. 11	formation	.. p. 44
		Terminalia-branching	.. p. 30
Saraca-streams	.. p. 42	Three-veined (leaves)	.. p. 19
Scale-leaf	.. p. 17	Tipped	.. p. 18
Scaly (bark)	.. p. 12	Toothed	.. p. 17
Secondary jungle	.. p. 41	Treble pinnate	.. p. 14
Seeds	.. p. 23	Trifoliolate	.. p. 14
Sepal	.. p. 21	Tropical dendron	.. p. 26
Septate pith	.. p. 13	Twig	.. p. 12
Sessile	.. p. 10	Two-lipped	.. p. 21
Siamese element	.. p. 40		
Side-stalk	.. p. 14	Umbel	.. p. 20
Side-veins	.. p. 19	Umbrella-shaped trees	.. p. 25, 26
Simple leaf	.. p. 14	Unarmed	.. p. 10
Simply pinnate	.. p. 14	Unisexual	.. p. 21
Spider-web veining	.. p. 19		
Spike	.. p. 20	Veins	.. p. 19
Spirally arranged	.. p. 18, 27	Venation	.. p. 13, 19
Sprays of foliage	.. p. 28, 29	Virgin forest	.. p. 41
Stalk	.. p. 14		
Stalked	.. p. 10	Winged	.. p. 18
Stamen	.. p. 21	Whorled	.. p. 18, 29



