

## RHIZOPHORACEAE

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*Ceriops tagal* (Perr.) C.B. Rob.

**Synonyms :** *Ceriops australis* White, *Ceriops boiviniana* Tul., *Ceriops candolleana* Arn., *Ceriops candolleana* var. *sasakii* Hayata, *Ceriops candolleana* var. *spathulata* Blume, *Ceriops forsteniana*, *Ceriops lucida* Miq., *Ceriops pauciflora* Benth., *Ceriops somalensis* Chiovenda, *Ceriops tagal* var. *australis* White, *Ceriops timoriensis* Domin, *Mangium caryophylloides* Rumph., *Rhizophora candel* (non L.) Blanco, *Rhizophora tagal* Perr., *Rhizophora timoriensis* DC.

**Vernacular name(s):** Tengar, Tengah (Mal.), Tangar, Tingih, Palun, Parun, Bido-bido (Ind.), Magtongod, Pakat, Rungon, Tagasa, Tangal, Tanggal, Tangal lalaki, Tigasan, Tungod - *Tangal* (Phil.), Madame (Myan.), Đà vôi (Viet.), Prong, Prong daeng (Thai.), Smerkrohorm (Camb.)

**Description :** Small tree or shrub up to 6 m tall, occasionally to 15(-25) m, with a grey, occasionally brown, smooth bark and with a flanged stem base. The tree often has small stilt roots. The rounded, glossy-green leaves measure 5.5-10 by 2-3.5 cm, are obovate-elliptic and often have an inwardly-curved margin. The 5-10 flowered, pendulous flower head measures 2 by 10-20. It has a long, slender stalk, is resinous and occurs at the ends of new shoots or in the axils on older ones. Calyx lobes are erect in flower, recurved in fruit, 4-5 mm long, with a 2 mm long tube. Flowers are white and soon turn brown. Petals are linked via marginal hairs and have a top that bears three trumpet-shaped lobes, 0.5 mm across. The stamens have long, slender filaments that extend far beyond the blunt anthers. Fruit is 1.5-2 cm long, with recurved, persistent sepals. The warty hypocotyl (often mistaken for the 'fruit') is smooth or slightly ridged, angular, slender and often rather short, 4-25 cm long. Variable species, and as a result a number of subspecies have been described, including: *Ceriops tagal* var. *australis*, found in northern Australia and Papua New Guinea (often recorded as *Ceriops australis*).

**Ecology :** Forms dense shrublands on the landward edge of tidal forests, in areas inundated by spring tides with well-drained soils. Also occurs along brackish-water fish ponds. It prefers clay substrates, and may coexist with *Ceriops decandra* though usually more abundant. Flowering occurs all year round. The species degenerates into a bushy shrub under unfavourable growth condition. Mangrove species.

**Distribution :** From Mozambique and East Africa to the Western Pacific, though northern Australia and Southeast Asia, and in Taiwan, Southern China (where it is rare) and New Caledonia. In Southeast Asia recorded from Myanmar, Cambodia, Thailand, Vietnam, the Philippines, Malaysia, Brunei, Singapore, Indonesia and Papua New Guinea.

**Abundance :** Common.

**Use(s) :** An extraction of the bark is used in obstetrical and haemorrhage cases. Tannin is produced from the bark. Dye is obtained from the wood and bark, and used in the 'batik' industry in Malaysia and Indonesia. The wood is heavy, very hard and very strong; does not check badly but shrinks excessively. Easy to split and work. The timber is useful for house construction, railway sleepers, paving blocks and tool handles, due to its longevity when immersed in salt water. It is one of the most durable of all the mangrove timbers, and is excellent firewood.

**Source of illustration :** Based on Ding Hou (1958), Tomlinson (1986) and Wightman (1989).

**Reference(s) :** Ding Hou (1958), Backer & Bakhuizen van den Brink (1963-8), Percival & Womersley (1975), Tomlinson (1986), Wightman (1989), Aksornkoe (1993), Aragones *et al.* (1998), Marschke (2000).

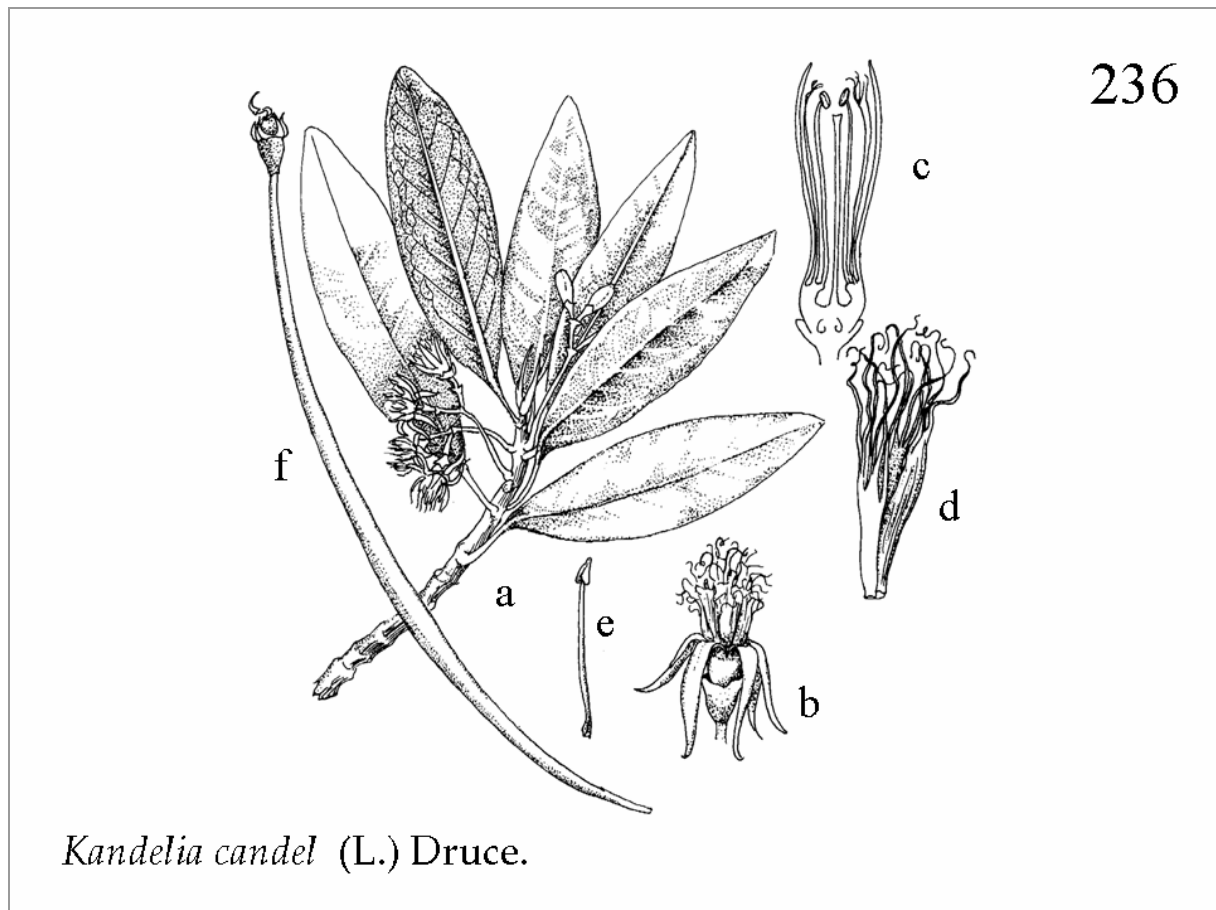


Fig. 236. *Kandelia candel* (L.) Druce. (a) Branchlet with buds and flowers, (b) flower, (c) longitudinal section of flower, (d) petal, (e) stamen, and (f) hypocotyl ('fruit').

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*Kandelia candel* (L.) Druce

**Synonyms :** *Kandelia rheedei* Wight & Arn., *Rhizophora candel* Linné

**Vernacular name(s) :** Berus-berus, Beras-beras, Pulut-pulut, Mempisang, Pisang-pisang laut (Mal.), Beus, Pulut-pulut, Pisang-pisang laut (Ind.), Pulut-pulut (Bru.), Bakauan baler (Phil.), Rang ka thae (Thai), Trang (Viet.)

**Description :** Shrub or small tree, up to 7 m tall, with a thickened stem base. Generally without proper buttresses or pneumatophores; roots may appear braided at the base of the trunk. The greyish to reddish-brown bark is smooth and has lenticels. Leaves measure 6-13 by 2.5-6 cm, are elliptic-oblong to narrowly so, or obovate-oblong, with a margin that is usually curled inward; leaf stalk 1-1.5 cm. The dichotomously branched flower cluster has 4 to sometimes 9 white flowers that are 1.5-2 cm long; petals are 14 mm long; calyx lobes number 5(-6). The calyx tube exceeds the ovary and has linear lobes that are recurved after the flower has fully expanded. The green fruit is ovoid, 1.5-2.5 cm long. The long, cylindrical hypocotyl (usually mistaken for the 'fruit') is club-shaped and 15-40 cm long and may have a reddish tint.

**Ecology :** Occurs sporadically on banks of tidal rivers among other mangroves, obviously (because of its rarity) occupying a narrow niche. Mangrove species.

**Distribution :** Occurs from India eastwards to Southeast Asia, Hong Kong, Guangdong (southern China), southern Japan and Taiwan. In Southeast Asia it has been recorded from Malaysia, Thailand, Myanmar, the Philippines, Cambodia, Vietnam, Brunei, Singapore and western Indonesia (north Sumatra and West Borneo).

**Abundance :** In Southeast Asia it occurs only very locally and is uncommon; it is listed as rare in Indonesia (Mogea *et al.*, 2001). In Southern China (Zhanjiang, Hong Kong), however, it is one of the more common mangrove species and it is often planted by the Forestry Bureau.

**Use(s) :** Mainly for firewood.

**Source of illustration :** Based on Ding Hou (1958).

**Reference(s) :** Burkill (1935), Ding Hou (1958), Said (1990), Aksornkoe (1993), Wilkie (1996), Ng & Sivasothi (1999), Yao (2000), Maung (2003).

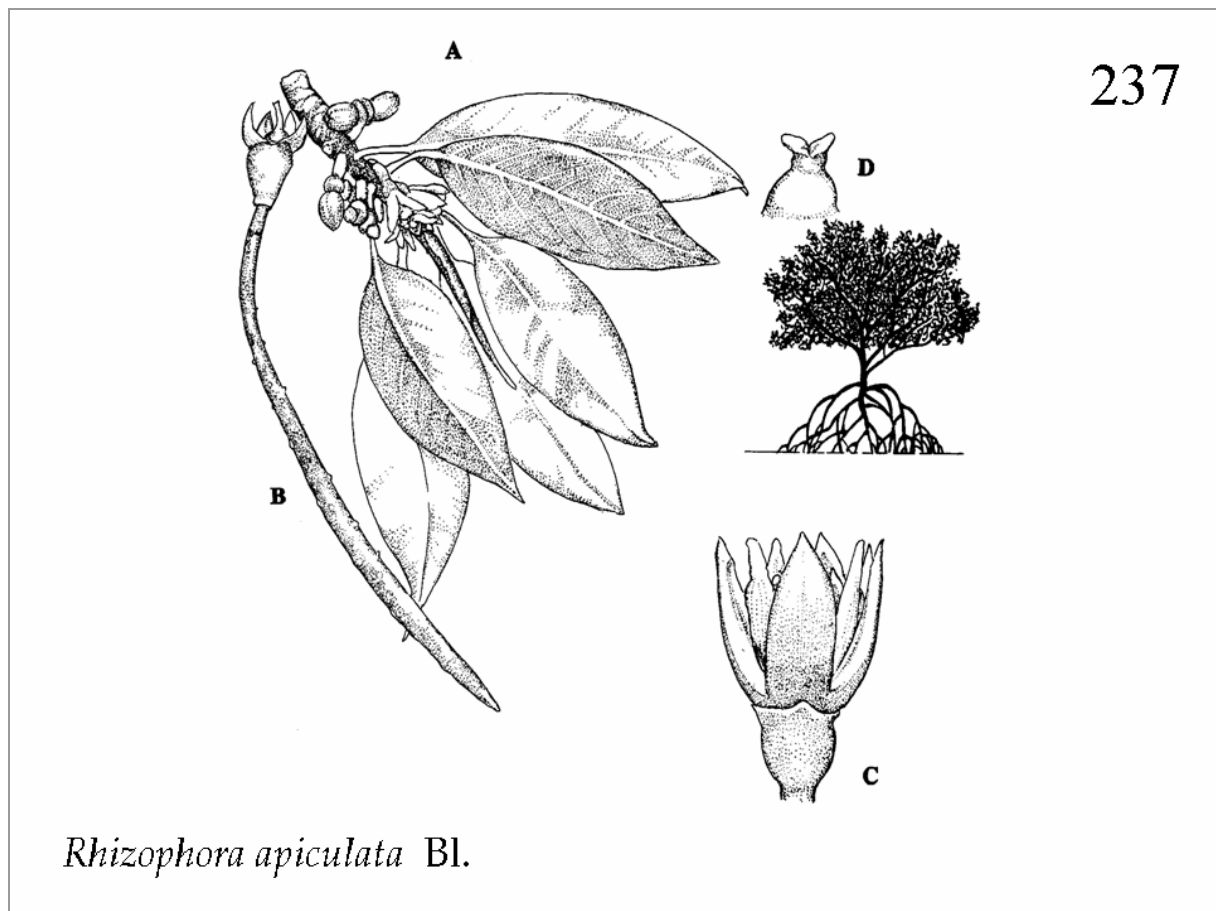


Fig. 237. *Rhizophora apiculata* Bl. (a) Branchlet with buds and flowers, (b) hypocotyl ('fruit'), (c) flower, (d) style, and (e) habit.

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*Rhizophora apiculata* Bl.

**Synonyms :** *Mangium candelarium* Rumph., *Rhizophora candelaria* DC., *Rhizophora conjugata* (non Linné) Arn., *Rhizophora lamarckii*, *Rhizophora mangle* (non Linné)

**Vernacular name(s) :** Bakau minyak, Bakau tandok, Bakau akik, Bakau puteh, akik (Mal.), Bangka Minyak, Donggo Akit, Jankar, Abat, Bangkita, Kalumagus, Kailau, Parai (Ind.), Bakauan lalaki, Bakauan, Bakau, Uakatan Bakad, Bakhau, Bakhaw, Lupa pula, Uakatan – *Bakauan-lalake* (Phil.), Du'o'c (Viet.), Kongkang, Kongkaang bai leu (Thai.), Kongkang-slektoch (Camb.)

**Description :** Erect tree to over 30 m tall, with a trunk that can be 50 cm in diameter. It has very conspicuous, arching stilt-roots extending up to 5 m up the stem, and occasionally has aerial roots from the branches. Bark is dark grey and chequered. The trunk may be clear for the first 10-12 m. The narrowly elliptic, leathery leaves measure 7-19 by 3.5-8 cm. They are dark green with a distinct light green zone along the midrib, which is tinged reddish underneath. The leaf stalk is 17-35 mm long, tinged reddish, and is flanked by leaflets at its base that measure 4-8 cm. Flower heads occur in the axils of leaf scars, each bearing two bisexual, yellowish flowers on a stalk that can be up to 14 mm long. Buds are broadly elliptic and finely fissured. Just below the buds are two fused, cup-shaped, fissured, bulbous leaflets. The four brownish-yellow to reddish sepals are persistent, and occur in a recurved form on the end of the fruit. The four yellow to white petals are membranous, flat and hairless, 9-11 mm long. There are 11-12 stemless stamens, and the style is 0.8 mm long. The oblong to pear-shaped, brown fruits are rough, 2-3.55 cm long, and contain one fertile seed. The cylindrical hypocotyl (often mistaken for the 'fruit') is green with purple, club shaped, 18-38 by 1-2 cm. A sterile hybrid between *Rhizophora apiculata* and *Rhizophora stylosa* exists, originally recognised as a separate species "*Rhizophora lamarckii*" (now *Rhizophora* X *lamarckii*).

**Ecology :** Occurs on deep, soft, muddy soils that are flooded by normal high tides. Avoids firmer substrates mixed with sand. Dominant: may form up to 90% of the vegetation at a site. Tidal waterways with strong freshwater input on permanent basis are also preferred. Branching of the stilt roots may be abnormal and caused by a beetle damaging the root tips. Crabs may hamper regrowth by devouring or removing the bark of seedlings until they are completely girdled or even bitten right through. Grows slowly, but flowers all year round. Mangrove species.

**Distribution :** From Sri Lanka throughout Southeast Asia to tropical Australia, Micronesia and the west Pacific Islands.

**Abundance :** Abundant in Southeast Asia; sparsely distributed in Australia.

**Use(s) :** The wood is very heavy to extremely heavy, and very hard. It requires careful seasoning to prevent splitting, but works and finishes well. Used for foundation piles, beams, and outriggers of dugout canoes. Also used for interior timber, furniture, firewood and the making of charcoal. The bark contains up to 30% tannin (per cent dry weight). Branched stilt roots are used for making anchors, after being weighted by a stone. In Java it is sometimes planted along fishponds to protect dikes and bunds. Used in mangrove rehabilitation and plantation forestry.

**Source of illustration :** Based on Ding Hou (1958), Tomlinson (1986) and Wightman (1989).

**Reference(s) :** Ding Hou (1958), Backer & Bakhuizen van den Brink (1963-8), Percival & Womersley (1975), Tomlinson (1986), Wightman (1989), Aksornkoae (1993), Aragonés *et al.* (1998), Yao (2000), Marschke (2000).

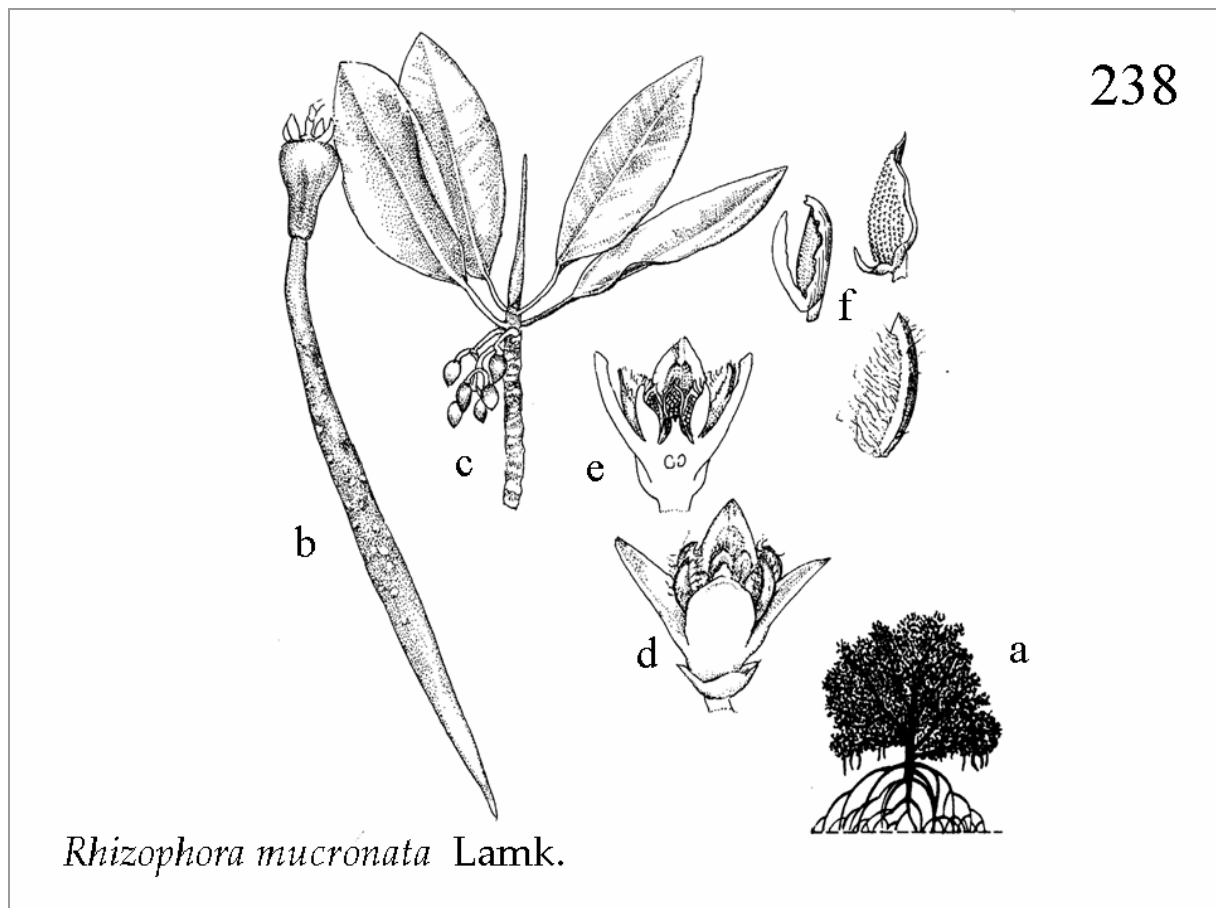


Fig. 238. *Rhizophora mucronata* Lamk. (a) Habit, (b) hypocotyl ('fruit'), (c) branchlet with buds, (d) flower, (e) longitudinal section of flower, and (f) stamens.

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*Rhizophora mucronata* Lamk.

**Synonyms :** *Mangium candelarium* Rumphius, *Rhizophora candelaria* Wight & Arn., *Rhizophora latifolia* Miq., *Rhizophora longissima* Blanco, *Rhizophora macrorrhiza* Griff., *Rhizophora mangle* (non Linné) Roxb., *Rhizophora mucronata* var. *typica* Schimp.

**Vernacular name(s) :** Bakau belukap, Bakau gelukap, Bakau jankar, Bakau hitam, Bakau kurap (Mal.) Bangka Itam, Dongoh Korap, Bakau Hitam, Bakau Korap, Bakau Merah, Jankar, Lenggayong, Belukap, Lolaro (Ind.), Bakau, Bakauan-babae, Bakhau, Bakhaw, Bangkau – *Bakauan-babe* (Phil.), Koriki, Pabo, Togo, Tortor, Totoa (PNG), Đung (Viet.), Kongkaang bai yai, Kongkang (Thai.)

**Description :** Erect tree, up to 27 m tall, rarely over 30 m, trunk up to 70 cm in diameter with a dark, almost black bark that is horizontally fissured. It has both stilt roots and aerial roots growing from lower branches. Leaves are broadly elliptic to oblong, usually 11-23 by 5-13 cm, and leathery. The green leaf stalk is 2.5-5.5 cm long, and the leaflets at the base of the leaf stalk are 5.5-8.5 cm. Stalks of flower heads are forked 2-3 times, and usually have 2-5 (up to 12) bisexual flowers, each on a 2.5-5 cm long individual stalk. The buds are widest near the base and have two 2-lobed leaflets near the base. The calyx is deeply lobed and pale yellow, 13-19 mm long. The four white petals have densely hairy margins, are sparsely hairy on the back and are about 9 mm long. There are eight stemless stamens, and the style is 0.5-1.5 mm long. The dull, brownish-green fruit is elongated to egg-shaped, often rough at the base, single seeded and 5-7 cm long. The cylindrical hypocotyl (often mistaken for the 'fruit') is rough and warty, 36-64 cm long and up to 2 cm wide.

**Ecology :** In similar localities to *Rhizophora apiculata*, but more tolerant of sandy and firmer substrates. Generally growing in groups near or on the banks of tidal creeks and in estuaries, seldom far from tidal water. Optimal development occurs in deeply inundated areas, on reasonably firm soils rich in humus. It is one of the most important and widespread mangrove species. Flowering occurs all year round. The seedlings are often predated on by crabs, preventing their establishment. Seedlings that have been dried in the shade for several days before planting are more or less avoided by crabs; the process possibly causes an accumulation of protective tannin in the tissues. Mangrove species.

**Distribution :** From East Africa, Madagascar and Mauritius to Southeast Asia, Australia, Melanesia and Micronesia. Introduced in Hawaii. In Southeast Asia it is found throughout.

**Abundance :** Very common.

**Use(s) :** The wood is very heavy to extremely heavy, very hard and strong; shrinks excessively and is rather difficult to work because of its hardness. Used for fuel and charcoal. The tannin in the bark is used for tanning and dyeing, especially of fishing lines and ropes. Occasionally used for treating cases of haematuria (blood in urine). May be planted along coastal fish ponds to protect dikes and bunds, and use for making fish traps.

**Source of illustration :** Based on Ding Hou (1958), Tomlinson (1986) and Wightman (1989).

**Reference(s) :** Ding Hou (1958), Backer & Bakhuizen van den Brink (1963-8), Percival & Womersley (1975), Tomlinson (1986), Wightman (1989), Aksornkoae (1993), Aragones *et al.* (1998), Yao (2000).

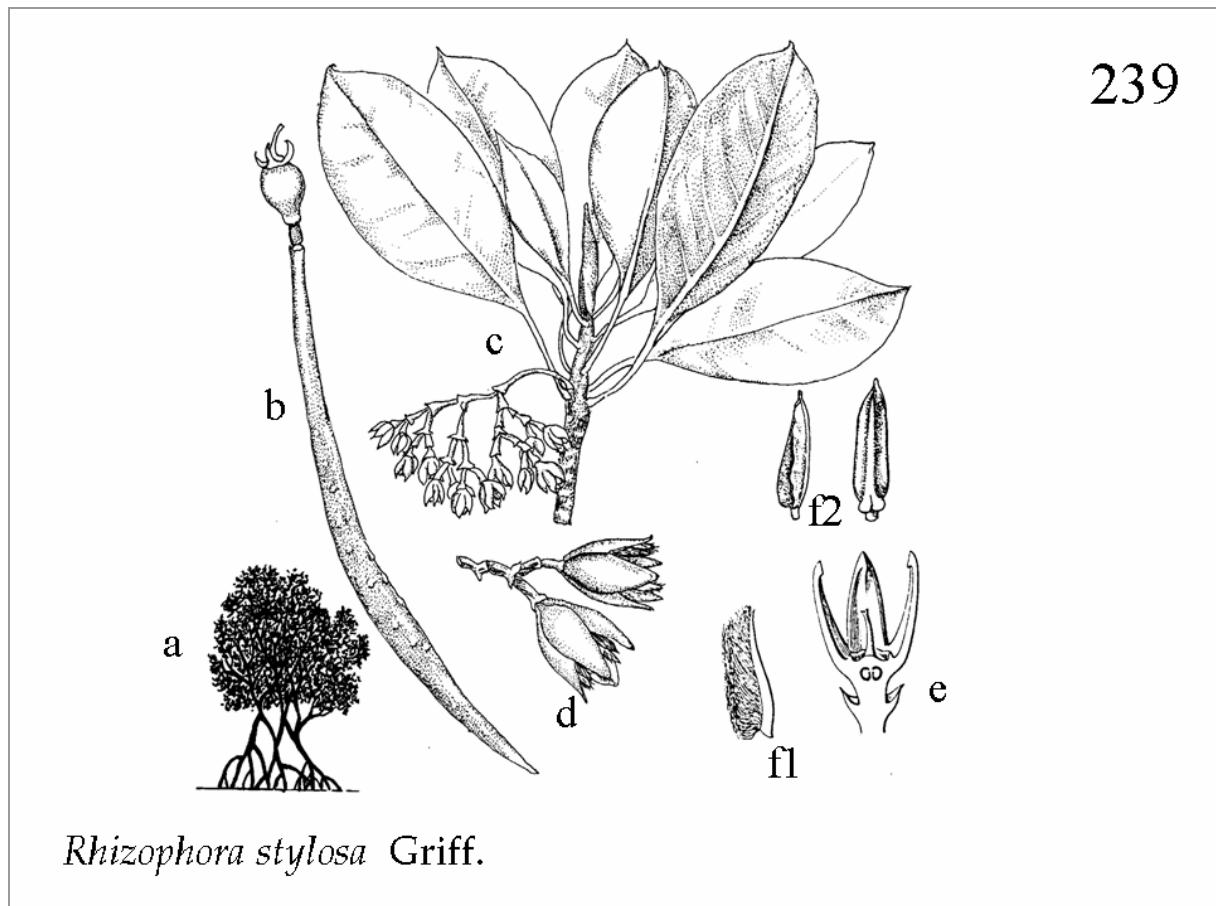


Fig. 239. *Rhizophora stylosa* Griff. (a) Habit, (b) hypocotyl ('fruit'), (c) branchlet with flowers, (d) pair of flowers, (e) longitudinal section of flower, and (f) stamens.



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*Rhizophora stylosa* Griff.

**Synonyms :** *Rhizophora lamarckii*, *Rhizophora mucronata* var. *stylosa* Schimp.

**Vernacular name(s) :** Generally the same names as for *Rhizophora mucronata* (Bakau in Malaysia and Indonesia); Bakauan bato, Bakhaw – *Bangkau* (Phil.).

**Description :** Multi- or single-trunked small tree, up to 10 m tall, with a smooth, grey to black, fissured bark; trunk may measure 10-15 cm diameter at breast height. It has stilt-roots that are up to 3 m long, and aerial roots emerging from the lower branches. Leaves are broadly elliptic, 6.5-12.5 by 3-7.5 cm, leathery, with a regularly-spotted lower surface and a pointed tip. The green leaf stalk is 1-3.5 cm long, with 4-6 cm long leaflets at its base. The flower heads are located in the axils and forked 3-5 times, with 5-8 (up to 32) bisexual flowers, each on a 2.5-5 cm long stalk. The buds are widest near the base, below which are two leaflets. The four pale-yellow calyx lobes remain present on the fruit, but are then recurved. The four yellowish to whitish petals are 8 mm long, and have densely woolly margins. Each flower has eight stamens and a 4-6 mm long style. The elongated, pear-shaped, brown fruit contains one fertile seed and is 2.5-4 cm long. The cylindrical hypocotyl (often mistaken for the 'fruit') is 20-35 cm, sometimes up to 1-2 by 54 cm. A sterile hybrid between *Rhizophora apiculata* and *Rhizophora stylosa* exists, originally recognised as a separate species "*Rhizophora lamarckii*" (now *Rhizophora* X *lamarckii*).

**Ecology :** Grows in a variety of tidal habitats on mud, sands, coarse grits and rock, preferring banks of tidal rivers, but also as a pioneering species in coastal environments or on landward margins of mangroves. One typical niche it may occupy is in the fringing mangroves of small 'coral' islands, growing on coral substrate. It produces flowers and fruit throughout the year. Probably pollinated by wind. Mangrove species.

**Distribution :** Apart from occurring in Taiwan and northern Australia, *Rhizophora stylosa* occurs primarily in Southeast Asia, where it has been recorded in Malaysia, the Philippines, Singapore, Vietnam, throughout Indonesia, Papua New Guinea and tropical Australia.

**Abundance :** Fairly common to common.

**Use(s) :** As timber, firewood and for the production of charcoal. Australian Aboriginals use it to make boomerangs, spears and ceremonial objects. Light wine and a concoction to cure haematuria (blood in urine) are made from the fruit.

**Source of illustration :** Based on Ding Hou (1958), Tomlinson (1986) and Wightman (1989).

**Reference(s) :** Ding Hou (1958), Backer & Bakhuizen van den Brink (1963-8), Percival & Womersley (1975), Tomlinson (1986), Wightman (1989), Aragones *et al.* (1998), Yao (2000).

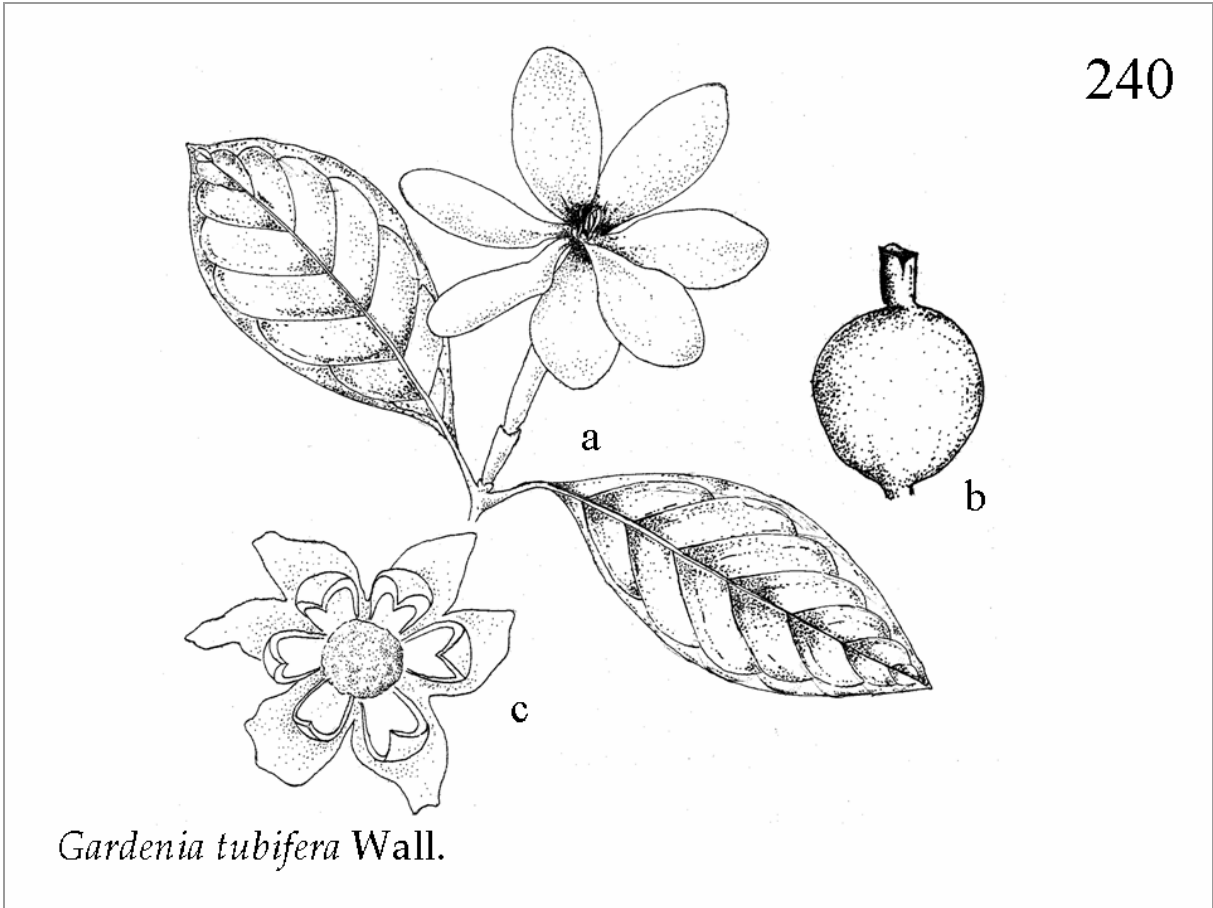


Fig. 240. *Gardenia tubifera* Wall. (a) Pair of leaves with flower, (b) fruit seen from side, and (c) ripe opened fruit, exposing the pulpy interior.

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***Gardenia tubifera* Wall.**

**Synonyms :** *Gardenia elata* Ridl., *Gardenia gumnifera*, *Gardenia lucida* Roxb., *Gardenia resinifera* Korth., *Gardenia speciosa* (Hk.) Hk. f.

**Vernacular name(s) :** Water Gardenia, Canbi resin tree (E), Sugang, Sulang-sulang (Bru.), Chempaka utan, Pekan heran, Mentiong (Mal.), Piuweh, Medang geliser, Delima hutan, Cempaka hutan, Kayu tulak (Ind.)

**Description :** A shrub or tree, 8-15(-25) m, and 75 cm girth, with a tendency towards *Terminalia*-like branching. Bark pale grey or grey-brown, smooth, to finely cracked or slightly scaly, buds and twigged varnished with pale yellow resin; inner bark pale brown, sapwood pale yellow. Leaves smooth, (slightly) obovate to elliptic, shortly tipped, rather light green, strongly ribbed, drooping, with upwardly curled edges, 3-10(-12) by 5-26(-30) cm; leaf stalk 1-2.5(-3.5) cm; resinous. Flowers 3-9 cm across, variable in size on different plants, at first creamy white, later orange-yellow, (very) fragrant; calyx tube 6-25 mm, smooth or slightly ribbed, often shortly split; corolla tube 3.5-10 cm long, petals number 6-9(-10), edges recurved. Fruit 2.5-5 cm wide, nearly round, pale apple green, crowned with the calyx tube, splitting open to reveal the orange-red interior, gaping widely; the inside of the fruit mealy, orange-yellow, with 6-8 very bony shells around the tomato-red seed mass. *Gardenia tubifera* forma *tubifera* has smaller leaves, not exceeding 6 cm in width, veins below are smooth, calyx tube 0.8-2 cm long, corolla tube 2.5-7.5 cm long, fruit up to 3.5 cm across. In Southeast Asian mangrove literature often described as *Gardenia lucida*.

**Ecology :** In lowland and hill forests. Form *tubifera* is usually found in lowland sites near the coast, in swamp areas or (occasionally, e.g. in Vietnam and Myanmar) on the landward margins of mangroves. Flowers open at dusk and last for three nights; they are creamy white on the first night, chrome-buff on the second, and intensely orange on the third day when they fall off. Birds, squirrels and musang are attracted by the brightly coloured seed mass for food. Mangrove associate species.

**Distribution :** From South to Southeast Asia, where it has been recorded in Myanmar, Thailand, Vietnam (as *Gardenia lucida*), Malaysia, Singapore, Brunei and Indonesia (Sumatra, Java, Borneo).

**Abundance :** Common.

**Use(s) :** Cultivated in Java. Wood used for construction of house interior. Resin is used to prepare mosquito repellent sticks in South Asia. Gum is used in the Indian system of medicine. Ornamental species, sold world-wide (as a botanical rarity).

**Source of illustration :** Corner (1988)

**Reference(s) :** Heyne (1950), Corner (1988), Wong (1989), Hong (2000), Maung (2003), [http://botanical.com/site/column\\_poudhia/30\\_one\\_night.html](http://botanical.com/site/column_poudhia/30_one_night.html).

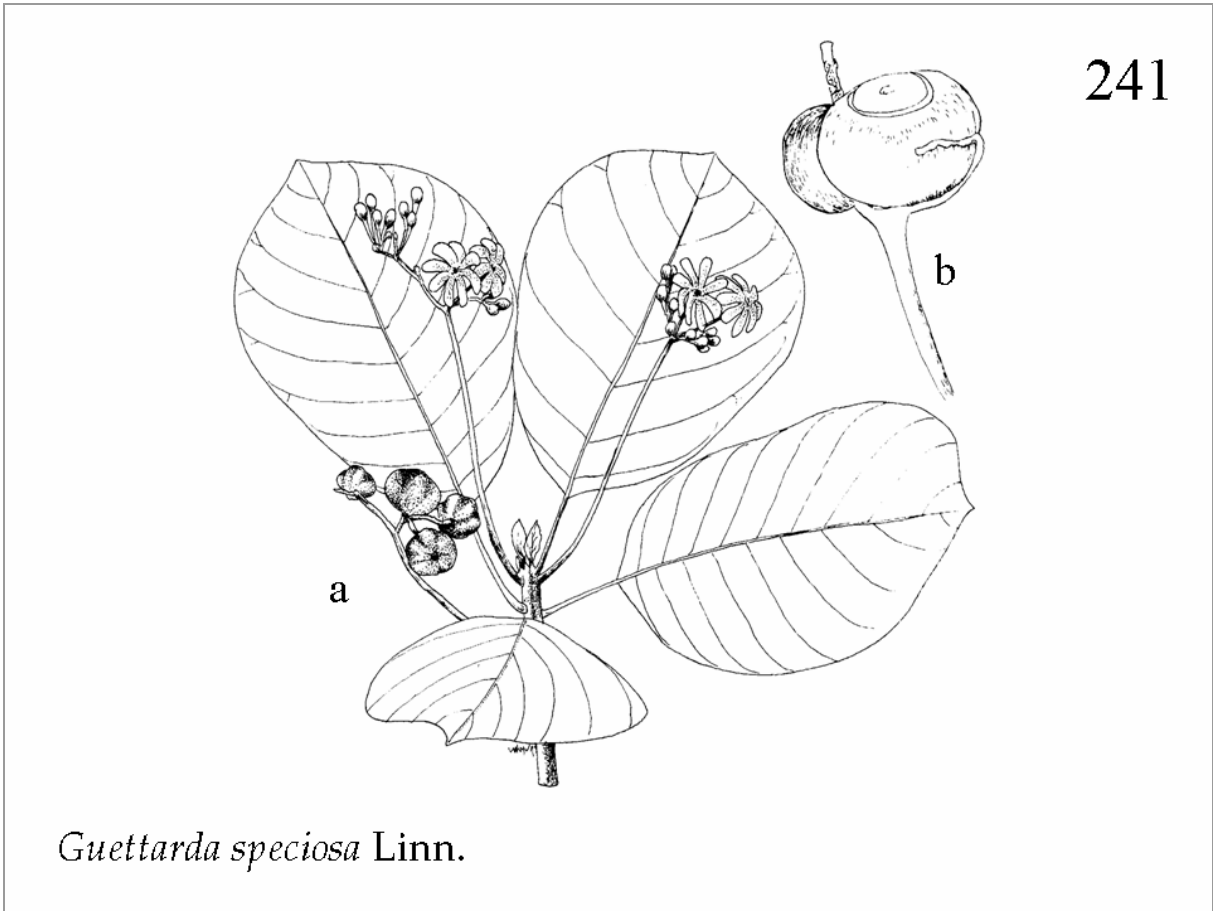


Fig. 241. *Guettarda speciosa* Linn. (a) Branchlet with flowers and fruit, and (b) two mature fruit.

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*Guettarda speciosa* Linn.

**Synonym(s) :** *Guettarda vermicularis* Blanco, *Nyctanthes hirsuta* Linn., *Tittius litorea*

**Vernacular name(s) :** Sea Randa, Beach Gardenia (E), Selar Makan (Mal.) Jati Pasir, Titi Laut, Kenyang-kenyang, Haruna, Tasi (Ind.), Banaro, Bagaolan, Balangigan, Balibagan, Kalumpangin, Kapagan, Lagbangan, Lambon, Malasurut, Tabon-tabon, Tabug, Tambon, Tulatalisai (Phil.)

**Description :** Spreading shrub or small tree, usually 4-10(-15) m tall, frequently many-stemmed, crooked, with a rounded crown. Bark is smooth and grey-brown. Twigs are thick, with large leaf scars. Leaves are opposite, broadly ovate or obovate, 9-24 by 6-20 cm, coarse below, and with hairs on both sides (or only below), rounded or heart-shaped at the base. Secondary veins occur in 8-11 pairs, while tertiary veins are ladder-like; leaf tips are blunt, while bases are rounded to heart-shaped; leaf stalks are 15-40 mm long. Flowers occur in clusters in the leaf axils; cluster stalks are 6-9 cm, while individual flowers occur almost stalkless on this common cluster stalk. Flowers are tubular, white and fragrant. The calyx is small and cup-shaped, while the corolla is trumpet-shaped, white on the outside with short, velvety hairs. The yellowish corolla tube is 17-35(-50) mm long and has 4-9 lobes. Fruits are without a stalk, flattened and round, 15-30 mm across, smooth, with a hard stone, green, then whitish or pinkish, closely (faintly) ribbed (4-6 grooves, corresponding with the 4-6 cells) when dried. Each cavity has one seed. Because of its large leaves one might mistake it for a *Barringtonia asiatica* or *Terminalia catappa*, but the leaves are set differently.

**Ecology :** Occurs on both rocky and sandy sea shores (Corner, 1988) and margins of mangroves (Hong & San, 1993), flowering throughout the year. The fragrant flowers are pollinated by moths, as they (usually 1-2 per axil) open an hour after sunset, and the corolla fall off the following morning. The tree flowers throughout the year. Fruits are buoyant and are probably dispersed by water. Mangrove associate species.

**Distribution :** Pantropical, and found throughout Southeast Asia. Not (yet) recorded in Brunei.

**Abundance :** Common.

**Use(s) :** Bark used to treat dysentery. The flowers are very fragrant, and women put them in their hair or string them into necklaces. They open in the evening, and fall before dawn. Bark is applied to wounds and abscesses.

**Source of illustration :** Based on Polunin (1988) and Wong (1989).

**Reference(s) :** Heyne (1950), Corner (1988), Polunin (1988), Wong (1989), Hong & San (1993), <http://farrer.riv.csu.edu.au/ASGAP/g-spe.html>, <http://bpi.da.gov.ph/websitemedicinal/all/b/banaro.htm>.

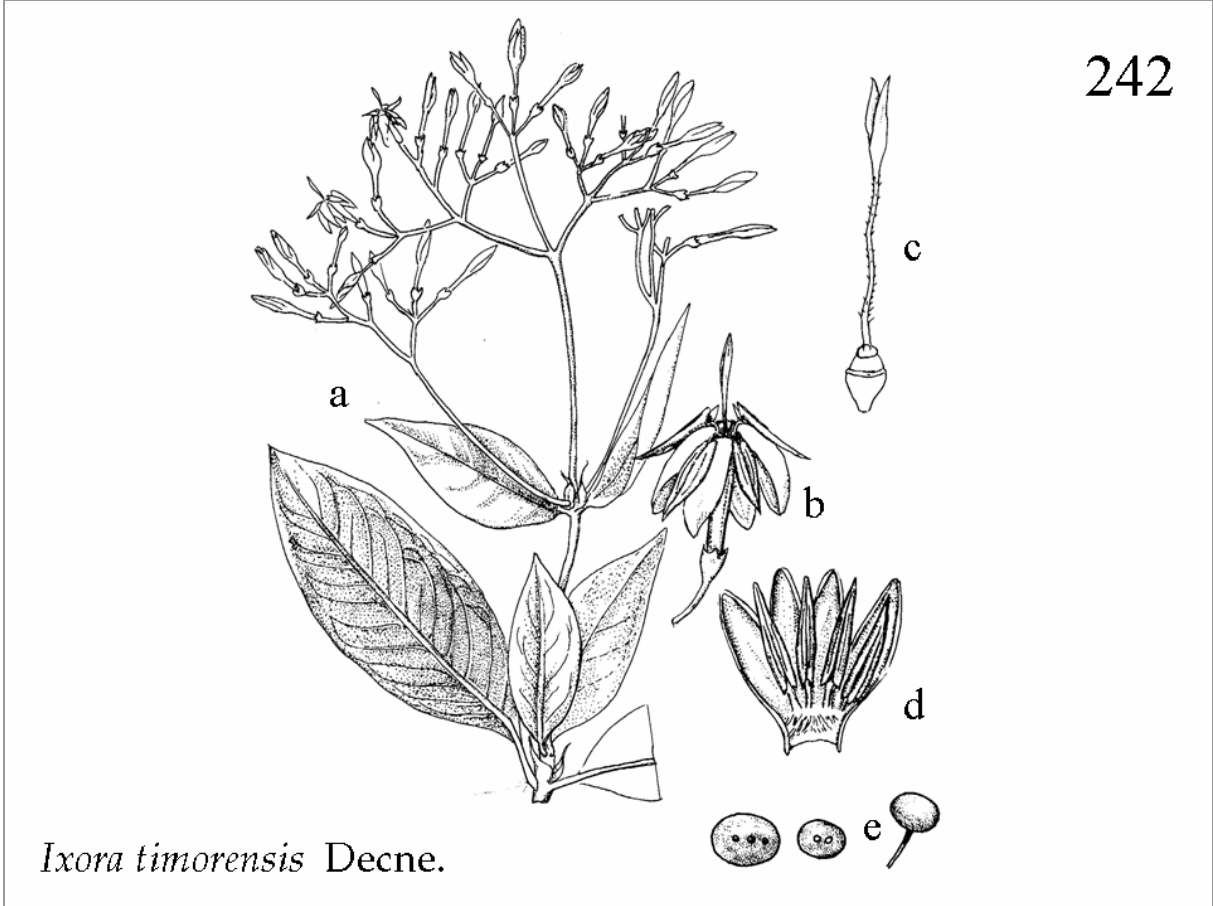


Fig. 242. *Ixora timorensis* Decne. (a) Branchlet with flowers, (b) flower, (c) stigma, (d) opened corolla exposing the stamens, and (e) fruit.

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*Ixora timorensis* Decne.**Synonyms :** Unknown.**Vernacular name(s) :** Unknown.

**Description :** Erect shrub or small tree, up to 6 m tall, with thin, leathery, lanceolate-oblong or almost round leaves, 3.5-7.5 by 10-17 cm; leaflets at the base of the leaf stalk (=stipules) are 6-7 mm long and pointed. Young twigs are reddish brown, square in cross-section. The flower heads are widely branched and have a stalk of 0.5-4 cm. The bisexual flowers have a strong, sweet scent and are white with a greenish tube, and a red style, 1-1.5 cm long. After several days the flowers turn pale brown, later turning black. The corolla is trumpet-shaped; its tube is tufted and hairy on the inside. Pollen becomes attached to the thickened upper part of the style while it is still in bud. In the opened flower the pale brown stamens hang down between the petals; at this point the anthers are empty. The hard berry is almost dry, greyish green but later red, and measures 6-7 mm across.

**Ecology :** Occurs on landward margins of mangroves. Rarely further inland, recorded to an altitude of 200 m asl on Java. Mangrove associate species.

**Distribution :** Southeast Asian species with a (very) limited distribution, found only in East Timor and Indonesia (Java northern coast, Bawean, Madura; October 1996 discovered by one of the authors [WG] in brackish lower reaches of the Sebangau Kecil river in Central Kalimantan, Indonesian Borneo).

**Abundance :** Locally common, but uncommon on the whole.

**Use(s) :** Unknown.

**Source of illustration :** Drawn from herbarium specimen, Bogor Herbarium.

**Reference(s) :** Backer & Bakhuizen van den Brink (1963-8).

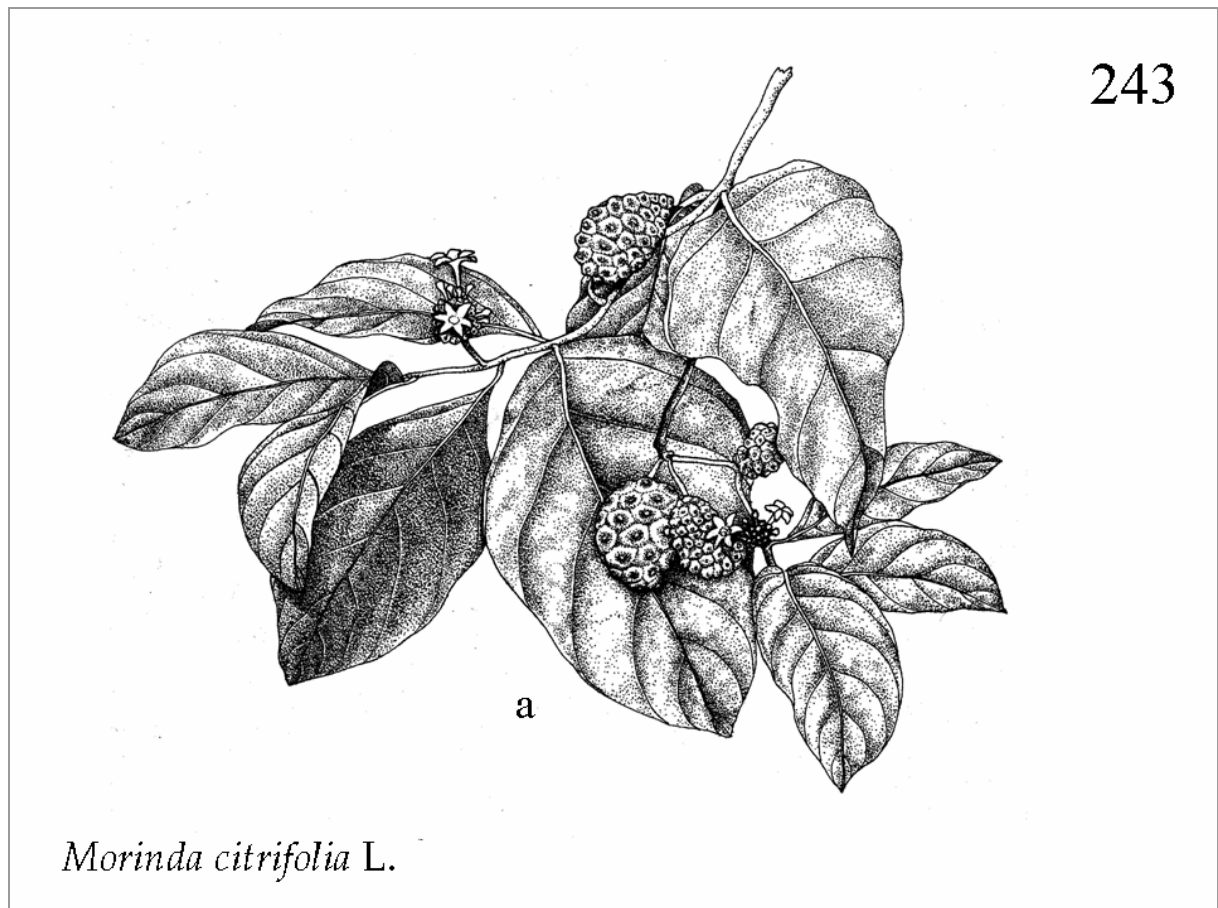


Fig. 243. *Morinda citrifolia* L. (a) Branchlet with flowers and fruit.



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*Morinda citrifolia* L.

**Synonyms :** *Bancudus latifolia* Rumph., *Morinda citrifolia* Hunter

**Vernacular name(s) :** Great Morinda, Indian Mulberry (E), Mengkudu besar, Mengkudu daun besar, Kemedu (Mal.), Bengkudu, Mengkudu, Mekudu, Cangkudu – *Mengkudu* (Ind.), Bakulu (ET)

**Description :** Small evergreen tree, 5-8 (-9)m, with a conical crown. Bark pale greyish-brown, shallowly fissured, smooth. Leaves opposite, arranged in alternating pairs, broadly elliptic, 10-30(-40) by 5-14(-17) cm, fleshy, secondary veins 5-8 pairs, with large, persistent leaflets at the base of the 1cm-long leaf stalk. Flower heads are produced on the upper sides of lateral branches, and appear to be leaf opposed because the leaves from the axils in which they appear are underdeveloped. Flower heads are solitary, 0.8-3.0 cm across, stalks 0.5-2.0 cm long, flowers white, corolla tube 10-12 mm long, smooth outside, hairy at the throat inside, corolla lobes 4 or 5, each 5-6 mm long, slightly fragrant. Fruiting heads oblong to ovoid, 1.2-5.5(-10) cm long, ripening whitish to yellowish, containing many seeds.

**Ecology :** Tolerant of a very wide range of habitats, from wet to dry, poor to rich soils, up to an altitude of 300 m asl. Cultivated in lowland areas throughout its range, commonly found wild along the coast, including rocky coasts and landward margins of mangroves. Often infested with the large red weaver ants *Oecophylla smaragdina* that fabricate nests from the large leaves of this species and attack with a frenzy if disturbed. The ripe fruit rots very readily, thereby spreading a terrible stench. Mangrove associate species.

**Distribution :** Possibly native to Southeast Asia and northern Australia, but now pantropical and subtropical, and especially common on the Pacific Islands. Type specimen from India (18<sup>th</sup> century), where it may have been introduced. Found throughout Southeast Asia.

**Abundance :** Common.

**Use(s) :** Wood is hard and has a fine and even texture. The dye morindin (yellow to deep orange) is obtained from the root bark, but this use has largely been displaced by cheap synthetic dyes. Leaves are used in combination with coconut oil and rubbed on the skin to treat stomach disorders and provide relief after childbirth. The fruits are used to treat wounds and are taken as an anti-diuretic; unripe fruits eaten as 'rujak' in Indonesia, but the bitter tasting ripe fruits are not eaten. The fruits are eaten as a famine food, and in some Pacific islands, are even a staple food of choice (Raratonga, Samoa, Fiji), where they were eaten raw or cooked. Elsewhere, the fruit is eaten raw with salt (Indochina, Australian Aborigines); or cooked as a curry. The fruits may also be fed to pigs. Young leaves can also be eaten as a vegetable and contain protein (4-6%). Seeds may be roasted and eaten.

**Source of illustration :** Drawn from live specimen.

**Reference(s) :** Heyne (1950), Afriastini (1988), Corner (1988), Wong (1989)  
<http://www.naturia.per.sg/buloh/plants/morinda.htm>,  
<http://www.agroforestry.net/pubs/tti/morinda.pdf>

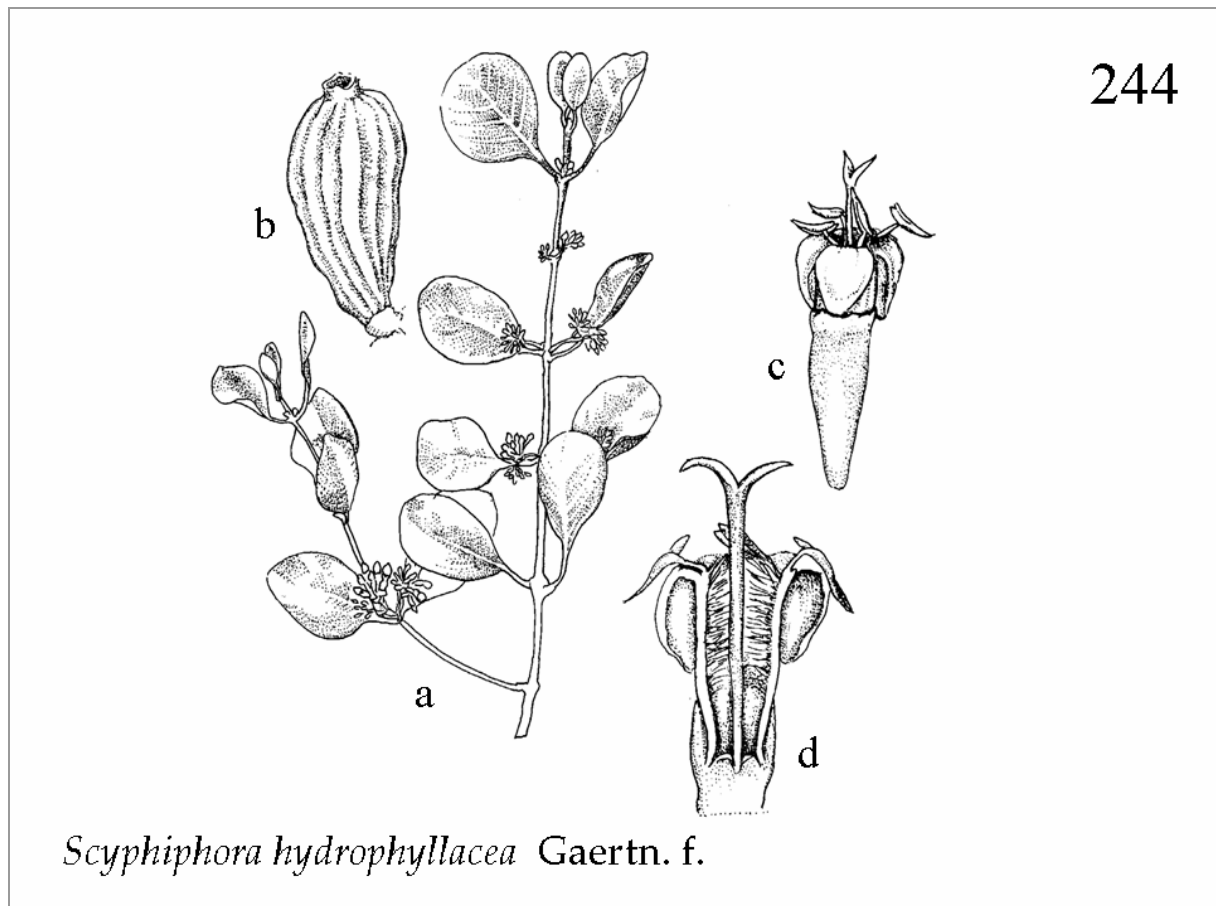


Fig. 244. *Scyphiphora hydrophyllacea* Gaertn. f. (a) Flowering branchlet, (b) fruit, (c) flower, and (d) longitudinal section of flower.

## RUBIACEAE

244

*Scyphiphora hydrophyllacea* Gaertn. f.

**Synonyms :** *Ixora manila* Blanco, *Scyphiphora hydrophyllacea* (sic)

**Vernacular names :** Perepat Lanang, Cingam, Duduk Perempuan, Dudul Rayap, Dandulit (Ind.), Agnaya, Aranaya, Arinaya, Balasiai, Hanbulali, Kulasi, Landing, Nilad, Nilar, Sabasa, Sagasa, Tabau, Tagsiak, Tugsiak, Unas – *Nilad* (Phil.), *Côi* (Viet.), See ngam (Thai)

**Description :** Erect, evergreen, often much-branched shrub or small tree, up to 3 m tall but rarely exceeding 2m, with rough, brown bark, resinous young shoots and, occasionally, with prop-roots in larger specimens. The glandular leaflets at the base of the leaf stalk form a hairy sheath. The slender leaf stalk is up to 13 mm long. Leaves are simple, leathery, glossy and obovate, measuring 4-9 by 2-5 cm. The bisexual, almost stemless, usually white flowers occur in dense clusters in leaf axils on stalks that measure up to 15 mm. The calyx tube is coiled and 5 mm long; the end of the tube is cup-shaped, 1 mm long, and crowned by four minute teeth. The cylindrical corolla tube is sometimes tinged with red, 2-4 mm long, with a rough-hairy mouth; the broadly elliptic petals measure 2 by 2.5 mm. Fruit is cylindrical, green and ribbed along its length (appearing 6-8 angular), corky inside, 8 mm long, and tipped with the remnants of the calyx. It does not open when ripe. Fruits contain four cylindrical seeds that each measure 1 by 2 mm. The shrub resembles *Lumnitzera*, which when sterile can be distinguished by its spirally-arranged leaves.

**Ecology :** Occurs on mud, sand and rocky substrates on the landward margin of mangroves or on the banks of tidal waterways. It appears intolerant of lengthy periods of freshwater inundation and usually occupies sites that are frequently inundated by the tide. It is reported to occur on sites that are unsuitable for colonisation by other mangrove species. Flowering occurs throughout the year. Flowers may be insect- or self-pollinated. Fallen fruit float and land along the shores in large quantities. Nectar is produced by a glandular disc at the base of the corolla. Produces a lot of fruit, but seed germination levels are relatively low. The fruit is well adapted to water dispersal because of the corky and buoyant fruit wall. Mangrove species.

**Distribution :** Occurs from southern India and Sri Lanka through Southeast Asia to northern Australia and western Polynesia (Solomon Islands). In Southeast Asia it has been recorded in Thailand, Vietnam, Cambodia, the Philippines, Malaysia, Brunei, Singapore, throughout Indonesia and Papua New Guinea.

**Abundance :** Scattered and locally common, but on the whole relatively uncommon.

**Use(s) :** Wood may be used to make utensils, such as spoons. Larger specimens used for fence posts and firewood. Contain high amounts of tannin and dye. A medicine is prepared from the leaves to treat stomach problems.

**Source of illustration :** Based on Tomlinson (1986), Wrightman (1989).

**Reference(s) :** Heyne (1950), Backer & Bakhuizen van den Brink (1963-8), Tomlinson (1986), Wightman (1989), Said (1990), Aksornkoae (1993), Aragones *et al.* (1998).

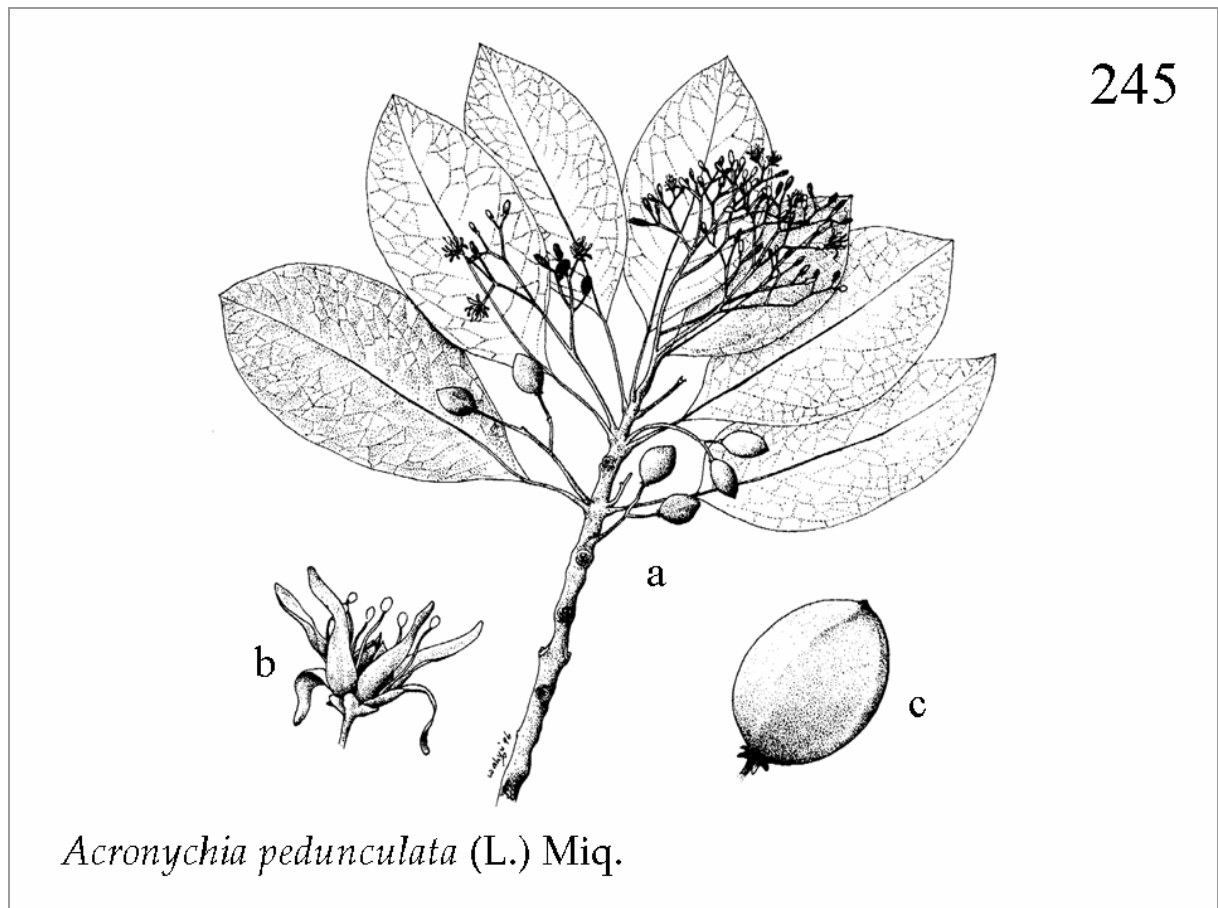


Fig. 245. *Acronychia pedunculata* (L.) Miq. (a) Branchlet with flowers and fruit, (b) flower, and (c) fruit.

## RUTACEAE

245

*Acronychia pedunculata* (L.) Miq.

**Synonym(s) :** *Acronychia arborea*, *Acronychia laurifolia* Blume, *Cyminosma pedunculata* DC., *Gela lanceolata* Lour., *Jambolifera pedunculata* L.

**Vernacular name(s) :** Kayu Semidra, Sarirah, Serilang, Sesira, Jerukan, Salira – *Ki salira* (Ind.)

**Description :** Small to large tree, 12-38 m, with a girth of up to 1.25 m. More usually 3-10 m tall. Twigs and leaf stalks are brown, the latter measuring 12-16 mm. Leaves are elliptic to oblong-elliptic, 3-6 by 5-15 cm, thinly leathery, with a net-like network of veins prominent on both sides; secondary nerves number 14-18 pairs. Leaves are opposite, simple and entire. Flowers are mainly 4-merous, with triangular sepals, petals that are lanceolate and hairy on the inside, and have eight stamens. Flowers measure 8-20 mm across. Fruit is round, green or cream-coloured, usually less than 1 cm across. Commonly called *Acronychia laurifolia* in Southeast Asian literature.

**Ecology :** Reported from primary and secondary lowland forest and margins of mangrove. From sea level up to 2,400 m on Java. Mangrove associate species.

**Distribution :** From Sri Lanka and India, to southern China, through Southeast Asia to western Polynesia. In Southeast Asia recorded from Malaysia, Brunei, Vietnam, Thailand, Indonesia (Sumatra, Java, Sulawesi and Papua).

**Abundance :** Locally common, but on the whole uncommon.

**Use(s) :** Sometimes used for internal construction timber, but it is not very durable. Very good for charcoal production. Young leaves are consumed as a vegetable. Leaves contain up to 0.06% etheric oils. Fruits are edible, and fruit dropped on the ground is often consumed locally. The fruit is also a favourite of monkeys and other wildlife.

**Source of illustration :** Drawn from herbarium specimen, Bogor Herbarium.

**Reference(s) :** Heyne (1950), Stone (1972), Whitmore, Tantra & Sutisna (1990), Hong & San (1993), Missouri Botanical Garden TROPICOS database ([www.mobot.mobot.org](http://www.mobot.mobot.org)), [http://www.rspg.thaigov.net/scbotdat/plantdat/rutaceae/apedun\\_1.htm](http://www.rspg.thaigov.net/scbotdat/plantdat/rutaceae/apedun_1.htm).

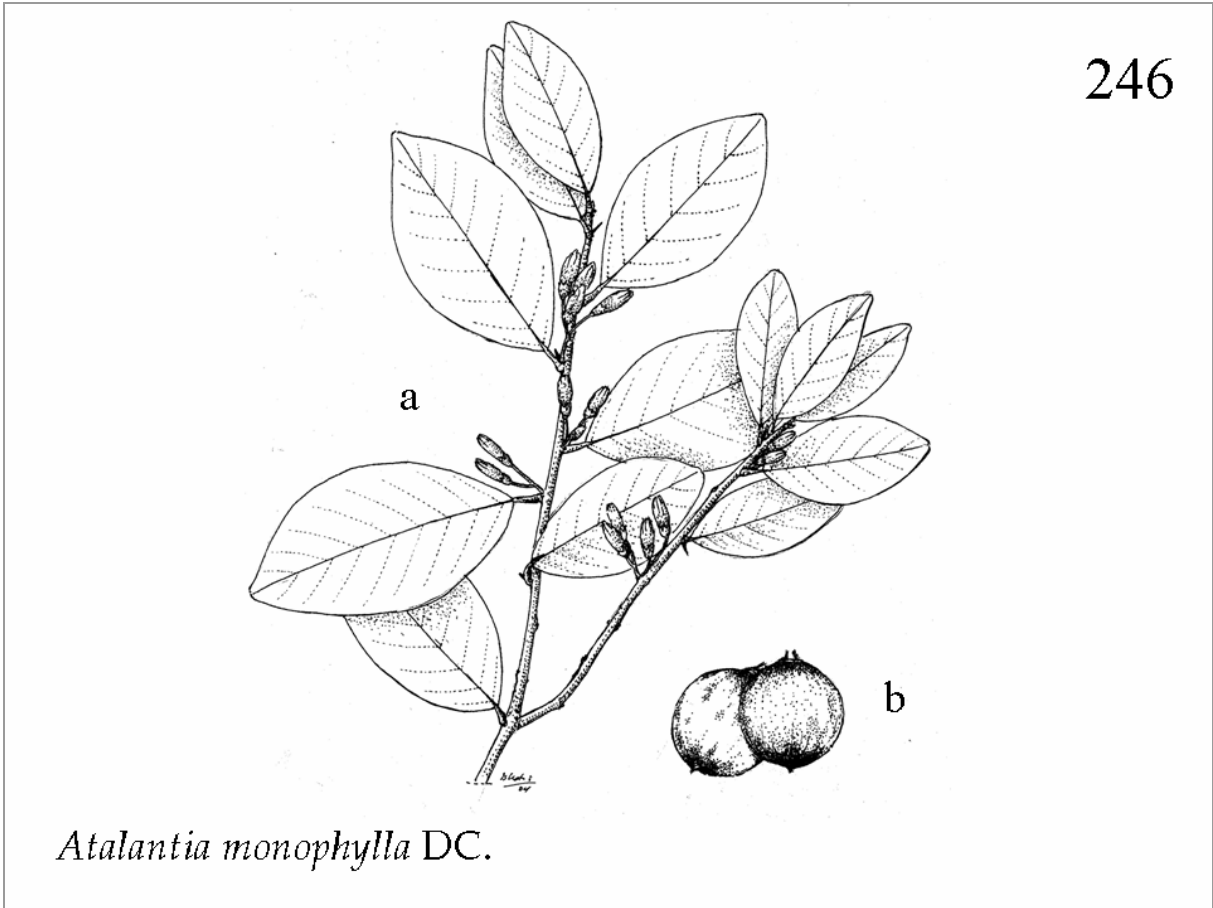


Fig. 246. *Atalantia monophylla* DC. (a) Flowering branchlet, and (b) fruit.

## RUTACEAE

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*Atalantia monophylla* DC.

**Synonyms :** *Atalantia spinosa* Tanaka

**Vernacular name(s) :** Sea Lime (E), Merlimau, Limau Hantu (Mal.), Malarayap (Phil.)

**Description :** A very spiny evergreen shrub or small tree, up to 6(-12) m, stem rather deeply fluted from the base and set with many short, stiff, thorny twigs; bark greyish brown and smooth; stem rarely more than 8 cm diameter; twigs more or less angular when young, usually armed with short, solitary, sharp spines in the leaf axils. Leaves are alternate, simple and wingless (unlike many other Rutaceae species). Leaf blade elliptic, 3.5-6.5(-11) cm by 3-4(-6.5) cm, rather leathery, smooth, notched at the tip; leaf stalk 0.5-1.0 cm long. The leaf blade is indented/notched and marked by a whitish spot. Flowers 12 mm wide and 10-13 mm long, white or tinged with pink, in small clusters located at the ends of branchlets or in axils; calyx splitting into 2 irregular lobes; petals 5, stamens 6-10, joined in a tube. Fruit rounded oblong, green, 12-19 mm wide. In habit the tree looks very much like a citrus, with its leaves standing stiffly erect; leaves smell like citrus when crushed.

**Ecology :** Recorded from rocky and sandy coasts, in dry open country, and along landward margins of mangroves. Mangrove associate species.

**Distribution :** From India eastwards to Southeast Asia, where it has been recorded in Myanmar, the Philippines, Peninsular Malaysia, Thailand and Cambodia.

**Abundance :** Locally common, but on the whole uncommon.

**Use(s) :** Wood used for making handles. The root and bark of *Atalantia monophylla* is dried, ground and used as a poultice to treat sprains and fractures.

**Source of illustration :** Redrawn from photograph obtained via Missouri Botanical Garden TROPICOS database ([www.mobot.org](http://www.mobot.org))

**Reference(s) :** Stone (1972), Corner (1988), Marschke (2000), Yao (2000).  
<http://www.mssrf.org/fris9809/fris1031.html>.

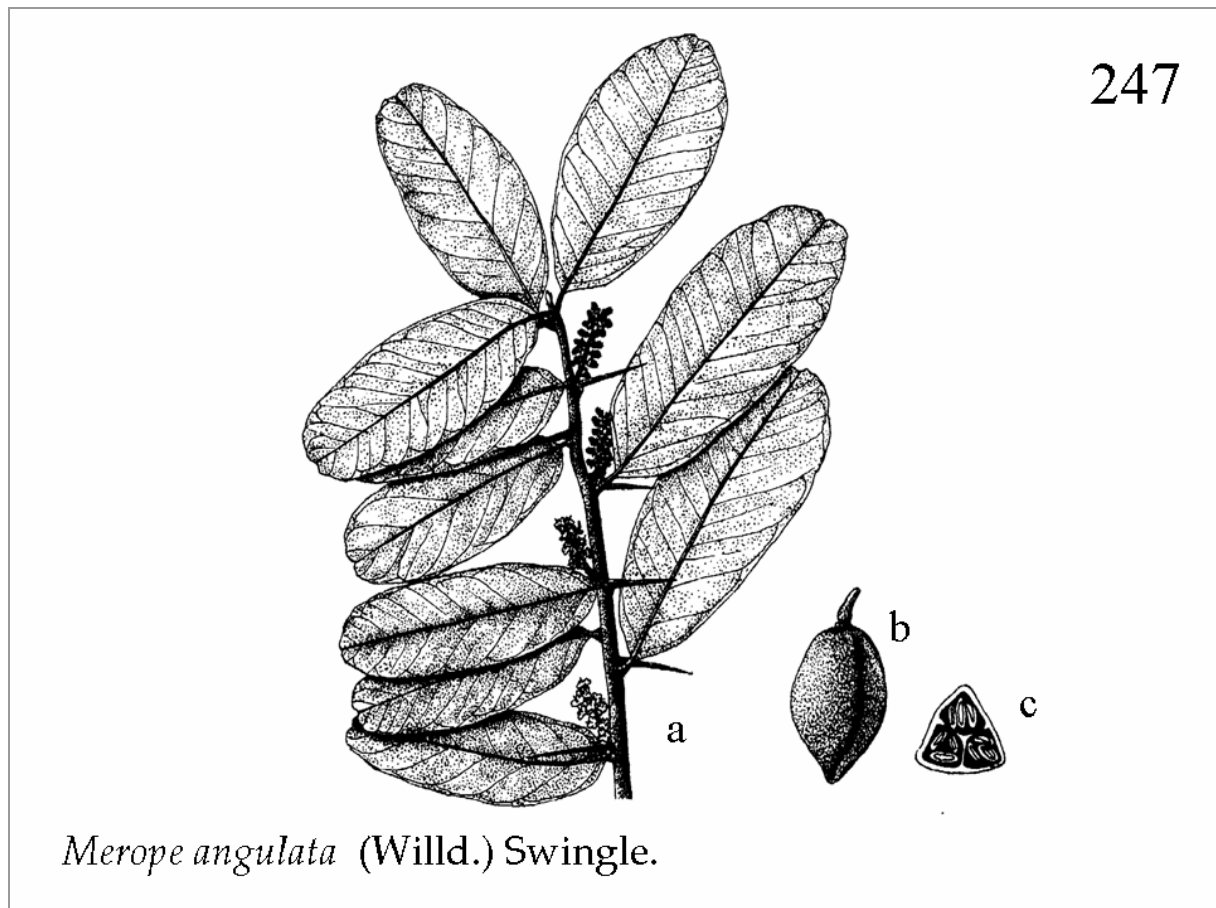


Fig. 247. *Merope angulata* (Willd.) Swingle. (a) Flowering branchlet, with spines, (b) fruit, and (c) cross-section of fruit showing seeds.



## RUTACEAE

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***Merope angulata* (Willd.) Swingle**

**Synonyms :** *Merope spinosa*, *Paramignya angulata* (Willd.) Burkill, *Paramignya longispina* Hk., *Sclerostylis spinosa*

**Vernacular name(s) :** Mangrove lime (E), Limau Lelang, Lemau lilang (Mal.)

**Description :** A broadly-branching, shrubby, occasionally scrambling, low tree, up to 3 m tall. It has (often paired) woody spines located in the axils and are 1.5-3.5(-5) cm long. The alternate, thickly leathery, aromatic leaves have transparent dots and measure 4.5-16 by 2-7 cm; the leaf stalks are unwinged; leaf edges are slightly notched; leaf tip blunt or slightly pointed. Leaves are covered with minute glands (visible as translucent dots when held to the light) and have a resinous, lime-like odour if bruised. The white, bisexual flowers are 5-merous, about 2 cm long, fragrant, solitary, and occur in leaf axils either in pairs or clusters of only a few flowers; stamens 10; petals are 7-9 mm long. The strongly smelling berry-like fruits are yellow, oblong or ovoid triangular, lemon-like, 2-5 cm long, with 3 flattened sides so that the fruit is triangular in cross-section; has 3 (4) chambers which each contain 1 large, long, flattened seed, 38 by 14 by 4 mm, contained in slime; tip is pointed.

**Ecology :** Restricted to landward margins of mangroves and along river banks. In Java, flowering has been recorded in March, May, November and December. Mangrove associate species.

**Distribution :** From West Bengal (India) eastwards through Southeast Asia, where it has been recorded from Myanmar, Malaysia, Singapore (where it is rare), Indonesia (Java), and Papua New Guinea.

**Abundance :** Rather scattered, but locally abundant.

**Use(s) :** Burkill (1935) reported the use of this plant to treat abdominal complaints and assist womb contraction after childbirth. Interesting for horticulture, as it may provide a salt-tolerant root stock for *Citrus*.

**Source of illustration :** Drawn from herbarium specimen, Bogor Herbarium; Corner (1988)

**Reference(s) :** Burkill (1935), Backer & Bakhuizen van den Brink (1963-8), Stone (1972), Tomlinson (1986), Maung (2003), <http://www.sbwr.org.sg/wetlands/text/101-03.htm>.

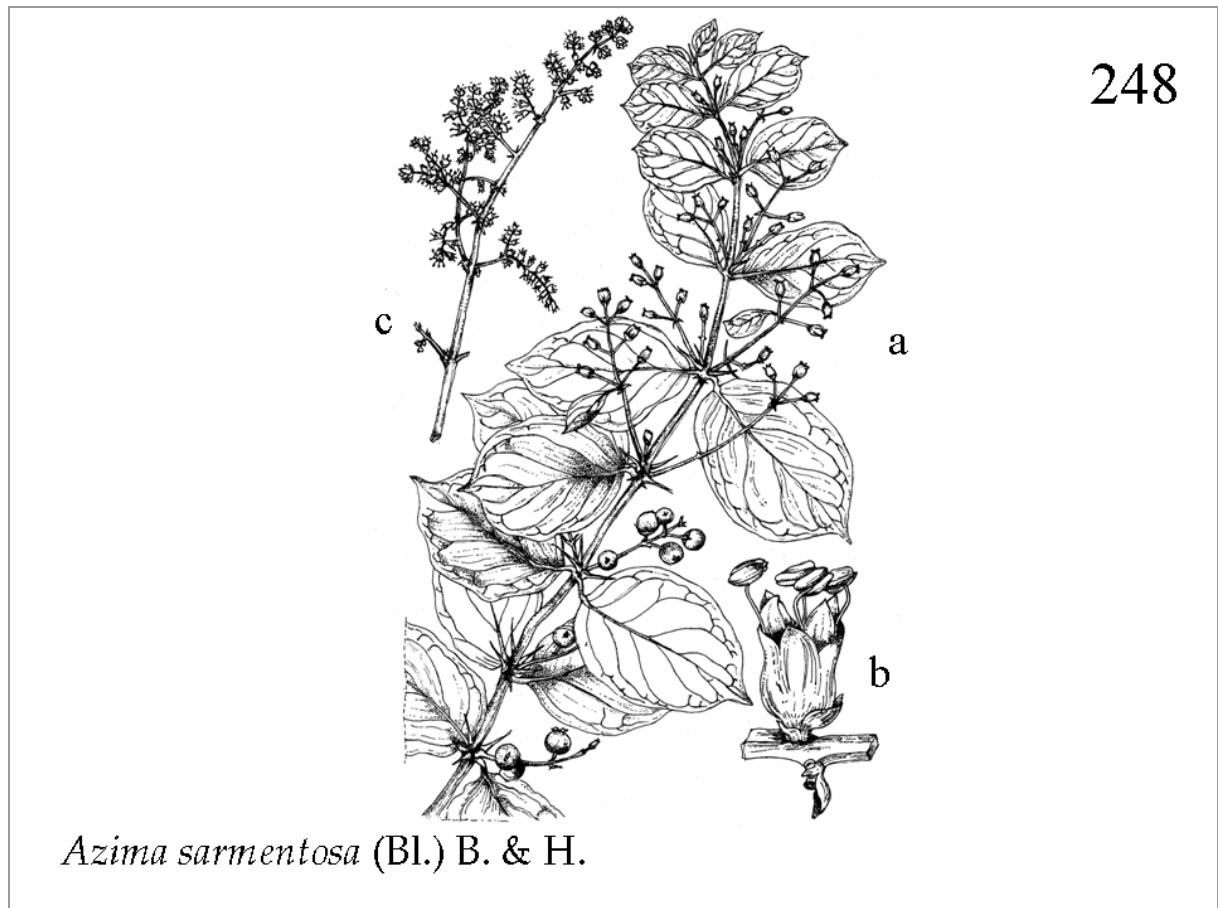


Fig. 248. *Azima sarmentosa* (Bl.) B. & H. (a) Branchlet with female flowers and fruit, (b) male flower, and (c) male flower cluster.

## SALVADORACEAE

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*Azima sarmentosa* (Bl.) B. & H.

**Synonyms :** *Actegeton sarmentosum* Bl., *Azima nova* Blanco, *Monetia barlerioides* (non L'Hér) Miq., *Monetia sarmentosa* Baill.

**Vernacular name(s) :** Papajaran, bulangan (Ind.), Chùm lé (Viet.)

**Description :** An erect shrub, often with drooping or rambling branches, 2-4 m, usually smooth and free of hairs. Leaf axils often with 1-2 thin, straight and very sharp 2-16 mm long spines that can easily break off. There are 2 leaflets at the base of each leaf stalk, that are persistent. Leaves are simple, opposite, variable: ovate, elliptic, oblong, oval, sub-orbicular or obovate, abruptly tipped with a triangular point; thinly leathery, with strong mid-rib, shining, 2-6.5 cm by 1.5-6.6 cm; leaf stalk 3-7 mm. Flowers in clusters of 1-25 cm long. Both calyx and corolla 4-merous. Male flowers crowded and (almost) without a stalk; calyx more or less deeply divided into obtuse erect segments, 2-2.5 mm long; petals somewhat longer than the calyx, oblong, green, 2-2.5 mm long. Female flowers on 1-8 mm long stalks, calyx 1.25-1.5 mm long, corolla as in male flower, but only 1.5-2 mm long. Fruit is an imperfectly 4-celled round berry, white, 6 mm diameter, each with (1-)2-3 seeds. The crushed branches and leaves emit an offensive smell.

**Ecology :** Dry coastal regions, from coast up to about 160 m asl. In periodically very dry localities, thickets, hedges, field and forest borders. Small family (3 genera, 11 species world-wide), generally confined to arid, hot and saline environments. Mangrove associate species.

**Distribution :** Southeast Asian species, recorded in Myanmar, Cambodia, Thailand, Vietnam, Peninsular Malaysia and Indonesia.

**Abundance :** Locally abundant, but with scattered distribution.

**Use(s) :** Unknown.

**Source of illustration :** Backer (1951)

**Reference(s) :** Backer (1951), Heywood (1993), Nguyen *et al.* (2000).

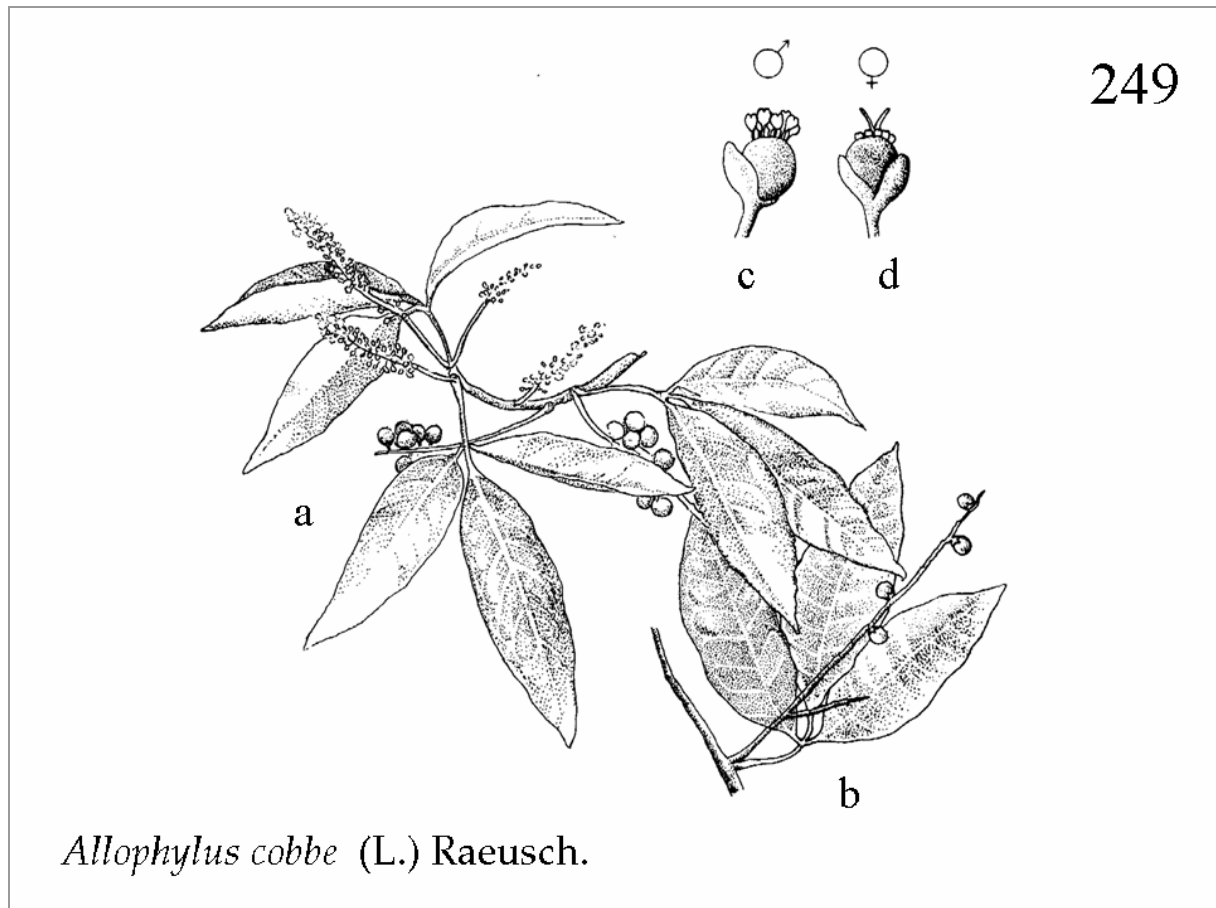


Fig. 249. *Allophylus cobbe* (L.) Raeusch. (a) Branchlet with flowers and fruit, (b) branchlet with fruit, (c) male flower, and (d) female flower.

## SAPINDACEAE

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*Allophylus cobbe* (L.) Raeusch.

**Synonyms :** *Allophylus amboinensis* Blume, *Allophylus apiocarpus* Radlk., *Allophylus blancoi* Blume, *Allophylus cambessedei* Blume, *Allophylus celebicus* Blume, *Allophylus chlorocarpus* Radlk., *Allophylus cobbe* (L.) Raeuschel., *Allophylus dimorphus* Radlk., *Allophylus filiger* Radlk., *Allophylus fulvoinervis* (Blume) Blume, *Allophylus glaber* Boerl., *Allophylus integrifolius* Blume, *Allophylus javensis* (Blume) Blume, *Allophylus leptococcus* Radlk., *Allophylus ligustrina* Blume, *Allophylus littoralis* (Blume) Blume, *Allophylus macrostachys* Radlk., *Allophylus micrococcus* Radlk., *Allophylus quinatus* Radlk., *Allophylus rufescens* Blume, *Allophylus rugosa* Blume, *Allophylus setulosus* Radlk., *Allophylus sumatranus* Blume, *Allophylus sundanus* Miq., *Allophylus ternatus* Lour., *Allophylus timoriensis* (DC.) Blume, *Allophylus unifoliolatus* Radlk., *Allophylus villosus* (Roxb.) Blume, *Allophylus zeylanicus* L., *Ampactus litorea* Rumph., *Aporetica penicellata* Blanco, *Aporetica ternata* Forst. & Forst., *Gmella trifolia* Lour., *Ornitrophe integrifolia* Willd., *Ornitrophe glabra* Roxb., *Ornitrophe repanda* Roxb., *Ornitrophe villosa* Roxb., *Paulinia seriana* auct. non L.: *Burm F.*, *Rhus cobbe* L., *Schmidelia bantamensis* Blume, *Schmidelia cobbe* (L.) DC., *Schmidelia fulvoinervis* Blume, *Schmidelia glabra* (Roxb.) Steud., *Schmidelia grossedentata* Turcz., *Schmidelia javensis* Blume, *Schmidelia leptostachya* Blume, *Schmidelia ligustrina* Blume ex Teijsm., *Schmidelia littoralis* Blume, *Schmidelia macrophylla* Zipp. ex Span., *Schmidelia mutabilis* Bl., *Schmidelia obovata* A. Gray, *Schmidelia parviflora* Zipp. ex Span., *Schmidelia racemosa* L., *Schmidelia ternata* (Forst. & Forst.) Cambess., *Schmidelia timoriensis* DC., *Schmidelia tormentosa* Hook.f. *Usubis triphylla* Burm. f. (250 synonyms are known)

**Vernacular name(s) :** Tit-berry (E), Keneras, Sijangè, Sicancang, Cukilan, Asa-Asa (Ind.), To sai (Thai)

**Description :** Erect or scrambling shrub, 2-4 m tall. Vegetative parts may be smooth or very densely covered with short hairs, especially on the veins. The leaves are three-lobed and have a stout, woody stalk that is 1-13 cm long. The ovate leaflets have incised margins and measure up to 26 by 13 cm. The slender flower heads measure 3.5-27 cm, are located in the leaf axils, and may be either smooth or densely covered with short hairs. Flowers are white and small, about 2 mm long. Fruits measure 12.5 by 7.5 mm, hang in bunches and are juicy, bright orange to red and (almost) smooth. Corner (1988) recognises five varieties, of which *Allophylus cobbe* var. *limosus* with small leaflets (2-7 by 5-14 cm) and a shrubby habit is found in mangroves and along muddy coasts.

**Ecology :** Occurs in mangroves, sea-shores, secondary forest, brushwood and hedges. Flowering occurs all year round, but especially during the west-monsoon. Mangrove associate species.

**Distribution :** Pantropical, found in South America, South Africa, Madagascar, India, Sri Lanka, throughout Southeast Asia, where it has been recorded in Brunei, Cambodia, East Timor, Thailand, Singapore, Malaysia, Indonesia and Papua New Guinea.

**Abundance :** Locally relatively common.

**Use(s) :** Poor quality wood, only used for roofing and sometimes as firewood. Edible fruit. Leaves used to make a mouth wash.

**Source of illustration :** Adema, Leenhouts & van Welzen (1994)

**Reference(s) :** Burkill (1935), Heyne (1950), Backer & Bakhuizen van den Brink (1963-8), Tomlinson (1986), Corner (1988), Aksornkoae (1993), Adema, Leenhouts & van Welzen (1994).

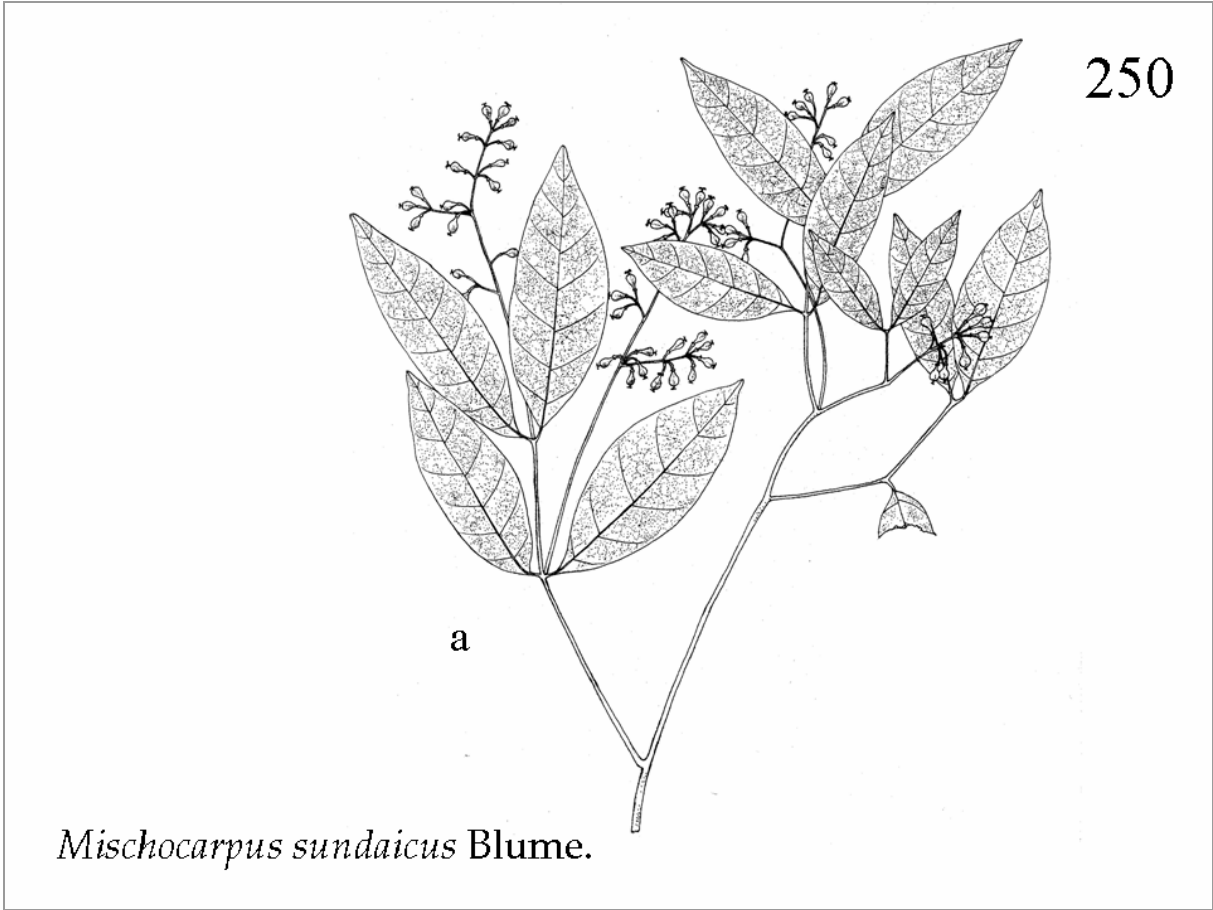


Fig. 250. *Mischocarpus sundaicus* Blume. (a) Fruiting branches.

## SAPINDACEAE

250

*Mischocarpus sundaicus* Blume

**Synonyms :** *Cupania erythrorhachis* Miq., *Cupania lessertiana* Cambess., *Cupania mischocarpus* Steud., *Cupania revoluta* Turcz., *Mischocarpus lessertianus* Ridley, *Mischocarpus oppositifolius* auct. non (Lour.) Merr., *Mischocarpus pyriformis* auct. non Radlk., *Mischocarpus vulcanicus* Elmer ex Merrill, *Pedicellia sundaica* Pierre

**Vernacular name(s) :** Pulas laut, Sugi (Mal.), Bintit, Bungkangan, Goleng, Kayu urum, Ki howe, Penjalinan, Pulas laut, Regil, Walik elar, Wegil (Ind.)

**Description :** Shrub or tree, 3-10(-30) m tall, young parts and flower clusters covered with short hairs; twigs 1.5-5 mm in diameter are usually reddish-brown or darkish-red. Leaves compound, in 1-3(-4) pairs, leaflets almost opposite/paired (=paripinnate); leaf stalk 1-11(-20) cm; stalks of leaflets 3-8(-10) mm. Leaflets are entire, ovate to elliptic, 4-17(-26) by 1.5-7(-10) cm, parchment-like to somewhat leathery, base rounded or angular, tip with short point, domatia usually present in the axils of the nerves below; midrib prominent above; nerves 8-15 per side, moderately curved; upper sides glossy, light to dark brown. Young leaflets are pinkish. Flower clusters are located in the axils or near the ends of branches, 1.5-25 cm long, branched; stalks of flowers are 1-3 mm long. Flowers are small, about 1.5 mm in diameter, and yellowish-green to greenish. Calyx fused along lower  $\frac{1}{4}$ - $\frac{1}{3}$ , lobes triangular, 0.65-2 by 0.5-1 mm; leaflets triangular, up to 1.5 mm long; outside covered with short hairs, inside smooth. Petals usually absent, occasionally up to 3, up to 1.5 mm long. Stamens (6-)(8-)(9), up to 4 mm long. Fruit 7-9(-20) mm high, smooth or very sparsely covered with hairs; at first sharply 3-angled, ripening red; contains red seed pulp; stalk 2-2.5 mm. Seeds round to elliptic, up to 7 mm long, 1 per fruit. Two forms can be recognised: one from sandy coasts with pale-coloured leaflets; the second from swamps and edges of mangroves with deep brown leaflets.

**Ecology :** Primary and secondary forest in lowland and coastal regions, from sea level up to 800(-1600) m altitude. Flowering mostly January-August; fruiting mostly May-December. In southern China, flowering October-November, fruiting from spring to summer. Mangrove associate species.

**Distribution :** From India and southern China (Guangxi, Hainan) and throughout Southeast Asia, where it has been recorded from Thailand, Vietnam, Malaysia, Singapore, the Philippines and Indonesia (Sumatra, Borneo, Java, Flores). According to Corner and Yap, this species occurs in Australia, but this is disputed by Adema *et al.* (1994), and Queensland Herbarium, who confirm that this is *Mischocarpus australis*.

**Abundance :** Relatively common.

**Use(s) :** Young shoots are consumed as vegetable. Produces good charcoal. Some reports of it being poisonous.

**Source of illustration :** Herbarium specimens Leiden Herbarium.

**Reference(s) :** Heyne (1950), Corner (1988), Yap (1989), Adema *et al.* (1994), <http://www.brisrain.webcentral.com.au/namechange.html>  
[http://flora.huh.harvard.edu/china/mss/volume12/Sapindaceae-US\\_original.htm](http://flora.huh.harvard.edu/china/mss/volume12/Sapindaceae-US_original.htm).

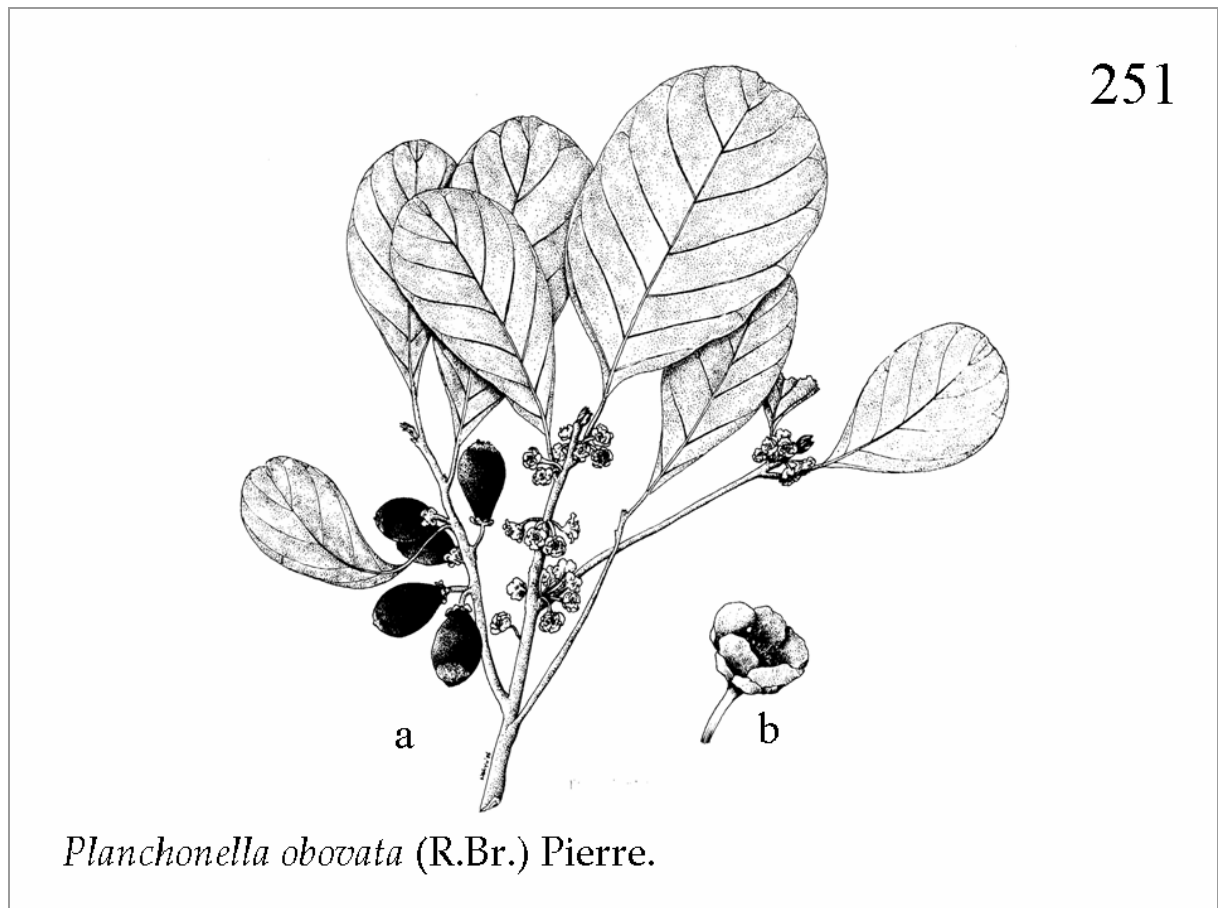


Fig. 251. *Planchonella obovata* (R.Br.) Pierre. (a) Flowering and fruiting branchlet, and (b) flower.



## SAPOTACEAE

251

***Planchonella obovata* (R.Br.) Pierre.**

**Synonym(s) :** *Pouteria obovata* (R. Br.) Baehni., *Sersalisia obovata* R. Br., *Sideroxylon argentatum*, *Sideroxylon bancanum*, *Sideroxylon chrysophyllum*, *Sideroxylon ferrugineum* Hook. & Arn., *Sideroxylon indicum*, *Sideroxylon microcarpum* Burck., *Sideroxylon nodosum*, *Sideroxylon obovatum*

**Vernacular name(s) :** Sea Gutta (E), Menasi, Misi (Mal.), Binasi, Balam Timah, Jengklok, Pancal, Arnana, Sambiring, Nyatoh labar, Nyatoh lamber (Ind.), Ngaa sai (Thai)

**Description :** Small to medium sized shrub or tree, up to 30 m (-40 m) tall and 1.5 m girth, but usually much smaller. The trunk is usually fluted and twisted, leaning, and with exposed roots, while older trees may develop symmetrical plank buttresses. Profuse white latex is present in trunk and branches. The crown is dense, bushy and coppery, while the bark is smooth to slightly scaly or fissured. Leaf stalks are 0.5-2.5 cm, scurfy, flat on top, while the leaves are obovate to elliptic, 2-10 by 3.5-25 cm, with a rounded tip and a tapered base. Leaves are alternate or opposite, usually velvety below and smooth above; when dry they are papery to leathery. Up to twelve greenish-white flowers occur in the leaf axils, or in the axils of leaf scars (where leaves formerly occurred). Flowers bisexual or seldom unisexual, solitary or several in clusters located in the axils, usually subtended by leaflets, (4- or)5(or 6)-merous, with 10 stamens. They measure 4-12 mm across and have a 1-4 mm stalk. The corolla is about 2.5 mm long, and sepals measure 1.2 by 2.5 mm. There are 5 stamens, inserted in the throat and opposite corolla lobes. Fruit is a berry, sometimes woody, 1-6-seeded, elongate to round, 7.5 by 12 mm, smooth, with 5 persistent sepals attached to the base. Seeds are compressed ellipsoid. Some authors find that *Planchonella* may not be sufficiently distinct from *Pouteria* to merit it being a separate genus.

**Ecology :** Common on rocky and sandy sea coasts, inland sandy heaths, limestone hills, secondary forests and occasionally in margins of mangroves. The coastal form is rarely taller than 10-13m. Always occurs scattered, and nowhere really common. Found up to 1,600 m on Flores. Mangrove associate species.

**Distribution :** From India to Hainan (China), Taiwan, throughout Southeast Asia to northern Australia. Recorded in Southeast Asia from Cambodia, Thailand, Vietnam, Malaysia, Singapore, Indonesia (Sumatra, Java, Borneo, the Lesser Sundas and Sulawesi) and Papua New Guinea.

**Abundance :** Uncommon to locally fairly common.

**Use(s) :** Timber of taller and straighter upland specimens may occasionally be used, but it easily cracks and is not very durable.

**Source of illustration :** Based on Ng (1972).

**Reference(s) :** Heyne (1950), Ng (1972), Corner (1988), Whitmore, Tantra & Sutisna (1990), Flora of China, vol. 15, p. 211 *Planchonella*, Aksornkoe (1993), Ng & Sivasothi (1999).

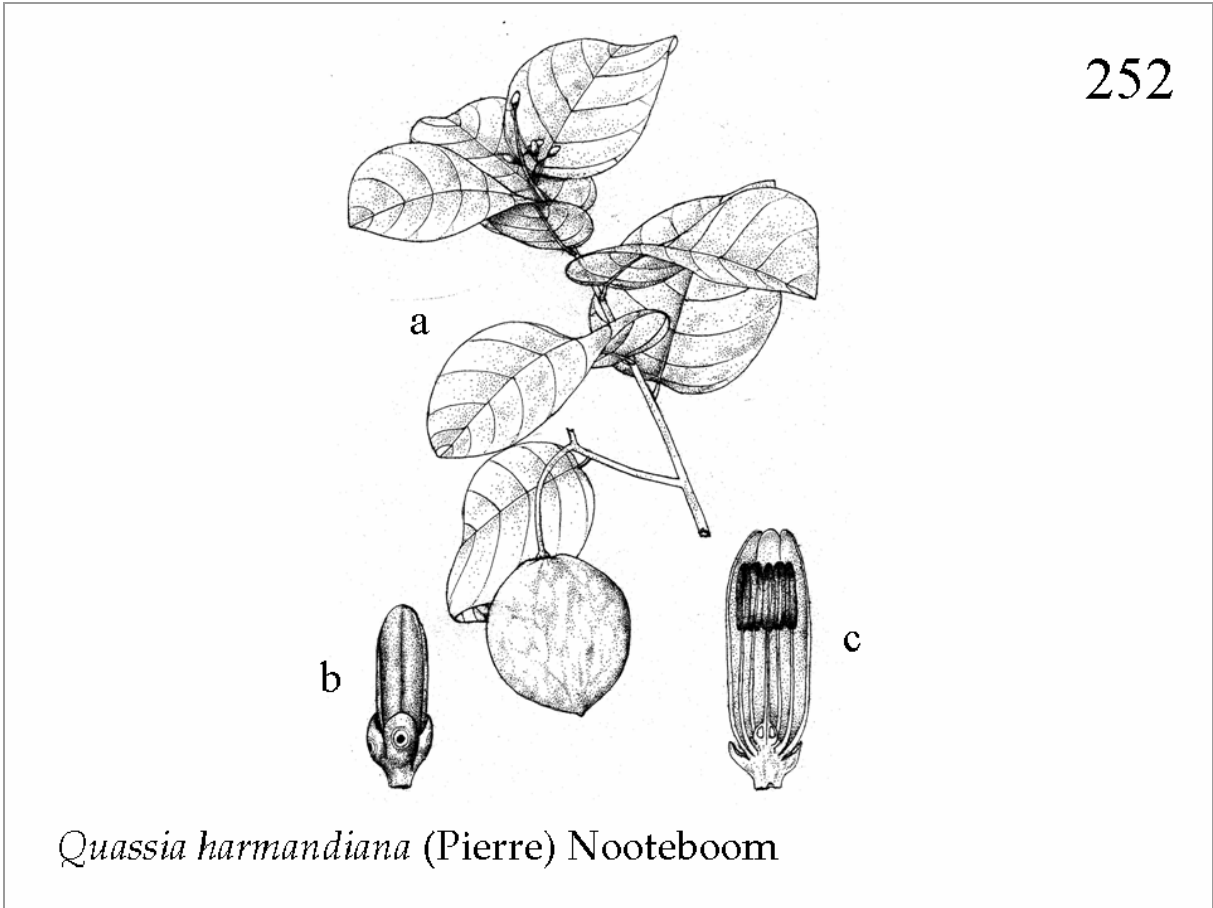


Fig. 252. *Quassia harmandiana* (Pierre) Nootboom. (a) Fruiting branchlet with flower buds, (b) flower bud, with glands on the calyx, and (c) opened flower revealing stamens.

## SIMAROUBACEAE

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***Quassia harmandiana* (Pierre) Nootboom**

**Synonyms :** *Eurycoma harmandiana* Pierre, *Locandia harmandii* Pierre, *Samadera harmandiana* Pierre, *Samadera harmandiana* (Pierre) Greshoff, *Samadera harmandii* Engl., *Samandura harmandiana* Pierre, *Samandura harmandii* Pierre

**Vernacular name(s) :** Unknown.

**Description :** Shrub to dwarf tree, 1-2 (rarely 8) m tall. Leaves compound, imparipinnate (odd in number, with an end, unpaired leaflet) 8-18 cm long; leaflets opposite or sub-opposite, linear, up to 3-5 mm by 3-7 cm, hard and leathery. Flowers small, occurring in large, pendulous panicles, up to 15 cm long, without glandular hairs. Calyx 5-merous, calyx lobes 1-1.5 mm. Petals 5 (rarely 6)-merous, lobes 1-1.5 by 3-3.5 mm, hairy on both sides; anthers 0.75 mm long. Ovary reduced, pubescent (only male flowers seen). Note that other *Eurycoma* species in the region such as *Eurycoma longifolia* have panicles with glandular hairs.

**Ecology :** Dwarf shrub found in open places in forest, riparian forests and scrub, but also recorded in mangroves. Mangrove associate species.

**Distribution :** Southeast Asia species, recorded from eastern Thailand, Cambodia and Laos PDR.

**Abundance :** Uncommon.

**Use(s) :** Root used in a bitter tonic, as well as an aphrodisiac, anti cancer medicine, and as an anti malarial. Roots contain alkaloids (Kanchanapoon, 2001a), and the leaves contain other active ingredients used in traditional medicine (Kanchanapoon, 2001b).

**Source of illustration :** Archive, Royal Botanic Garden, Kew; Netherlands National Herbarium <http://www.nationaalherbarium.nl/virtual/>

**Reference(s) :** Nootboom (1962), Kanchanapoon (2001a,b), Netherlands National Herbarium (<http://www.nationaalherbarium.nl/virtual/>).

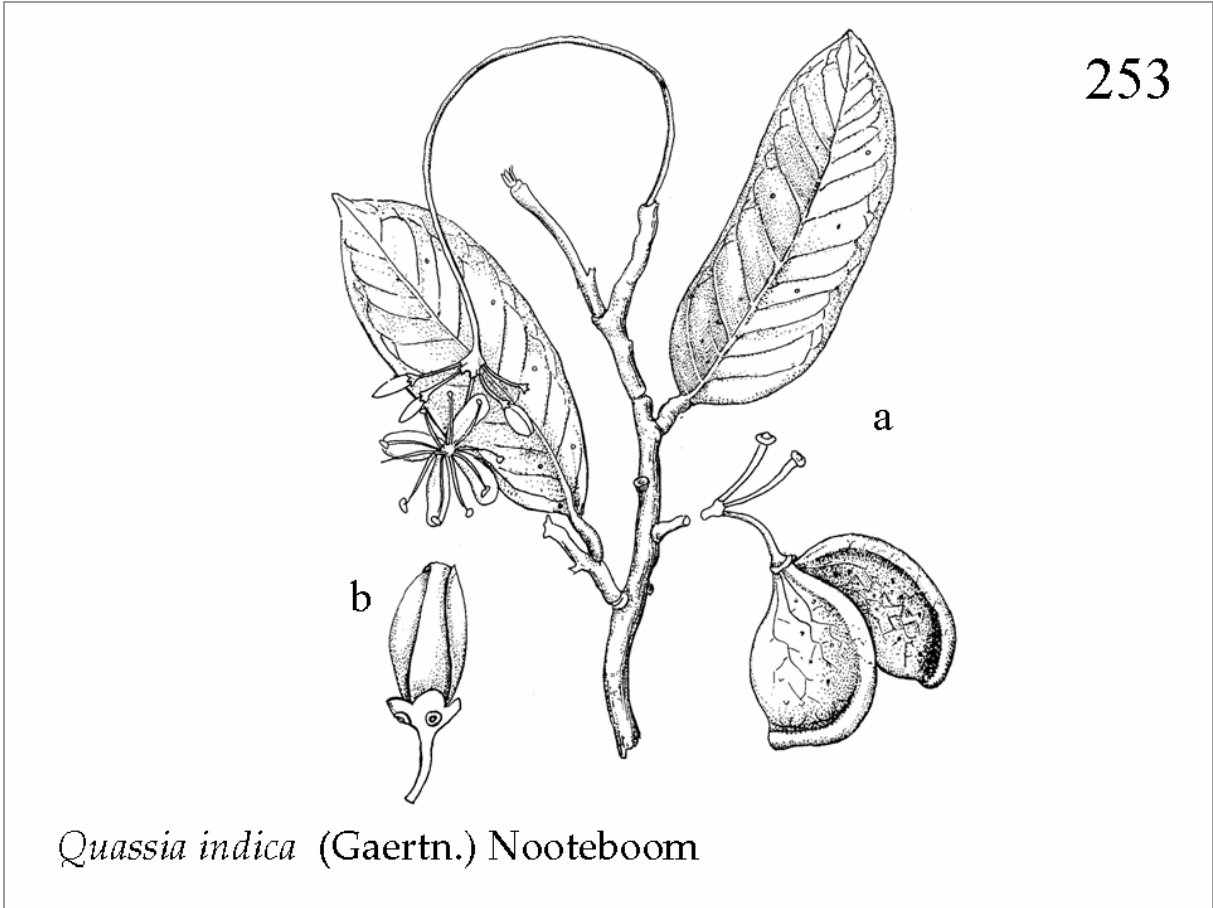


Fig. 253. *Quassia indica* (Gaertn.) Nootboom. (a) Branchlet with flowers and fruit, and (b) flower bud, with glands on the calyx.

## SIMAROUBACEAE

253

***Quassia indica* (Gaertn.) Nootboom**

**Synonyms :** *Locandia glandulifera* Pierre, *Locandia indica* O.K., *Locandia madagascariensis* O.K., *Locandia mekongensis* Pierre, *Locandia merguensis* Pierre, *Locandia pendula* Pierre, *Manungala pendula* Blanco, *Mauduita penduliflora* Comm., *Niota commersonii* Pers., *Niota lamarckiana* Bl., *Niota lucida* Wall., *Niota pentapetala* Poir., *Niota tetrapetala* Poir., *Samadera brevipedata* Scheff., *Samadera glandulifera*, *Samadera indica* Gaertn., *Samadera madagascariensis* A. Juss., *Samadera madagascariensis* Gaertn., *Samadera mekongensis* Pierre, *Samadera pentapetala* G. Don., *Samadera tetrapetala* (Poir.) G. Don., *Samandura indica* Baill., *Vitmannia elliptica* Vahl.

**Vernacular name(s) :** Rapus, Kelepis, Kayu Pahit, Gatep Pahit, Onne (Ind.), Daraput, Linatog-anat, Linton-gamai, Mabingdato, Palagarium, Palagium, Ponoan (Phil.)

**Description :** Smooth, evergreen, shrub or tree, up to 20 m tall. The base of each shoot has several stiff, persistent scales. The elliptic-oblong to lanceolate leaves measure 12-30 by 4-12 cm, and have a conspicuous venation on both surfaces. Leaves usually have two pitted glands at the base of the lower side; similar glands occur randomly on the surface. The leaf stalk measures 1-2.5 cm. The umbell-shaped flower head droops, is smooth or covered with short, soft hairs, and has up to 20 or more bisexual flowers. The stalk is 1-30 cm long, more or less flattened and thickened at the end, located at the end of branches or in axils. The individual flower stalks, 0.5-2.5 cm, are jointed in the lower half. The calyx is 2-3 mm long, covered with soft hairs, and has four (3-5) lobes that are about as long as the tube or longer. The four (3-5) free, creamy-green to violet, purplish or brownish petals are covered with soft hairs underneath. They are narrowed towards the base and measure up to 3 by 1 cm. Fruits usually occur in groups of 1-4, each measuring 4-9 by 2.5-5 cm. They are flattened, with a straight inner and a semi-circular outer margin. The wall of the fruit has glands that are similar to those on the leaf. The seed measures up to 3.5 by 2.5 cm. All parts of the tree are reportedly very bitter.

**Ecology :** Occurs in wet places in lowland forests, at altitudes below 150 m, sometimes in localities that are periodically inundated by freshwater or sea water. Also occurs on landward margins of mangroves. In eastern Sabah (Malaysia) it is common in young swamp forests on the landward margin of mangroves. Flowering occurs all year round. Mangrove associate species.

**Distribution :** Found from the western Indian Ocean, Madagascar, Sri Lanka, and India to Southeast Asia and the Bismarck and Solomon islands. In Southeast Asia it has been recorded in Myanmar, Cambodia, Thailand, Vietnam, Malaysia, the Philippines, Indonesia (not recorded in Sumatra and the Lesser Sunda islands) and Papua New Guinea.

**Abundance :** Usually very rare, but locally rather common in the eastern part of its range.

**Use(s) :** Cultivated in Java and elsewhere. The seeds are given as an emetic and purgative, and sometimes for bilious fevers. The plant is also used as a tonic and as an insecticide, especially against ants. The seeds contain oil to the extent of one third of their weight, but as it is difficult to obtain in large quantities it is not exploited commercially. Timber used for domestic purposes. In the Philippines chips of wood are put in coconut oil which is drunk as a purgative. The same oil is used as a liniment for rheumatism and bruises.

**Source of illustration :** Based on Nootboom (1962).

**Reference(s) :** Nootboom (1962), Backer & Bakhuizen van den Brink (1963-8), Said (1990).

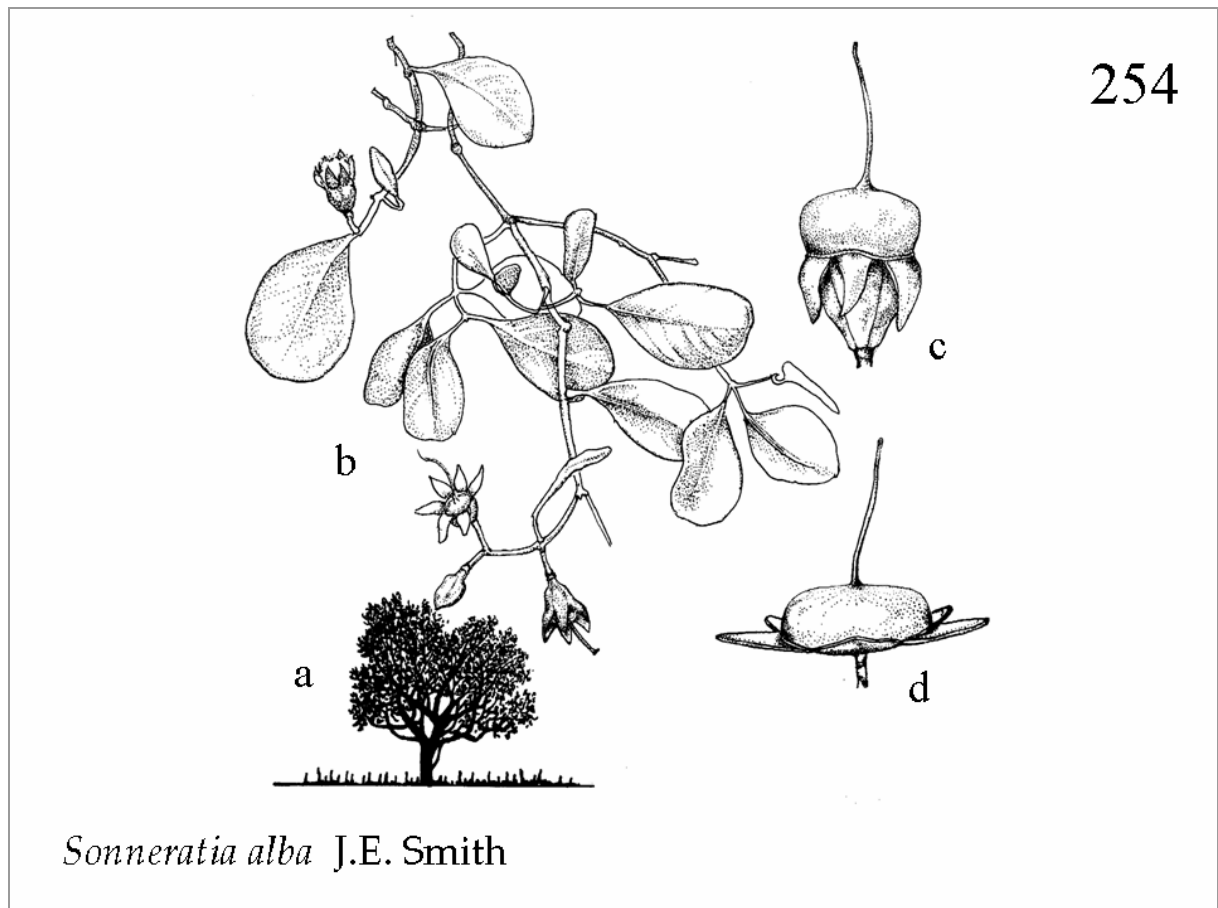


Fig. 254. *Sonneratia alba* J.E. Smith. (a) Habit, (b) branchlet with flowers and immature fruit, (c) fruit with typical reflexed sepals, and (d) fruit with sepals in horizontal plane (less typical).

## SONNERATIACEAE

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*Sonneratia alba* J.E. Smith

**Synonyms :** *Chiratia leucantha* Montr., *Mangium caseolare album* Rumph., *Rhizophora caseolaris* Linné, *Sonneratia acida* Benth., *Sonneratia alba* F.Vill., *Sonneratia caseolaris* Engl., *Sonneratia griffithii* (non Kurz) Watson, *Sonneratia iriomotensis* Masamune, *Sonneratia mossambicensis* Klotzsch ex Peters

**Vernacular names :** Mangrove apple (E), Pedada, Perepat, Pidada (Mal.), Pedada, Perepat, Pidada, Bogem, Bidada, Posi-posi, Wahat Putih (Ind.), Bunayon, Buñgalon, Hikau-hikauan, Ilukabban, Lukabban, Pagatpat, Palalan, Palatpat, Patpat, Payan – *Pagatpat* (Phil.), Bân đẳng (Viet.), Ampouthmar, Rompea-chheu (Camb.), Lampoo thale (Thai)

**Description :** Evergreen, spreading, hairless tree, usually 3-15 m, occasionally up to 20 m tall. Bark is cream-coloured to brown, with smooth, fine, longitudinal fissures. Thick, underground cable roots spread radially and arise in conical, stout, 25 cm-tall pneumatophores. Leaves are simple, opposite, leathery, obovate-ovate, measuring 5-12.5 by 3-9 cm, and bear vestigial glands at the base of the leaf stalks. Leaf stalks are 6-15 mm long. The bisexual flowers occur either solitarily or in groups of three, terminally on small branches, and have a stout, up to 1 cm-long stalk. The ellipsoid buds are 2-3 times as long as broad, including the coiled base. The bell-shaped and leathery calyx tube is often ribbed. The 6-7 persistent sepals are green outside, red inside and 2-2.5 cm long. The narrow, white, often in the lower part reddish petals measure 13-20 by 0.5-1.5 mm. These are soon shed, or occasionally are lacking altogether. The numerous, long, white stamens are also soon shed. The flattened, round berry does not open when ripe. It measures 3 by 4 cm, contains many seeds, and bears the persistent sepals at its base. These are usually reflexed, but may also be flattened into a plane. Exhibits a great deal of morphological variation. Hybrids are also known, and the hybrid between *Sonneratia alba* and *Sonneratia caseolaris* is described as *Sonneratia X gulngai* (in PNG).

**Ecology :** A pioneering species in the mangrove habitat, intolerant of long periods of exposure to fresh water. Preferred soils are consolidating mud and sands, occasionally rock, coral and gravel. It is frequently found in coastal locations that are sheltered from strong wave action, also in estuarine areas and around offshore islands. Where other tree species have been removed (e.g. for fuel), it may form dense stands. Flowering occurs all year round. Flowers are ephemeral and nocturnal, pollinated by hawk-moths, birds and fruit-eating bats. On rocky coastlines it spreads vegetatively. Fireflies congregate on the trees at night. Fruit buoyancy is due to the air-bearing tissue in the seed. Pneumatophores are absent when the tree occurs on a solid substrate. Mangrove species.

**Distribution :** From East Africa, the Seychelles and Madagascar, throughout Southeast Asia, to tropical Australia, New Caledonia, the west Pacific islands and Southwest Oceania.

**Abundance :** Common. Locally abundant.

**Use(s) :** The somewhat sour fruit is edible and a haemorrhage-checking compress is made from it. The timber is used for boat and house construction in Sulawesi (Indonesia), flooring, bridge and wharf construction, and as fuel in periods of shortage. Generally considered a strong construction material for all kinds of interior work, furniture, musical instruments, cabinet making, but requires bronze nails. Pneumatophores are used by the Papuans for corks and floats.

**Source of illustration :** Backer & van Steenis (1951), Tomlinson (1986) and Wightman (1989).

**Reference(s) :** Heyne (1950), Backer & van Steenis (1951), Backer & Bakhuizen van den Brink (1963-8), Percival & Womersley (1975), Duke (1984), Tomlinson (1986), Wightman (1989), Aksornkoae (1993), Aragonés *et al.* (1998), Marschke (2000).

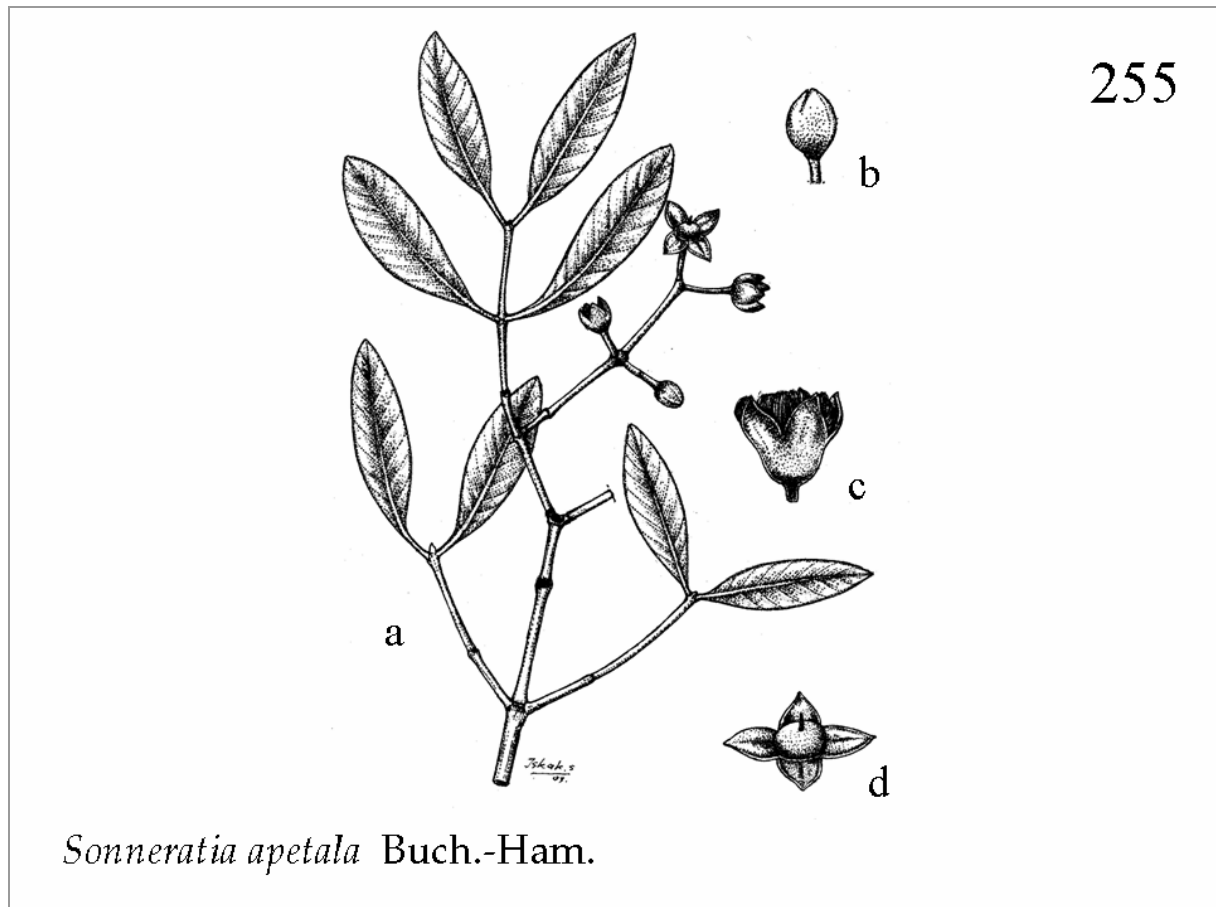


Fig. 255. *Sonneratia apetala* Buch.-Ham. (a) Fruiting and flowering branch, (b) bud, (c) flower, and (d) fruit.



## SONNERATIACEAE

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***Sonneratia apetala* Buch.-Ham.**

**Synonyms :** *Blatti apetala* O.K., *Kambala apetala* Rafin.

**Vernacular names :** Mangrove apple (E)

**Description :** Small tree, up to 12-15 (-20) m tall with drooping branches and branchlets. Bark smooth, with horizontal lenticels. Leaves are simple, opposite, sparse, long and thin, 5.5-13 by 1.5-3.75 cm, gradually tapering towards the apex, attenuating at the base; nerves and veins indistinct; leaf stalk 5-10 mm. The canopy of mature trees is often very open and the branches tend to droop. Flowers usually grouped in 3's. Buds oblong, 1.5 cm long. Calyx – including tube and lobes – in flower about 1.5-2 cm long, smooth, not ribbed; calyx lobes up to twice as long as the tube. Calyx lobes – usually numbering 4 – lie flat in the ripe fruit (as in *Sonneratia caseolaris*), either horizontally expanded or curled back. Fruit pale, broader than high, broadly rounded, about 22 mm in diameter, by 12-18 mm; thin-walled. Other *Sonneratia* may at times also be without petals, so the name is not entirely fitting (Tomlinson, 1986).  $2n = 18$  (Fedorov, 1969, in Khan, 1980). Fruit bunches may grow directly on the tree stem (i.e. cauliflorous).

**Ecology :** Found in mangrove forests, forming pure stands, especially in the inland, less saline zones. As with other *Sonneratia* species the flowers open at night and are pollinated by bats and moths. Mangrove species.

**Distribution :** From India and Sri Lanka eastwards up to southern Myanmar. Not found elsewhere in Southeast Asia. Reportedly planted in southern China (Guangdong Province; pers. comm. Tom Dahmer, September 2004) after introduction from Bangladesh, and has become common in the Zhanjiang NNR.

**Abundance :** Generally rarer than other *Sonneratia* species, but locally common. Common in the Sunderbans mangroves of Bangladesh and India. Very rare in Sri Lanka, where a population of six trees have been recorded at Muttur (near Trincomalee; Tomlinson, 1986).

**Use(s) :** Wood is good for planks, oars, boxes, bobbins for textile mills, and as firewood. Tender young leaves are favoured by deer. Flowers are locally an important source of honey.

**Source of illustration :** Based on Khan (1980).

**Reference(s) :** Backer & van Steenis (1951), Khan (1980), Tomlinson (1986).

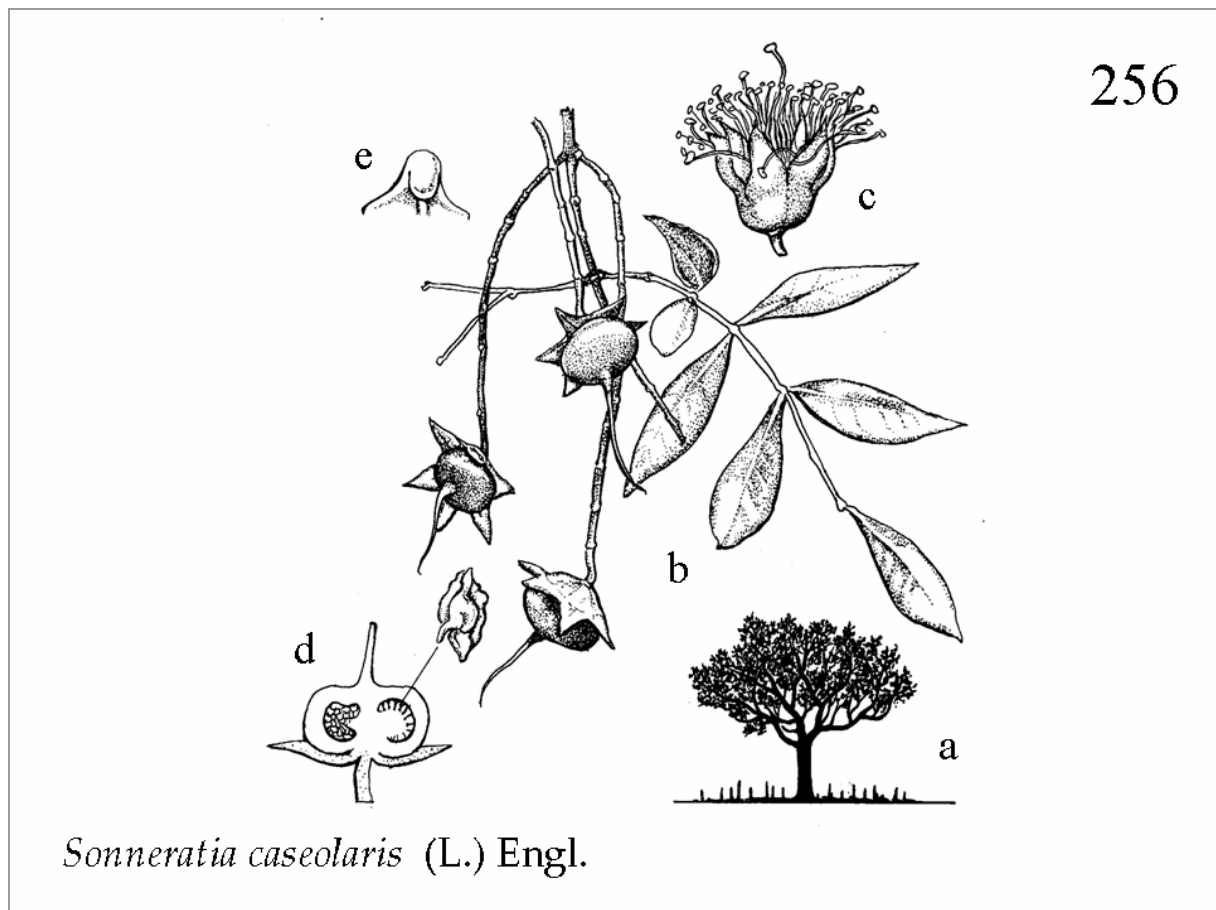


Fig. 256. *Sonneratia caseolaris* (L.) Engl. (a) Habit, (b) branchlet with fruit, (c) flower, (d) longitudinal section of fruit, with detail of seed (inset) and (e) detail of leaf tip, with recurved point.

## SONNERATIACEAE

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*Sonneratia caseolaris* (L.) Engl.

**Synonyms :** *Aubletia caseolaris* Gaertn., *Blatti acide* Lamk., *Blatti caseolaris* O.K., *Blatti pagatpat* Niedenzu, *Mangium caseolare rubrum* Rumph., *Rhizophora caseolaris* L., *Sonneratia acida* Linné, *Sonneratia evenia* Bl., *Sonneratia lanceolata* Bl., *Sonneratia neglecta* Bl., *Sonneratia obovata* Bl., *Sonneratia ovalis* Korth., *Sonneratia pagatpat* Blanco, *Sonneratia rubra*.

**Vernacular names :** Mangrove apple (E), Berembang (Mal.), Pedada, Perepat, Pidada, Bogem, Bidada, Rambai, Wahat Merah, Posi-posi Merah (Ind.), Hikau-hikauan, Ilukabban, Pagatpat, Palapat, Palata, Payar – *Pedada* (Phil.), Bân sê (Viet.), Lam phu, Lampoo (Thai.), Ampou-krohóm (Camb.)

**Description :** Small to medium-sized tree, up to 15 m, rarely up to 20 m tall, with many, often very strong, vertical pneumatophores and a rather lax crown, much like a (weeping) willow tree. Crown rounded, spreading, not dense. The ends of the branches droop, and are quadrangular when young. Leaves are simple, opposite, variable in size, measuring 5-13 by 2-5 cm. Tip of most leaves has a minute, recurved point (see illustration). The leaf stalk is broad and very short. Flowers occur in groups of 1-3 together at the ends of stems. The flower buds are broadly oval, less than twice as long as broad. When in full flower, the calyx tube is shallowly cup-shaped and smooth, usually without ribs. The calyx lobes (6, rarely 7 or 8) are usually distinctly longer than the tube, green outside, greenish- or yellowish-white inside. The narrow petals measure about 17-35 mm by 1.5-3.5 mm and are dark red. The numerous stamens are 2.5-3.5 cm long and are soon shed; filaments carmine below, white above. They are red in their lower part, and white in their upper part. The green fleshy fruit occurs on the flattened calyx tube with its nearly horizontally-spreading lobes. It is flattened-round, measuring 3-4 by 5-7.5 cm. Hybrids are also known, and the hybrid between *Sonneratia alba* and *Sonneratia caseolaris* is described as *Sonneratia X gulngai* (in PNG).

**Ecology :** Occurs in less saline parts of mangrove forests on deeply muddy soil, along tidal creeks with slow-moving water, never on coral banks. Found along rivers, occurring upstream to where the tidal influence is still felt, also in areas that are predominantly freshwater. It is intolerant of shade. When fully flowering, flowers contain abundant nectar. As with other *Sonneratia* species the flowers open at night and are pollinated by bats and moths. Flowering occurs throughout the year. Seeds are buoyant. During heavy rains the inclination of the leaves may shift from horizontal to vertical. Mangrove species.

**Distribution :** From Sri Lanka, throughout Southeast Asia, to tropical Australia, the Solomon Islands and the New Hebrides. In Southeast Asia recorded from Cambodia, Vietnam, Thailand, Malaysia, Singapore, the Philippines, Brunei, East Timor, Indonesia (throughout) and Papua New Guinea. Introduced to southern China (Guangdong; (Howes *et al.*, 2004)

**Abundance :** Common, and locally abundant.

**Use(s) :** The sour young fleshy fruit is edible. Poor quality timber, but occasionally used to salt-water piling. When better firewood is not available, this wood is used. After having been boiled in water, the pneumatophores are an inferior substitute for cork. Pneumatophores are also used for making wooden soles of shoes. The bark contains a moderate amount of tannin.

**Source of illustration :** Backer & van Steenis (1951), Tomlinson (1986) and Wightman (1989).

**Reference(s) :** Watson (1928), Heyne (1950), Backer & van Steenis (1951), Backer & Bakhuizen van den Brink (1963-8), Percival & Womersley (1975), Khan (1980), Duke (1984), Tomlinson (1986), Aksornkoae (1993), Aragones *et al.* (1998), Ng & Sivasothi (1999), Marschke (2000).

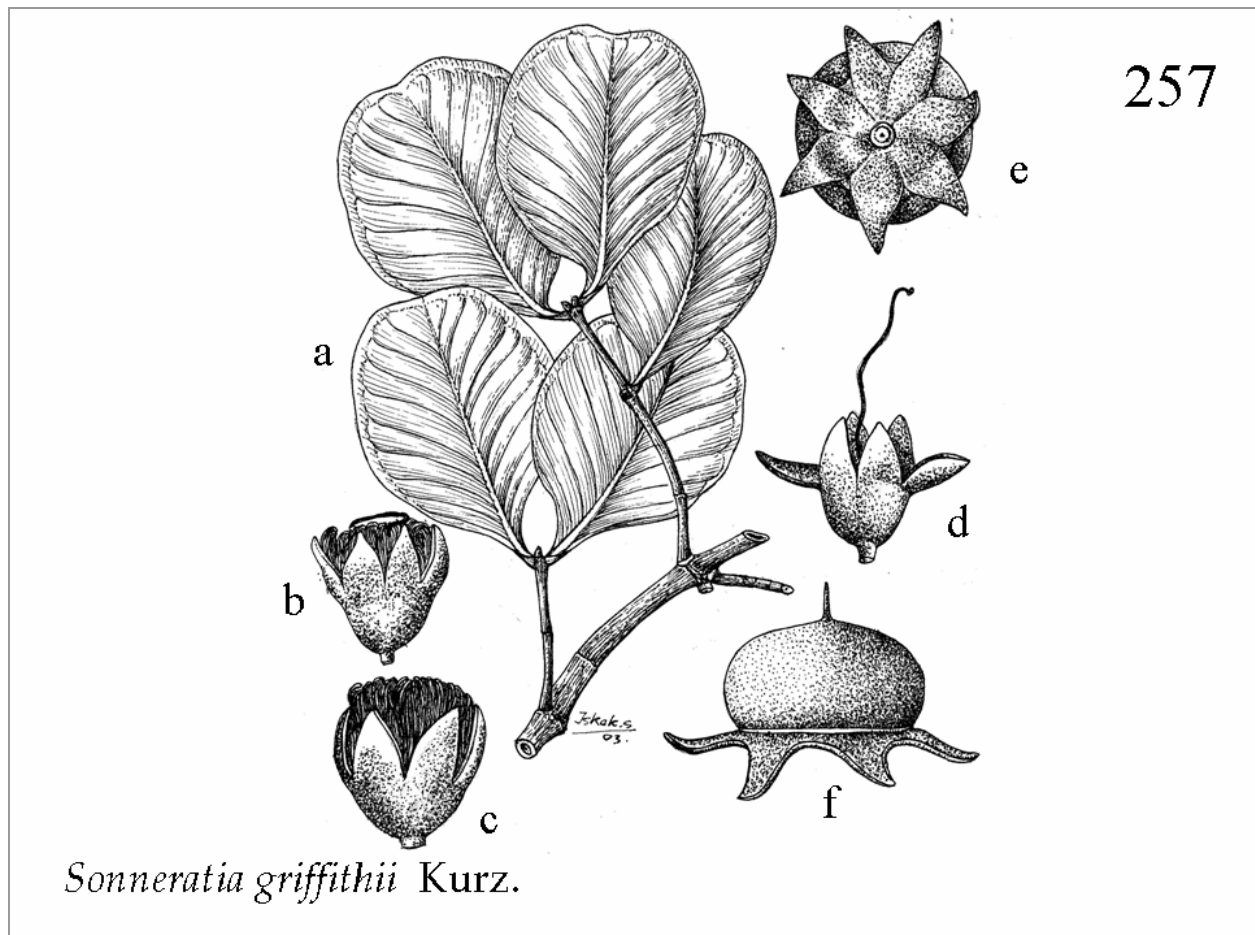


Fig. 257. *Sonneratia griffithii* Kurz. (a) Part of branch, (b) flower, partly opened, (c) flower, opened, (d) flower, with style extended, (e) fruit, seen from stalk, and (f) fruit, seen from side.

## SONNERATIACEAE

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*Sonneratia griffithii* Kurz.

**Synonyms :** *Sonneratia acida* var. *griffithii* King., *Sonneratia alba* (non SM) Griff.

**Vernacular names :** Mangrove apple (E), Pedada (Mal.), Lampaen thale, Lam phaen (Thai.), Ampea (Camb.)

**Description :** Tree, up to 20 m tall, with a trunk up to 100 cm diameter. Leaves are simple, opposite, thick, 7-10.5 by 5.5-9 cm, obovate to almost round, base rounded, contracted into a short leaf stalk; tip is usually broadly rounded. (9-)10-14 leaf nerves distinct, prominent on the upper side of the leaf, ascending at an angle. Mature flower bud 2.5-3 cm long. Flowers are generally greenish-white. Calyx tube 3-3.5 cm long, widely bell-shaped, in fruit expanded together with the lobes horizontally up to 6.5 cm diameter. Calyx lobes number 6-7, and do not envelope the base of the fruit. Fruit 2.5-3 cm high, 4-5.5 cm diameter, thick, style less persistent than in *Sonneratia caseolaris*. Reportedly common, but scarce in herbaria (Backer & van Steenis, 1951). Closely related to *Sonneratia caseolaris*, from which it can be distinguished by the prominent leaf veins and the absence of petals.

**Ecology :** Flowering recorded from January (Thailand) to March (Myanmar), fruiting in January (Thailand). Mangrove species.

**Distribution :** From Myanmar, Thailand and Peninsular Malaysia westward up to southeast Bangladesh (Chittagong) and the Andaman Islands. Possibly also in Sumatra, but not yet recorded.

**Abundance :** Reportedly common (Backer & van Steenis, 1951), but not often recorded. Possibly often confused with other species.

**Use(s) :** Unknown.

**Source of illustration :** Based on Backer & van Steenis (1951) and Khan (1980).

**Reference(s) :** Backer & van Steenis (1951), Khan (1980), Tomlinson (1986), Aksornkoae (1993), Marschke (2000).

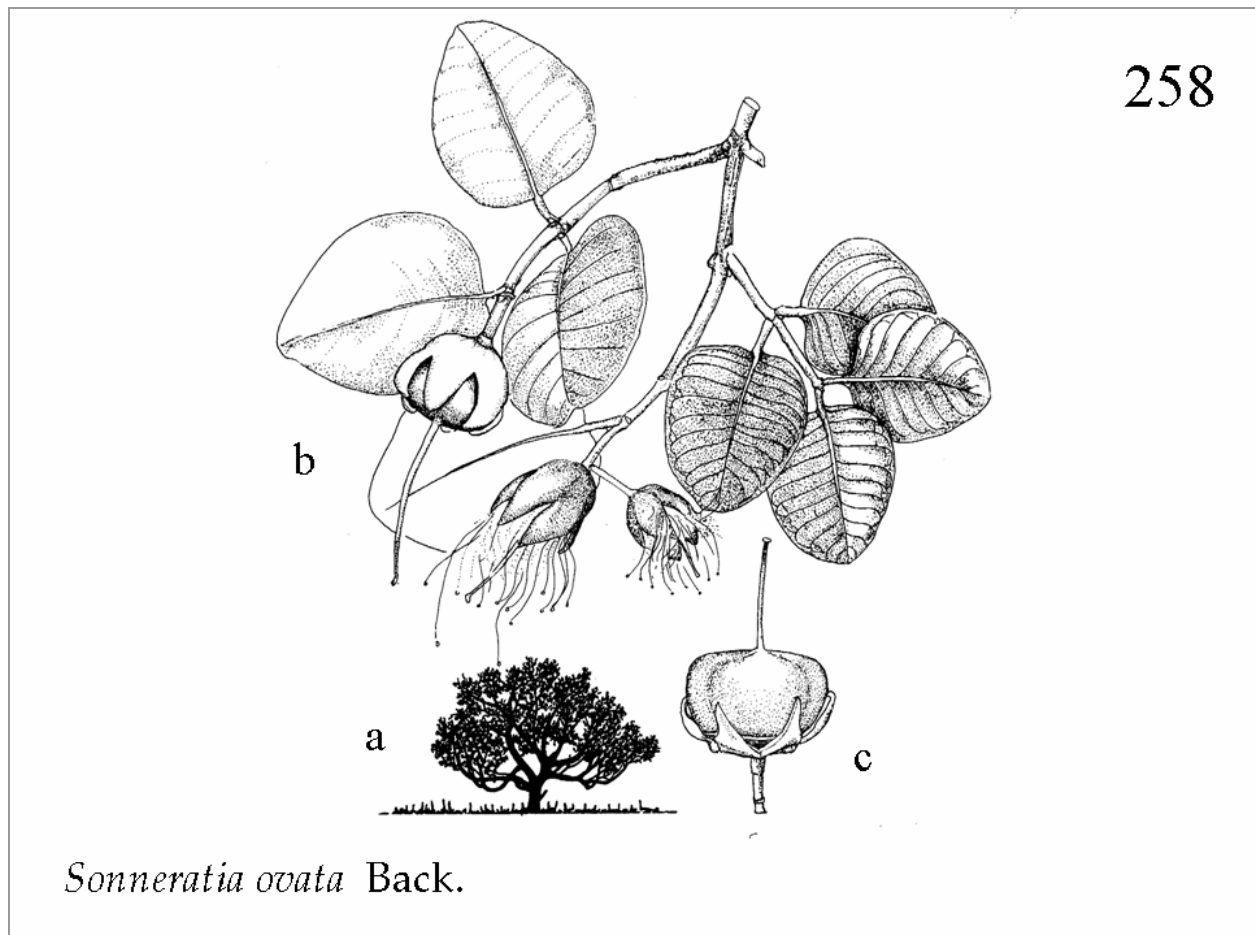


Fig. 258. *Sonneratia ovata* Back. (a) Habit, (b) branchlet with flowers and fruit, and (c) fruit, with enveloping sepals.

## SONNERATIACEAE

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***Sonneratia ovata* Back.****Synonyms :** *Sonneratia alba* auct. plur. Watson**Vernacular names :** Mangrove apple (E), Bogem, Kedabu (Ind.), Gedabu (Mal.), Pagatpat, Pagatpat baye (Phil.), Bả'n ở'i (Viet.), Ampea (Camb.), Lampaen (Thai)**Description :** Small or medium-sized tree, usually up to 5 m, occasionally up to 20 m tall, with quadrangular young branches and vertical pneumatophores. Leaves are simple, opposite, broadly ovate, oval or almost round, measuring 4-10 by 3-9 cm. The leaf stalk is 2-15 mm long. Flowers are solitary or occur in groups of three at the tops of stems. The slender flower stalks are 1-2 cm long, or occasionally absent. The flower buds are broadly oval, less than twice as long as broad, and covered with small warts. The calyx is 2.5-4.5 cm long, with a tube that is broadly cup-shaped and arises from a sharply contracted, short, stalk-like base. There are usually six calyx lobes, which are as long as the tube or slightly longer when fully open. Their inner surface is strongly tinged with red. They remain occur on the fruit, enveloping the berry. Petals are absent. The numerous stamens, which fall off quickly, are white. The ripe berry measures 3-5 by 2.5-3.5 cm.**Ecology :** Occurs on the landward margin of mangroves, in less saline areas, on muddy soils and along tidal creeks. It never occurs on coral reefs. Flowering occurs throughout the year. Mangrove species.**Distribution :** From Southeast Asia to northern Queensland, Australia. In Southeast Asia it has been recorded in Cambodia, Thailand, Vietnam, the Philippines, Malaysia, Singapore, Indonesia (Riau Archipelago, Sumatra, Java, Borneo, Sulawesi, the Moluccas, Papua) and Papua New Guinea. First record for Borneo October 1996 by the first author (Giesen) in brackish lower reaches of the Sebangau River in Central Kalimantan, Indonesia.**Abundance :** Locally common, but on the whole rather rare.**Use(s) :** Firewood. Young fruits eaten as 'rujak' in Indonesia.**Source of illustration :** Based on combination of photographs and Backer & van Steenis (1951).**Reference(s) :** Backer & van Steenis (1951), Backer & Bakhuizen van den Brink (1963-8), Percival & Womersley (1975), Tomlinson (1986), Giesen (1991), Ng & Sivasothi (1999), Yao (2000), Marschke (2000).

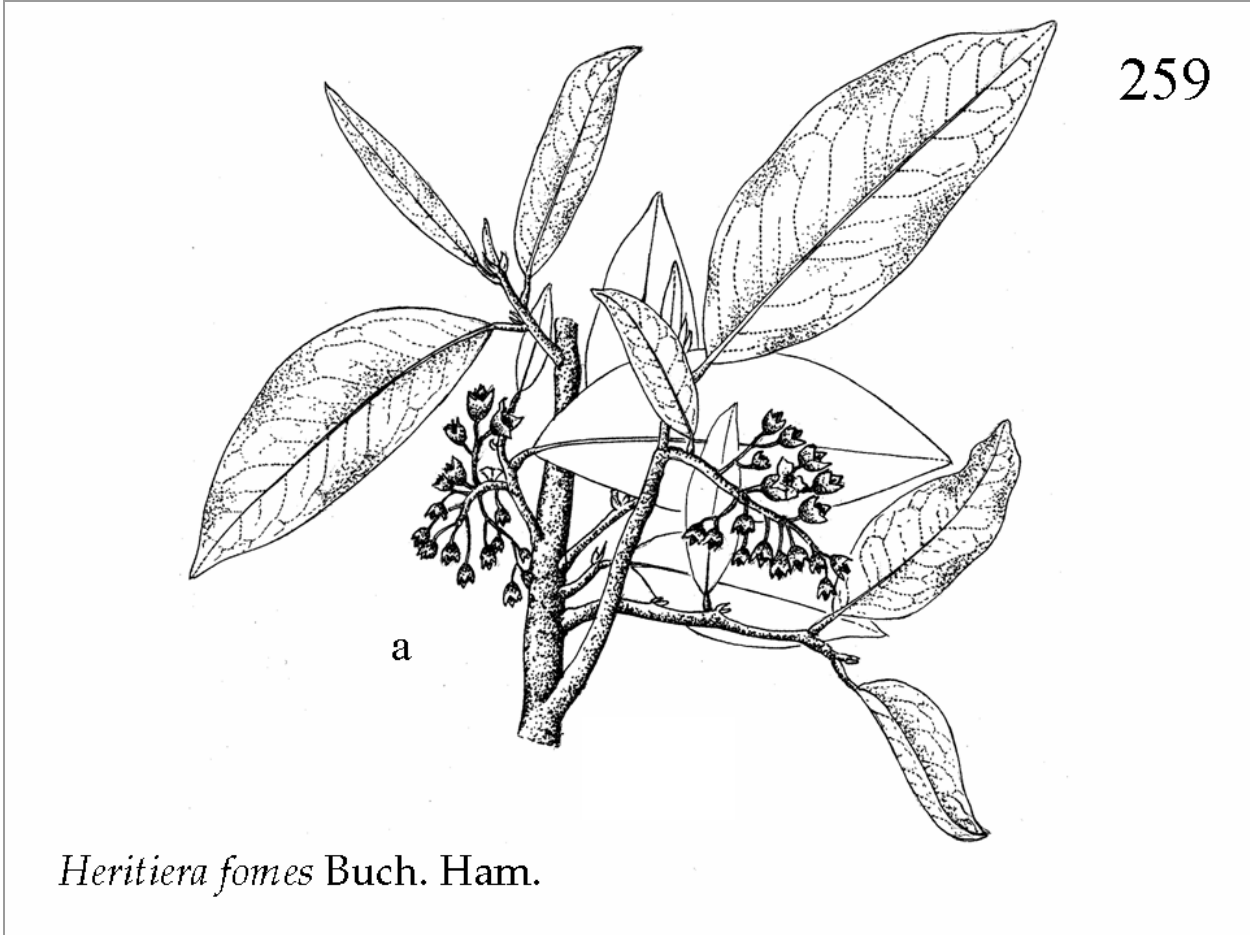


Fig. 259. *Heritiera fomes* Buch. Ham. (a) Flowering branch.



## STERCULIACEAE

259

*Heritiera fomes* Buch. Ham.**Synonyms :** Unknown**Vernacular name(s) :** Sundari, Sundri (Bangla), Kanazo (Myanmar)

**Description :** Medium-sized tree, up to 25 m, with many erect, pointed pneumatophores. Leaves alternate, simple, with leaflet at the base of each leaf stalk 1 cm long, round, grey, slightly woody. Leaf blade elliptic lanceolate, entire, pointed, thick and slightly hard, about 10-20 by 5-10 cm. Upper surface pale green and smooth, lower surface whitish grey and rough, with very short, scurfy hairs and net-like venation. Flower clusters are pendulous and much branched. Flowers are unisexual, small, creamy-coloured to pale brownish, and with a 6.5 mm, hairy flower stalk. Sepals number 4-5, and are rounded or cup-shaped, with a tube beneath, and 4-5 lobes. Calyx lobes are ovate, pointed, hairy, and both the inner and outer surface are leathery. Petals are absent. the male flower has 5 stamens that are fused together. The female flower has 4-5 carpels that are loosely attached and are 2.5 mm long. The style is terminal, long, white but after maturation it becomes brown. The fruit consists of a cluster of woody, indehiscent, keeled or winged ripe carpels, knobbly with a ridge underneath, together with a transverse, circular ridge, 2-4 cm. Seeds are solitary and do not exhibit vivipary, but are buoyant.

**Ecology :** Gregarious species. In the Sundarbans (India, Bangladesh) this species has been affected by a 'top-dying' disease since at least the late 1980s, which has been attributed to a combination of changes in hydrology, fungal disease and insect pests. It is a species of the landward edges of mangroves and along brackish tidal streams. Mangrove species.

**Distribution :** South to Southeast Asian species, recorded from India, Sri Lanka, Bangladesh and Myanmar (Ayeyarwady delta).

**Abundance :** Locally very common and abundant, but with a limited overall distribution.

**Use(s) :** Timber is similar to teak and used for boat building and furniture. It checks soil erosion in the tidal forests and loosely consolidated, silted up soil.

**Source of illustration :** Flora of Bangladesh.

**Reference(s) :** Tomlinson (1986).

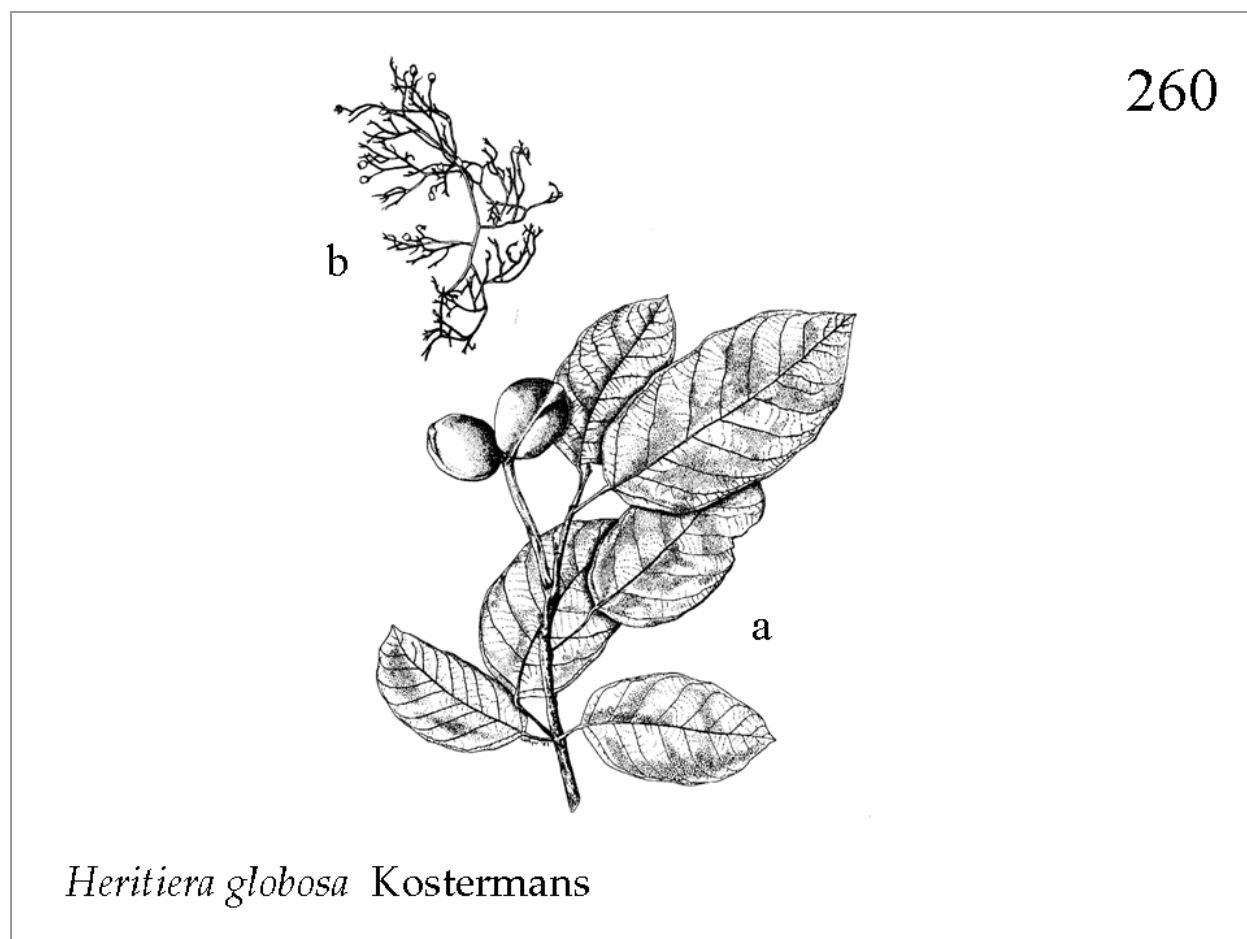


Fig. 260. *Heritiera globosa* Kostermans. (a) Branchlet with ripe fruit, and (b) inflorescence with diminutive flowers.

## STERCULIACEAE

260

*Heritiera globosa* Kostermans**Synonyms :** Unknown.**Vernacular name(s) :** Dungun besar (Mal.)

**Description :** Evergreen tree up to 25 m tall, with a buttressed trunk and dark or grey, fissured bark. Individual trees bear either male or female flowers. The buttresses are well developed and snake-like, and extending 2-4 m from the base of the trunk. The stiff, leathery leaves are grouped towards the ends of the branches. They are oblong or ovate-elliptic, and measure 10-20 by 5-10 cm, sometimes even 30 by 15-18 cm. The leaf stalk is longer than 2 cm, and may be up to 4 cm long. Leaves are dark green above and greyish-white beneath because of a layer of overlapping, star-shaped scales. Flowers are unisexual and occur in complex, hairy clusters that mainly occur in the axils of leaves at the ends of branches. They may also occur immediately below the resting terminal bud. The flowers are 4-5 mm long, with a cup-shaped calyx that is reddish and hairy inside, and green and hairy outside. There are no petals. Male flowers are more numerous, but smaller than the female flowers (on different trees!). The woody, rounded, shiny-brown fruit measures about 4-6 cm diameter, with a shallow ventral crest that is extended at the far end into a beak or wing, with the wing always slightly recurved in a characteristic manner. It matures in hanging clusters and is 1-seeded. Very much like *Heritiera littoralis* (see next description), from which it can be distinguished by its round fruit and longer leaf stalk.

**Ecology :** Occurs behind the tidal zone of the mangrove belt, but has also been collected 70 km from the sea in tidally influenced, freshwater river systems. Mangrove associate species.

**Distribution :** Limited distribution, known only from Eastern Malaysia (Sarawak, Sabah), Brunei and Indonesian Kalimantan (Borneo), but may have a wider distribution range.

**Abundance :** Locally relatively common.

**Use(s) :** A heavy and hard timber.

**Source of illustration :** Based on Kostermans (1959).

**Reference(s) :** Kostermans (1959), Tomlinson (1986), <http://www.rbgekew.org.uk/herbarium/brunei/bclhome.htm>.

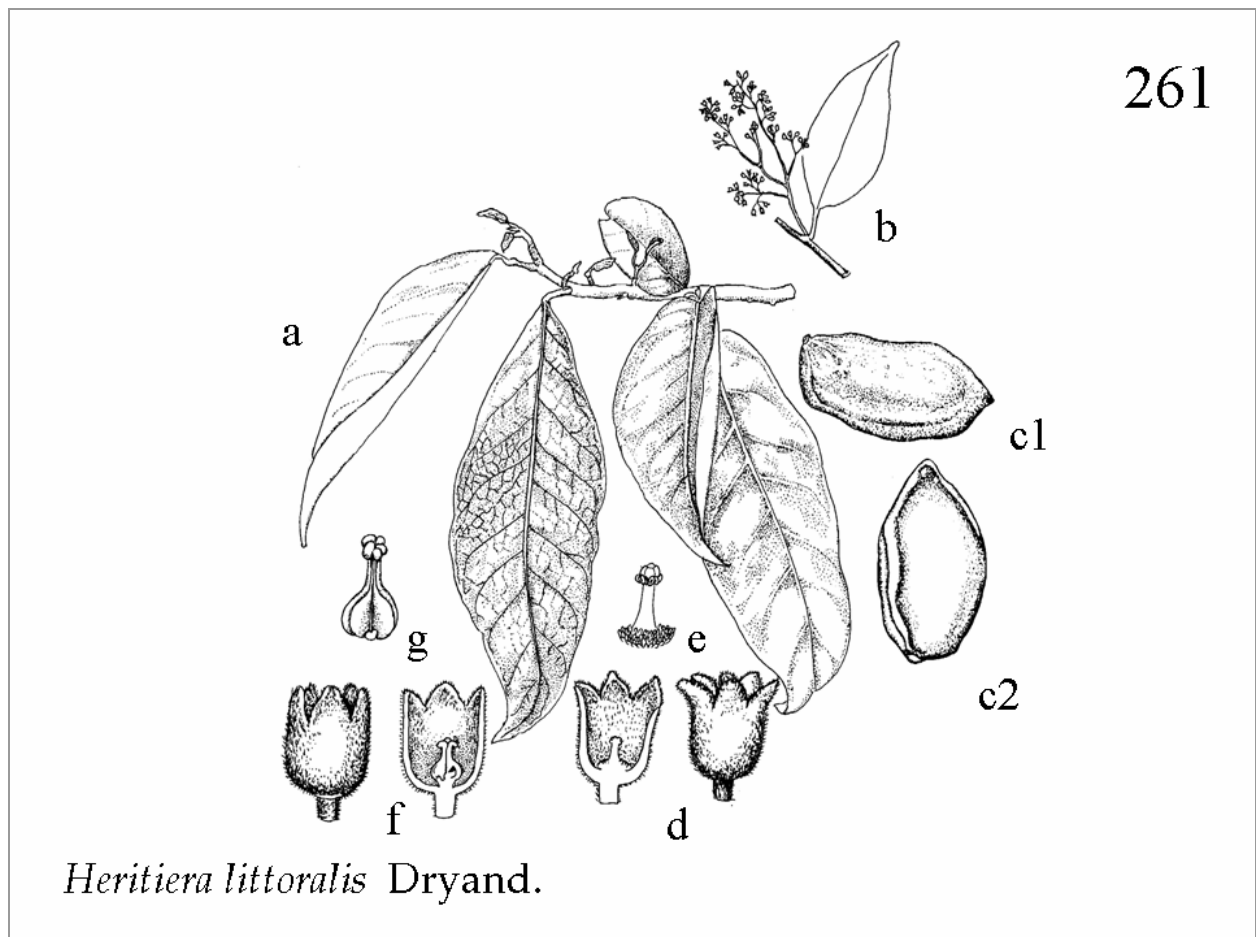


Fig. 261. *Heritiera littoralis* Dryand. (a) Branchlet with leaf buds, (b) branchlet with flowers, (c) winged, woody fruit, (d) male flower, (e) stamen column and disk, (f) female flower, and (g) stigma, subdivided into carpels.

## STERCULIACEAE

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*Heritiera littoralis* Dryand.

**Synonyms :** *Balanopteris minor* Gaertn., *Balanopteris tothila* Gaertn., *Helicteres apetala* Blanco, *Heritiera littoralis* Dryand. ex W.Ait., *Heritiera minor* Lam., *Sterculia cymbiformes* Blanco

**Vernacular name(s) :** Looking-glass tree (E), Dungun, Dungun laut (Mal.) Dunggu, Dungun, Dungun laut, Atung Laut, Lawanan Kete, Rumung, Balang, Pasisir, Lawang, Cerlang Laut, Lulun, Rurun, Belohila, Blakangabu (Ind.), Basit, Baut, Bayag-kabayo, Dungun, Magayao, Malarungon, Palingapoi, Palugapig, Paronapin, Paunapin – *Dungon-late* (Phil.), Pinle-kanazo (Myan.), Cui bien, C[aa]y cui, Cui (Viet.), Ngon kai, Ngonkai thale (Thai.), Dawm-klai, Kann-kai, Semornsakmot (Camb.)

**Description :** Evergreen tree up to 15-25 m tall, with a buttressed trunk and dark or grey, fissured bark. The trunk normally attains a diameter of about 35 cm at breast height. Individual trees bear either male or female flowers. The stiff, leathery leaves are bunched towards the ends of the branches. They are oblong or ovate-elliptic, and measure 10-20 by 5-10 cm, sometimes even 30 by 15-18 cm. Leaf stalks measure 0.5-2 cm. Leaves are dark green above and greyish-white beneath because of a layer of overlapping, star-shaped scales. Flowers are small (4-5 mm) and indistinct, unisexual and occur in complex, hairy clusters that mainly occur in the axils of leaves at the ends of branches. They may also occur immediately below the resting terminal bud. Flowers have a cup-shaped calyx that is reddish and hairy inside, and green and hairy outside. There are no petals. Male flowers are more numerous, but smaller than the female flowers (on different trees!). Flowers described by Corner as 'dull-purple bells with 4-6 teeth, hanging in yellowish tassels, 5-17 cm long'. The woody, shiny-brown to purplish fruit measures 5-6 by 6-8(-10) cm and has a keel or short flange along one side. It matures in hanging clusters and is 1-seeded. Very much like *Heritiera globosa* (see previous description), from which it can be distinguished by its elongated, larger fruit and shorter leaf stalk.

**Ecology :** Very frequently found on the landward margins of mangroves, and may also occupy the fringes of adjacent lowland forest, or rocky shores. It seems intolerant of high salinities and does not occur in very exposed or poorly drained sites. Occasionally associated with *Excoecaria*, *Avicennia* and *Xylocarpus*. Flowering occurs all year round. The curious boat-like fruits are commonly found along shorelines – they can float for weeks and germinate when they are stranded at high tide. Mangrove associate species.

**Distribution :** Occurs from East Africa and Madagascar to southern China (Guangdong, where it is rare), Australia and the Pacific as far as New Caledonia. Found throughout Southeast Asia.

**Abundance :** Common.

**Use(s) :** The wood is heavy and very durable, used for canoes, house posts, telegraph poles and masts, wharf decking, boat planking, and so on. Produces good firewood, and is a good raw material for wrapping and printing paper. The bark contains tannin and is used to treat rope and nets. Fruits/seeds are used for treatment of diarrhoea and dysentery. Seeds are used in fish dishes. Roots are used as fish poison.

**Source of illustration :** Based on Kostermans (1959), Percival & Womersley (1975), Tomlinson (1986).

**Reference(s) :** Heyne (1950), Kostermans (1959), Backer & Bakhuizen van den Brink (1963-8), Percival & Womersley (1975), Tomlinson (1986), Corner (1988), Aksornkoae (1993), Aragones *et al.* (1998).

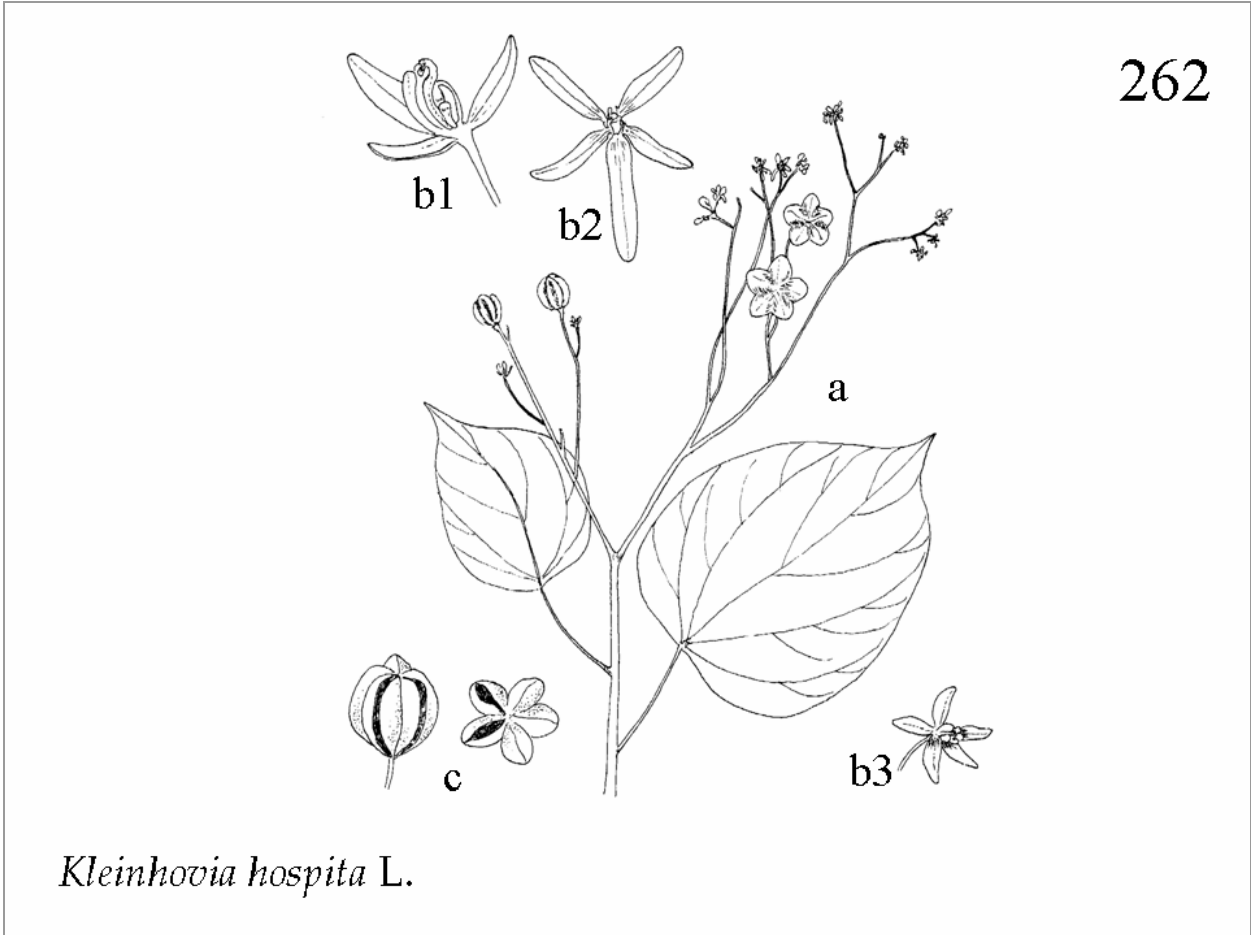


Fig. 262. *Kleinhovia hospita* L. (a) Branchlet with flowers and fruit, (b) flowers, and (c) fruit.

## STERCULIACEAE

262

*Kleinhovia hospita* L..

**Synonym(s) :** *Cattimarus* Rumph. , *Grewia meyeniana* Walp., *Kleinhovia serrata* Blanco

**Vernacular name(s) :** Guest Tree (E), Temahau (Mal.), Mahar, Temahau, Katimahar, Mangar, Tangkele, Kayu Tahun, Katimaha, Bintangar, Bintana, Wintangar – *Katimaga* (Ind.), Apung-apung, Balansi, Bantana, Bignon, Biknong, Biluan, Binong, Bitanag, Bitnong, Hamitanago, Lapuis, Marakapas, Pampas, Panampat, Taag, Tagnag, Tamanag, Tan-ag, Tanak, Tangag, Toloktok, Unapong (Phil.)

**Description :** Small to medium sized tree, usually less than 20 m tall, but occasionally up to 30-40 m, with a girth of up to 90 cm (-120 cm). The crown is deep and dense, with ascending, spreading limbs, and the trunk forks low, coppicing from old stumps. Bark is fawn-grey, with fine, fibrous fissures and a powdery surface. Wood is soft, pale yellow, while timber is a pinkish buff colour. Twigs are covered with soft hairs. Leaf stalks are 2.5-10 cm, slender, while leaves are hairy, ovate or heart-shaped, 5-15 by 3.7-12.5 cm, with a pointed tip, entire margins and a palm-nerved base. Leaves are usually light green. Flowers occur in terminal clusters that protrude from the canopy. Individual flowers are 1 cm across and 5-merous. Sepals are pink and petals are much smaller and inconspicuous, the upper ones being yellowish. Fruit is a 5-ribbed, rounded, inflated capsule, 20-25 cm across, with thin, pink walls; five chambers, each containing 1-2 whitish seeds. The only species in the genus.

**Ecology :** Occurs in open country and along river banks, including tidal areas and landward margins of mangroves. Found in primary lowland forest, coastal forest and well developed secondary forest. From sea level up to about 500 m asl. According to Kochummen (1972) the species is restricted to regions with a pronounced dry season; however, the main author of this publication has observed *Kleinhovia hospita* doing very nicely in always humid parts of West and South Kalimantan. In habit the tree looks similar to *Hibiscus tiliaceus*, except for its protruding pink flowers and inflated fruits. Mangrove associate species.

**Distribution :** From the Mascarene Islands (east of Madagascar) and tropical East Africa to Polynesia. Occurs throughout Southeast Asia.

**Abundance :** Common.

**Use(s) :** Bark and leaves are poisonous and used for removing ecto-parasites; the bark produces a weak fibre. Some finely patterned wood is used for making much-prized handles of Javanese *kris* (ritual knives). The seeds are reportedly very poisonous.

**Source of illustration :** Based on Keng (1987).

**Reference(s) :** Heyne (1950), Kochummen (1972), Sastrapradja *et al.* (1979), Afriastini (1988), Corner (1988), <http://bpi.da.gov.ph/websitemedicinal/all/t/tan-ag.htm>.

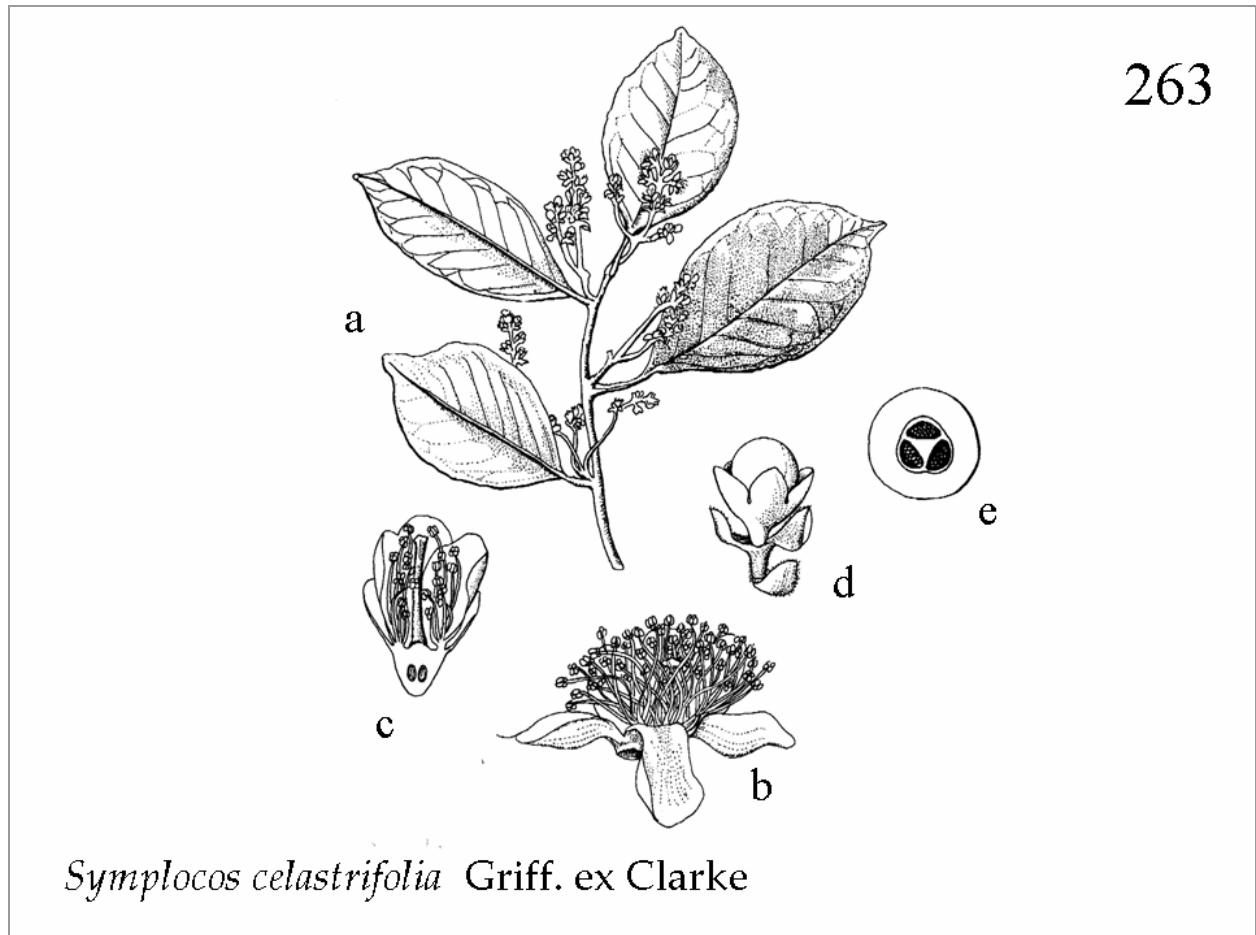


Fig. 263. *Symplocos celastrifolia* Griff. ex Clarke. (a) Flowering branchlet, (b) flower, (c) longitudinal section of flower, (d) fruit, and (e) cross-section of fruit.



## SYMPLOCACEAE

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*Symplocos celastrifolia* Griff. ex Clarke

**Synonyms :** *Eugeniodes celastrifolius* O.K., *Symplocos candicans* Brand., *Symplocos hutchinsonii* Brand., *Symplocos nigricans* Brand., *Symplocos peninsularis* Brand.

**Vernacular names :** Kayu Tanyong, Kulimbabok, Tanjong Jawa, Tanjong-tanjong, Kendung, Krunjing, Adad, Bintangur Pantai, Mangkinang Tikus, Tawi (Ind.)

**Description :** Shrub or small tree, usually less than 12 m, rarely up to 30 m tall, with smooth twigs and trunk attaining a girth of up to 2 m. The elliptic leaves, 5.5-15 by 2-6 cm, are smooth, or (rarely) sparsely covered with fine hairs on the midrib and veins underneath. Secondary nerves 5-7 pairs, faintly visible on both sides. Often the upper surface of the leaf is very dark, and the lower surface is olive-brown. The leaf stalk is 3-15 mm long. Flowers are scented, creamy-coloured to whitish. The flower cluster is often branched at the base, 3-12 cm long, and its stalks are covered with fine hairs. The calyx is smooth, 1.5-2.5 mm, with lobes that have a fringe of hairs along the edge. The corolla is 4-6 mm long, and there are numerous stamens. Fruit is round and pink, green, yellow or dark blue, 4-10 by 3-8 mm. The smooth pip has three cells, but usually only one (the smallest) contains a viable seed. Seed and embryo are U-shaped.

**Ecology :** Usually occurs in coastal, either primary or secondary lowland forests, especially in the transition zone between mangrove (especially *Nypa*) and freshwater swamps. Usually in deep, swampy, sandy soils, but also in a variety of other habitats such as sandy beaches, sandbanks near the sea, heath forest, *Casuarina* peat swamp, *Shorea laevifolia* forest, dry bamboo ridges and red or yellow sandy loams, at altitudes of up to 750 m, and in exceptional cases, even 1,900 m. Flowering occurs from March to May and fruiting from June to August. Fruits are buoyant, because the sterile cells are filled with air. Mangrove associate species.

**Distribution :** Southeast Asian species, recorded in Thailand, Malaysia, Singapore, the Philippines, Indonesia (throughout, but not (yet) recorded in Java and the Lesser Sunda Islands) and Papua New Guinea.

**Abundance :** Locally relatively common.

**Use(s) :** Unknown.

**Source of illustration :** Based on Nootboom (1977).

**Reference(s) :** Nootboom (1977), Kochummen (1978d).

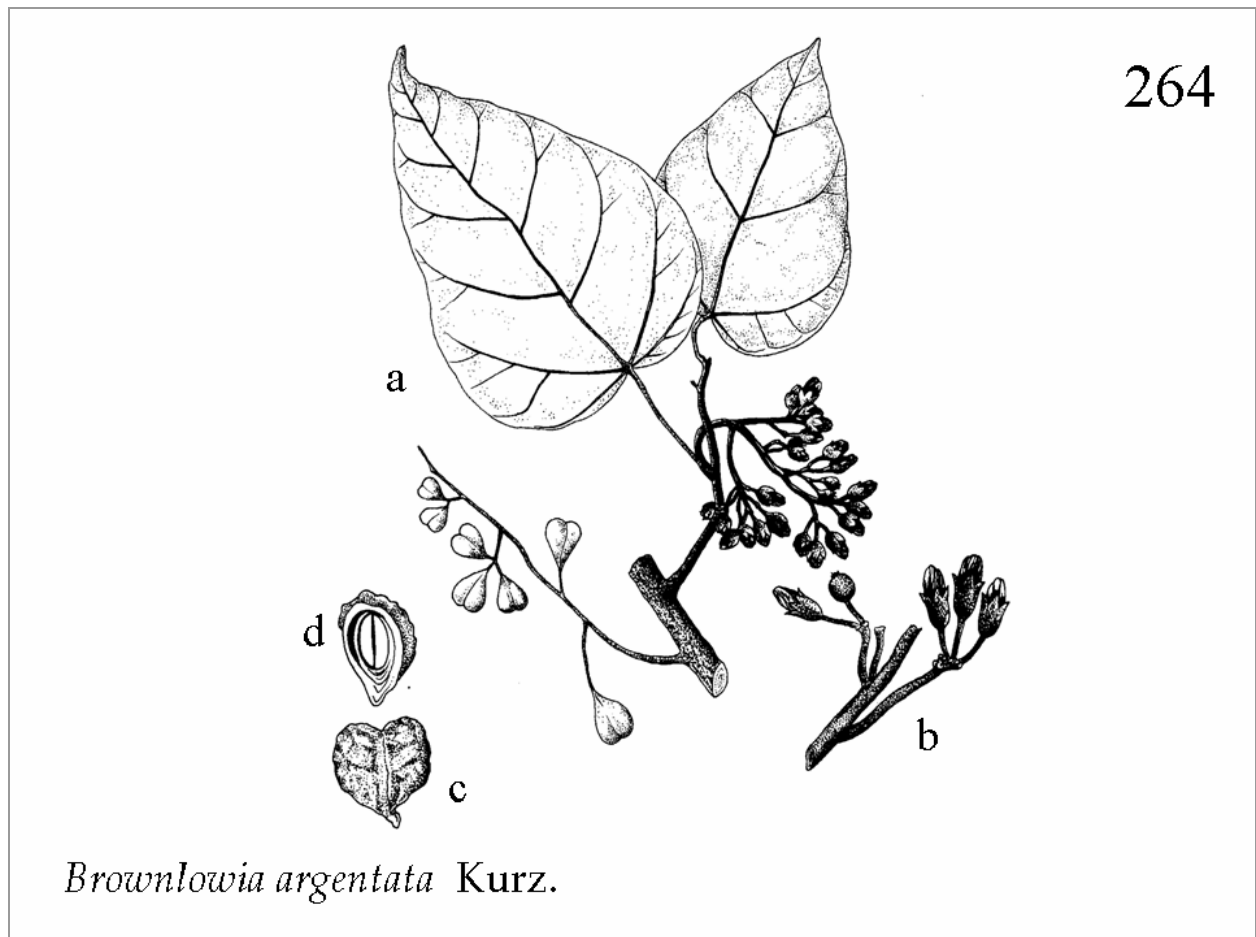


Fig. 264. *Brownlowia argentata* Kurz. (a) Flowering and fruiting branchlet, (b) flowers, (c) fruit, and (d) right half of fruit.

## TILIACEAE

264

***Brownlowia argentata* Kurz.****Synonyms :** *Brownlowia lepidota*, *Brownlowia riedelii* Hemsl.**Vernacular name(s) :** Dungun, Durian laut (Mal.), Kiei, Ai, Pemandum, Migin, Pribo (Ind.)

**Description :** Shrub or small tree, up to 10 m (rarely 20 m) tall and 10 (-15) cm in diameter. Much-branching, with a greyish-brown or grey-mottled, cracked or thin, flaky, smooth bark. Leaves are stiff but thin, ovate, 8-25 by 6-17 cm, with a heart-shaped, or rarely abruptly tapered base and a pointed tip. The upper surface of the leaf is glossy and rather smooth, while the lower leaf surface and the twigs are covered with a dense, flattened layer of tiny, hairy scales, brownish. The slender leaf stalk is 4-6 cm long, and ends in a fleshy or corky swelling just below the leaf. The terminal flower head is erect, rather narrow and lax. The 5-lobed calyx is scaly. The corolla is 5-8 mm long, pale orange to salmon pink, and has numerous yellow stamens. The fruit is a woody capsule or nut, scaly, bilobed or heart-shaped (alternatively: shaped like a golf putting-club), up to 2 cm long, on a (max.) 1 cm long thick stalk. The tree is similar to *Heritiera littoralis*, which is also called 'dungun' in Malaysia and Indonesia, and also has brownish undersides to the leaves. But the leaves of *Heritiera* are also silvery beneath and they are not heart-shaped. The leaves of *Brownlowia* resembles those of *Hibiscus tiliaceus* and *Thespesia populnea* in shape, and as all three may be found growing together in Southeast Asia some care is needed in distinguishing them. The leaves of *Hibiscus* are rather ashen white underneath, while those of *Brownlowia* brownish and those of *Thespesia* green.

**Ecology :** Occurs in the landward margins of mangroves, or along brackish rivers, often trailing in water. True mangrove species.

**Distribution :** Occurs from Southeast Asia to the West Pacific (Solomon Islands). In Southeast Asia recorded from Myanmar, the Malay Peninsula, Singapore, the Philippines, throughout much of Indonesia (not yet recorded from Java and the Lesser Sunda Islands) and Papua New Guinea.

**Abundance :** Locally common, but on the whole uncommon.

**Use(s) :** Timber.

**Source of illustration :** Drawn from herbarium specimen, Bogor Herbarium, and partially based on Kostermans (1961) & Ashton (1988).

**Reference(s) :** Kostermans (1961), Kochummen (1978e), Tomlinson (1986), Ashton (1988), Corner (1988), Ng & Sivasothi (1999).

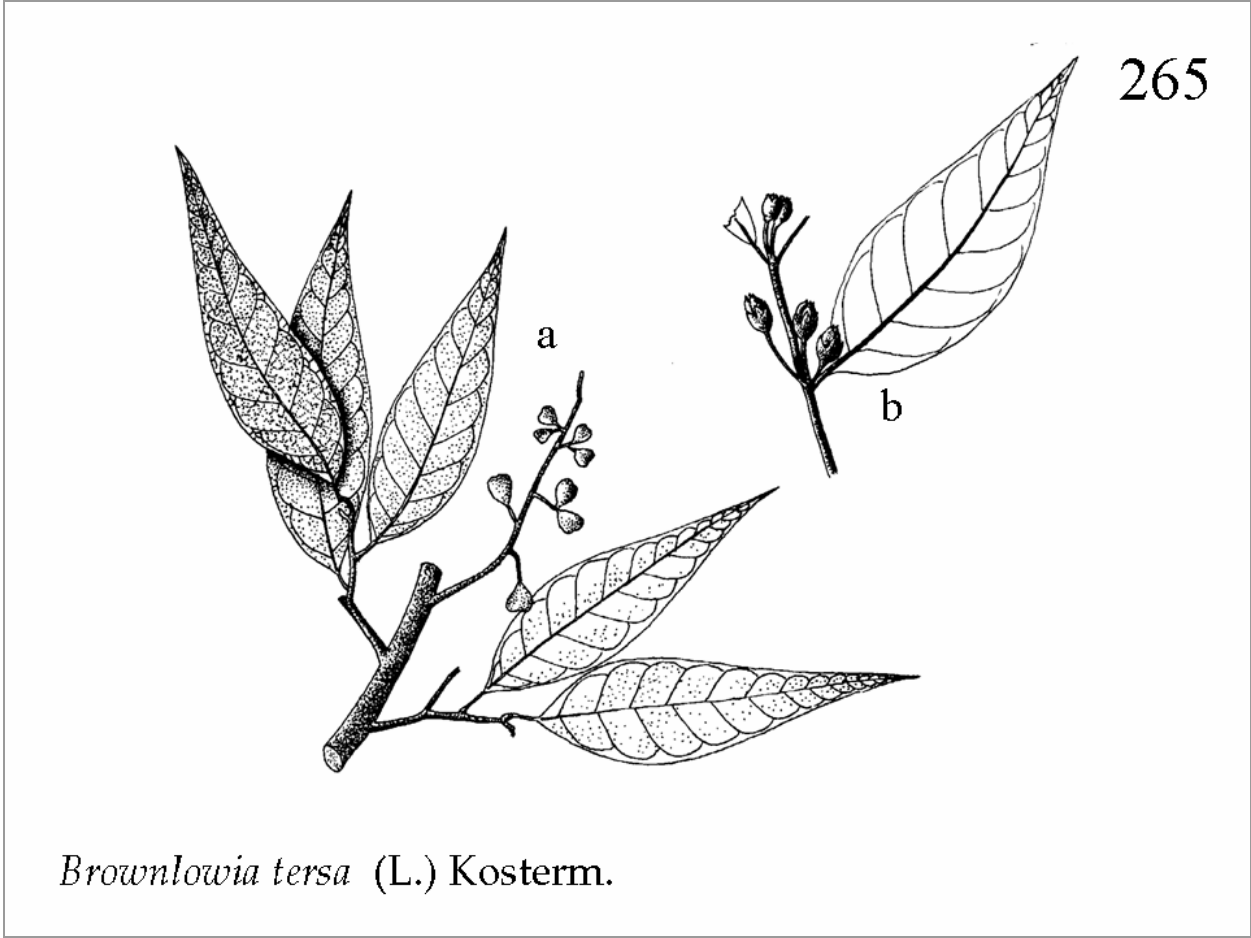


Fig. 265. *Brownlowia tersa* (L.) Kosterm. (a) Fruiting section of branch, and (b) flowering branchlet.

## TILIACEAE

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***Brownlowia tersa* (L.) Kosterm.**

**Synonyms :** *Brownlowia beccarii* (Mast.) Pierre, *Brownlowia lanceolata* Benth., *Dialycarpa beccarii* Mast., *Glabraria tersa* Linné, *Heritiera attenuata*, *Heritiera lanceolata*, *Litsea tersa*, *Malapoenna tersa*, *Niota polyandra*, *Tetranthera tersa*, *Vittmannia polyandra*

**Vernacular name(s) :** Dungun (Mal.), Dungun air (Ind.), *Maragomon* (Phil.), Nam nong (Thai)

**Description :** Shrub, usually 1.5-2 m (rarely 5 m) tall. The smaller branches are covered with a dense layer of minute, flattened scales. Branches are grey, smooth and marked with lines and grooves along their length. The narrow, lanceolate to elliptic-lanceolate leaves are rigid and thin or leathery, 2-5 by 6-20 cm, with a rounded base and a pointed tip. The upper surface is glossy and smooth, while the lower surface is grey-green and covered with a dense layer of tiny, hairy scales. The leaf stalk is 1-2 cm long. The flower heads occur in axils or at the ends of branches, few-flowered, and are up to 4 cm long. The calyx is bell-shaped and 5 mm long, with 3-5 lobes. The corolla is pink with a yellow base, slightly longer than the calyx (about 6 mm), with 5 petals. Fruit is a woody capsule or nut, 15 mm long, bilobed or heart-shaped (alternatively: shaped like a golf putting-club), and is pale greyish-green, covered with small, brown warts. It is often confused with *Camptostemon* because both have a scaly leaf. It can be distinguished by the shape of its fruit and the flowers, which occur in clusters.

**Ecology :** Occurs in relatively sunny locations in mangrove swamps, and along creeks where mud is accreting. Often found on sandy shores or firm mud, along with *Nypa*. Gregarious species. True mangrove species.

**Distribution :** From India (Orissa) to Southeast Asia, where it has been recorded in Myanmar, Cambodia, Thailand, Malaysia, Brunei, Singapore, the Philippines, Indonesia (Sulawesi, Borneo, Sumatra, the Moluccas).

**Abundance :** Locally abundant, but on the whole rather rare.

**Use(s) :** Sometimes used for fencing or as fuelwood.

**Source of illustration :** Drawn from herbarium specimen, Bogor Herbarium, and partially based on Kostermans (1961), Ashton (1988).

**Reference(s) :** Burkill (1935), Kostermans (1961), Kochummen (1972e), Tomlinson (1986), Ashton (1988), Corner (1988), Giesen & Sukotjo (1991), Aksornkoae (1993), Aragones *et al.* (1998), Ng & Sivasothi (1999), Maung (2003).

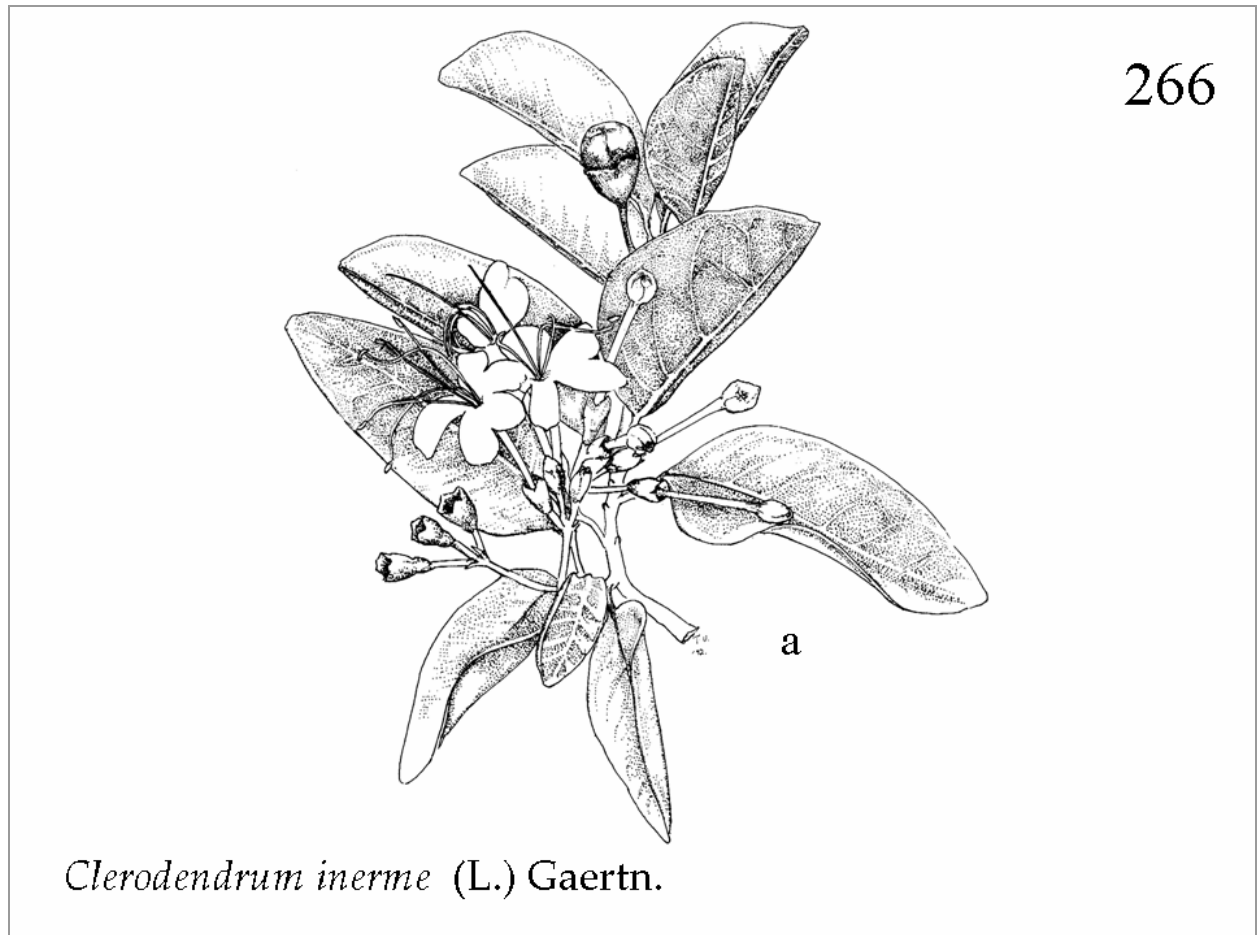


Fig. 266. *Clerodendrum inerme* (L.) Gaertn. (a) Flowering and fruiting branchlet.

## VERBENACEAE

266

*Clerodendrum inerme* (L.) Gaertn.

**Synonyms :** *Clerodendrum buxifolium* (Willd.) Spreng., *Clerodendrum capsulare* Blanco, *Clerodendrum commersonii* Spr., *Clerodendrum nereifolium* (Roxb.) Schauer., *Jasminum litoreaum* Rumph., *Volkameria buxifolia* Willd., *Volkameria inermis* L., *Volkameria neriifolia* Roxb.

**Vernacular name(s) :** Wild Jasmine, Seaside Clerodendrum, Indian Privet, Glorybower (E), Gambir laut (Mal.), Gambir laut, Ketuwer, Manor utan, Kembang bugang, Biring jene, Wiri salo, Manuru dowongi, Koi a koi, Rappae-rappae, (Ind.), Dâỵ chùm gọng (Viet.), Sam ma ngaa (Thai)

**Description :** Erect, drooping or straggling shrub, sometimes climbing or a small tree, usually 0.5-3 m (occasionally up to 10 m), stems woody and smooth, with drooping branches and purplish young twigs that are densely covered with short hairs. Leaves opposite, ovate to elliptical, thinly fleshy and smooth, measuring 1.5-14 by 0.7-5(-8) cm, with a pointed tip and with obvious leaf stalk. On the lower surface the leaves have dark green dots and near the base of the stalk they often have a few large, sunken glands. Leaves are smooth on both sides and have 5-8 pairs of nerves. The flower clusters are 3(-7) flowered, joined at a common base point, located in the axils; upper clusters appear terminal. Calyx is bell- or cup-shaped, purple-edged, 5 mm long and with 5 teeth-shaped lobes, often 5-ribbed, and has many glands on the outside; smooth to densely hairy. The 5 corolla lobes are ovate, rounded, smooth and white, while the tube, 1.5-3.5 cm, is pale lilac; may be either smooth or hairy. The 4 reddish to purple stamens protrude about 2 cm from the rest of the flower and curve upwards. The fruit is egg-shaped to round, with flattened top; green, but when ripe they are black and dry, 1.5 cm across, and breaking into 4 lobes each bearing a thick, corky wall.

**Ecology :** Mainly (according to Heyne, exclusively) in or near brackish or saltwater, in marine or maritime localities, including mangroves. Potentially invasive species, especially in Hawaii where it has been introduced as an ornamental. Variable species, with most variation in habit, leaf form, degree of hairiness of the calyx, and form of the flower clusters. Mangrove associate species.

**Distribution :** Occurs from India and Sri Lanka through Southeast Asia to southern China, Australia and Polynesia. In Southeast Asia recorded in Myanmar, Cambodia, Thailand, Vietnam, the Philippines, Malaysia, Singapore, Indonesia (Borneo, Sumatra, Java). Cultivated in Hawaii, Australia, and the West Indies and probably elsewhere in warm climates.

**Abundance :** Locally common.

**Use(s) :** Particularly the seeds, but also the roots, are used as an effective medicine to treat poisoning from fish or other marine animals. A concoction from the leaves is used to treat wounds. Used in Indonesian appetizer dish. Fruit used in Java to treat dysentery. Cultivated as an ornamental.

**Source of illustration :** Kochummen (1978b), and partially from photograph.

**Reference(s) :** Lam (1919), Heyne (1950), van Steenis *et al.* (1951), Backer & Bakhuizen van den Brink (1963-8), Kochummen (1978b), Aksornkoae (1993), Maung (2003), [www.unepscs.org/ProjectComponents/Mangroves/mangroves.htm](http://www.unepscs.org/ProjectComponents/Mangroves/mangroves.htm).

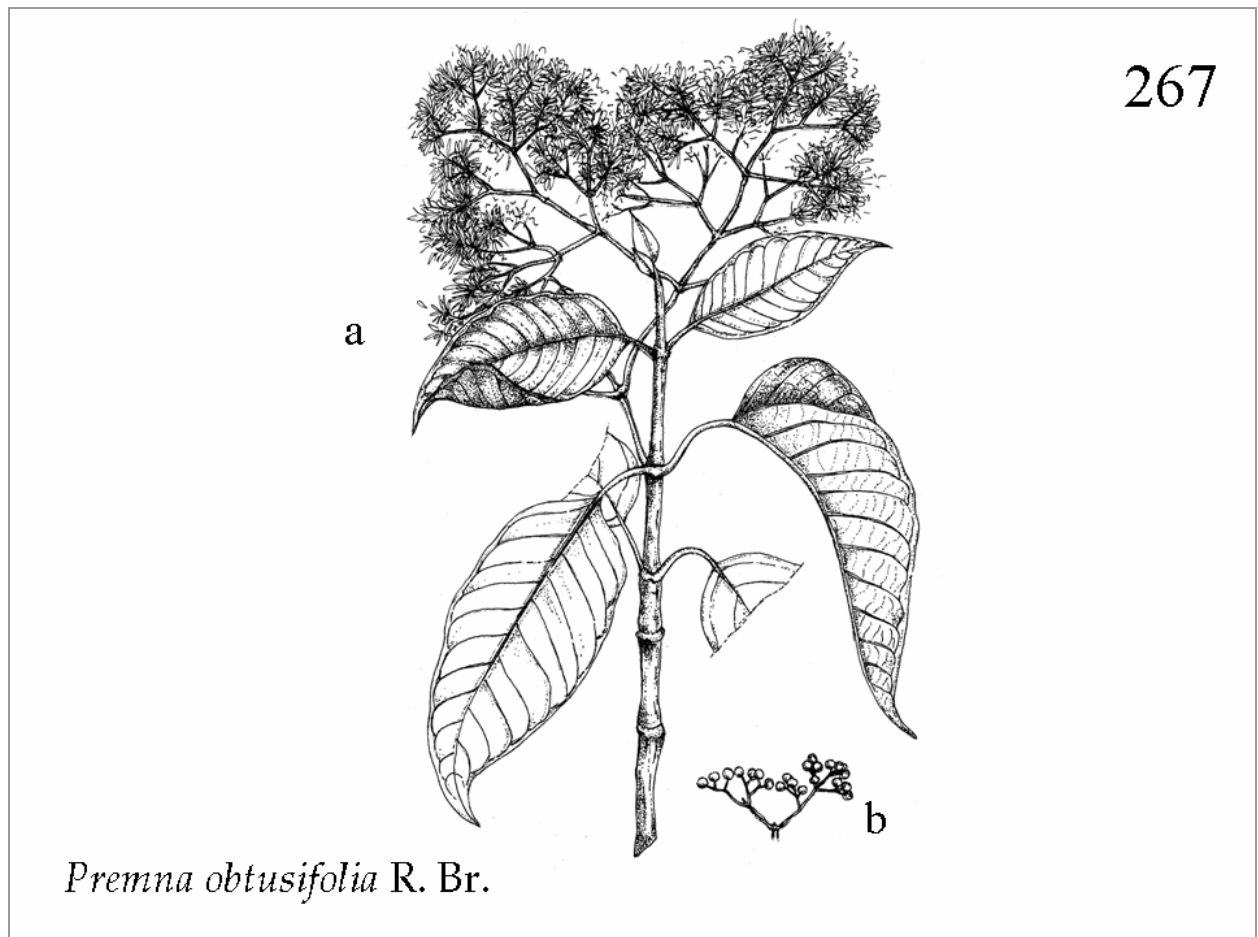


Fig. 267. *Premna obtusifolia* R. Br. (a) Flowering branch, and (b) fruit cluster.



## VERBENACEAE

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***Premna obtusifolia* R. Br.**

**Synonyms :** *Premna abbreviata* Miq., *Premna corymbosa* (Burm. f.) Rottl. & Willd., *Premna cyclophylla* Miq., *Premna foetida* Reinw. ex Blume, *Premna gaudichaudii* Schau., *Premna integrifolia* L., *Premna laevigata* Miq., *Premna littoralis* K. & G., *Premna nitida* K.Schum., *Premna opulifolia* Miq., *Premna ovalifolia* Wall., *Premna ovata* R.Br., *Premna sambucina* Wall., *Premna scandens* Boj., *Premna serratifolia* Blanco, *Premna serratifolia* L., *Premna subcordata* Turcz.

**Vernacular name(s) :** Daun kambing, Sayur kambing (Ind., Mal.), Chaa luead (Thai)

**Description :** A small to medium sized tree, occasionally climbing or straggling shrub, up to 10 metres, trunk up to 40 cm diameter. On sea shores it may assume a creeping or low shrub habit. Leaves simple, entire, opposite, with a variable shape (ovate, ovate-oblong, elliptic), 8-25 by 4-10 cm, pointed tip, with (4-)7-12 lateral veins on either half (4-5 on smaller leaves; more on larger leaves); star-shaped hairs underneath; leaf stalk 7-65 mm long. Leaves have a foetid smell when crushed. Flowers are very small (<5mm), 4-5 lobed, greenish-white or yellow, in large, terminal, bunched clusters. Fruit is a small, round, reddish to black berry, 5-6 mm. Highly variable species, with major variations in leaves, habit and flower clusters; as a result described under many scientific names. The description by King and Gamble (*Premna littoralis*) is of a coastal specimen from Perak (Malaysia), but regarded by Lam (1919) as being unreliable in its diagnostics.

**Ecology :** Grows in a wide range of soils, but preferring most, well-drained soils. Usually found near the sea, according to Lam (1919). In coastal lowlands (<500m asl), sandy beaches, but also occurring in mangroves on occasion. Branches easily take root when planted. Larger tree trunks are often hollow. Mangrove associate species.

**Distribution :** From East Africa, Madagascar, Mauritius, the Indian Sub-continent to Southeast Asia, Southern China, Australia and Polynesia. In Southeast Asia it has been recorded in Myanmar, Cambodia (uncommon), Thailand, Peninsular Malaysia, the Philippines, Indonesia (Sumatra, Borneo, Java, Lesser Sundas, Sulawesi, Moluccas), East Timor and PNG. Probably found throughout the region.

**Abundance :** Locally common; also planted.

**Use(s) :** Planted as hedges (branches easily take root). Wood is very hard and durable, and has an attractive pattern; used for machete handles. Bark used as twine. Leaves used to improve lactation. Used as fodder for sheep and goats (hence the common name in Malay). Boiled leaves used to relieve itchiness.

**Source of illustration :** Khan & Alam (1996)

**Reference(s) :** Lam (1919), Heyne (1950), Kochummen (1978b), Aksornkoe (1993), Khan & Alam (1996), Marschke (2000).

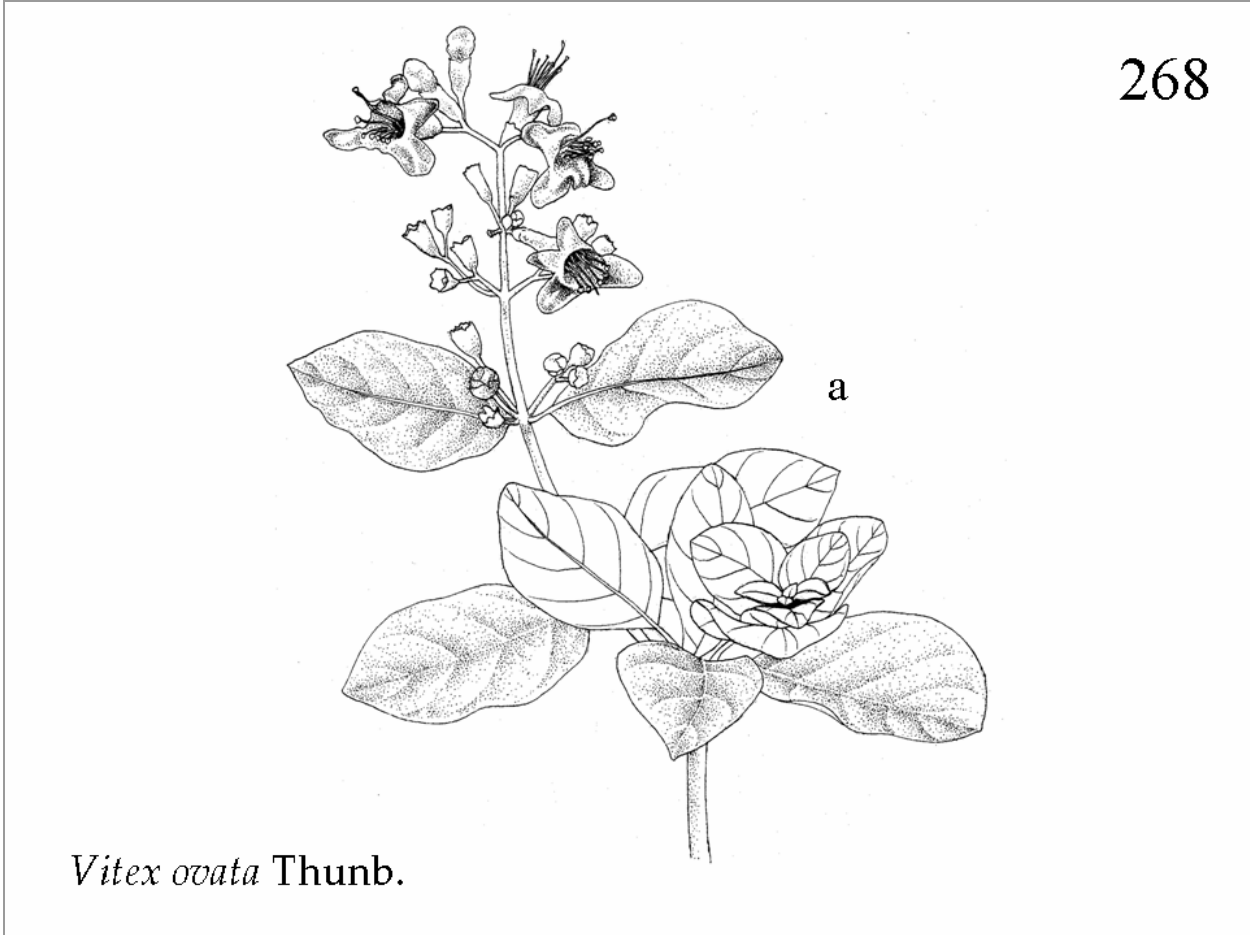


Fig. 268. *Vitex ovata* Thunb. (a) Flowering and fruiting terminal branch.

## VERBENACEAE

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*Vitex ovata* Thunb.

**Synonyms :** *Lagondium vulgare* Rumph., *Vitex rotundifolia* L. f., *Vitex trifoliata* var. *ovata* (Thunb.) Makino, *Vitex trifolia* var. *simplicifolia* Chamisso, *Vitex trifolia* var. *unifoliolata* Schauer.

**Vernacular name(s) :** Chaste Berry, Vitex, Chasteberry, Monk's pepper, Cloister pepper (E), Lenggundi, Lagundi, Lemuning, Muning, Demundi (Mal.), Lagundi, Lilegundi, Dunuko, Galumi, Al tuban, Sangari, Lawarani, Rala (Ind.)

**Description :** Prostrate shrubs, with prostrate to creeping stems, rooting at nodes; occasionally a small tree, 1-3m; branchlets covered with silky hairs when young. Entire plant – but especially the leaves – is strongly aromatic. Leaves mostly 1-3-foliolate, without stalks or with only a very short stalk, 1.5-5 (rarely 30) mm; leaf blade obovate to spoon-shaped, ovate-elliptic, broadly oblong-elliptic, or circular, 1.5-3 by 2.5-5 cm, velvety to minutely covered with silky hairs, usually pale dull green, base tapering to rounded, margin entire, tip abruptly pointed to rounded. Flowers in compact terminal cylindrical or ovate clusters, 1-2.5 by 3-10 cm. Calyx cup-shaped, 4-5 mm, slightly 2-lipped, with 5 teeth, outside covered with minute silky hairs and glands, inside smooth. Corolla purplish mauve to lilac blue, a thin tube abruptly fanning out at the end, outside covered with minute silky hairs and glands, long shaggy hairs in tube and inside on lower half of large front lobe of lower lip. Stamens and style protruding. Fruit dark (reddish) brown when dry, round, 6 mm long. Highly variable species.

**Ecology :** Beach vegetation, sandy dunes, and sandy landward edges of mangroves; usually coastal, but on Java it has been planted up to an altitude of 1,000 m asl. Common in gardens and villages in Malaysia and Indonesia. Flowering from July to September, fruiting from September to November. Mangrove associate species.

**Distribution :** Found along most of the Chinese coast, from Shandong south to Guangdong; further in Taiwan, Korea, Japan, through Southeast Asia; extending westwards to Mauritius and India, eastwards to Polynesia and Hawaii. In Southeast Asia recorded from Myanmar, Thailand, Cambodia, Malaysia, the Philippines and Indonesia (Sumatra, Java, Sulawesi, Moluccas).

**Abundance :** Common.

**Use(s) :** *Vitex ovata* has been used since ancient times as a female remedy. One of its properties was to reduce sexual desire, and it is recorded that Roman wives whose husbands were abroad with the legions spread the aromatic leaves on their couches for this purpose. It became known as the chasteberry tree. During the Middle Ages, Chasteberry's supposed effect on sexual desire led to it becoming a food spice at monasteries, where it was called "Monk's pepper" or "Cloister pepper." In tradition, it was also known as an important European remedy for controlling and regulating the female reproductive system. Several studies indicate that *Vitex* can help control acne. In Indonesia leaves are kept in cupboards to deter cockroaches.

**Source of illustration :**

[http://www.hear.org/starr/hiplants/images/thumbnails/html/vitex\\_rotundifolia\\_thumbnails.htm](http://www.hear.org/starr/hiplants/images/thumbnails/html/vitex_rotundifolia_thumbnails.htm)

**Reference(s) :** Lam (1919), Heyne, (1950), Kochummen (1978b), Corner (1988), Maung (2003),

<http://www.australianplants.org/fsdfour.htm>,

[http://www.holistic-online.com/Herbal-Med/\\_Herbs/h211.htm](http://www.holistic-online.com/Herbal-Med/_Herbs/h211.htm),

<http://www.whitley-award.org/Articles/projects/rufford/TruongQuangTam.html>