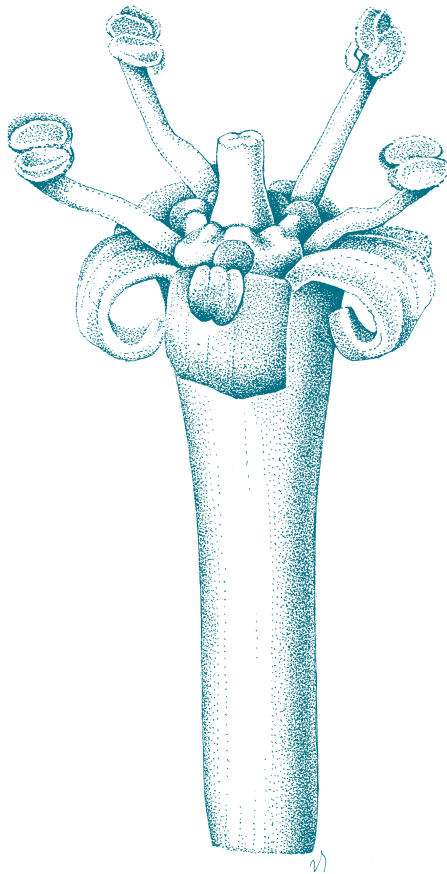


Species
Plantarum

Flora of the World

12. Opiliaceae



Cover illustration:

Champereia manillana (Blume) Merr. var. *manillana*. Reproduced with permission from *Willdenowia* 9: 15, fig. 1 (1979). Drawn by Eva Dieckmann.

SPECIES PLANTARUM

FLORA OF THE WORLD

PART 12. OPILIACEAE

by Paul Hiepko

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CONTRIBUTORS TO THIS PART

Text

Paul Hiepko, Botanischer Garten und Botanisches Museum Berlin-Dahlem, Freie Universität Berlin, Königin-Luise-Str. 6-8, D-14195 Berlin, Germany, E-mail: p.hiepko@bgbm.org

Illustrations

Eva Dieckmann, Ingo Haas, Paul Hiepko, Christine Hillmann-Huber, Sigrid Jacob, Monika Lüchow, Michael Rodewald, Botanischer Garten und Botanisches Museum Berlin-Dahlem, Freie Universität Berlin, Königin-Luise-Str. 6-8, D-14195 Berlin, Germany

Species Plantarum Steering Committee (as on December 2007)

- G. Achoundong, Herbar National de Cameroon, Yaoundé, Cameroon
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B. Khayota, National Museums of Kenya, Nairobi, Kenya
J. Kirschner, Inst. Bot., Průhonice, Czech Republic (Vice-Chairman, Receiving Editor)
H.P. Linder, Institut für Systematische Botanik, Zurich, Switzerland
P.-A. Loizeau, Conservatoire et Jardin botaniques, Genève, Switzerland
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N.R. Morin, The Arboretum at Flagstaff, Arizona, USA
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H. Ohashi, Tohoku University, Sendai, Japan
R.J. Pankhurst, Royal Botanic Garden, Edinburgh, UK
G. Prance, Royal Botanic Gardens, Kew, UK
M. Sanjappa, Botanical Survey of India, Kolkata, India
T. Santisuk, Royal Forest Department, Bangkok, Thailand
Sebebe Demissew, Addis Ababa University, Addis Ababa, Ethiopia
J.H. Seyani, National Herbarium and Botanic Gardens, Zomba, Malawi
G.F. Smith, National Botanical Institute, Pretoria, South Africa (Chairman)
W. Thomas, New York Botanic Gardens, Bronx, New York, USA (Secretary)
W.L. Wagner, Smithsonian Institution, Washington DC, USA (Treasurer)
A.J.G. Wilson, Australian Biological Resources Study, Canberra, ACT, Australia
K. Wilson, Royal Botanic Gardens, Sydney, NSW, Australia
J.L. Zarucchi, Missouri Botanical Garden, Saint Louis, Missouri, USA

INTRODUCTION

Species Plantarum aims to provide in concise format, and with standardised data fields, basic taxonomic information on the vascular plants of the world, including accepted names and synonyms with bibliographic data, types of names, keys and descriptions from family to varietal levels, geographical distributions, ecological information and other related matters, and to publish it in both hard copy and electronic form.

The format of the *Species Plantarum* is based on that of *Flora of Australia*, with some departures made necessary by the different scale of the project. Initially (vols. 1 to 11, and the introductory volume), the series was edited and published for the Species Plantarum Project and IOPI by the Australian Biological Resources Study (ABRS), producers of *Flora of Australia*. The editorial work is being continued by J. Kirschner (receiving editor, Institute of Botany, Academy of Sciences of the Czech Republic), C.E. Anderson (University of Michigan, Ann Arbor) and K. Marhold (Institute of Botany, Slovak Academy of Sciences).

Treatments are contributed on a voluntary basis. Each part of *Species Plantarum* is intended to provide a complete account of a family, subfamily, large genus or other related taxonomic group. While treatments of small families may be shorter, it is intended that contributions will, in general, cover at least 50 to 100 species. Authors should contact the receiving editor before the preparation of their contributions.

Distribution maps are based on those in R.K. Brummitt, *World Geographical Scheme for Recording Plant Distributions* 2nd edn (2001), and the 'countries' adopted are those of Level 3 and 4 that work. Description of distribution follows the same work, with a two-digit code for regions and a three-letter code for the 'country'. Upper case letters for the 'country' indicate native distribution; lower case letters indicate that the taxon is only present in that 'country' as an introduced and naturalised plant. If a taxon is extinct in a 'country', this is indicated by a dagger. Distribution of species as cultivated plants is not included.

Journal titles are abbreviated according to G.D.R. Bridson & E.R. Smith, *Botanico-Periodicum-Huntianum/Supplementum* (1991). Book titles are abbreviated according to F.A. Stafleu & R.S. Cowan, *Taxonomic Literature* (2nd edn) Vols 1-7, and *Supplements* (1976-), except that upper case initial letters are used for proper names and significant words. Authors of plant names are abbreviated according to R.K. Brummitt & C.E. Powell, *Authors of Plant Names* (1992).

J. Kirschner
Průhonice
December 2007

Documenting plant diversity at a global scale.
Progress with the *Species Plantarum Programme – Flora of the World*

The publication of this, the twelfth volume in the Species Plantarum Programme – Flora of the World (SPPFW) series, marks the first volume to have been produced jointly by two new editors, in Slovakia by Dr Karol Marhold and in the Czech Republic by Dr Jan Kirschner. They accepted the editorial responsibilities following the resignation, after many years of dedicated service and support to the SPPFW, of first Dr Tony Orchard and then Ms Annette Wilson, both of the Australian Biological Resources Study (ABRS), Canberra, Australia. As a Steering Committee, and certainly also on behalf of the global botanical fraternity, we would like to extend a sincere word of appreciation to Tony and Annette for having edited and produced the first 11 volumes in this series. They brought an exceptional level of dedication and professionalism to the editing of these initial volumes of the SPPFW. Their dedication to the minutiae of publishing taxonomic works has established a remarkable level of quality in the publication of SPPFW volumes that will be difficult to surpass.

Although the SPPFW still lacks major funding sources, it stands as a monument to the dedication of the members of Steering Committee, and the institutions they represent, to this global thrust that they have managed to see through its initiation and initial execution. I would also like to express my sincere appreciation to the other elected officers of the SPPFW for their contributions, over many years, that have made the establishment and progression of the Programme more than just a dream. They are:

Vice Chairperson: Dr Jan Kirschner (Institute of Botany, Academy of Sciences, Průhonice), Secretary: Dr Dick Brummitt (Royal Botanic Gardens Kew), and, since 2007, Dr Wayt Thomas (NYBG, New York), Treasurer: Dr Warren Wagner (Smithsonian Institution). The rest of the members of the Steering Committee are mentioned elsewhere in this volume. They have played, and continue to play, an important role in marketing the Programme and supporting it in various ways.

For a documented history of the SPPFW, see:

BRUMMITT, R.K., CASTROVIEJO, S., CHIKUNI, A.C., ORCHARD, A.E., SMITH, G.F. & WAGNER, W.L. 2001. The Species Plantarum Project, an international collaborative initiative for higher plant taxonomy. *Taxon* 50: 1217–1230.
BRUMMITT, R.K. 2005. The new Species Plantarum Programme: a personal perspective. *Symb. Bot. Upsal.* 33 (3): 179–186.

SMITH, G.F. 1999a. Documenting plant diversity on a global scale: recent progress with the Species Plantarum: Flora of the world project. *S. African J. Sci.* 95: 55–56.

SMITH, G.F. 2000. Further developments in the Species Plantarum: Flora of the World project. *S. African J. Sci.* 96: 482–483.

SMITH, G.F. 2002. The Species Plantarum Project: Flora of the World moves ahead. *S. African J. Sci.* 98: 28.

SMITH, G.F. 2006. The Species Plantarum Programme – Flora of the World forges ahead at the International Botanical Congress in Vienna, Austria. *S. African J. Sci.* 102: 3.

Prof. Dr Gideon F. Smith, FLS, FCSSA

Chairperson of the Species Plantarum – Flora of the World Steering Committee

*Chief Director: Research and Scientific Services, South African National Biodiversity Institute
/ Professor of Botany, Department of Botany, University of Pretoria, South Africa*

PREFACE AND ACKNOWLEDGEMENTS

After having finished the revision of the last genus of *Opiliaceae* Dr. R. K. Brummitt asked me whether I could prepare a manuscript for the Flora of the World. I would like to thank him for his encouragement to finish this treatment. I thank the Botanischer Garten und Botanisches Museum Berlin-Dahlem for much support during my time on the staff of this institution and also for the possibility to use all facilities after my retirement. I especially thank R. K. Brummitt (Kew), Dr C. Anderson, and Dr Jan Kirschner (Průhonice) for carefully reviewing the manuscript and for their critical editorial comments. I would also like to thank Dr Pierre-André Loizeau and Nicolas Wyler (Geneva) for the production of the new distribution maps from my specimen database.

Paul Hiepko

OPILIACEAE

P.Hiepko

Opiliaceae (Benth.) Valeton, *Crit. Overz. Olacin.* 136 (1886), *nom. cons.*

Basionym: *Opilieae* Benth., *Trans Linn. Soc. London* 18: 679 (1841), sub *Olacaceae*.

Type: *Opilia* Roxb.

Evergreen trees, shrubs, or lianas, root parasites. Leaves without stipules, petiolate, distichous, simple, entire, mostly glabrous, pinnately nerved; dried leaves mostly finely tubercled by cystoliths located in the mesophyll. Inflorescences axillary or cauliflorous, rarely terminal, panicle-like, racemose, umbellate or spicate; bracts small, caducous, rarely persistent (*Cansjera*). Flowers small, mostly pedicellate, actinomorphic, (3–) 4–5(-6)-merous, mainly bisexual, sometimes unisexual and plants dioecious or gynodioecious; perianth with valvate, free or sometimes partly united tepals, rarely wanting; stamens as many as and opposite to the tepals (in female flowers rudimentary or wanting); anthers introrse, 2-celled, longitudinally dehiscent; disc intrastaminal, lobed or annular; pistil 1; ovary superior, 1-celled; style short or none; stigma entire or shallowly lobed; ovule 1, ± pendulous from apex of a central placenta, anatropous and unitegmic, sometimes integument not differentiated. Fruit drupaceous; pericarp thin; mesocarp fleshy-juicy; endocarp woody or crustaceous. Seed large, conform to drupe; hilum basal in funnel-shaped cavity. Embryo terete, embedded in rich, oily endosperm, nearly as long as seed, with (2–) 3–4 linear cotyledons.

Ten genera, 33 species, around the tropics. Nine genera are restricted to the Old World. Some occur only in Asia and Australia, others in Africa and Madagascar; *Opilia* and *Urobotrya* occur in Asia and Africa. The single neotropical genus, *Agonandra*, is distributed from northern Mexico to northern Argentina. For 8 of the 10 genera root parasitism has been described (Kubat, 1989). The fruits of some species are eaten as well as the young shoots of *Champereia* and *Melientha*.

Before Valeton (1886) established the *Opiliaceae* as a distinct family the genera had been placed by different authors in several other families. Bentham & Hooker (1862) treated the tribe *Opilieae* (*Cansjera*, *Agonandra*, *Lepionurus*, and *Opilia*) as a part of their *Olacineae* (*Olacaceae*), whereas *Champereia* was in their system a member of *Santalaceae* (Bentham & Hooker, 1880). Engler (1889) treated *Champereia* as a genus of *Santalaceae*; the other genera were placed in two different tribes of the family *Olacaceae*, namely the *Opilieae* (*Opilia*, *Cansjera*, and *Lepionurus*) and *Agonandreae* (*Agonandra*).

In 1897, Engler accepted the family *Opiliaceae* (including *Champereia*) as established by Valeton (1886). In the classification of Sleumer (1935), the same two tribes were accepted: *Opilieae* and *Agonandreae*. The second tribe was composed of the genera *Agonandra* and *Gjellerupia*. However, since *Gjellerupia* is obviously more closely allied to *Urobotrya* and *Lepionurus*, with respect to morphological, anatomical, and palynological characters, it has to be included in the *Opilieae*. Since it could be shown (Hiepko, 2000) that the ovule of *Agonandra* is more or less pendulous as in all other genera of *Opiliaceae* the two tribes are not recognized here.

The raceme-like inflorescence typical for several genera of *Opiliaceae* is not a true raceme, since the flowers mostly are arranged in (dichasial) lateral cymes on the more or less long rachis.

The perianth was originally described as differentiated into calyx and corolla, but since the flowers show only a slightly cupuliform torus that hardly can be called a calyx the terms “perianth” and “tepals” are used here.

G.Bentham & J.D.Hooker, *Olacineae* trib. *Opilieae*, *Gen. Pl.* 1: 349–350 (1862); T.Valeton, *Crit. Overz. Olacin.* (1886); H.G.A.Engler, *Olacaceae* trib. *Opilieae* & *Agonandreae*, in H.G.A.Engler & K.A.E.Prantl, *Nat Pflanzenfam.* 3(1): 240–241 (1889); H.G.A.Engler, *Opiliaceae*, in H.G.A.Engler & K.A.E.Prantl, *Nat. Pflanzenfam., Nachtr.* 1: 142–143 (1897); H.O.Sleumer, *Opiliaceae*, in H.G.A.Engler & K.A.E.Prantl, *Nat. Pflanzenfam.* 2nd edn, 16b:

33–44 (1935); P.Hiepko, Opiliaceae, *Fl. Males. ser. I*, 10: 31–52 (1984); R.Kubat, Vergleichende morphologisch-anatomische Untersuchungen an den unterirdischen Organen der Opiliaceae unter Berücksichtigung ihrer taxonomischen Signifikanz, *Diss. Univ. Marburg* (1989); P.Hiepko, Opiliaceae, *Fl. Neotrop.* 82: 1–55 (2000); H.Qiu & P.Hiepko, Opiliaceae, *Fl. China* 5: 205–207 (2003).

KEY TO GENERA

- 1 Inflorescence a panicle or panicle-like, in axils of leaves, often also on older branches and on the main trunk
 - 2 Plant polygamous (gynodioecious); flowers with distinct pedicels; drupe 10–25 mm long **1. Champeria**
 - 2: Plant dioecious; male flowers sessile, female flowers with a very short pedicel; drupe 23–40 mm long **2. Melientha**
- 1: Inflorescence a raceme, umbel or spike, in axils of leaves, rarely on older branches or on the trunk
 - 3 Flowers in spikes, each flower in axil of a small persistent bract; tepals united, with tube urceolate and lobes shorter than tube **9. Cansjera**
 - 3: Flowers in racemes or umbellate inflorescences; bracts usually caducous before anthesis; tepals free or united at base only (rarely female flowers without perianth)
 - 4 Flowers in racemes or ± umbellate inflorescences (5–15 mm long); bracts small (c. 1 mm long) and always only 1 flower per bract
 - 5 Inflorescence racemose or subumbellate; flowers perigynous with cupular receptacle; stamens shorter than tepals **8. Rhopalopilium**
 - 5: Inflorescence umbellate or subumbellate; flowers hypogynous; stamens longer than tepals **7. Pentarhopalopilium**
 - 4: Flowers in racemes, mostly longer than 15 mm; bracts usually bigger and broadly ovate to cordate (if small and lanceolate then racemes longer than 10 cm); mostly 3 or more (rarely 1) flowers per bract
 - 6 Flowers unisexual; bracts broadly ovate to cordate, sometimes peltate; male flowers with rudimentary pistil; female flowers with or without perianth, without stamens
 - 7 Disc of male flowers lobed or annular to urceolate (fused lobes); female flowers with caducous perianth; Neotropics **10. Agonandra**
 - 7: Disc of male flowers annular; female flowers without perianth; New Guinea **5. Gjellerupia**
 - 6: Flowers bisexual; bracts broadly ovate to orbicular or lanceolate
 - 8 Tepals united at base, lobes spreading; stamens not exceeding perianth **3. Lepionurus**
 - 8: Tepals free, recurved; stamens exceeding perianth
 - 9 Woody climber or shrub to small tree; rachis of raceme and pedicels usually densely covered with mostly brownish hairs; bracts broadly ovate to orbicular, peltate; disc lobed **6. Opilia**
 - 9: Shrub or small tree, rachis of raceme and pedicels glabrous or puberulous; bracts broadly ovate or narrowly lanceolate (if narrowly lanceolate then racemes longer than 10 cm), not peltate; disc annular **4. Urobotrya**

OPILIACEAE

1. CHAMPEREIA

Champereia Griff., *Calcutta J. Nat. Hist.* 4: 237 (1843)

Type: *Champereia griffithiana* Planch. ex Kurz

Opilia sect. *Opiliastrum* Baill., *Adansonia* 3: 123 (1862). T: *Opilia manillana* Baill.

Govantesia Llanos, *Revista Progr. Ci. Exact.* 15: 191 (1865). T: *Govantesia malulucban* Llanos

Nallogia Baill., *Bull. Mens. Soc. Linn. Paris* 2: 985 (1892). T: *Nallogia gaudichaudiana* Baill.

Yunnanopilia C.Y.Wu & D.Z.Li, *Acta Bot. Yunnan.* 22: 249 (2000). T: *Yunnanopilia longistaminea* (W.Z.Li) C.Y.Wu & D.Z.Li

[*Malulucban* Blanco, *Fl. Filip.* 188 (1837), *nom. inval.* (vernacular name only)]

Polygamous small trees or shrubs, with bisexual or female flowers; branchlets glabrous. Leaves glabrous. Inflorescence a panicle, axillary, often also on older branches or on the main trunk. Inflorescences with bisexual flowers widely branched; female inflorescences denser, rachises sometimes finely puberulous. Flowers yellowish green, pedicellate, (4–) 5 (–6)-merous, solitary or in fascicles along branches of inflorescence; bracts minute, fugacious. Bisexual flowers: tepals reflexed; filaments filiform; ovary conical, half immersed in fleshy, annular disc; stigma sessile, ± entire. Female flowers: tepals not reflexed; stamens rudimentary; disc lobed. Drupe shortly pedicellate; ellipsoid.

One species widely distributed in China, Taiwan, Indo-China, and Malesia.

P.Hiepko, *Champereia* in A revision of Opiliaceae I. Genera of the eastern Old World, excluding *Opilia*, *Willdenowia* 9: 14–22 (1979); P.Hiepko, *Champereia* (in Opiliaceae), *Fl. Males. ser. I*, 10: 35–38 (1984); P.Hiepko, *Champereia* (in Opiliaceae), *Fl. Thailand* 5(1): 94–95 (1987).

1. *Champereia manillana* (Blume) Merr., *Philipp. J. Sci., C.* 7: 233 (1912)

Cansjera manillana Blume, *Mus. Bot.* 1: 246 (1851). T: Philippines, Manila, 1819, *G.S.Perrottet s.n.*; holotype: L.

Opilia manillana Baill., *Adansonia* 3: 124 (1862). T: “Manilla ... Perrottet, ann. 1819”; lectotype: P, *vide* P.Hiepko, *Willdenowia* 9: 16 (1979).

Small tree, usually 4–8 m high, rarely up to 20 m high, or shrub. Leaves with petioles 3–5 (–8) mm long; lamina ovate, oblong, or lanceolate, usually 6–18 (–25) cm long, 2–8 (–11) cm wide, shortly attenuate, rarely rounded at base, slightly acuminate or acute at apex; lateral veins 5–9 per side. Panicles solitary or in groups of 2–4; main rachis up to 20 cm long; bracts ovate, 0.5–1 mm long, acute. Bisexual flowers: pedicels 2–5 mm long, thickened upwards; tepals 1–1.5 mm long, oblong; stamens as long as tepals; disc annular, crenulate, green; ovary 0.5 mm long. Female flowers: pedicels 0.5 mm long; tepals 0.5 mm long; staminodes scaly, 0.2 mm long; disc lobes smaller than staminodes; ovary c. 0.5 mm long; stigma cushion-shaped. Drupe orange-red, 10–25 mm long, 7–17 mm wide; pedicel 1.5–5 mm long. Figs 1 & 2.

One species with two varieties, from southern China and Taiwan to the Andaman Is., Indo-China, Malesia and New Guinea.

Champereia manillana is extremely variable in vegetative characters, especially in form and size of the leaves. Therefore it is impossible to accept the several species described and named by Merrill. The flowers are rather uniform. The variation of the size of the fruits is considerable. Because of the much bigger fruits found in China 2 varieties are distinguished.

Drupe 10–16 mm long, 7–10 mm wide

a. var. manillana

Drupe 22–25 mm long, 15–17 mm wide

b. var. longistaminea

a. *Champereia manillana* (Blume) Merr. var. *manillana*

Opilia cumingiana Baill., *Adansonia* 3: 124 (1862); *Champereia cumingiana* (Baill.) Merr., *Philipp. J. Sci.* 1, Suppl.: 50 (1906). T: Philippines, Luzon, *H.Cuming 1129*; lecto: P, *fide* P.Hiepko, *Willdenowia* 9: 16 (1979).

Govantesia malulucuban Llanos, *Revista Progr. Ci. Exact.* 15: 191 (1865). T: Filipinas, *A.Llanos 45*; neo: A, *fide* P.Hiepko, *Willdenowia* 9: 16 (1979).

Champereia griffithiana Planch. ex Kurz, *J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist.* 44: 154 (1875), as *Champereya*; *Champereia griffithii* Planch. ex Kurz, *Forest Fl. Burma* 2: 330 (1877), *nom. illeg.* T: Burma [Myanmar], Mergui, *W.Griffith 937*; holotype: K.

Nallogia gaudichaudiana Baill., *Bull. Mens. Soc. Linn. Paris* 2: 985 (1892); *Champereia gaudichaudiana* (Baill.) Tiegh., *Bull. Soc. Bot. France* 41: 65 (1894). T: Malacca, *C.Gaudichaud 83*; holotype: P, *n.v.*

Champereia platyphylla Merr., *Philipp. J. Sci.*, C. 11: 177 (1916). T: Philippines, Samar, Catubig River, *M.Ramos BS 24248*; lectotype: US; isotype: K, P, *fide* P.Hiepko, *Willdenowia* 9: 16 (1979).

Champereia oblongifolia Merr., *Philipp. J. Sci.*, C. 11: 177 (1916). T: Philippines, Samar, Catubig River, *M.Ramos BS 24382*; lectotype: US; isotype: BO, K, P, *fide* P.Hiepko, *Willdenowia* 9: 16 (1979).

Champereia lanceolata Merr., *Univ. Calif. Publ. Bot.* 15: 57 (1929). T: N Borneo, Elphinstone prov., Tawao, *A.D.E.Elmer 20679*; holotype: UC; isotype: A, B, BISH, BO, BR, C, K, M, NY, SING, U, Z.

Illustrations: P.Hiepko, *Willdenowia* 9: 15, fig. 1; 17, fig. 2; 22, fig. 4, 2 (1979); *Fl. Males. ser. I*, 10: 36, fig. 1; 37, fig. 2; 40, fig. 5b (1984).

Maps: P.Hiepko, *Willdenowia* 9: 18, fig. 3 (1979); *Fl. Males. ser. I*, 10: 38, fig. 3 (1984).

Drupe 10–16 mm long, 7–10 mm wide. Figs. 1 & 2.

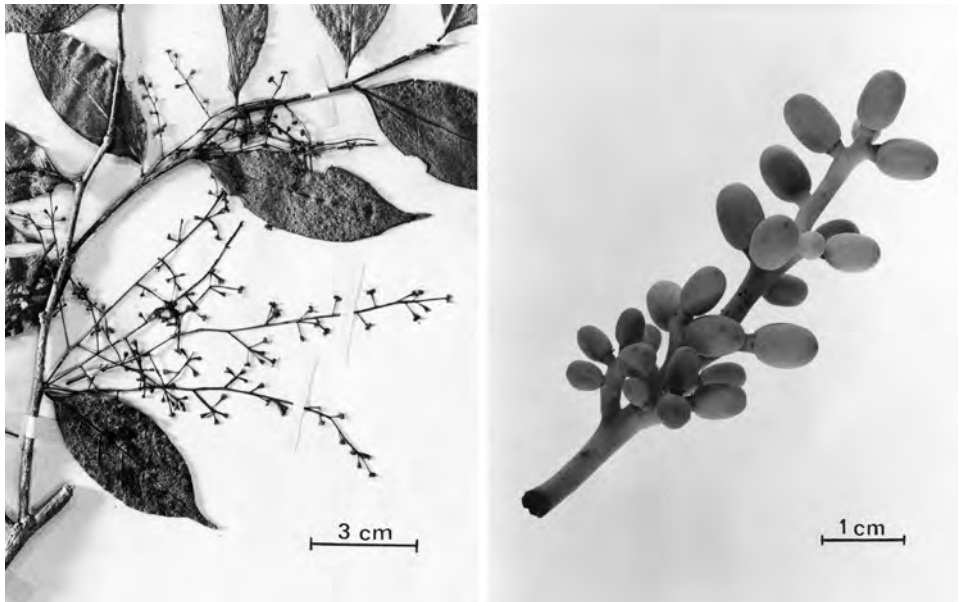


Figure 1. *Champereia manillana* var. *manillana*. Left: twig with inflorescences with bisexual flowers (*Rahmat si Toroos 3297*, A); right: young infructescence developed from a female inflorescence (*P.Hiepko 364*, B). Photographs by Sigrid Jacob. Reproduced with permission from P.Hiepko, *Willdenowia* 9: 17, fig. 2 (1979).

OPILIACEAE

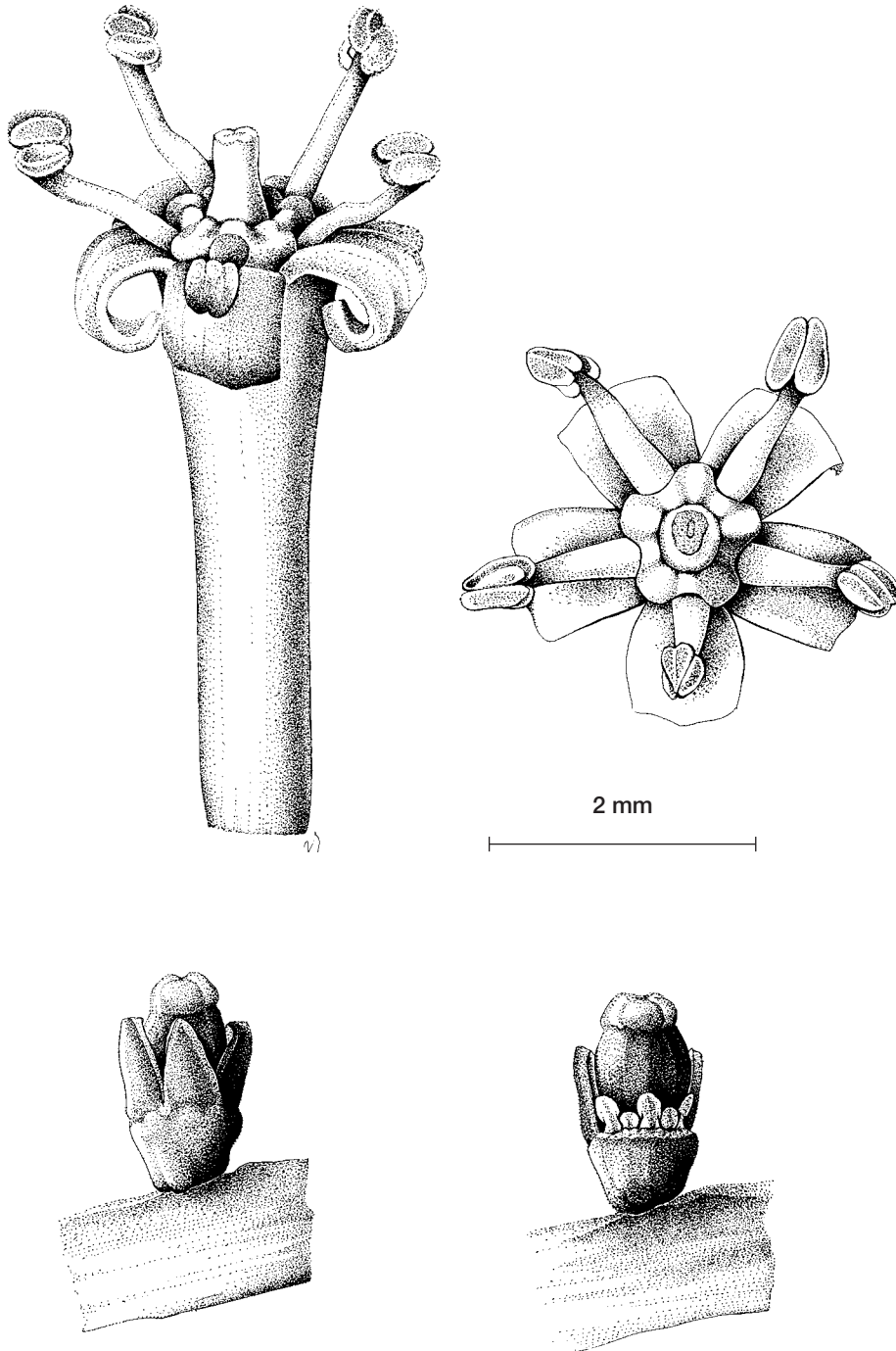


Figure 2. *Champereia manillana* var. *manillana*. **A-B**, bisexual flower; **C**, female flower; **D**, female flower, two tepals removed (**A-B**, R.Geesink & P.Hiepko 7823, B; **C-D**, P.Hiepko 364, B). Drawn by Eva Dieckmann. Reproduced with permission from P.Hiepko, *Willdenowia* 9: 15, fig. 1 (1979).

Taiwan, Andaman Is., Indo-China, and through Malesia to New Guinea. 38: TAI. 41: AND, MYA, THA, VIE. 42: BOR, JAW, LSI, MLY, MOL, PHI, SUL, SUM. 43: NWG. In open evergreen forest and dry monsoon forest; from sea level to 1600 m. Flowers and fruits throughout the year. Map 1.

38. TAIWAN: Hengchun Penin., Bangkingsing, *A.Henry 129* (A, BM, NY). **41.** THAILAND: Chanthaburi, Kao Sabap, *A.Kerr 17967* (BK, BM, K, L). VIETNAM: Tonkin, prov. de Vinh-Yen, route de Vinh Yen au Tam Dao, *P.A.Petelot 4822* (NY, P, US). **42.** BORNEO: Sabah, Kudat distr., Bak bak, *Brand SAN 30939* (K, KEP, SAN). LESSER SUNDA IS.: Flores, S part of Mt Ndeki, *A.J.G.H.Kostermans & N.Wirawan 128* (AAU, K, L). MALAYA: Penang, Waterfall Gardens Forest, *Hardial & Samsuri 193* (B, C, K, L, SING). MOLUCCAS: Amboina, Amahusu, *C.B.Robinson 1811* (BO, K, NY, US). PHILIPPINES: Mindanao, Davao prov., Mt Mayo, *M.Ramos & G.Edaño BS 49504* (B, BO, K, NY, P, SING, UC). SULAWESI: Kabajana, Eempuhu, *J.E.W.Elbert 3280* (A, G, K, PNH, SING). **43.** NEW GUINEA: Papua Jaya, Waren, 60 miles S of Manokwari, *R.Kanehira & S.Hatusima 13013* (A, BO).

Young leaves and young fruits are eaten as vegetables. Leaves and roots are pounded to make a poultice for ulcers, and the boiled root is used for rheumatism in Malaysia. In the Philippines the leaves are pounded and applied for headache and stomachache (P.Hiepkko, *Willdenowia* 9: 21, 1979).

b. *Champereia manillana* var. *longistaminea* (W.Z.Li) H.S.Kiu, *J. Trop. Subtrop. Bot.* 5(3): 3 (1997)

Melientha longistaminea W.Z.Li, *Acta Bot. Yunnan.* 11: 407 (1989); *Champereia longistaminea* (W.Z.Li) D.D.Tao, *Guihaia* 13: 9 (1993); *Yunnanopilia longistaminea* (W.Z.Li) C.Y.Wu & D.Z.Li, *Acta Bot. Yunnan.* 22: 249 (2000). T: China, Yunnan, Yuanjiang, *W.Z.Li 8842208*; holo: SWFC, n.v.

Illustration: W.Z.Li, *Acta Bot. Yunnan.* 11: 408, fig. 1 (1989), as *Melientha longistaminea*.

Drupe 22–25 mm long, 15–17 mm wide.

Southern China (Guangxi and Yunnan). 36: CHC. In forests and thickets on rocky limestone hills, between 300 and 1300 m. Flowers Apr.–May; fruits June–July. Map 2.

36. CHINA SOUTH CENTRAL: Yunnan, Foo-ning, baan-luen, *C.W.Wang 88700* (KUN).

Doubtful name

Champereia gnetocarpa Kurz, *J. Bot.* 13: 325 (1875), as *Champereya*

T: Nicobars, Kamorta, Kurz?.

The type could not be traced. According to the description of Kurz the fruits are comparatively large (16.5–18.5 mm long): some fruits from the Andamans are 15 mm long, and *C. gnetocarpa* is perhaps a synonym of *C. manillana*.

Excluded name

Champereia perrottetiana Baill., *Adansonia* 3: 125 (1862)

This is *Scleropyrum pentandrum* (Dennst.) Mabb. (Santalaceae).

OPILIACEAE

2. MELIENTHA

Melientha Pierre, *Bull. Mens. Soc. Linn. Paris* 1: 762 (1888)

Type: *Melientha suavis* Pierre

Dioecious small trees; branchlets glabrous. Leaves glabrous, in dry state hard and brittle. Inflorescence panicle-like branched, mostly on main trunk but also on branches and even in axils of uppermost leaves; rachises minutely papillate to puberulous. Male flowers: 4 or 5-merous, sessile, solitary or in groups of 3–5 in axil of minute bract; tepals reflexed; filaments very short, attached to base of tepals; anthers relatively large; disc lobes fleshy, as big as the rudimentary ovary. Female flowers: 4 or 5-merous, solitary or sometimes in groups of 3 or 4 per bract, with very short pedicels; tepals adjacent to ovary; the rudimentary stamens (staminodes) alternating with broad disc lobes; ovary globose, stigma sessile. Drupe pedicellate, ellipsoid to slightly ovoid or obovoid.

One species with two subspecies, from Indo-China to North Borneo and the Philippines.

F.Gagnepain, *Opiliaceae in H.Lecomte, Fl. Indo-Chine* 1: 802, f. 89 (1911); in *Fl. Indo-Chine, Suppl.* 1: 731 (1948); P.Hiepko, *Opiliaceae of Thailand, Nat. Hist. Bull. Siam Soc.* 27: 120–121 (1978); P.Hiepko, *Melientha in A revision of Opiliaceae I. Genera of the eastern Old World, excluding Opilia, Willdenowia* 9: 23–28 (1979); P.Hiepko, *Melientha (in Opiliaceae), Fl. Males. ser. I*, 10: 38–40 (1984); P.Hiepko, *Melientha (in Opiliaceae), Fl. Thailand* 5(1): 95–96 (1987).

1. *Melientha suavis* Pierre, *Bull. Mens. Soc. Linn. Paris* 1: 763 (1888)

T: Cambodia, in montibus Chereev, *J.B.L.Pierre* 557; lecto: P, *fide* P.Hiepko, *Willdenowia* 9: 23 (1979); isolecto: A, B fragm., C, K, P.

Tree up to 13 m. Leaves with petiole 1–5 mm long; lamina lanceolate, elliptic to ovate (or obovate), (4–) 6–12 (–16) cm long, 2.5–5 (–7) cm wide; base cuneate-attenuate; apex obtuse- or retuse-mucronulate, sometimes acute to acuminate; lateral veins 5–6 (–8) per side, hardly prominent on both sides. Inflorescences often in groups on swellings at the trunk or solitary on branches and in axils of leaves; main rachis up to 15 cm long, in fruiting state up to 20 cm long; bracts ovate, c. 0.5 mm long, acute. Drupe yellow, 23–40 mm long, 15–21 mm wide; pedicel 3–7 mm long.

Drupe ellipsoid or slightly ovoid, 23–30 mm long

a. subsp. *suavis*

Drupe ellipsoid to ± obovoid, 35–40 mm long

b. subsp. *macrocarpa*

a. *Melientha suavis* Pierre subsp. *suavis*

Melientha acuminata Merr., *Philipp. J. Sci.* 29: 477 (1926). T: Philippines, Mindanao, Cotabato prov., Port Lebak, *C.Sulit* FB 29435; lecto: UC, *fide* P.Hiepko, *Willdenowia* 9: 24 (1979); isolecto: A, B, BM, BO, K.

Illustrations: P.Hiepko, *Willdenowia* 9: 22, fig. 4, 1; 24, fig. 5; 25, fig. 6 (1979); P.Hiepko, *Fl. Males. ser. I*, 10: 39, fig. 4; 40, fig. 5a (1984).

Maps: P.Hiepko, *Willdenowia* 9: 26, fig. 7 (1979); P.Hiepko, *Fl. Males. ser. I*, 10: 40, fig. 6 (1984).

Tree up to 11 m. Leaves with petiole 1–2 mm long; lamina lanceolate or elliptic to ovate, (4–) 6–12 (–16) cm long, 2.5–5 (–7) cm wide; base cuneate-attenuate; apex obtuse- or retuse-mucronulate, sometimes acute. Male flowers: tepals oblong, c. 1.5 mm long, acute; anthers almost sessile, oval, 1–1.5 mm long, yellow; disc lobes and rudiment of ovary thick, irregularly angular, c. 0.5 mm long. Female flowers green; pedicels less than 0.5 mm long; tepals c. 1 mm, acute; staminodes shorter than 0.5 mm; disc lobes as long as staminodes, but much broader; ovary globose, c. 1 mm diam., stigma sessile. Main rachis of infructescence up to 5 mm diam. Drupe in dry condition usually yellowish brown, ellipsoid or ± ovoid, 23–30 mm long, 15–17 mm wide; pedicels 3–5 mm long. Fig. 3.

Indo-China to Philippines (Mindanao). 41: CBD, LAO, THA, VIE. 42: MLY, PHI. In deciduous forests locally common, rarely in (dry) evergreen forest. Flowers Dec.–Mar.; fruits Apr.–July. Map 3.

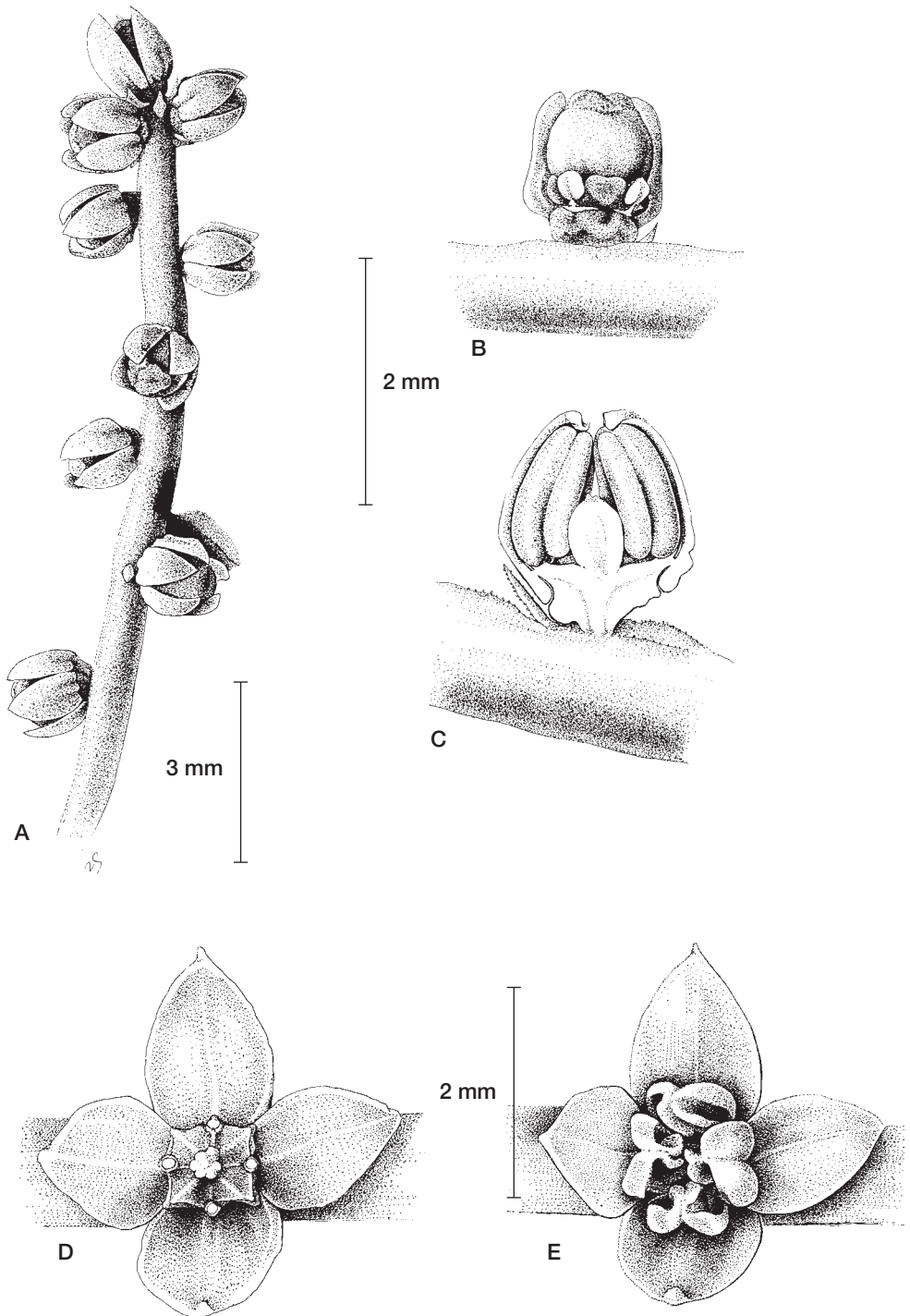


Figure 3. *Melientha suavis* subsp. *suavis*. **A**, part of a female inflorescence; **B**, female flower, two tepals removed; **C**, LS of a male flowerbud; **D**, male flower, the stamens removed; **E**, male flower (**A-C**, *N.Put* 666, K; **D-E**, *J.F.Maxwell* 75-70, B). Drawn by Eva Dieckmann. Reproduced with permission from P.Hiepko, *Willdenowia* 9: 24, fig. 5 (1979).

OPILIACEAE

41. LAOS: Bang-muc, Expedition du Me-Kong 1866–68, *C.Thorel 3039* (P). THAILAND: Northern. Lamphun, Me Lee, *W.P.Winit 133* (BM, K); North-eastern. Loei, Kao Krading, *A.F.G.Kerr 20034* (BK, BM, K); Eastern. Surin, *N.Put 666* (BK, K); South-eastern. Chon Buri, Kow Kieo, *J.F.Maxwell 75-70* (B, BK). VIETNAM: Annam, between L. Bar Ching and L. Da Ban, *E.Poillane 13555* (BO, P, UC). 42. MALAYA: Pulau Penang, *M.Haniff 223* (SING, UC). PHILIPPINES: Mindanao, Misamis Or. prov., Claveria, *PNH 13753* (A, L, PNH).

Flowers strongly fragrant. Young shoots and inflorescences are eaten after boiling as vegetables. Fruits edible. Wood often used for charcoal in Thailand.

Since the identification of *M. suavis* without flowers or fruits is very difficult, leaves of vegetatively similar species of Opiliaceae are sometimes eaten. If leaves of *Urobotrya siamensis*, a species widespread in the same habitat as *Melientha* in Thailand, are eaten these may cause death by poisoning [P.Hiepko, *Willdenowia* 9: 28 (1979)].

b. *Melientha suavis* subsp. *macrocarpa* Hiepko, *Willdenowia* 9: 28 (1979)

T: Borneo, Sabah, Mt. Kinabalu, Ulu Liwagu and Ulu Mesilau, *Royal Soc. North Borneo Exped., Chew & al. RSNB 2518*; holotype: B; isotype: BO, K n.v., L.

Illustration: P.Hiepko, *Willdenowia* 9: 27, fig. 8 (1979).

Map: P.Hiepko, *Willdenowia* 9: 26, fig. 7 (1979); P.Hiepko, *Fl. Males. ser. I*, 10: 40, fig. 6 (1984).

Tree up to 13 m. Leaves with petiole 2–5 mm long; lamina lanceolate, elliptic or slightly obovate, 8–15 cm long, 2.3–4.5 cm wide; base cuneate-attenuate; apex shortly acuminate. Flowers not seen (according to the label of *KEP 80403* the flowers are attached to the stem, “apetalous, 4 green sepals, 4 stamens”). Main rachis of infructescence up to 7 mm diam. Drupe in herbarium specimens dark brown, ellipsoid to ± obovoid, 35–40 mm long, 21 mm wide; pedicels 7 mm long.

North Borneo. 42: BOR. In primary forest up to 1500 m, on black rocky soil. Fruits Jul. & Aug. Map 4.

42. BORNEO: Sabah. Kota Belud distr., 1/2 mile from Kendusan on Ranau trail, *KEP 80403* (KEP, SING); East Kalimantan, Pasir distr., Gunung lumut Protection forest, Rantau layung village, *Ambriansyah & F. Slik 2864* (L).

3. LEPIONURUS

Lepionurus Blume, *Bijdr.* 1148 (1827)

Opilia sect. *Lepionurus* (Blume) Baill., *Adansonia* 3: 124 (1862). Type: *Lepionurus sylvestris* Blume

Leptonium Griff., *Calcutta J. Nat. Hist.* 4: 236 (1843). Type: *Leptonium oblongifolium* Griff.

Bisexual shrubs, erect or straggling, usually glabrous, sometimes young twigs with short hairs. Leaves glabrous. Inflorescence an axillary raceme, with 3 flowers per bract; rachis slender, glabrous; bracts broad-scaly, with hyaline, shortly ciliate margin, pale green, densely imbricate, caducous, lowermost bracts smaller, sterile and persisting. Flowers (3–) 4 (–5)-merous; perianth united, deeply lobed; stamens not exceeding perianth; filaments flattened; disc cupular, with irregularly lobed margin; ovary ovoid-conical; stigma ± sessile, entire or shallowly 4-lobed. Drupe pedicellate, ellipsoid to somewhat ovoid or obovoid.

One variable species from Nepal and Assam to western Malesia.

P.Hiepko, Opiliaceae of Thailand, *Nat. Hist. Bull. Siam Soc.* 27: 123–124 (1978); P.Hiepko, A revision of Opiliaceae I. Genera of the eastern Old World, excluding *Opilia*, *Willdenowia* 9: 38–43 (1979); P.Hiepko, *Lepionurus* (in Opiliaceae), *Fl. Males. ser. I*, 10: 43–45 (1984); P.Hiepko, *Lepionurus* (in Opiliaceae), *Fl. Thailand* 5(1): 98–100 (1987).

1. *Lepionurus sylvestris* Blume, *Bijdr.* 1148 (1827)

Lepionurus javanicus G.Don, *Gen. Hist.* 2: 16 (1832), *nom. illeg.* T: Java, *Herb. Lugd. Bat.* 908. 158-185; lecto: L; isolecto: K, *fide* P.Hiepko, *Willdenowia* 9: 39 (1979).

Leptonium oblongifolium Griff., *Calcutta J. Nat. Hist.* 4: 237 (1843); *Lepionurus oblongifolius* (Griff.) Mast. in J.D.Hooker, *Fl. Brit. India* 1: 583 (1875). T: [Assam?] "*Leptonium oblongifolium* Griff.," *Herb. Hooker s.n.*; holo: K.

Opilia acuminata Wall. [Cat. 243, no. 7206. 1829, *nom. nud.*] ex Baill., *Adansonia* 3: 124 (1862), *nom. illeg.* T: Mt. Sillet, *Herb. Wallich* 7206; lecto: K; isolecto: B, G, GH, K, M, *fide* P.Hiepko, *Willdenowia* 9: 39 (1979).

Lepionurus sylvestris var. *lanceolata* Valetton, *Crit. Overz. Olacin.* 153 (1886). T: Kasia mts., *Native collector s.n.*; syn or holo: *n.v.*

Lepionurus oblongifolius var. *angustifolius* Ridl., *Fl. Malay Penins.* 3: 173 (1924). T: Malay Peninsula: Perak, Gunung Kerbau, 1200 m, a. 1913, *H.C.Robinson s.n.*; holo: K; iso: SING.

Illustrations: P.Hiepko, *Willdenowia* 9: 40, fig. 15; 44, fig. 17 (1979); P.Hiepko, *Fl. Males. ser. I*, 10: 44, fig. 9 & fig. 10 (1984).

Maps: P.Hiepko, *Willdenowia* 9: 41, fig. 16 (1979); P.Hiepko, *Fl. Males. ser. I*, 10: 44, fig. 11 (1984).

Shrub, usually less than 2 m, rarely up to 6 m. Leaves with petiole 1–5 (–8) mm; lamina extremely variable in shape, obovate, oblong, lanceolate or ovate, (5.5–) 10–16 (–25) cm long, (1.5–) 3–7 (–9) cm wide, ratio 2–4 (–10), shortly attenuate or attenuate at base, acutely acuminate apically; lateral veins (5–) 8–10 (–13) per side, with midrib and veins often prominent beneath. Racemes 1–8 (–17) per axil; rachis erect, drooping or pendulous, 2–5 cm long (up to 6 cm in fruiting state); bracts broadly ovate, 4–5 (–7.5) mm long, 3–5 (–8) mm wide, acuminate or apiculate. Flowers 3 per bract, on a tubercle, without bracteoles; pedicels 1–2 mm long; perianth tube 0.5 mm long, resting on cupular hypanthium; perianth yellowish, 2–4.5 mm across; lobes spreading, ovate, acute; stamens inserted below margin of disc, as long as perianth tube; pistil c. 1 mm long. Drupe orange-red, resting on thickened disc, 9–16 mm long, 6–10 mm wide; pedicel 2–2.5 mm long. $n = 10$, P.K.Khosla, *Nucleus* 21: 211 (1978). Fig. 4.

Himalayas and to Sumatera, W. Jawa, and Borneo. 36: CHC. 40: ASS, EHM, NEP. 41: MYA, THA, VIE. 42: BOR, JAW, MLY, SUM. Usually in evergreen forest, locally common undergrowth, from sea level up to 1250 m, rarely up to 1800 m (Sikkim) or 2000 m (Sumatera). Flowers & fruits throughout the year. Map 5.

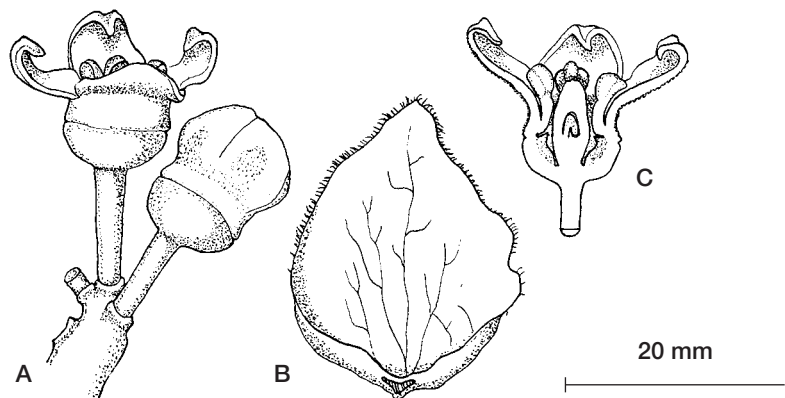


Figure 4. *Lepionurus sylvestris*. **A**, two flowers of a triad, one just opened; **B**, bract; **C**, LS of flower (A–C, *D.Nicolson* 3072, US). Drawn by Paul Hiepko. Reproduced with permission from P.Hiepko, *Willdenowia* 9: 40, fig. 15 (1979).

OPILIACEAE

36. CHINA SOUTH-CENTRAL: Yunnan, Szemao forest, 1200 m, *A. Henry 12804* (A, NY, US). **40.** ASSAM: Dhekia-juli, Apr. 1902, *A.C. Chatterjee s.n.* (FI, G, L, M, U, WU, Z). NEPAL; Mechi Zone, Jhapa distr., Ganjabari, *D. Nicolson 3072* (BM, US). **41.** THAILAND: Peninsular, Pattani, Kao Kalakiri, *A.F.G. Kerr 15037* (BK, BM, K, L). VIETNAM. Annam, Col des Nuages near Tourane [= Da Nang], *E. Poilane 8014* (E, K, P). **42.** BORNEO. Sabah, Beaufort distr., Beaufort hills, *SAN 28112* (K, L, SAN). JAWA: Ujung Kulon Nature Res., Mt. Pajung, *N. Wirawan 198* (BO, G, K, L, P); Nusa Kambangan, *S.H. Koorders 39671* β (BO, L). MALAY PENINSULA: Perak, Larut, *King's Coll. 5502* (ABD, BO, K, SING, U, UC). SUMATERA: Enggano, Malakoni, *W.J. Lütjeharms 4871* (A, BO, K, L, SING).

The leaves of *Lepionurus sylvestris* are extraordinarily variable in shape and size. Extremely narrow leaves (ratio about 10) are especially striking, but such forms occur sporadically in all parts of the range of the species next to plants with a more common leaf shape (Myanmar, Thailand, Malay Penins., Sumatera). The number of inflorescences per axil is also very variable. Whereas in the greater part of the range 1–8 racemes are found, one third of the specimens from Assam show in part more than 10 racemes per axil.

In Peninsular Thailand the roots are locally used for a medicine against fever. In Pahang (Malay Penins.) a poultice of the plant or of the root is applied for headache [P. Hiepko, *Willdenowia* 9: 43 (1979)].

Excluded name

Lepionurus pubescens Ridl., *Trans. Linn. Soc. London, Bot.* 9, 1: 27 (1916) = *Scleropyrum auran-tiacum* (Lauterb. & K. Schum.) Pilg. (Santalaceae).

4. UROBOTRYA

Urobotrya Stapf, *J. Linn. Soc., Bot.* 37: 89 (1905)

Opilia subg. *Urobotrya* (Stapf) Engl., *Bot. Jahrb. Syst.* 43: 171 (1909). Type: *Urobotrya congolana* (Baill.) Hiepko [lecto fide P. Hiepko, *Bot. Jahrb. Syst.* 107: 138 (1985)].

Bisexual shrubs or small trees, sometimes climbing; branchlets glabrous or puberulous. Leaves glabrous or sparsely puberulous. Inflorescence an axillary raceme, with 1, 3 or more pedicellate flowers per bract, with or without bracteoles; rachis slender, glabrous or puberulous; bracts narrowly lanceolate or broadly ovate, puberulous or ciliate, caducous, some basal bracts persistent. Flowers bisexual, 3–5-merous; tepals free, oblong, acute; stamens exceeding perianth; disc annular, fleshy; ovary conical to cylindrical; stigma sessile. Drupe pedicellate, ellipsoidal or subglobose.

Seven species in 2 sections: 2 species in West and Central Africa, 5 species in tropical Asia from Thailand to Flores.

J. Hutchinson & J.M. Dalziel, *Urobotrya* (in Opiliaceae), in *Fl. W. Trop. Afr.* 1: 463 (1928); H.O. Sleumer, *Opilia* subgen. *Urobotrya*, in H.G.A. Engler & K.A.E. Prantl, *Nat. Pflanzenfam.* 2nd edn, 16b: 38 (1935); J. Louis & J. Léonard, *Opilia* subgen. *Urobotrya* (in Opiliaceae), in *Fl. Congo Ruanda-Urundi* 1: 279–287 (1948); R.W.J. Keay in J. Hutchinson & J.M. Dalziel, *Fl. W. Trop. Afr.* 2nd edn, 1: 651 (1958); P. Hiepko, Die Gattungsabgrenzung bei den Opiliaceae, *Ber. Deutsch. Bot. Ges.* 84: 661–663 (1972); J.-F. Villiers, *Opilia* (in Opiliaceae), in *Fl. Cameroun* 15: 172, pl. 37 (1973); J.-F. Villiers, *Fl. Gabon* 20: 172, pl. 37 (1973); P. Hiepko, A revision of Opiliaceae I. Genera of the eastern Old World, excluding *Opilia*, *Willdenowia* 9: 29–36 (1979); P. Hiepko, *Urobotrya* (in Opiliaceae), *Fl. Males. ser. I*, 10: 41–43 (1984); P. Hiepko, A revision of Opiliaceae III. *Urobotrya* Stapf, *Bot. Jahrb. Syst.* 107: 137–152 (1985).

The morphology of inflorescences is of taxonomic importance within *Urobotrya*. In the species of *U.* sect. *Lepionuroides* these lateral cymes consist normally of three pedicellate flowers in the axil of each bract. The same ternate groups of flowers are to be found in *Lepionurus* and *Opilia*. In *U. congolana* the number of flowers per cyme varies from 3 to 8, and the number of

the very small lateral bracteoles is also variable. The inflorescence of *U. sparsiflora* subsp. *sparsiflora* is the most reduced type in the genus, and it looks like a true raceme. In the axil of each bract only one flower is developed; however, the occurrence of three bracteoles at the base of the pedicel indicates that these partial inflorescences are cymes that have been reduced to a single flower. (P.Hiepko, *Bot. Jahrb. Syst* 107: 138, 139, fig. 1, 1985).

KEY TO SECTIONS

Young racemes shortly pedunculate, with narrowly lanceolate bracts; flowering racemes usually longer than 10 cm; flowers solitary, or 3 or more per bract **1. U. sect. Urobotrya**

Young racemes not pedunculate, with broadly ovate to orbicular bracts; flowering racemes mostly shorter than 10 cm; flowers usually 3 per bract **2. U. sect. Lepionuroides**

1. UROBOTRYA SECT. UROBOTRYA

Urobotrya Stapf sect. *Urobotrya*

Inflorescences axillary, shortly pedunculate, pendulous, with 1 or 3–6 (–8) flowers per bract; rachis 7–30 (–42) cm long, mostly longer than leaves, puberulous; bracts narrowly lanceolate, caducous before anthesis, some (sterile) basal bracts persistent; bracteoles present, very small, caducous. Flowers 5-merous, with long, glabrous pedicels; stamens much longer than tepals; ovary ± conical. Drupe ellipsoidal or subglobose; pedicel bending upwards.

Two species, each with 2 subspecies, in the humid parts of W. and Central Africa.

Drupe yellow (rarely orange to reddish), ellipsoidal or subglobose, usually more than 15 mm wide; rachis of inflorescence 20–31 (–42) cm long; branchlets and leaves glabrous

..... **1. U. congolana**

Drupe red to orange, ellipsoidal to subcylindrical, 6–8 (–12) mm wide; rachis of inflorescence 7–22 cm long; branchlets puberulous, leaves sparsely hairy beneath to glabrescent

..... **2. U. sparsiflora**

1. *Urobotrya congolana* (Baill.) Hiepko, *Ber. Deutsch. Bot. Ges.* 84: 662 (1972)

Opilia congolana Baill., *Bull. Mens. Soc. Linn. Paris* 2: 872 (1890). T: Congo, *F.-R.Thollon s.n.*, a. 1889; holo: P.

Shrub or small tree, sometimes climbing, up to 4 (–5) m high; twigs glabrous. Leaves with petiole 2–10 mm long; lamina elongate-oblong-elliptic to broadly elliptic or slightly ovate, rarely obovate, (9–) 12–21 (–24) cm long, (2.5–) 3–10 (–12) cm wide, cuneate to rounded, rarely subcordate at base, acuminate apically, glabrous; midrib and veins prominent beneath; lateral veins 5–6 (–8) per side. Racemes usually solitary, sometimes 2–4 per axil; rachis 20–31 (–42) cm long (in fruiting state up to 53 cm), puberulous with hairs white; bracts 1–2 mm long, puberulous outside; bracteoles ovate. Flowers in groups of (3–) 4–6 (–8) per bract; pedicels (4–) 10–15 mm long; tepals greenish, 1.5–2 mm long; filaments 5–8 mm long, white; disc yellowish; ovary conical to cylindrical, c. 1 mm long. Drupe yellow (or orange to reddish).

In W Africa from Sierra Leone to Ivory Coast and Central Africa from SE Nigeria to Gabon.

There is only one character for a clear distinction between the 2 subspecies of *U. congolana*: the fruits of subsp. *afzelii* are more or less globose in contrast to the ellipsoidal fruits of subsp. *congolana*. Inflorescences are more or less uniform in both subspecies.

Drupe ellipsoidal, 25–32 mm long; leaves oblong-elliptic to broadly elliptic, ovate (or obovate) and rounded at base; basal lateral veins rarely ascending up to the middle of the leaf

..... **1a. subsp. congolana**

Drupe subglobose, 15–20 mm long, 13–18 mm wide; leaves usually narrowly oblong-elliptic to elliptic or ovate and cuneate to rounded at base and with strongly developed lateral veins, often ascending up to the middle of the leaf **1b.** subsp. **afzelii**

1a. Urobotrya congolana (Baill.) Hiepko subsp. **congolana**

Urobotrya minutiflora Stapf, *J. Linn. Soc., Bot.* 37: 90 (1905); *Opilia minutiflora* (Stapf) Engl., *Bot. Jahrb. Syst.* 43: 172 (1909). T: Cameroon, near Victoria, *W.Kalbreyer* 6; holo: K; iso: BM.

Opilia macrocarpa Pierre & Engl. in H.G.A.Engler, *Bot. Jahrb. Syst.* 43: 172 (1909). T: Gabon, environs de Libreville, *R.P.Klaine* 485 (Herb. Pierre 6452); lecto: P; isoelecto: P, *fide* P.Hiepko, *Bot. Jahrb. Syst.* 107: 141 (1985).

Illustrations: P.Hiepko, *Bot. Jahrb. Syst.* 107: 143, fig. 2 A–C (1985); J.F.Villiers, *Fl. Cameroun* 15: 172, pl. 37, 7–14 (1973), as *Opilia congolana*.

Map: P.Hiepko, *Bot. Jahrb. Syst.* 107: 147, fig. 4 (1985).

Leaves oblong-elliptic to broadly elliptic, ovate or obovate, 11–24 cm long, 3–12 cm wide, rounded, or rarely cuneate or subcordate at base, mostly abruptly acuminate at apex; basal lateral veins rarely ascending up to middle of leaf. Inflorescence rachis 23–28 cm, in fruiting state up to 40 (–53) cm long. Flowers in groups of (3–) 4–6 (–8). Drupe ellipsoidal, 25–32 mm long, 15–18 mm diam. (in dry state), yellow, sometimes reddish; pedicel 15–18 mm long. Mesocarp of fresh fruits 3–4.5 mm thick. Fig. 5 A–C.

SE Nigeria and W Cameroon to Gabon and Congo. 22: NGA. 23: CMN, CON, EQG, GAB. Undershrub in rain-forest or dry forest, in riverine forest and secondary forest. Flowers and fruits throughout the year. Map 6.

22. NIGERIA: Ogoja prov., Ikom dist., Afi River Forest Reserve, *R.W.J.Keay*, *FHI 18738* (B, FHO). 23. CAMEROON: Kumba dist., S Bakundu, *A.Binuyo & Daramola*, *FHI 35560* (FHO, K, WAG); between Buea and Mayuko, *J.M.Dalziel 8244* (K, P, US). CONGO: Djoumouna, 15 km SW of Brazzaville, *C.Farron 4688* (P). EQUATORIAL GUINEA: near Nkolendangan, *G.Tessmann B154* (B). GABON: near Libreville, *R.P.Klaine 485* (P).

1b. Urobotrya congolana subsp. **afzelii** (Engl.) Hiepko, *Bot. Jahrb. Syst.* 107: 144 (1985)

Opilia afzelii Engl., in H.G.A.Engler & K.A.E.Prantl, *Nat. Pflanzenfam. Nachtr.* 1: 143 (1897); *Urobotrya afzelii* (Engl.) Stapf ex Hutch. & Dalziel, *Fl. W. Trop. Afr.* 1: 463 (1928). T: Sierra Leone, without date, *A.Afzelius s.n.*; lecto: UPS; isoelecto: B, UPS, *fide* P.Hiepko, *Bot. Jahrb. Syst.* 107: 144 (1985).

Urobotrya angustifolia Stapf, *J. Linn. Soc., Bot.* 37: 89 (1905); *Opilia angustifolia* (Stapf) Engl., *Bot. Jahrb. Syst.* 43: 171 (1909). T: Liberia, within 6 miles of Monrovia, a. 1904, *A.Whyte s.n.*; lecto: K, *fide* P.Hiepko, *Bot. Jahrb. Syst.* 107: 144 (1985).

Urobotrya latifolia Stapf, *J. Linn. Soc., Bot.* 37: 89 (1905); *Opilia latifolia* (Stapf) Engl., *Bot. Jahrb. Syst.* 43: 171 (1909). T: Liberia, within 6 miles of Monrovia, a. 1904, *A.Whyte s.n.*; holo: K.

Urobotrya trinervia Stapf, in H.Johnston, *Liberia* 2, App. 4: 587 (1906); *Opilia trinervia* (Stapf) Engl., *Bot. Jahrb. Syst.* 43: 171 (1909). T: Liberia, within a radius of 20 miles from Kakatown, *A.Whyte s.n.*, Apr. 1904; holo: K; iso: B, K.

Urobotrya stapfiana Hutch. & Dalziel, *Fl. W. Trop. Afr.* 1: 463 (1928), *nom. superfl.*; *Opilia stapfiana* (Hutch. & Dalziel) Sleumer, in H.G.A.Engler & K.A.E.Prantl, *Nat. Pflanzenfam.* 2nd edn, 16b: 38 (1935). T: Liberia, within a radius of 20 miles from Kakatown, Apr. 1904, *A.Whyte s.n.*; holo: K; iso: B, K.

Illustration: P.Hiepko, *Bot. Jahrb. Syst.* 107: 145, fig. 3 A–D (1985).

Map: P.Hiepko, *Bot. Jahrb. Syst.* 107: 147, fig. 4 (1985).

Leaves (often narrowly) oblong-elliptic to elliptic or ovate, 9–19 (–21) cm long, 2.5–7 (–8.5) cm wide, cuneate to rounded at base, gradually, rarely abruptly acuminate at apex; basal lateral veins often prominent and ascending up to middle of leaf. Inflorescence rachis 20–31 (–42) cm long. Flowers in groups of 4–6. Drupe yellow, subglobose, 15–20 mm long, 13–18 mm diam. (in dry state); pedicel 12–17 mm long. Mesocarp of fresh fruits 5–7 mm thick. Fig. 6.

Sierra Leone, SE Guinea, Liberia and southern Ivory Coast. 22: GUI, IVO, LBR, SIE. Undershrub in rain-forest on sand or laterite, also in riverine forest or secondary forest, locally common (Sierra Leone). Flowers and fruits throughout the year. Map 7.

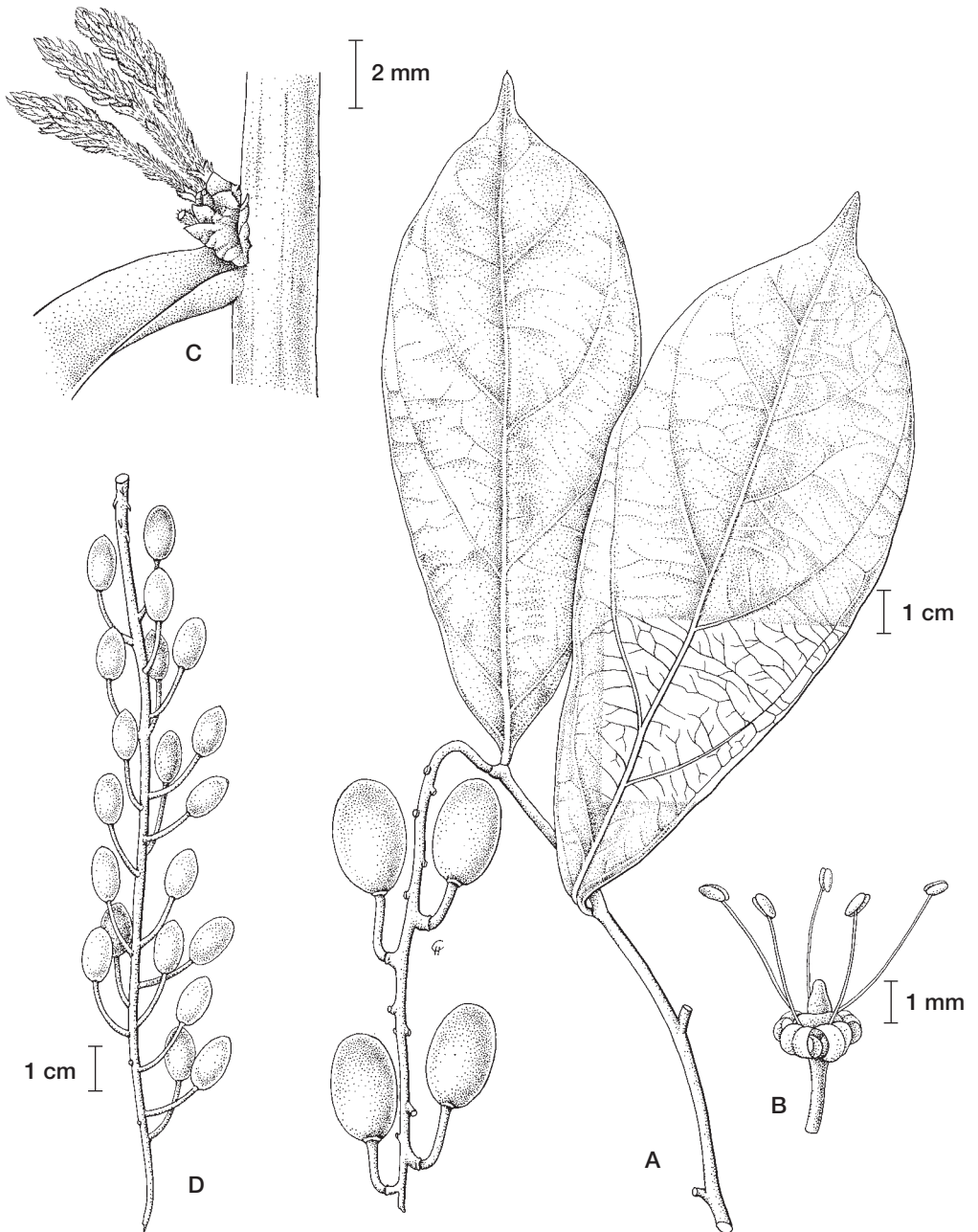


Figure 5. *Urobotrya congolana* subsp. *congolana*. **A**, branch with hanging infructescence; **B**, flower; **C**, young axillary inflorescences. – *Urobotrya sparsiflora* subsp. *sparsiflora*. **D**, hanging infructescence, fruits not yet mature (**A**, A.J.B. Chevalier 27560, P; **B**, A. Staudt 474, B; **C**, J.J. Bos 5507, WAG; **D**, L. Dubois 886, BR). Drawn by Christine Hillmann-Huber. Reproduced with permission from P. Hiepko, *Bot. Jahrb. Syst.* 107: 143, fig. 2 (1985).

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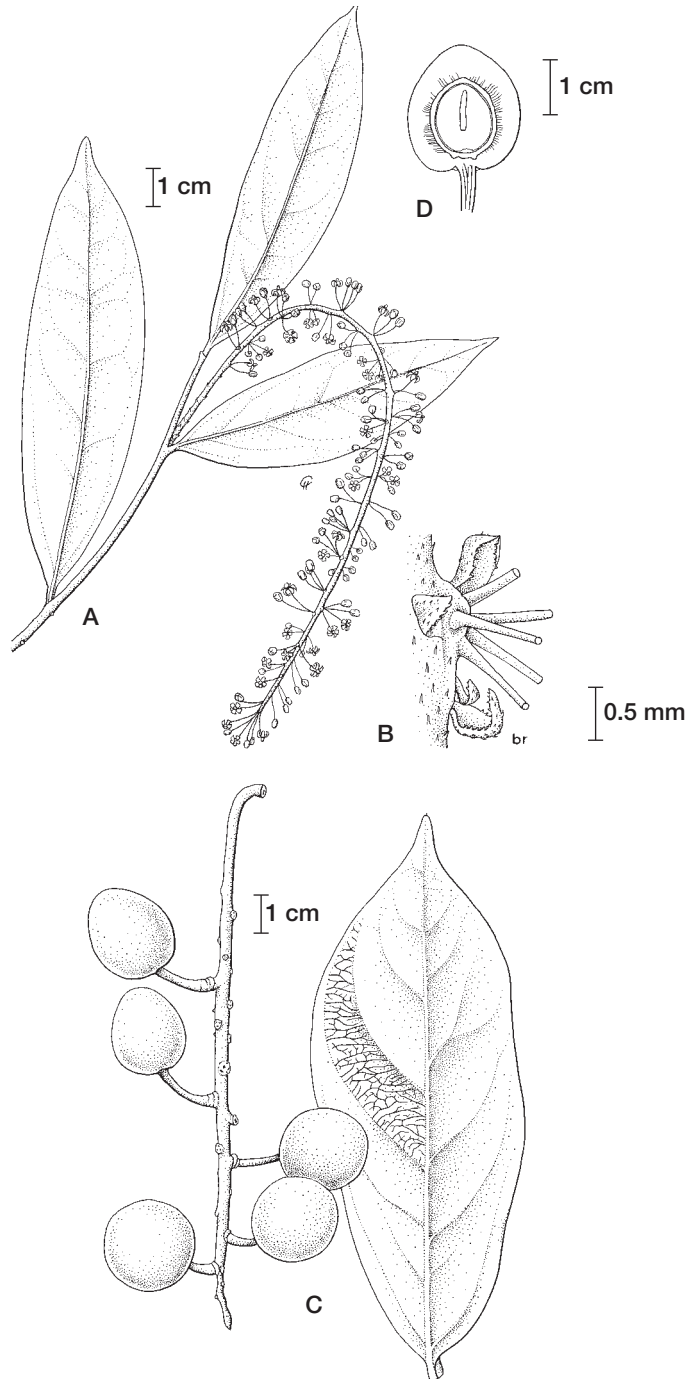


Figure 6. *Urobotrya congolana* subsp. *afzelii*. **A**, branch with inflorescence; **B**, lateral cyme of the inflorescence (flowers cut off, br = bract); **C**, hanging infructescence and leaf; **D**, LS of drupe (**A**, *J.K.Morton & Sesay SL 667*, K; **B**, *A.Whyte s.n.*, B; **C-D**, *A.M.Van Harten 110*, B). Drawn by Christine Hillmann-Huber. Reproduced with permission from P.Hiepko, *Bot. Jahrb. Syst.* 107: 145, fig. 3 (1985).

22. GUINEA: Kissidougou, Kéréma, *J.G.Adam 5767* (MO). IVORY COAST: Forest near Bécédi, *L.Ake Assi 10836* (UCJ). LIBERIA: Monrovia, *G.P.Cooper 249* (BM, FHO, NY, US); Boporo dist., Zuie, *J.T.Baldwin 10682* (K, MO, US, WAG). SIERRA LEONE: Freetown, Mt. Aureole, *J.M.Dalziel 1006* (K); Hastings, *J.K.Morton & Sesay SL 667* (K, WAG).

In Sierra Leone the flexible wood was used as springs for traps. Also in Sierra Leone the root is beaten, mixed with white clay and rubbed on the body for rheumatism etc. (P.Hiepko, *Bot. Jahrb. Syst.* 107: 146, 1985).

2. *Urobotrya sparsiflora* (Engl.) Hiepko, *Ber. Deutsch. Bot. Ges.* 84: 662 (1972)

Opilia sparsiflora Engl., *Bot. Jahrb. Syst.* 43: 172 (1909). T: [Zaire], Unterer Kongo, zwischen Bouga u. Wessa am Sanga, *R.Schlechter 12692*; holotype: B; isotype: BR.

Shrub, sometimes climbing, 1–3 m high; twigs densely puberulous. Leaves with petiole 2–7 mm long; lamina oblong-elliptic to elliptic, ovate or slightly obovate, (8–) 12–18 (–21) cm long, (2.2–) 4–8 (–10.5) cm wide, attenuate to rounded, sometimes subcordate at base, shortly acuminate apically, glabrous above, sparsely hairy to glabrescent beneath; midrib and veins prominent beneath; lateral veins 5–8 per side. Racemes usually solitary, rarely 2 per axil; rachis 7–22 cm long, puberulous with hairs brownish; bracts narrowly lanceolate, 1–2 mm long, puberulous outside; bracteoles ovate. Flowers solitary or in groups of 3 or 4 (–5) per bract; pedicels 5–8 (–11) mm long; tepals greenish, 2–3 mm long; filaments 6–8 mm long, white; ovary conical to cylindrical, c. 1.5 mm long. Drupe red to orange, ellipsoidal to subcylindrical, 13–19 mm long, 6–8 (–12) mm diam. (in dry state). Pedicel 10–13 (–16) mm long.

From southern Central African Republic to northeastern Angola.

Rachis of inflorescence 7–15 cm long; flowers always solitary **2a.** subsp. ***sparsiflora***

Rachis of inflorescence 15–22 cm long; flowers in groups of 3–4 (–5). . **2b.** subsp. ***bruneelii***

2a. *Urobotrya sparsiflora* (Engl.) Hiepko subsp. *sparsiflora*

Illustrations: J.Louis & J.Léonard, *Fl. Congo Ruanda-Urundi* 1: 281, pl. 28 (1948), as *Opilia sparsiflora*; P.Hiepko, *Bot. Jahrb. Syst.* 107: 145, fig. 2 D (1985).

Map: P.Hiepko, *Bot. Jahrb. Syst.* 107: 147, fig. 4 (1985).

Rachis of inflorescence 7–15 cm long. Flowers always solitary. Fig. 5 D.

Southern Central African Republic, Congo, Zaire and northeastern Angola. 23: CAR, CON, ZAI. 26: ANG. Undershrub in periodically inundated riverine forest or in swamp forest. Flowers and fruits throughout the year. Map 8.

23. CENTRAL AFRICAN REPUBLIC: Boukoko, *C.Tisserant 2212* (BM, P). CONGO: Pays Bouaka, between Bangui and Kémo, *A.J.B.Chevalier 5265* (P). ZAIRE: Likimi, *G.Gilbert 1643* (BR); Kidima, galerie de la Bilumbu, *H.Callens 3497* (BR, K). **26.** ANGOLA: Lunda, Dundo, rio Luachimo, 18 Apr 1937, *L.W.Carrisso & F.Sousa s.n.* (BM).

2b. *Urobotrya sparsiflora* subsp. *bruneelii* (De Wild.) Hiepko, *Bot. Jahrb. Syst.* 107: 149 (1985)

Opilia bruneelii De Wild., *Bull. Jard. Bot. Etat* 4: 366. (1914), as *bruneeli*. T: Zaire, Forestier Central, Baringa Yalo, pres de la rive de la Bolombo, a. 1906, *A.Bruneel s.n.*; lecto: BR, *fide* P.Hiepko, *Bot. Jahrb. Syst.* 107: 149 (1985).

Map: P.Hiepko, *Bot. Jahrb. Syst.* 107: 147, fig. 4 (1985).

Rachis of inflorescence 15–22 cm long. Flowers in groups of 3–4 (–5).

Central Zaire. 23: ZAI. Undershrub in riverine forest or in swamp forest, sometimes in secondary forest. Flowers and fruits throughout the year. Map 9.

23. ZAIRE: Forestier Central, Rivière Aruwimi, between Yambuya and Mongandjo, *C.Evrard 2142* (BR, K); Yangambi, *J.Louis 11451* (BR, C, PNH); Bas Katanga, Territ. Bakwanga, Route Miabi, *L.Liben 1955* (BR, K).

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Opilia bruneelii was treated by J.Louis & J.Léonard (in *Fl. Congo Ruanda-Urundi* 1: 280, 1948) as conspecific with *O. sparsiflora* Engl. It has been separated since the difference in the arrangement of the flowers (solitary or in groups of 3–5) is connected with a distinct distributional pattern. It should be mentioned that only 2 of the 6 syntypes of *O. bruneelii*, namely *Bruneel s.n.* (lectotype) and *Mortehan* 295, belong to this subspecies. The other syntypes have solitary flowers and belong to subspecies *sparsiflora*.

2. UROBOTRYA SECT. LEPIONUROIDES

Urobotrya sect. *Lepionuroides* Hiepko, *Willdenowia* 6: 471 (1972), *nom. inval.* (type not designated); *Nat. Hist. Bull. Siam. Soc.* 27: 121 (1978)

Type: *Urobotrya latisquama* (Gagnep.) Hiepko

Inflorescence axillary or on main trunk, not pedunculate, usually with 3 pedicellate flowers per bract; rachis shorter than the leaves, glabrous or puberulous; bracts broadly ovate to orbicular, caducous, only some basal (smaller) bracts persistent; usually without bracteoles. Flowers 3 or 4 (–5)-merous; stamens not much longer than tepals; ovary conical to cylindrical. Drupe ellipsoidal, pedicel not bending upwards.

Five species from S. China and Vietnam to Borneo and Flores.

- 1 Inflorescence 7–16 cm long, rachis glabrous or densely puberulous
 - 2 Inflorescence densely puberulous, pedicels 1–1.5 mm 7. **U. parviflora**
 - 2: Inflorescence glabrous, pedicels 3 mm or longer
 - 3 Pedicels 3–5 mm long 3. **U. latisquama**
 - 3: Pedicels 15–20 mm long 4. **U. longipes**
- 1: Inflorescence up to 5.5 cm long, rachis glabrous
 - 4 Inflorescence 2.5–4 cm long, tepals and filaments 2 mm long, drupe 8–10 mm long, 6.5–8 mm wide 5. **U. siamensis**
 - 4: Inflorescence 4.5–5.5 cm long, tepals and filaments c. 1 mm long, drupe 14–16 mm long, 7 mm wide 6. **U. florensensis**

3. *Urobotrya latisquama* (Gagnep.) Hiepko, *Ber. Deutsch. Bot. Ges.* 84: 662 (1972)

Lepionurus latisquamus Gagnep., *Notul. Syst. (Paris)* 1: 201 (1910). T: Laos, Keng-trap, *C.J.Spire* 1043; holo: P, B fragm.

Lepionurus macrostachyus Gagnep., *Notul. Syst. (Paris)* 1: 202 (1910). T: Tonkin, Environs du poste de Yen-Lang, *B.Balansa* 3206; holo: P.

Lepionurus oxylepis Gagnep., *Notul. Syst. (Paris)* 13: 135 (1947). T: Tonkin, massif de Nui-Bien, pres Cho-bo, *E.Poilane* 13211; lecto: P, *fide* P.Hiepko, *Willdenowia* 9: 29 (1979).

Map: P.Hiepko, *Willdenowia* 9: 36, fig. 12 (1979).

Small tree up to 4 m (sometimes climbing); twigs glabrous. Leaves with petiole 1–3 mm long; lamina glabrous, lanceolate-elliptic to narrowly lanceolate, rarely ovate or obovate, (7–) 11–18 (–23) cm long, (3–) 4–6 (–7) cm wide; base cuneate; apex acuminate or acute; lateral veins 8–10 (–12) per side. Racemes usually solitary, axillary, but also on older branches or on the main trunk; rachis 7–11 cm long, glabrous; bracts broadly ovate to orbicular, abruptly acuminate, 6–7 mm long and wide. Flowers usually without bracteoles; pedicels 3–5 mm long; tepals 4, greenish-yellow, 3 mm long; stamens white; filaments 4–5 mm long; disc broadly protruding-annular; ovary cylindrical, subconical in upper part, 1–1.5 mm long. Drupe red, 13–15 mm long, 7–9 mm wide; pedicel 5–6 mm long.

SE China, Laos, NE Thailand, and N Vietnam. 36: CHS. 41: LAO, THA, VIE. In evergreen forest up to 1000 m. Flowers Mar.–July; fruits Aug.–Sept. Map 10.

36. CHINA SOUTHEAST: Kwangsi, Silung Hsien, *Zoo 67784* [n. v., *vide* W.-Y.Chun & F.-C.How, *Acta Phytotax. Sin.* 7: 62 (1958)]. 41. THAILAND: Loei, Pu Tong, *A.F.G.Kerr 8866* (BM, K); Prov. Lampang, Distr. Wang Nua, Doi Lueng National Park, *J.F.Maxwell 97-245* (BKF). VIETNAM: Tonkin: Phu Ho, *R.Pasquier 3016* (A, UC); prov. de Vinh Yen, Ravin du Pont du Linhs, *P.A.Petelot 5952* (A, B, NY).

4. *Urobotrya longipes* (Gagnep.) Hiepko, *Ber. Deutsch. Bot. Ges.* 84: 663 (1972)

Lepionurus longipes Gagnep., *Notul. Syst. (Paris)* 13: 135 (1947). T: [Vietnam], Annam, massif de Đông-ché, prov. Quang Tri, *E.Poilane 10526*; holotype: P; isotype: A, B.

Illustration: F.Gagnepain, in *Fl. IndoChine*, Suppl. 1: 733, fig. 86 (1948).

Map: P.Hiepko, *Willdenowia* 9: 36, fig. 12 (1979).

Shrub, 3 m; twigs glabrous. Leaves with petiole 3–4 mm long; lamina glabrous, lanceolate, 7–11 cm long, 2.5–5 cm wide; base cuneate; apex slightly acuminate; lateral veins 7–9 per side. Inflorescences on main trunk, 7–12 cm long (in fruiting state up to 16 cm long), glabrous; bracts ovate, acuminate, 8–9 mm long, 4–5 mm wide. Flowers with pedicels 15–20 mm long; tepals and stamens 4 (only flowerbuds known, shape and size like those of *U. latisquama*). Young fruits ± globular; pedicels up to 30 mm.

S Vietnam. (known only from the type) 41: VI. In evergreen forest up to 600 m. Map 11.

This species is separated from the similar species *U. latisquama* by the very long pedicels and the more narrow shape of the bracts.

5. *Urobotrya siamensis* Hiepko, *Willdenowia* 6: 471 (1972)

T: N Thailand, Kamphaeng Phet, *T.J.Sørensen, K.Larsen & B.Hansen 6625*; holotype: K; isotype: BKF, C.

Illustration: P.Hiepko, *Willdenowia* 9: 31, fig. 9 (1979).

Map: P.Hiepko, *Willdenowia* 9: 36, fig. 12 (1979).

Shrub or small tree up to 5 m; twigs mostly glabrous. Leaves with petiole 2–3 mm long; lamina glabrous, narrowly ovate to elliptic (6–) 8–12 (–18) cm long, 2.5–4 (–6) cm wide; base attenuate or obtuse; apex mostly acuminate; lateral veins 8–10 per side. Racemes on young and older branches in the axils of present or fallen leaves, usually solitary, sometimes in two's; rachis 2.5–4 cm long (in fruiting state up to 7 cm), glabrous; bracts broadly ovate to triangular, apex obtuse or apiculate, base subcordate, 4 mm long, 5 mm wide. Flowers without bracteoles; pedicels 1.5–2 mm long; tepals 4, greenish yellow to whitish, c. 2 mm long; stamens white, filaments c. 2 mm; disc green, annular; ovary conical, c. 1 mm long. Drupe bright red, apiculate, 8–10 mm long, 6.5–8 mm wide; pedicel 2–4 (–7) mm long. Fig. 7.

S. Myanmar, Thailand (excl. Peninsular Thailand), NW. Laos, W. Cambodia, S. Vietnam. 41: CBD, LAO, MYA, THA, VI. In dry evergreen forest (in Thailand locally common), rarely in deciduous forest; often on limestone hills; from sea level up to 1000 m. Flowers Nov.–June, fruits Dec.–Aug. Map 12.

41. LAOS: Pak Lai, Xieng cong, *C.Thorel s. n.*, Me Kong Exped. 1866–68 (P). MYANMAR: Tavoy distr., Tenasserim river, *R.N.Parker 2419* (DD, K). THAILAND: Lampang, Mé Lawng, *W.P.Winit 1243* (BK, K); Chaibadan, Dong Paya Yen, *A.F.G.Kerr 7990* (BK, BM, K); Chantaburi, Khao Soi Dao, *R.Geesink & P.Hiepko 7915* (B, L); Nong Daeng, *C.Pengkhai 253* (BKF, C, K, L). VIETNAM: Annam. Da Nang (Tourane), *J. & M.Clemens 4325* (A, G, K, MICH, NY, UC, US); Ba Ran, *E.Poilane 9792* (E, L, P).

Leaves and/or fruits locally used for a medicine against intestinal parasites, in large amounts a deadly poison. Young shoots sometimes eaten instead of those of *Melientha suavis* with fatal results [P.Hiepko, *Willdenowia* 9: 32 (1979)]. For instance, in February 2005 in West Cambodia (Pailin Prov.) more than 60 people suffered poisoning after having eaten leaves of *Urobotrya siamensis* instead of *Melientha suavis* and 15 of them (mainly children) died (M. Tourdjman, pers. comm.).

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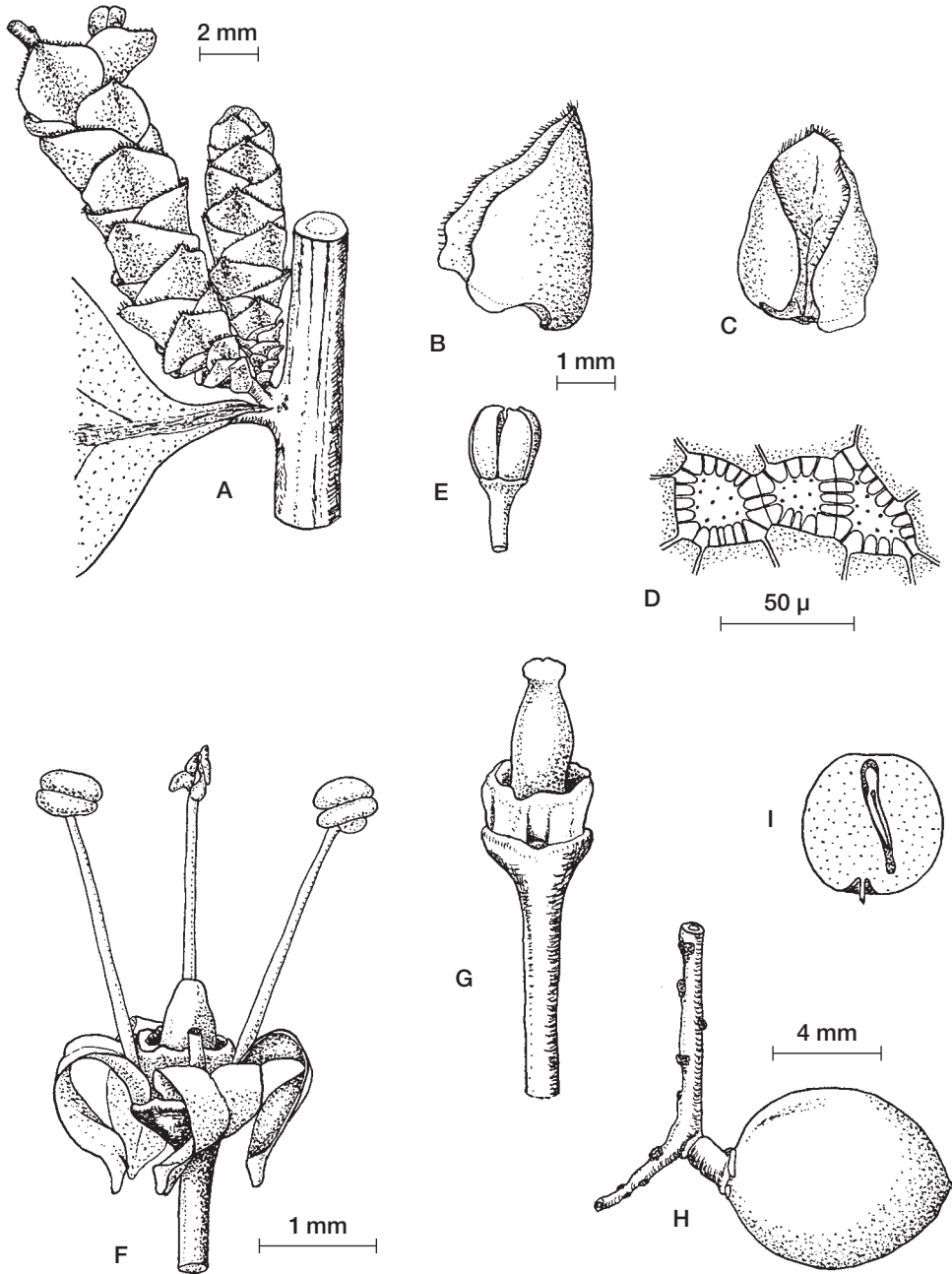


Figure 7. *Urobotrya siamensis*. **A**, two young inflorescences; **B**, bract, side view; **C**, bract, adaxial view; **D**, group of sclerenchymatic cells from a bract; **E**, flower-bud; **F**, flower, one stamen cut off; **G**, pistil with disc after flowering; **H**, drupe; **I**, LS of seed (**A-G**, *T.J.Sørensen, K.Larsen & B.Hansen 6625, K*; **H**, *A.F.G.Kerr 7990, K*; **I**, *D.J.Collins 1986, K*). Drawn by Paul Hiepko. Reproduced with permission from P.Hiepko, *Willdenowia* 9: 31, fig. 9 (1979).

6. *Urobotrya floresensis* Hiepko, *Willdenowia* 9: 32 (1979)

T: Lesser Sunda Is., Flores, *J.A.J.Verheijen* 3516; holo: L.

Illustration: P.Hiepko, *Willdenowia* 9: 33, fig. 10 (1979).

Map: P.Hiepko, *Willdenowia* 9: 36, fig. 12 (1979).

Small treelet; twigs puberulous. Leaves with petiole 1–2 mm long, lamina glabrous, only the midrib underneath with short hairs; ovate to elliptic, (5–) 8–12 cm long, (2–) 3–4.5 cm wide; base rounded to cuneate; apex shortly acuminate; lateral veins 7–8 per side. Racemes axillary, solitary; rachis 4.5–5.5 cm long, glabrous; bracts broadly ovate, apiculate, 2.5–3 mm long and wide. Flowers without bracteoles; pedicels 1.5 mm long; tepals 3, rarely 4, c. 1 mm long; stamens white, filament c. 1 mm long; disc cup-shaped, up to nearly half the length of the ovary; ovary cylindrical to conical, 0.7 mm long; stigma tripartite. Drupe 14–16 mm long, 7 mm wide; pedicel 3 mm long.

Lesser Sunda Is. (Flores). 42: LSI. Map 13.

42. LESSER SUNDA IS.: Flores, Tengku Dila, *J.A.J.Verheijen* 3131 (L); W. Flores, Manggarai, Kandang, *E.Schmutz* 4452 (L).

This species is distinguished by several characters, partly typical for different other species of the genus: puberulous twigs, relatively small flowers, and large fruits (like *U. parviflora*), glabrous and comparatively short rachis (like *U. siamensis*). A unique character of *U. floresensis* is the trimerous flower, not only with three tepals and stamens, but also showing a tripartite stigma.

7. *Urobotrya parviflora* Hiepko, *Willdenowia* 6: 474 (1972)

T: Borneo, Samarinda, Blajan river, Loa lempong, *Nedi* 738; holo: BO.

Illustration: P.Hiepko, *Willdenowia* 9: 35, fig. 11 (1979).

Map: P.Hiepko, *Willdenowia* 9: 36, fig. 12 (1979).

Shrub, 1–5 m tall; twigs puberulous. Leaves with petiole 1–3 (–5) mm long; lamina glabrous, but midrib pilose on both sides, elliptic to broadly ovate or lanceolate, (6–) 8–13 (–17) cm long, (1–) 2.5–5 (–7) cm wide; base rounded or cuneate; apex shortly acuminate; midrib prominent and rounded, lateral veins 6–8 per side. Racemes axillary, usually solitary, rarely in twos; rachis 8–12 cm long, densely puberulous; bracts broadly ovate, acuminate, 3–4 mm long, 4 mm wide, finely hairy on both sides. Flowers without bracteoles; pedicels 1–1.5 mm long; tepals (3–) 4 (–5), whitish, c. 1 mm long; stamens white, filaments c. 1 mm long; disc annular, low; ovary conical, c. 0.5 mm long. Drupe red, slightly apiculate, 13 mm long, 8.5 mm wide; pedicels up to 2.5 mm long.

Borneo (Brunei, Sabah, N. & NE. Kalimantan). 42: BOR. In primary and secondary evergreen forest from sea level up to 540 m. Flowers and fruits throughout the year. Map 14.

42. BORNEO: Brunei. Brunei Tembrong, en route from Kpg. Biang to Bt. Biang, *Hotta* 13313 (L). – Sabah. Keningau, SE of Nabawan, *Cockburn SAN* 66201(K); Elphinstone prov., near Tawao, *A.D.E.Elmer* 21795 (K, L, M, UC). – Kalimantan. Berau, Tdg. Redeb, Kelai river, near Long Lanuk, *A.J.G.H.Kostermans* 21069 (BO, K, L, NY, SING).

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5. GJELLERUPIA

Gjellerupia Lauterb., *Nova Guinea* 8: 817, t. 149 (1912)

Type: *Gjellerupia papuana* Lauterb.

Dioecious shrubs or small trees; twigs puberulous. Leaves glabrous, but midrib hairy above. Inflorescence an axillary raceme with 1–3 pedicellate flowers per bract; rachis slender, glabrous, rarely with some scattered hairs; bracts broadly cordate, green, with hyaline ciliate margin, densely imbricate, caducous, only some basal (smaller) bracts persistent. Male flowers (3–) 4 (–5)-merous; tepals free, oblong, acute, reflexed; stamens exceeding perianth; disc annular, fleshy; pistil rudimentary. Female flowers without perianth and stamens; disc annular, thinly fleshy; ovary ± conical; stigma sessile. Drupe pedicellate, almost globular.

One species endemic in New Guinea.

P.Hiepko, *Gjellerupia* in A revision of Opiliaceae I. Genera of the eastern Old World, excluding *Opilia*, *Willdenowia* 9: 36–38 (1979); P.Hiepko, *Gjellerupia* (in Opiliaceae), *Fl. Males. ser. I*, 10: 45–46 (1984).

This genus was placed by Sleumer [*Nat. Pflanzenfam.* 2nd edn, 16b: 40 (1935)] together with *Agonandra* in the tribe *Agonandreae* in his classification of *Opiliaceae*; however, *Urobotrya* is the genus most closely allied to *Gjellerupia*. The male flowers of *Gjellerupia* show a striking similarity with the flowers of, e.g., *U. siamensis* (see fig. 7F); furthermore the pollen type and the placentation of the ovule are the same in both genera [P.Hiepko, *Willdenowia* 9: 37 (1979)].

Gjellerupia papuana Lauterb., *Nova Guinea* 8: 817, t.149 (1912)

T: West New-Guinea: Biwak Hollandia (Humboldt-Bai), auf mit Urwald bedeckten Hügeln, *K. Gjellerup* 182; lecto: B, *vide* P.Hiepko, *Willdenowia* 9: 37 (1979); isolecto: BO, K, L, U.

Illustrations: P.Hiepko, *Willdenowia* 9: 37, fig. 13 (1979); P.Hiepko, *Fl. Males. ser. I*, 10: 45, fig. 12 (1984).

Map: P.Hiepko, *Willdenowia* 9: 39, fig. 14 (1979).

Shrub or small tree up to 6 m. Leaves with petiole 1–4 mm long; lamina ovate to narrowly lanceolate, 5–15 (–17) cm long, 1.5–4 (–5.5) cm wide; base attenuate to rounded; apex acute to acuminate; midrib prominent beneath; lateral veins 8–15 per side. Racemes axillary, usually solitary, rarely 2 or 3 together; rachis 1–2 cm (in fruiting state up to 2.5 cm); bracts 2–3 mm long, 2–3.5 mm wide. Male flowers 1–3 per bract; pedicels 1.5–4 mm; tepals 1.5–2 mm long; stamens 1.5–2.5 mm long; disc undulate; rudimentary pistil cylindrical, up to c.1 mm long, spindly. Female flowers 3 per bract; disc 0.5 mm long; ovary conical 1 mm long. Drupe red, 10–12 mm diam.; pedicel 5–7 mm long, often bent. Fig. 8.

Papua Jaya and Papua New Guinea. 42: NWG. Locally common as undergrowth in high evergreen forest, often an limestone ridges. Flowers and fruits throughout the year. Map 15.

42. NEW GUINEA: Papua Jaya. Geelvink Bay, Nabire, *R.Kanehira* & *S.Hatusima* 11547 (A, BO); Hollandia [Jayapura], *L.J.Brass* 8869 (A, BO, BRI, L). Papua New Guinea. Sepik distr., Aitape subdistr., along Bliri River between Kaiye and Karandu, *Darbyshire* & *R.D.Hoogland* 8232 (A, L).

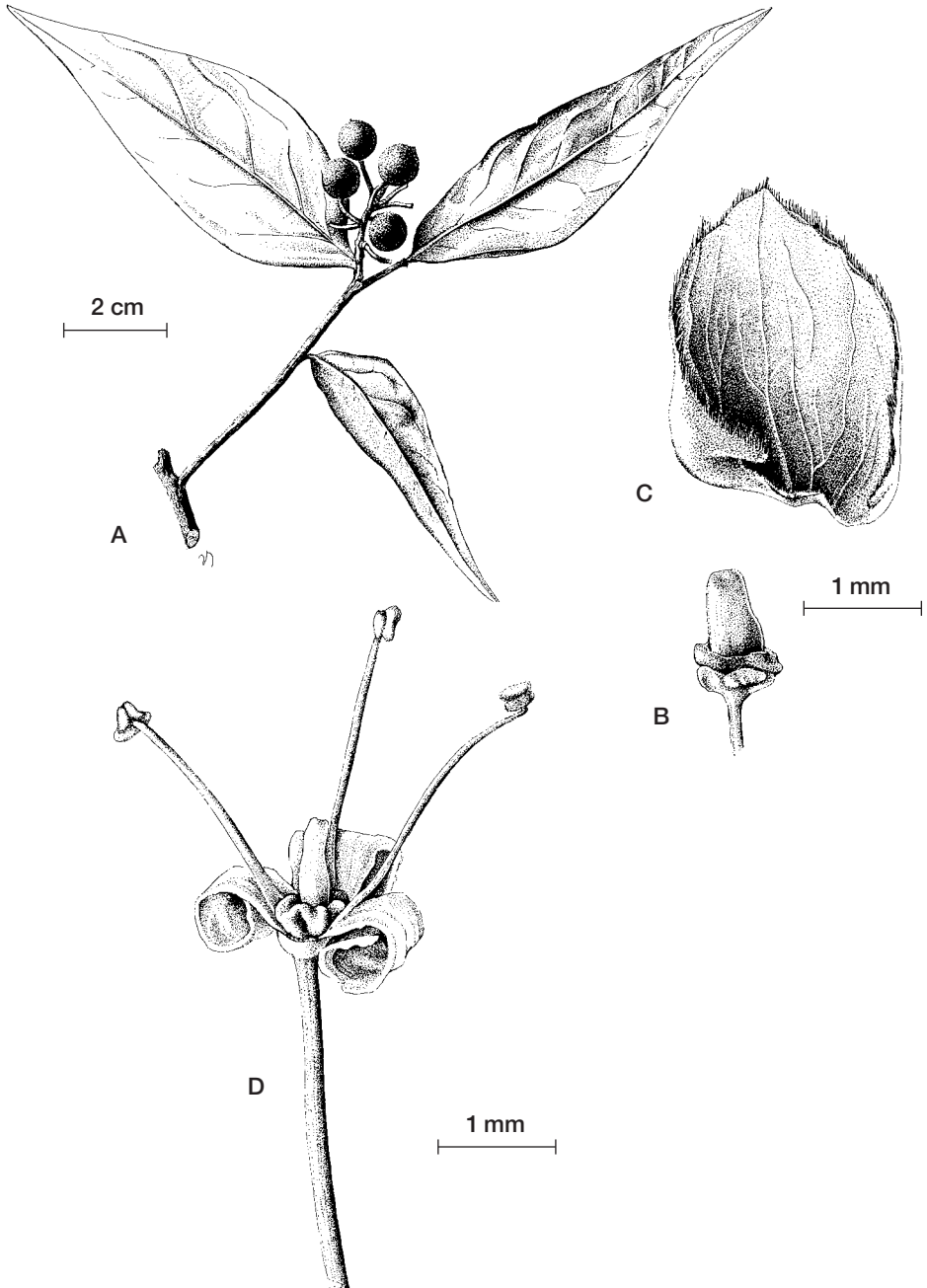


Figure 8. *Gjellerupia papuana*. **A**, twig with infructescence; **B**, female flower; **C**, bract from a male inflorescence; **D**, male flower, one tepal and one stamen removed (**A**, Darbyshire & R.D.Hoogland 8232, L; **B**, (K.Gjellerup 170, B; **C**, A.J.G.H.Kostermans & Soegeng 266, L; **D**, A.J.G.H.Kostermans & Soegeng 390, L). Drawn by Eva Dieckmann. Reproduced with permission from P.Hiepko, *Willdenowia* 9: 37, fig. 13 (1979).

OPILIACEAE

6. OPILIA

Opilia Roxb., *Pl. Coromandel* 2: 31, t.158 (1802)

Type: *Opilia amentacea* Roxb.

Grotia Guill. & Perr., in J.B.A.Guillemin et al., *Fl. Seneg. Tent.* 100, t. 22 (1831). T: *Grotia celtidifolia* Guill. & Perr.
Tetanosia Rich. ex M.Roem., *Fam. Nat. Syn. Monogr.* 1: 23 (1846). T: *Tetanosia olacioides* (Wight & Arn.) M.Roem.
[*Pentitidis* Zipp. ex Blume, *Mus. Bot.* 1: 246 (1851), nom. inval. (pro syn.)].

Bisexual woody climbers, erect shrubs or small trees; young branchlets glabrous or puberulous to tomentose. Leaves glabrous to pubescent or tomentose. Inflorescences short axillary racemes, conelike when young; rachis and pedicels usually densely covered with brownish hairs, rarely glabrous; bracts broadly ovate to orbicular, peltate, closely imbricate, caducous. Flowers solitary or in groups of 2 or 3 in the axil of one bract, sweet-scented; tepals free, (4 or) 5, recurved; stamens exceeding perianth; disk lobed, with (4 or) 5 thick, fleshy, often irregularly toothed lobes; ovary cylindrical to ellipsoid, stigma sessileentire. Drupe pedicellate, approximately ellipsoid, sometimes puberulous.

Two species (one comprising 3 varieties) in tropical Africa, one species extending to tropical Asia, the Solomon Isl., and N. Australia.

H.O.Sleumer, *Opilia* (incl. *Urobotrya*), in H.G.A.Engler & K.A.E.Prantl, *Nat. Pflanzenfam.* 2nd edn, 16b: 38 (1935); J.Louis & J.Leonard, *Fl. Congo Ruanda-Urundi* 1: 279. (1948) (s. lat.); J.Garcia in *Fl. Zambes.* 2: 336. 1963; G.Ll.Lucas in *Fl. Trop. E. Afr., Opiliaceae*: 1. 1968; J.-F.Villiers in *Fl. Cameroun* 15:168. 1973; in *Fl. Gabon* 20:168. 1973 (s. lat.); P.Hiepko, *Opiliaceae* II. *Opilia* Roxb., *Willdenowia* 12: 161–182 (1982); P.Hiepko, *Opilia* (in *Opiliaceae*), *Fl. Males. ser. I*, 10: 46–48 (1984); P.Hiepko, *Opilia* (in *Opiliaceae*), *Fl. Australia* 22: 26–29 (1984); P.Hiepko, *Opilia* (in *Opiliaceae*), *Fl. Thailand* 5(1): 101 (1987).

Evergreen climber (sometimes erect), leaves longer than 5 cm; rachis of flowering racemes at least 15 mm long **1. O. amentacea**

Deciduous shrub or small tree (sometimes scandent), leaves less than 5 cm long; rachis of flowering racemes mostly less than 10 mm long..... **2. O. campestris**

1. *Opilia amentacea* Roxb., *Pl. Coromandel* 2: 31, t.158 (1802)

T: [Illustration] t. 158 in W.Roxburgh, *Pl. Coromandel* 2 (1802); lecto (excl. fruit), *fide* P.Hiepko, *Willdenowia* 12: 163 (1982).

Grotia celtidifolia Guill. & Perr. in J.B.A.Guillemin et al., *Fl. Seneg. Tent.* 100, t. 22 (1831); *Opilia celtidifolia* (Guill. & Perr.) Endl. ex Walp., *Repert. Bot. Syst.* 1: 377 (1842); *Opilia senegalensis* Baill., *Adansonia* 2: 381, t.10 (1862) (nom. illeg., superfl.). T: Senegambie, *F.R.Leprieur s.n.*; lecto: P, *fide* P.Hiepko, *Willdenowia* 12: 163 (1982); isolecto: P.

Ximena olacioides Wight & Arn., *Prodr. Fl. Ind. Orient.*: 89 (1834); *Tetanosia olacioides* (Wight & Arn.) M.Roem., *Fam. Nat. Syn. Monogr.* 1: 23 (1846). T: s. loc., *Herb. Wight 962*; lecto: K, *fide* P.Hiepko, *Willdenowia* 12: 163 (1982); isolecto: E, G.

Opilia pentitidis Blume, *Mus. Bot.* 1: 246 (1851); *Pentitidis scandens* Zipp. ex Blume, *Mus. Bot.* 1: 245 (pro syn.). T: Nova Guinea, *A.Zippellius s.n.*; lecto: L, *fide* P.Hiepko, *Willdenowia* 12: 163 (1982); isolecto: B, C, MEL, P, S, U.

Opilia javanica Miq., *Fl. Ned. Ind.* 1, 1: 784 (1856). T: Java, *Herb. Horsfield s.n.*; holo: K, iso: CAL, GH, MEL, U.

Opilia amentacea var. *tomentella* Oliv., *Fl. Trop. Afr.* 1: 352 (1868); *Opilia tomentella* (Oliv.) Engl. in *Pflanzenw. Ost-Afrikas* C:168 (1895); *Opilia celtidifolia* var. *tomentella* (Oliv.) G.Ll.Lucas, *Kew Bull.* 21: 242 (1967). T: Mozambique, 'Livingston's Zambesi Exped.', *J.Kirk s.n.*, a.1860; holo: K.

Opilia thorelii Gagnep., *Notul. Syst. (Paris)* 1: 206 (1910). T: Cambodia, Compong Soai, *F.J.Harmand 358*; lecto: A, *fide* P.Hiepko, *Willdenowia* 12: 163 (1982); isolecto: K.

Opilia fragrans Elmer, *Leaflet Philipp. Bot.* 5: 1824 (1912). T: Philippines, Palawan, Brooks Point, *A.D.E.Elmer12691*; lecto: NY, *fide* P.Hiepko, *Willdenowia* 12: 163 (1982); isolecto: B, BISH, BO, E, G, K, MO, U, US, Z.

Opilia angiensis De Wild., *Rev. Zool. Bot. Africaines* 10, Suppl. Bot.: 13 (1922). T: Zaire, Kivu Province, Angi, J.C.C.Bequaert 5829; holotype: BR.

Opilia ruwenzoriensis De Wild., *Rev. Zool. Bot. Africaines* 10, Suppl. Bot.: 12 (1922). T: Zaire, Ruwenzori, Butagu, J.C.C.Bequaert 3840; holotype: BR.

Opilia celtidifolia var. *sphaerocarpa* Chiov., *Webbia* 8: 231 (1951). T: Ethiopia, El Dire al Campo base, R.Corradi 8425; lectotype: FI, *vide* P.Hiepko, *Willdenowia* 12: 164 (1982).

Illustrations: P.Hiepko, *Willdenowia* 12: 165, fig. 1; 166, fig. 2 (1982); P.Hiepko, *Fl. Australia* 22: 26, fig. 7D–G (1984).

Maps: P.Hiepko, *Willdenowia* 12: 167, fig. 3; 168, fig. 4 (1982); P.Hiepko, *Fl. Males. ser. I*, 10: 47, fig. 13, Asia only (1984).

Woody climber up to 15 m (rarely up to 30 m), sometimes erect shrub or small tree; young branches glabrous or puberulous to tomentellous, hairs mostly branched; bark smooth or fissured, pale to dark grey or brown; with corky, longitudinal lenticels. Leaves with petiole 2–7 (–10) mm long; lamina glabrous or more or less tomentellous, lanceolate to ovate or elliptic, 5–12 (–16) cm long, (1.5–) 2–5 (–6.5) cm wide; base attenuate to more or less rounded; apex acute or shortly acuminate to obtuse; midrib and veins prominent on both sides, more prominent beneath; lateral veins (4–) 7–9 (–11) per side. Racemes 1–5 (–20) per leaf axil, rachis pubescent, 1.5– (–5.5) cm long when flowering; bracts 2–3 mm diam., ciliate, slightly pubescent outside. Flowers usually 3 per bract; pedicels more or less pubescent, 1.5–2 mm long; tepals cream to yellowish-green, often shortly pubescent outside, oblong with a short inflexed top, 1.5–2 mm long; stamens as long as the tepals; filaments filiform; disc lobes subclavate to broadly obovoid, green, c. 0.7 mm long; ovary c. 1.3 mm long. Drupe orange-yellow, 15–39 (–40) mm long, 13–18 mm wide; pedicels mostly thickened upwards, 5–7 (–10) mm long. $2n = 20$, S.Mangenot & G.Mangenot, *Bull. Jard. Bot. Etat* 28: 323 (1958) (as *Opilia celtidifolia*). Fig. 9.

Tropics of the Old World, from Senegal through W., Central, and E. Africa southwards to Mozambique and S. Madagascar; from India and Sri Lanka through Myanmar, Thailand, Indochina, and Malesia to the Solomon Islands and N. Australia. 22: BEN, BKN, GAM, GHA, GNB, GUI, IVO, MLI, NGA, SEN, SIE, TOG. 23: BUR, CAR, CMN, GAB, RWA, ZAI. 24: CHA, ETH, SUD. 25: KEN, TAN, UGA. 26: ANG, MLW, MOZ, ZAM, ZIM. 29: MDG. 36: CHC. 40: IND, SRL. 41: CBD, LAO, MYA, THA, VIE. 42: BIS, BOR, JAW, LSI, MOL, PHI, SUL. 43: NWG, SOL. 50: NTA, QLD, WAU. Habitat ranging widely from coastal bushland through savannah and open dry forest to secondary forest and light rain-forest; often in riverine forest. In E. Africa frequently on ant hills. From sea level up to 1050 m (in Burma), in E. Africa up to 1800 rarely 2400 m. Flowers and fruits in many parts of the range more or less throughout the year; in W. Africa flowers Oct.–Apr., fruits Jan.–July; in SE. Africa flowers July–Dec., fruits Oct.–Feb. Map 16.

Form, size, and texture of the leaves vary considerably as well as the indumentum of branches and leaves. These are all grading characters and it is impossible to find sharp boundaries for the definition of infraspecific taxa. The name *Opilia celtidifolia* was used in all African floras published during the last two decades despite of the fact that several authors did not see any characters to distinguish between specimens from Asia and from Africa, e.g., D.Oliver in *Fl. Trop. Afr.* 1: 352 (1868): “I find no sufficient ground to maintain the African species as distinct.”

P.Hiepko, *Willdenowia* 12: 166–169 (1982) distinguished 4 informal groups, which occur predominantly in separate parts of the range, but are connected through many intermediate forms:

Group a (*'amentacea'*): In India and Sri Lanka young branches and petioles are puberulous; this indumentum is gradually reduced in the range east of India. Specimens from Malesia are usually glabrous, in Australia some specimens show the same indumentum as plants from India.

Group b (*'celtidifolia'*): Young branches and leaves are usually glabrous (as in Malesia); leaf apex mostly acute or acuminate, rarely obtuse. From E. Africa southwards, twigs and leaves becoming more and more tomentellous, gradually changing into group c.

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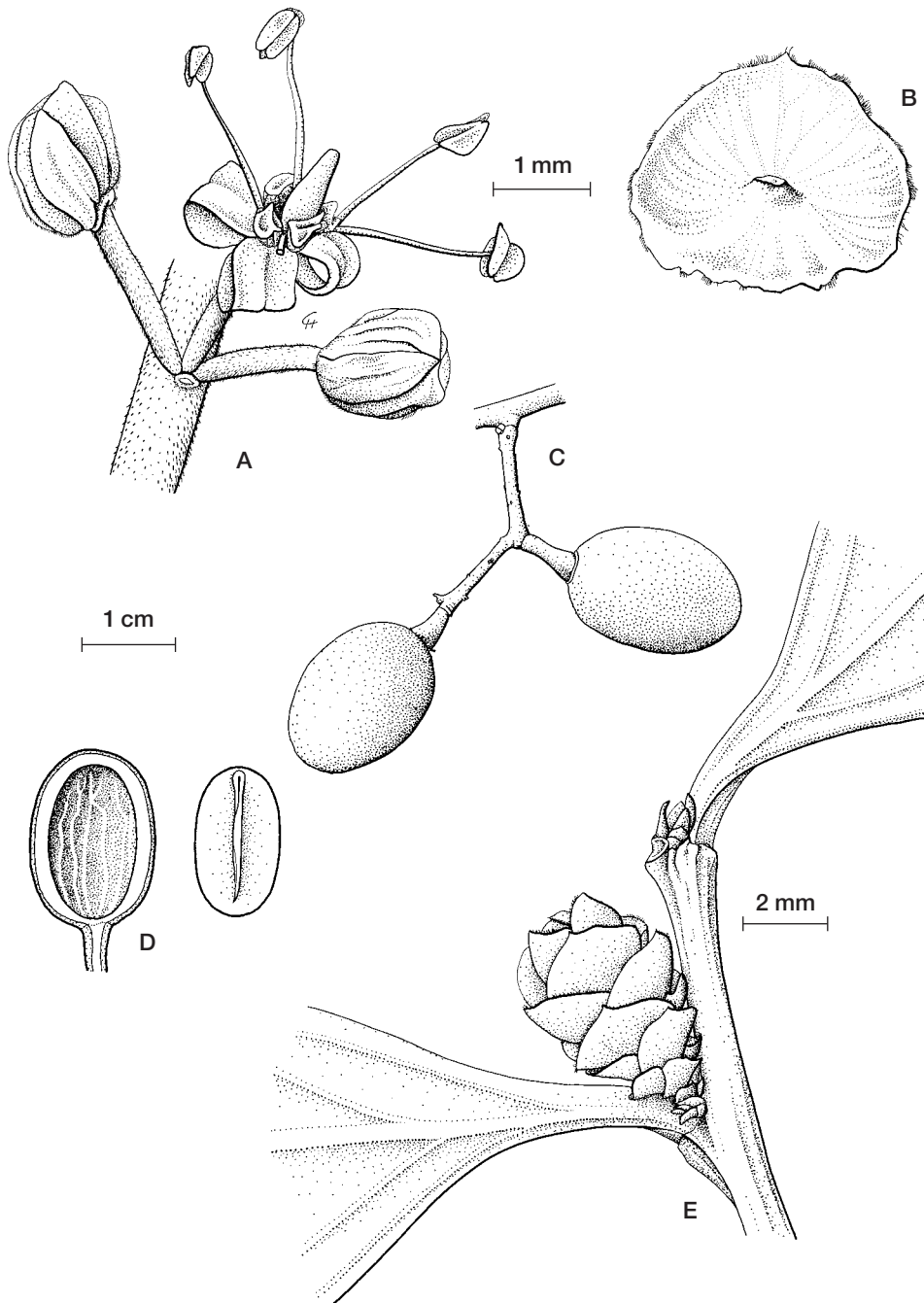


Figure 9. *Opilia amentacea*. **A**, group of 3 flowers in the axil of a fallen bract, one stamen of the open central flower cut off; **B**, peltate bract, adaxial view; **C**, infructescence with two drupes; **D**, left: drupe cut in half, seed removed; right: seed, cut in half; **E**, twig with young inflorescence (**A-B**, *FHI 23979*, B; **C-D**, *O. Warnecke 307*, B, alc.; **E**, *A.F. Stolz 1512*, B). Drawn by Christine Hillmann-Huber. Reproduced with permission from P. Hiepko, *Willdenowia* 12: 166, fig. 2 (1982).

Group c (*'tomentella'*): Young branches more or less tomentellous, leaf-apex more often obtuse.

Group d: This group is characterized by relatively stout inflorescences with brownish hairs on rachis and pedicels. The branches are mostly glabrous, the leaves more consistently lanceolate and coriaceous, but there are also transitional forms to group b (e.g., in the Central African Republic, Nigeria, and Ghana) or, rarely, to group c.

The juicy mesocarp of the fruit is edible, but it is rarely reported that the fruits are eaten by people: N. Australia and Sudan. Some collectors mention on the labels that the fruits are eaten by chimpanzees (The Gambia) or baboons (Kenya). In N. Nigeria a decoction of the leaves and roots is used as a medicine for domestic animals. In Ivory Coast the root decoction is drunk for worms, and in Tanzania it is used for headache and for fever. In Cameroon stem and leaves are used as fish-poison [P.Hiepko, *Willdenowia* 12: 164 (1982); H.M.Burkill, *The useful plants of West Tropical Africa*, vol. 4: 308–309 (1997)].

22. SENEGAL: Sangalkam, *J.Berhaut 2373* (BR, P, Z). IVORY COAST: Tehini, Bouna Nat. Park, *R.A.A.Oldeman 918* (B, MO, WAG, Z). **23.** CAMEROON: c. 20 km N of Obala, bank of Sanaga River, *W.J.J.O.de Wilde c. s. 2668* (B, K, MO, WAG, Z). ZAIRE: Dist. Kivu Nord, N of Lac Kivu, between Goma and Sake, c.1500 m, *H.U.Stauffer 96* (K, UPS, WAG, Z). **24.** ETHIOPIA: Fazokel, Tumad, *K.G.T.Koitschy 471* (BM, FI, GOET, M, MEL, MO, P, Z). **25.** TANZANIA: Kymbila dist., N of Lake Nyasa, *A.F.Stolz 1500* (C, K, MO, P, S, UPS, Z). **40.** SRI LANKA: Hambantota distr., Ruhuna Nat. Park, Block N, *Wirawan 708* (L, K, NY, US). **41.** THAILAND: Northern. Nan, Hue Kua, *A.F.G.Kerr 5024* (AAU, ABD, BK, K). **42.** PHILIPPINES: Luzon: Bataan prov., Lamao River, Mt. Mariveles, *FB 2315* (BO, K, NY, SING, US). **50.** AUSTRALIA: N. Territory, Arnhem Land, Oenpelli, *R.Specht 1088* (A, BRI, CANB, K, MEL, US).

2. *Opilia campestris* Engl., *Bot. Jahrb. Syst.* 43: 173 (1909)

T: Tanzania, am Fuß des Uguenogebirges zwischen Sadani und Kwagogo, *A.Engler1655*; lecto: B, *vide* P.Hiepko, *Willdenowia* 12: 174 (1982).

Deciduous shrub or small tree, sometimes, scandent, up to 5 m high, often with short leafless, spiny branches; young branches mostly puberulous; bark grey-brown to blackish. Leaves with petiole 1–2 (–4) mm long; lamina puberulous to tomentose when young, partly glabrous when mature, elliptic to broadly ovate or narrowly obovate, 10–50 mm long, 6–30 (–50) mm wide; base cuneate to attenuate; apex broadly acute to obtuse or retuse. Racemes solitary or clustered on short younger branches, rachis 3–8 (–12) mm long, pubescent, rarely glabrous; bracts 2 mm diam., ciliate, almost glabrous outside. Flowers 1, 2, or 3 per bract; pedicels 1.5–4 mm long; flowers like that of *O. amentacea*, but disc lobes shorter and obovoid, tepals less caducous and glabrous outside. Drupe whitish-green or purplish, slightly beaked when young, shortly tomentose, up to 10 mm (rarely 15 mm) long; pedicels thickened upwards, 5–10 mm long.

Ethiopia, NW. Somalia, Kenya, and Tanzania, also Angola and Namibia.

- 1** Rachis of inflorescence 3–4 mm, glabrous, pedicels glabrous..... **2b. var. glabra**
1: Rachis mostly longer than 4 mm, pubescent; pedicels mostly pubescent
2 Leaves broadly ovate to elliptic, (15–) 20–50 mm long, 10–30 (–50) mm wide, apex acute to obtuse; flowers inserted singly or in groups of 2 or 3 **2a. var. campestris**
2: Leaves narrowly obovate to elliptic, 10–25 (–35) mm long, 6–15 mm wide, apex obtuse or retuse; flowers solitary **2c. var. strobilifera**

2a. *Opilia campestris* Engl. var. *campestris*

Opilia angolensis Exell & Mendonça, *Bol. Soc. Brot.* ser. 2, 25: 110 (1951). T: Angola, Dist. Bumbo, ad basim de Serra da Xella [Chela], *F.M.J.Welwitsch 468*; holo: LISU holo, n.v.; iso: BM.

Illustrations: G.L.Lucas, *Fl. Trop. E. Afr., Opiliaceae*: 4, fig. 1 (1968); P.Hiepko, *Willdenowia* 12: 175, fig. 5C–E (1982).

Map: P.Hiepko, *Willdenowia* 12: 177, fig. 6 (1982).

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Shrub or small tree, up to 5 m high, sometimes scandent, young branches puberulous. Leaves with petiole 2 (–4) mm long; lamina broadly ovate to elliptic, (15–) 20–50 mm long, 10–30 (–50) mm wide; base shortly cuneate; apex acute to obtuse; midrib and veins slightly prominent on both sides, often more prominent above; lateral veins (2–) 4–5 (–6) per side. Rachis of raceme 5–8 (–12) mm long, pubescent, pedicels mostly pubescent. Flowers in groups of 2 or 3, or solitary. Fig. 10 C–E.

S. Ethiopia, Kenya, and Tanzania, also Angola and Namibia. 24: ETH. 25: KEN, TAN. 26: ANG. 27: NAM. Open deciduous bushland or dense scrub (Namibia), in E. Africa often growing on termite mounds; up to 1450 m alt. Flowers Oct.–Dec. (–March), appearing 2–3 days after first rain; fruits (Oct.–) Nov.–Mar. Map 17

24. ETHIOPIA: Galla e Sidama, ad Ueb Ruspoli, *D.Riva 753 (Coll. Ruspoli 831)* (B, FI). 25. KENYA: Galole-Garissa road, *J.B. Gillett 16502* (FI, UPS, WAG). TANZANIA: Masai Distr., 26 km W of Naberera, c. 1450 m, *H.Leippert 5365* (K); Ugogo, kleiner Felsberg bei Gulwe, 850 m, *A.Peter 32923* (B). 26. ANGOLA: Dist. Cuanza Norte, *J.Gossweiler 9197* (BR, COI, K). 27. NAMIBIA: Kaokoveld, N of Ohopoho, *B. de Winter & O.A.Leistner 5270* (B, K, M).

The fruits are edible (sweet juicy mesocarp) and in Namibia much liked by Herero. In Kenya the shrubs are browsed by camels [P.Hiepko, *Willdenowia* 12: 176 (1982)].

2b. *Opilia campestris* var. *glabra* Hiepko, *Willdenowia* 12: 176 (1982)

T: Angola, Moçamedes, Lola, *Henriques & M.Moreno 70*; holo: COI; iso: BM.

Map: P.Hiepko, *Willdenowia* 12: 177, fig. 6 (1982).

Small tree up to 3 m, young branches glabrous. Leaves with petiole 2 mm long; lamina elliptic to ovate, 50 mm long, 22 mm wide, glabrous. Racemes usually solitary, rachis 3–4 mm long, glabrous. Flowers solitary, otherwise like that of var. *campestris*; pedicels 4 mm long, glabrous. Fruit not seen.

Angola (only type collection, locality see above). 26: ANG. Map 18.

This variety differs from the other two in its glabrous inflorescences. The rachis and pedicels in var. *campestris* and var. *strobilifera* are pubescent.

2c. *Opilia campestris* var. *strobilifera* (Hutch. & E.A.Bruce) Hiepko, *Willdenowia* 12: 176 (1982)

Opilia strobilifera Hutch. & E.A.Bruce, *Kew Bull.* 1941: 126 (1941). T: Somaliland, Daba Bur, *J.B. Gillett 4636*; holo: K.

Illustration: P.Hiepko, *Willdenowia* 12: 175, fig. 5A & B (1982).

Map: P.Hiepko, *Willdenowia* 12: 177, fig. 6 (1982).

Shrub or small tree, up to 3 m, young branches puberulous; bark pale to dark grey. Leaves with petiole 1 mm long; lamina shortly pubescent, pale bluish-green, narrowly obovate to elliptic, 10–25 (–35) mm long, 6–15 mm wide; base attenuate; apex obtuse or retuse, sometimes mucronulate; midrib and veins often hardly or not visible above, better visible beneath, veins 1–3 (–4) per side. Rachis of raceme 4–6 mm long, pubescent. Flowers solitary, like that of var. *campestris*; pedicels c. 2 mm long, pubescent. Fruits not seen. Fig. 10 A & B.

Ethiopia (Harar prov.) and NW Somalia. 24: ETH, SOM. In mixed open bush and *Acacia* woodland; 1080–1500 m alt. Flowers Sept.–Mar. Map 19.

24. ETHIOPIA. Harar prov.: Erer river area, 60 km W of Dire Dawa, c. 1100 m, *W.Burger 3385* (B, FI, K, S). SOMALIA: El Dab, E of Ainabo, *Hemming 148* (K).

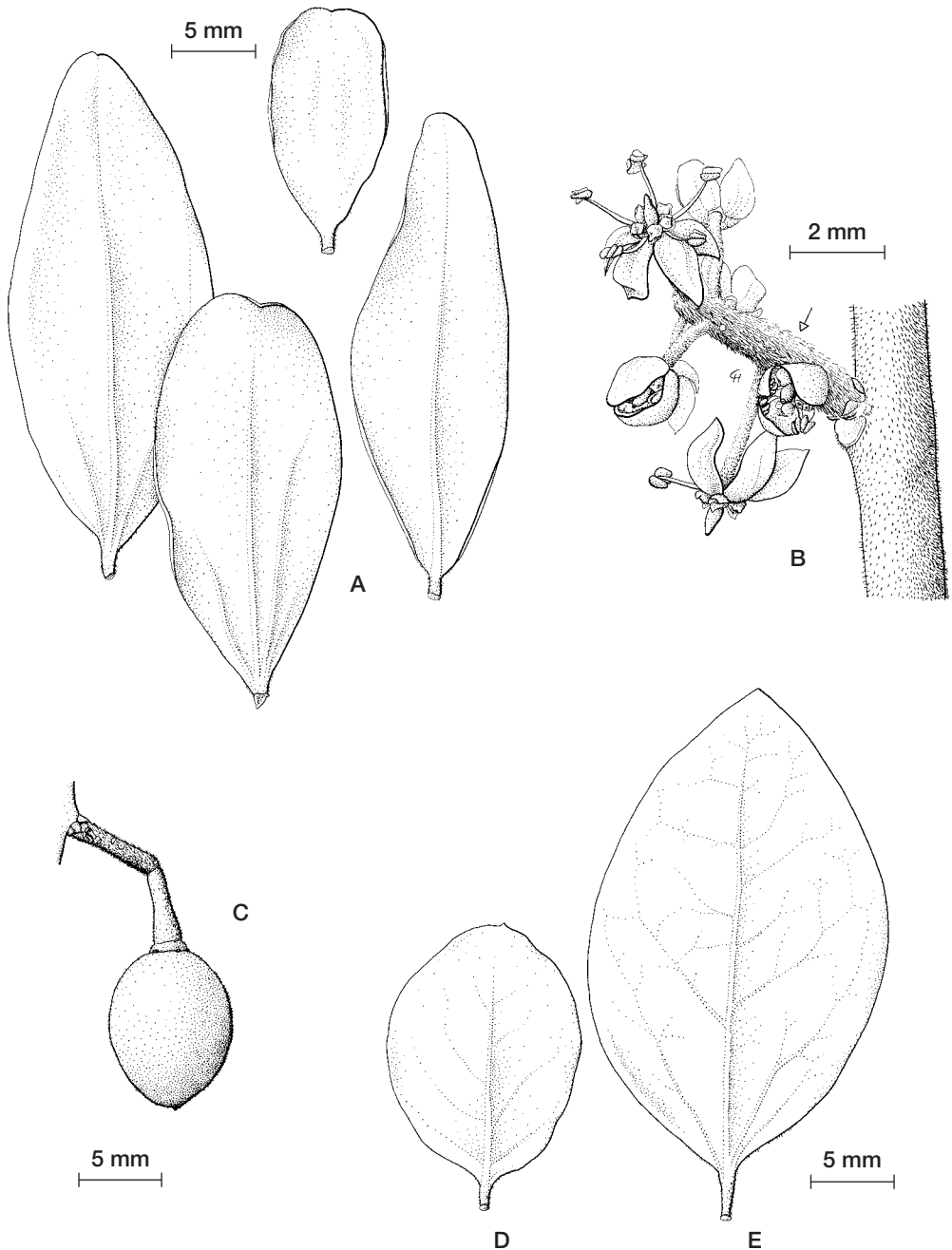


Figure 10. *Opilia campestris* var. *strobilifera*. **A**, leaves; **B**, inflorescence, one flower removed (arrow), stamens partly fallen off. – *Opilia campestris* var. *campestris*. **C**, infructescence with one drupe; **D-E**, leaves (**A**, Hemming 2279, K; **B**, W.Burger 2494, K; **C**, J.B.Gillett 16502, WAG; **D**, A.Engler 1625, B; **E**, J.B.Gillett 12657, B). Drawn by Christine Hillmann-Huber. Reproduced with permission from P.Hiepko, *Willdenowia* 12: 175, fig. 5 (1982).

OPILIACEAE

Excluded names

Opilia mildbraedii Engl., *Bot. Jahrb. Syst.* 54: 291 (1917) = *Thecacoris lucida* Hutch. (Euphorbiaceae) [cf. G.Ll.Lucas in *Fl. Trop. E. Afr.*, Opiliaceae: 1 (1968)].

Opilia obovata Peter, *Repert. Spec. Nov. Regni Veg. Beih.* 40, 2 Anhang: 12, t. 17, 3 (1932) = *Embelia* sp. (Myrsinaceae) [cf. H.O.Sleumer in H.G.A.Engler & K.A.E.Prantl, *Nat. Pflanzenfam.* 2nd edn, 16b, Nachtr.: 339 (1935)].

Opilia odorata Spreng., *Syst. Veg.*, 16th edn, 1: 766 (1825) = *Aglaia odorata* Lour. (Meliaceae).

Opilia odoratissima Zipp. ex Miq., *Ann. Mus. Lugd.-Bat.* 4: 43 (1869), pro syn. = *Aglaia odoratissima* Blume (Meliaceae).

7. PENTARHOPALOPILIA

Pentarhopalopilia (Engl.) Hiepko, *Bot. Jahrb. Syst.* 108: 280 (1987)

Rhopalopilia sect. *Pentarhopalopilia* Engl., *Bot. Jahrb. Syst.* 43: 175 (1909). T: *Pentarhopaloplia umbellulata* (Baill.) Hiepko

Bisexual woody climbers or erect shrubs, young branchlets glabrous, pilose or puberulous. Leaves glabrous or partly hairy. Flowers pedicellate, hypogynous, 5-merous, in umbellate or subumbellate axillary inflorescences, one flower per bract, bracts and bracteoles ovate to lanceolate, usually caducous before anthesis. Receptacle flat. Tepals free, with a short inflexed top, reflexed, caducous. Stamens free or attached basally to tepals, exceeding perianth; filaments filiform. Disc-lobes 5, fleshy, often irregularly toothed, alternating with stamens. Ovary superior, stigma sessile, entire or shallowly lobed. Drupe ellipsoid or subglobose.

Four species, 2 in western and southern Central Africa and at the coast of E. Africa, 2 in Madagascar.

H.G.A.Engler, *Opiliaceae africanae*, *Bot. Jahrb. Syst.* 43: 175–177, as *Rhopalopilia* sect. *Pentarhopalopilia* (1909); J.G.Garcia, *Fl. Zambes.* 2: 338, as *Rhopalopilia* (1963); G.Ll.Lucas, *Fl. Trop. E. Afr.*, *Opiliaceae*: 5–6, as *Rhopalopilia* (1968); P.Hiepko, A revision of Opiliaceae IV. *Rhopalopilia* Pierre and *Pentarhopalopilia* (Engler) Hiepko gen. nov., *Bot. Jahrb. Syst.* 108: 280–288 (1987).

- 1 More or less climbing shrubs or woody climbers; twigs glabrous or ± pilose to pubescent; rachis of inflorescence puberulous or pilose, flowers puberulous or glabrous; leaves usually longer than 20 mm
- 2 Twigs and leaves glabrous, rachis of inflorescence puberulous, 10–20 (–30) mm long **1. P. umbellulata**
- 2: Twigs pilose or pubescent, leaves glabrous or glabrescent, rachis of inflorescence puberulous or ± pilose, usually less than 14 mm long
- 3 Twigs ± pilose, hairs curved downwards; petiole and midrib of leaves hairy on both sides; rachis of inflorescence usually 7–14 mm long, puberulous; flowers puberulous; fruits ellipsoid to obovoid, puberulous **2. P. marquesii**
- 3: Twigs ± pubescent, hairs curved upwards; leaves glabrous, adaxial side of petiole hairy only; rachis of inflorescence up to 4 mm long, ± pilose, flowers glabrous; fruit subglobose, glabrous **3. P. madagascariensis**
- 1: Erect, much branched shrub up to 4 m tall; twigs, rachis of inflorescence and flowers densely puberulous; leaves rarely longer than 20 mm (8–25 mm long) **4. P. perrieri**

1. *Pentarrhopalopilium umbellulata* (Baill.) Hiepko, *Bot. Jahrb. Syst.* 108: 281 (1987)

Opilia umbellulata Baill., *Adansonia* 8: 199 (1868); *Rhopalopilium umbellulata* (Baill.) Engl., *Bot. Jahrb. Syst.* 43: 175 (1909). T: Zanzibar, *L.H.Boivin s.n.*, Aug. 1847; holo & iso: P.

Opilia sadebeckii Engl., *Notizbl. Königl. Bot. Gart. Berlin* 2: 282 (1899). T: Tanzania, Pangani, *F.Stuhlmann 659*; syn: B; Zanzibar, *F.Stuhlmann 661*; syn: B.

Illustration: G.L.Lucas, *Fl. Trop. E. Afr., Opiliaceae*: 6, fig. 2, as *Rhopalopilium umbellulata* (1968); P.Hiepko, *Bot. Jahrb. Syst.* 108: 281, fig. 4F & G (1987).

Map: P.Hiepko, *Bot. Jahrb. Syst.* 108: 286, fig. 6 (1987).

Woody climber, climbing up to 10 m, rarely ± erect shrub; twigs glabrous. Leaves with petiole 1–2 (–3) mm, glabrous; lamina glabrous, ovate to elliptic or lanceolate, (3–) 4–8 (–10) cm long, 1.5–4 (–5) cm wide; base cuneate to ± rounded; apex long acuminate, acute, obtuse or emarginate, often mucronulate; midrib prominent on both sides of the lamina, more prominent beneath, lateral veins 4–6 per side. Inflorescence subumbellate, puberulous, 1–2 (–4) per axil, rachis of inflorescence 10–20 (–30) mm long, flower-bearing part of the inflorescence club-shaped, with c. 20 flowers; bracts and bracteoles ovate, up to 1 mm long, hairy. Flowers sweet-scented, puberulous outside; pedicels 1.5–5 mm, puberulous; tepals oblong, 1–1.5 mm long; stamens 1.5–2 mm long; disc lobes broad, c. 0.5 by 0.5 mm, irregularly (mostly 3-) toothed. Ovary concial, c. 1 mm long, stigma truncate, later shallowly lobed. Drupe yellowish orange, subglobose, apiculate, glabrous, 7–10 mm diam. Fig. 11 F & G.

Coastal area of Kenia, Tanzania, Zanzibar and Mozambique. 25: KEN, TAN. 26: MOZ. Heliophilous woody climber in coastal bushland or dry evergreen forest; locally common. Flowers and fruits throughout the year. Map 20.

25. KENYA: Kilifi Dist., Mida, *R.M.Graham A319 = F.D. 1830* (EA, FI, K, S); Kwale Dist., 17 km S of Mombasa, c. 0.5 km from coast, *P.Hiepko et al. 2634* (B, EA). TANZANIA: Tanga Dist., Sawa, *H.G.Faulkner 1919* (B, EA, K, S); Pangani Dist., Msubugwe Forest Res., *S.R.Semsei 2250* (B, EA, FHO, K); Usaramo, between Daressalam and Mbagara Lake, *A.Peter 44919* (B). ZANZIBAR: near Chukwani, *H.G.Faulkner 2390* (B, EA, K, S). 26. MOZAMBIQUE: Cabo Delgado, Tungue, between Palma and Cabo Delgado, *L.A.G.Barbosa 2160* (COI, EA, G, K).

The climbing adult form of the species shows an interesting feature in its architecture. At the base of the main climbing axis (diam. c. 1.5 cm) two whorls of initially leafless (stoloniferous) branches develop just above the soil and creep for a ± long distance before they find support for climbing [P.Hiepko, *Bot. Jahrb. Syst.* 108: 282, fig. 5 (1987)].

2. *Pentarrhopalopilium marquesii* (Engl.) Hiepko, *Bot. Jahrb. Syst.* 108: 284 (1987)

Rhopalopilium marquesii (Engl.) Engl., *Bot. Jahrb. Syst.* 43: 176 (1909); *Opilia umbellulata* var. *marquesii* Engl., *Notizbl. Königl. Bot. Gart. Berlin* 2: 282 (1899). T: Angola, in convallibus humidis fl. Cuangi, *S.Marques 183*; holo (COI).

Rhopalopilium soyauxii Engl., *Bot. Jahrb. Syst.* 43: 176 (1909). T: Angola [Cabinda], Chinchoxo, forest N of Tonde near Isalowe, *H.Soyaux 161*; holo & iso: B; iso: C, K, M.

Rhopalopilium verdickii De Wild., *Pl. Bequaert.* 5: 475 (1932) ('Verdicki'). T: Zaire, Haut Katanga, Lukafu, *C.Verdick 617*; holo: BR.

Illustrations: H.G.A.Engler, *Bot. Jahrb. Syst.* 43: 174, fig. 1B & C, as *Rhopalopilium Marquesii* (1909); J.F.Villiers, *Fl. Cameroun* 15: 178, pl. 39, 11–18, as *Rhopalopilium marquesii* (1973); P.Hiepko, *Bot. Jahrb. Syst.* 108: 281, fig. 4 A–C (1987).

Map: P.Hiepko, *Bot. Jahrb. Syst.* 108: 286, fig. 6 (1987).

Woody climber, up to 5 m, rarely ± erect shrub; twigs ± pilose. Leaves with petiole 1–2 (–3) mm, densely pilose; lamina glabrescent, midrib and secondary veins usually hairy beneath; lanceolate or ovate lanceolate, 2–7 (–9) cm long, 2–3.5 cm wide; base rounded or subcordate, rarely cuneate; apex acute or subacuminate; midrib prominent on both sides, more prominent beneath, lateral veins 3–7 per side. Inflorescence umbellate, puberulous, solitary, rarely 2 per axil, rachis of inflorescence 7–14 (–25) mm, flower bearing part of the rachis ± globular, with up to 27 flowers; bracts and bracteoles ovate, up to 1 mm long, hairy. Flowers puberulous;

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pedicels 1–3.5 mm, puberulous; tepals oblong, 1–1.5 mm long, ± reflexed, puberulous outside; stamens 1.5–2 mm long; disc lobes broadly ovate to triangular, c. 0.5 mm long, often irregularly toothed. Ovary conical, c. 1 mm long, stigma truncate, later shallowly lobed. Drupe pale orange, ellipsoid to obovoid, puberulous, up to 12 mm long, 8 mm wide. Fig. 11 A–C.

Dryer parts of western and southern Central Africa. 23: CON, ZAI. 26: ANG, ZAM. In thickets, riverine forest and forest. Flowers June–Nov.; fruits Aug.–Jan. Map 21.

23. CONGO: Region Sud de Pointe Noire, entre Djeno et la frontière du Cabinda, *C.Farron 4766* (P). ZAIRE: route Boma Banana, *J.Wagemans 1564* (BR, K). 26. ANGOLA: Lower Congo, Santo Antonio do Zaire, *J.Gossweiler 8547* (B, BM, BR, US). ZAMBIA: Mwinilunga Dist., Zambesi R., *F.White 3314* (BM, FHO, K, MO).

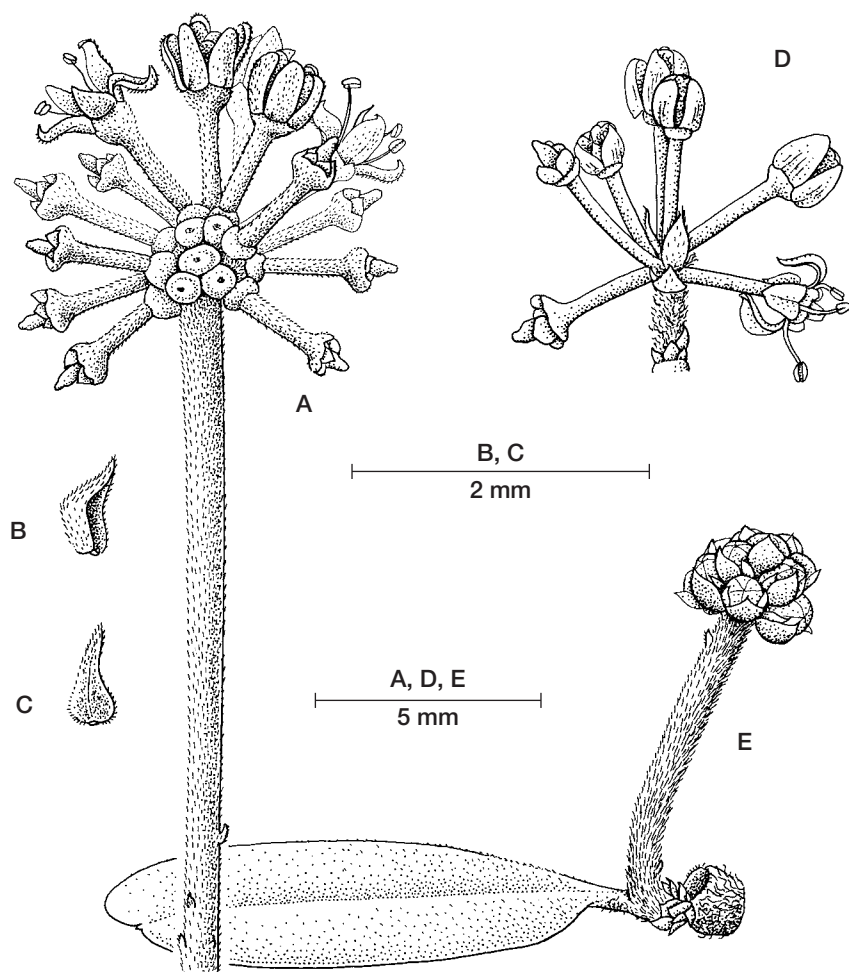


Figure 11. *Pentarhopalopilia*. A–C, *P. marquesii*: A, inflorescence, some flowers removed; B, bract, side view; C, bracteole, abaxial view; D, *P. madagascariensis*: inflorescence with persistent bracts; E, *P. perrieri*: young inflorescence on a short shoot, with basal leaf; F–G, *P. umbellulata*: F, flower, pedicel cut; G, flower just after anthesis (A–C, *J.Gossweiler 8547*, B; D, *R.Capuron 23239-SF*, P; E, *R.Capuron 27963-SF*, P).

3. *Pentarrhopalopilia madagascariensis* (Cavaco & Keraudren) Hiepko, *Bot. Jahrb. Syst.* 108: 285 (1987)

Rhopalopilia madagascariensis Cavaco & Keraudren, *Bull. Soc. Bot. France* 102: 209 (1955). T: Madagascar, Boina, J.M.H.A.Perrier 6053; holo: P.

Rhopalopilia umbellulata sensu Cavaco & Keraudren, *Fl. Madag., Fam. 59 bis, Opiliacées*: 4, fig. 1, 9 & 10 (1955).

Illustration: A.Cavaco & M.Keraudren, *Fl. Madag., Fam. 59 bis, Opiliacées*: 3, fig. 1, 6–8, as *Rhopalopilia madagascariensis* (1955); P.Hiepko, *Bot. Jahrb. Syst.* 108: 281, fig. 4 D (1987).

Map: P.Hiepko, *Bot. Jahrb. Syst.* 108: 286, fig. 6 (1987).

Shrub, more or less climbing; twigs \pm pubescent. Leaves with petiole c. 1 mm, hairy above; lamina glabrous, elliptic to subobovate, 1.5–3.5 (–4) cm long, 7–15 mm wide; base cuneate to attenuate; apex obtuse or emarginate, often mucronulate; mid rib slightly prominent on both sides of the lamina, lateral veins 7–9 per side. Inflorescence subumbellate, solitary, rachis 2–3 (–4) mm, partly pilose to glabrescent, flower bearing part of the rachis slightly swollen with up to 16 flowers; bracts and bracteoles ovate, c. 0.5 mm long, ciliate. Flowers glabrous; pedicels 2–2.5 mm, glabrous or with some hairs; tepals oblong, c. 1 mm long; stamens as long as and

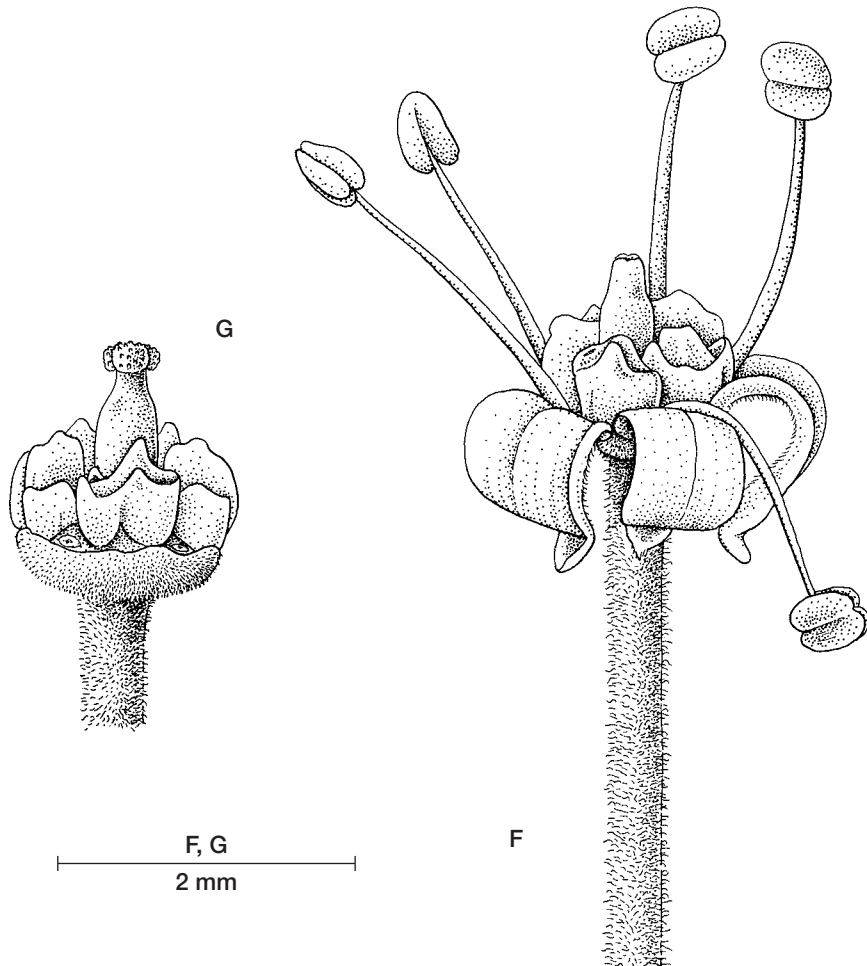


Figure 11. *Pentarrhopalopilia*. **F-G**, *H.G.Faulkner 2390*, B). Drawn by Christine Hillmann-Huber. Reproduced with permission from P.Hiepko, *Bot. Jahrb. Syst.* 108: 281, fig. 4 (1987).

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basally attached to the tepals; disc lobes half as long as the ovary, truncate to irregularly toothed; ovary ovoid to conical, 0.8 mm long; stigma truncate to shallowly lobed. Drupe orange, subglobose, minutely apiculate, glabrous, diam. up to 12 mm. Fig. 11 D.

Endemic to N and NW Madagascar. 29: MDG. In dry forest and savanna near the coast, on calcareous hills and an dry sandy soil. Flowers and fruits \pm throughout the year. Map 22.

29. MADAGASCAR: Vohémar, *R. Capuron* 27492 SF (P); Manongarivo, Ambongo, *J.M.H.A. Perrier* 2262 (P).

4. *Pentarhopalopilia perrieri* (Cavaco & Keraudren) Hiepko, *Bot. Jahrb. Syst.* 108: 287 (1987)

Rhopalopilia perrieri Cavaco & Keraudren, *Bull. Soc. Bot. France* 102: 209 (1955). T: Madagascar, Sud ouest, environs de Manampetsa, *J.M.H.A. Perrier* 19135; holo & iso: P.

Illustrations: A. Cavaco & M. Keraudren, *Fl. Madag. Fam. 59 bis, Opiliacées*: 3, fig. 1, 1–5, as *Rhopalopilia perrieri* (1955); P. Hiepko, *Bot. Jahrb. Syst.* 108: 281, fig. 4 E (1987).

Map: P. Hiepko, *Bot. Jahrb. Syst.* 108: 286 (1987).

Erect, much branched shrub up to 4 m; younger branches densely grey pubescent; branches differentiated into long and short shoots without internodes. Leaves with petiole 0.5–2 mm long, hairy; lamina glabrescent, margin of basal part hairy, obovate to oblong, 8–25 mm long, 4–10 mm; base attenuate to cuneate; apex obtuse or emarginate, often minutely mucronulate; midrib and secondary veins hardly visible, lateral veins 3 per side. Inflorescence subumbellate, solitary in the axil of fallen leaves of long shoots or 1–3 on short shoots, rachis (2–) 4–9 (–11) mm, densely pubescent, flower bearing part of the rachis slightly swollen, with up to 16 flowers; bracts broadly ovate, bracteoles lanceolate, both c. 1 mm long, hairy. Flowers puberulous outside; pedicels 3–4 (–8) mm long, puberulous; tepals oblong to narrowly triangular, c. 2 mm long; stamens c. 3 mm long; disc lobes half as long as the ovary, mostly 3 toothed; ovary cylindrical to conical, c. 1 mm long; stigma truncate to shallowly lobed. Drupe orange, ellipsoid, finely puberulous, 11–16 mm long, 9–13 mm wide. Fig. 11 E.

Endemic to the dry areas of S and SW Madagascar. 29: MDG. In thickets with *Alluaudia*, *Didierea* etc., often an calcareous soil. Flowers and fruits throughout the year. Map 23.

29. MADAGASCAR: Prov. Tuléar, c. 18 km S of Tulear near St. Augustin, *D. Lorence* 1929 (K, MO); route Efoetsy Itampolo, à 10–15 km au Nord d'Itampolo, *R. Capuron* 20637 SF (K, P); Nord d'Amboasary, route de Behara, *R. Capuron* 20453 SF (K, P).

The flowers of this species have been described by Cavaco & Keraudren (1955) as 'sessile'. There are indeed in nearly all collections such sessile flowers, but other flowers of the same specimens and all fruits are pedicellate. The sessile flowers are obviously malformations (galls) caused by insects (or fungi?) [P. Hiepko, *Bot. Jahrb. Syst.* 108: 288 (1987)].

8. RHOPALOPILIA

Rhopalopilia Pierre, *Bull. Mens. Soc. Linn. Paris* 2: 1263 (1896)

Type: *Rhopalopilia pallens* Pierre

Bisexual lianas or shrubs, young branchlets glabrous or pilose to puberulous. Leaves glabrous or partly pubescent. Inflorescences axillary racemes or subumbellate; rachis brownish pubescent or glabrous; bracts caducous. Flowers pedicellate, perigynous, 4-merous; receptacle cupular; tepals free, caducous; stamens free or attached basally to tepals, more or less horizontally inclined toward centre of flower; filaments 4-edged or flattened vertically, shorter than tepals; disc connate to the cupular receptacle, fleshy, shallowly divided into 4 lobes, lobes alternating with stamens; pistil superior, surrounded by cupular disk; style short or none, stigma entire or shallowly lobed. Drupe pedicellate, ellipsoid or subglobose.

Three species in the rain forest area of Central Africa.

H.G.A.Engler, *Rhopalopilia* (in Opiliaceae), in H.G.A.Engler & K.A.E.Prantl, *Nat. Pflanzenfam., Nachtr.* 1: 143 (1897); H.G.A.Engler, Opiliaceae africanae, *Bot. Jahrb. Syst.* 43: 175–177 (1909) (excl. sect. *Pentarhopalopilia*); J.Louis & J.Léonard, *Rhopalopilia* (in Opiliaceae) in *Fl. Congo Ruanda Urundi* 1: 283–287 (1948); J.F.Villiers, *Rhopalopilia* (in Opiliaceae) in *Fl. Cameroun* 15: 173–180 (1973); in *Fl. Gabon* 20: 173–180 (1973); P.Hiepko, A revision of Opiliaceae IV. *Rhopalopilia* Pierre and *Pentarhopalopilia* (Engler) Hiepko gen. nov., *Bot. Jahrb. Syst.* 108: 271–291 (1987).

- 1 Shrub or small tree, sometimes climbing, at least partly hairy; rachis of raceme up to 15 mm long, with 10–20 flowers; drupe ellipsoid
- 2 Shrub up to 2.5 m, leaves small, up to 5 cm long; rachis of raceme 15 mm long, not swollen **1. R. hallei**
- 2: Shrub or small tree, sometimes climbing, often taller than 3 m; leaves usually about 10 cm long; rachis of raceme up to 10 mm long, flower bearing part swollen and club shaped **2. R. pallens**
- 1: Liana, glabrous; inflorescence subumbellate, rachis less than 5 mm long, with 8–10 (–12) flowers; drupe ovoid to subglobular **3. R. altescandens**

1. *Rhopalopilia hallei* Villiers, *Bull. Inst. Fondam. Afrique Noire, Sér. A, Sci. Nat.* 33: 44, pl. 1 (1971)

T: Gabon. Riv. Bicoudou, Lebamba, *N.Hallé 2060*; holo: P.

Illustrations: J.F.Villiers, *Fl. Cameroun* 15: 175, pl. 38 (1973); *Fl. Gabon* 20: 175, pl. 38 (1973); P.Hiepko, *Bot. Jahrb. Syst.* 108: 275, fig. 1 (1987).

Map: P.Hiepko, *Bot. Jahrb. Syst.* 108: 278, fig. 3 (1987).

Shrub up to 2.5 m; twigs densely pubescent, hairs yellowish brownish, curved upwards. Leaves with petiole 1 mm, pubescent; lamina glabrous above, only midrib densely hairy, glabrescent beneath, midrib, secondary veins and margin hairy, oblong lanceolate, 1.8–5 cm long, 12–18 mm wide; base cordate; apex acuminate; midrib and secondary veins prominent beneath; lateral veins 5–7 per side. Racemes solitary or 2 per axil, rachis up to 15 mm long, brownish pubescent, with 10–14 flowers, more or less evenly spread over the rachis; bracts and bracteoles lanceolate to triangular, pubescent, shorter than the pedicels. Flowers pubescent outside, diam. of the cupular receptacle 2 mm; pedicels 1–2 mm, pubescent; tepals triangular, 1.5 mm long, reflexed; stamens shorter than tepals; filaments flattened vertically, 0.4 mm long; disc as described for the genus. Ovary conical, elongated in a very short style, stigma shallowly 4 lobed. Fruit unknown.

S. Gabon. 23: GAB. Known from the type collection only. Map 24.

2. *Rhopalopilia pallens* Pierre, *Bull. Mens. Soc. Linn. Paris* 2: 1263 (1896)

T: Gabon, Libreville, a. 1891, *A.Jolly s.n.* (Herb. Pierre 6339); holo: P.

Shrub or small tree, sometimes climbing, 1–5 (–15) m tall; twigs densely brownish pubescent. Leaves with petiole 1–2 (–4) mm, pubescent; lamina glabrous above, glabrescent beneath, elliptic, oblong elliptic, lanceolate to (broadly) ovate, 4–15 (–22) cm long, 2–6 (–8) cm wide; base cuneate to rounded, sometimes cordate; apex acuminate; midrib and secondary veins prominent beneath, lateral veins 4–7 per side. Racemes usually solitary, rarely 2–4 per axil; sterile part of the rachis 2–4 mm, pubescent, flower bearing part of the rachis club shaped, 3–6 mm long, finely yellowish puberulous, with 10–20 flowers; bracts and bracteoles lanceolate to triangular, puberulous. Flowers puberulous or glabrous outside, diam. 3–4 mm, yellowish; pedicels 2–3.5 mm, puberulous or glabrous; tepals angular ovate, 1.5 mm long, reflexed; stamens half

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as long as and basally connate to the tepals, filaments 4 edged; disc as described for the genus; ovary conical, elongated into a very short style, stigma truncate, very shortly exceeding the disc. Drupe resting on the thickened cupula, ellipsoid, puberulous or glabrous, 15–18 mm long, 7–12 mm wide.

Cameroon, Gabon, Congo, and Zaire. 23: CMN, CON, GAB, ZAI. Undershrub in riverine forest, rain forest, and secondary forest. Flowers and fruits throughout the year.

Rachis of raceme, pedicels, flowers and fruits puberulous **2a. var. pallens**
Rachis of raceme sparsely hairy at the base only, flower bearing part, pedicels (usually), flowers and fruits glabrous **2b. var. glabriflora**

2a. *Rhopalopilia pallens* Pierre var. **pallens**

Rhopalopilia pallens var. *angustifolia* De Wild., *Etudes Fl. Bas Moyen Congo* 1: 61 (1903). T: Zaire. Bas Congo, Kimuenza, *J.Gillet* 2053; holo: BR.

Illustrations: J.F.Villiers, *Fl. Cameroun* 15: 177, pl. 39, 1–10 (1973); *Fl. Gabon* 20: 177, pl. 39, 1–10 (1973); P.Hiepko, *Bot. Jahrb. Syst.* 108: 276, fig. 2 (1987).

Map: P.Hiepko, *Bot. Jahrb. Syst.* 108: 278, fig. 3 (1987).

Description as for the species, but rachis of raceme, pedicels, flowers and fruits always puberulous. Fig. 12.

SW. Cameroon, Gabon, Congo and Zaire. 23: CMN, CON, GAB, ZAI. Map 25.

23. CAMEROON: Bipinde, *G.Zenker* 4338 (B, BR, G, GOET, K, L, M, MO, P, S, WU, Z). CONGO: Alima Léfini, Gamboma, *B.Descoings* 6940 (P). GABON: Environs de Libreville, *T.-J.Klaine* 1800 (B, G, K, P). ZAIRE: Terr. Madimba, Gombe Matadi, riviere Luazi, *P.Compère* 1760 (BR, K); Kimuenza, *J.Mildbraed* 3644 (B); Kisantu, Kimbuba, *H.Callens* 4587 (BR); Kasai, Kikwit, *H.Vanderyst* 9196 (BR).

In contrast to a typical raceme the apical flowers open first and the basal flowers are always the youngest ones (see Fig. 12 A).

2b. *Rhopalopilia pallens* var. **glabriflora** J.Léonard, *Bull. Jard. Bot. Etat* 18: 147 (1947)

T: Zaire. Dist. Forestier Central, Yangambi, *J.Louis* 7492; holo: BR; iso: FHO.

Rhopalopilia poggei Engl., *Notizbl. Königl. Bot. Gart. Berlin* 2: 282 (1899). T: Zaire. Kasai, Mukenge, *P.Pogge* 1324 (B).

Illustrations: H.G.A.Engler, *Bot. Jahrb. Syst.* 43: 176, fig. 2, as *Rhopalopilia Poggei* (1909); J.Louis & J.Léonard, *Fl. Congo RuandaUrundi* 1: 286, pl. 29 (1948).

Map: P.Hiepko, *Bot. Jahrb. Syst.* 108: 278, fig. 3 (1987).

Description as for the species, but fertile part of the raceme, pedicels (usually), flowers and fruits glabrous.

E. Zaire. 23: ZAI. Map 26.

23. ZAIRE: Dist. Forestier Central, Yangambi, plateau de l'Isalove, *J.Louis* 9240 (BR, C, EA, MO); Prov. Orientale, Terr. langi, Yangambi Yaosuka, *P.Bamps* 717 (BR, K).

3. *Rhopalopilia altescandens* Mildbr. [*Wiss. Erg. Zweit. Deut. Zentr. Afr. Exped., Bot.* 54 (1922), nom. inval.] ex Sleumer, *Notizbl. Bot. Gart. BerlinDahlem* 12: 65. (1934).

T: Cameroon, Molundu, forest between Lukomo, Bumba and Bange, *J.Mildbraed* 4425; holo & iso: B.

Rhopalopilia poggei var. *bequaertii* De Wild., *Pl. Bequaert.* 5: 474 (1932) ('*Bequaertii*'); *Rhopalopilia bequaertii* (De Wild.) J.Léonard in J.Louis & J.Léonard, *Opiliaceae in Fl. Congo Ruanda Urundi* 1: 286 (1948) ('*Bequaertii*'). T: Zaire. Stanleyville, vallée de la Tshopo, *J.Bequaert* 6917; holo: BR.

Illustrations: J.F.Villiers, *Fl. Cameroun* 15: 179, pl. 40 (1973); *Fl. Gabon* 20: 179, pl.40 (1973).

Map: P.Hiepko, *Bot. Jahrb. Syst.* 108: 278, fig. 3 (1987).

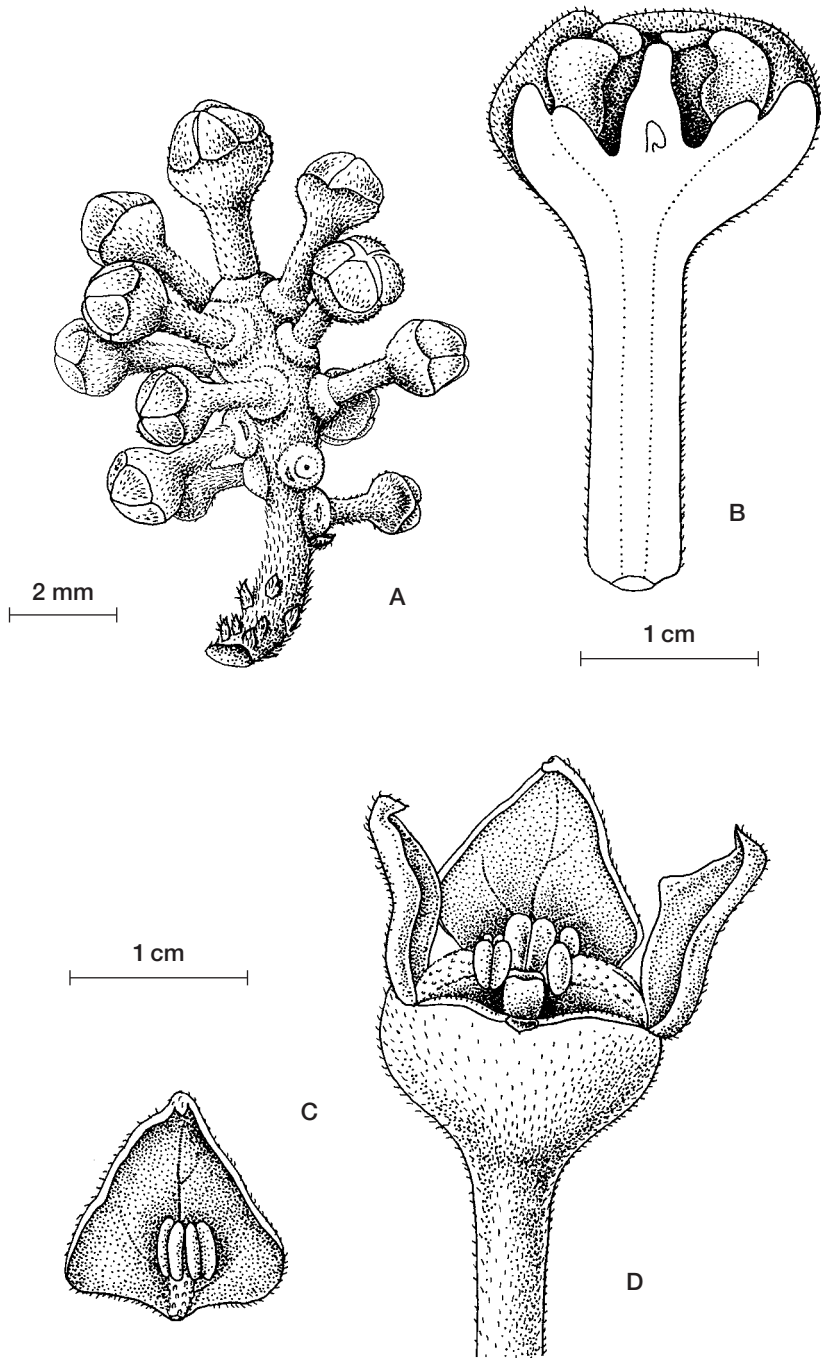


Figure 12. *Rhopalopilia pallens* var. *pallens*. **A**, inflorescence just before anthesis of the apical flower, bracts and bracteoles fallen, some flowers removed; **B**, flower after anthesis, longitudinally cut in half; **C**, tepal and attached stamen; **D**, flower, front tepal and stamen removed (**A-B**, *J.Mildbraed* 3644, **B**; **C-D**, *T.-J.Klaine* 1800, **B**). Drawn by Christine Hillmann-Huber. Reproduced with permission from P.Hiepko, *Bot. Jahrb. Syst.* 108: 276, fig. 2 (1987).

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Liana, up to 6 m or more, at the base 1–2 cm diam.; twigs glabrous. Leaves with petiole 1–2 mm, glabrous; lamina glabrous on both sides, narrowly ovate to elliptic, (3–) 4–8 (–11) cm long, 1.5–3 (–4) cm wide; base shortly attenuate or cuneate; apex long acuminate; midrib prominent on both sides, lateral veins 4–6 per side. Inflorescence subumbellate, glabrous, solitary or (rarely) 2 per axil, rachis 3–4 (–5) mm, flower bearing part much swollen, with 8–10 (–12) flowers. Bracts and bracteoles very small, triangular, caducous before anthesis. Flowers 4 merous (apical flowers rarely 5 merous), glabrous, diam. 2 mm; pedicels 2–2.5 mm long, glabrous; tepals triangular, 1.25 mm long, reflexed; stamens basally connate to the tepals, filament ± ellipsoid, 0.5 mm long; disc as described for the genus; ovary conical, elongated in a very short style, stigma truncate or shallowly 4 lobed, slightly exceeding the disk. Drupe resting on the thickened cupula, orange, ovoid to subglobular, glabrous, 13–17 mm long, 13–14 mm wide.

SE Cameroon, S. Central African Republic, northern Zaire. 23: CAR, CMN, ZAI. Heliophilous liana in riverine forest or rain forest. Flowers and fruits throughout the year. Map 27.

23. CAMEROON: Bertoua, 6 km along road to Batouri and Bétaré Oya, *F.J.Breteler 2227* (BR, P, WAG). CENTRAL AFRICAN REPUBLIC: Mbaiki, Station Boukoko, *C.Tisserant 1328* (BM, MO, P). ZAIRE: Environs de Likimi, *L.Malchair 401* (BR).

The flowers are ± equally developed within one inflorescence, but the basal flowers usually open first.

9. CANSJERA

Cansjera Juss., *Gen. Pl.* 448 (1789), *nom. cons.*

Type: *Cansjera rheedei* J.F.Gmel.

Tsjeru-caniram Rheede ex Adans. *Fam. Pl.* 2: 80 (1763).

Bisexual lianas or erect shrubs; young branchlets densely covered with mostly upcurved hairs. Leaves glabrous or hairy. Flowers green to yellow-green or white, in axillary spikes, each flower in axil of small persistent bract; rachis and bracts densely hairy. Perianth urceolate or campanulate with 4 small recurved lobes, rarely 5-lobed, pilose. Stamens as long as perianth-tube. Disc lobed, the ± fleshy scales alternating with stamens. Ovary ovoid to cylindrical; style short, not or hardly exceeding perianth-tube; stigma capitate, tending to be 4-lobed. Drupe ellipsoidal to ± globular, glabrous, sessile on persistent lacerated perianth.

A genus of three species, from India and Sri Lanka to S China, New Guinea and northern Australia.

C.F.Meissner, *Cansjera* (in Thymelaeaceae), in A.L.P.P. de Candolle (ed.), *Prodr.* 14(2): 519 (1857); G.Bentham, *Cansjera* (in Olacineae), *Fl. Austral.* 1: 393–394 (1863); P.Hiepko & H.C.Weber, Zur Wuchsform und Haustorienbildung des Wurzelparasiten *Cansjera rheedii* Gmel. (Opiliaceae), *Willdenowia* 8: 351–362 (1978); P.Hiepko, *Cansjera* in A revision of Opiliaceae I. Genera of the eastern Old World, excluding *Opilia*, *Willdenowia* 9: 43–50 (1979); P.Hiepko, *Cansjera* (in Opiliaceae), *Fl. Males. ser. I*, 10: 48–51 (1984); P.Hiepko, *Cansjera* (in Opiliaceae), *Fl. Australia* 22: 28–29 (1984); P.Hiepko, *Cansjera* (in Opiliaceae), *Fl. Thailand* 5(1): 102–103 (1987).

- 1 Petiole and lamina densely covered with branched hairs, mostly shorter than 3 cm, apex obtuse or retuse; spikes 3–10 mm long with 3–6 (–8) flowers **3. C. parvifolia**
- 1: Petiole hairy, lamina glabrous, mostly longer than 5 cm, long-narrowed or apex acute to acuminate; spikes 10–40 mm long, usually more than 8 flowers per spike
 - 2 Leaves ovate to lanceolate or elliptic, apex ± acuminate; perianth tube 2.5–3 mm long **1. C. rheedei**
 - 2: Leaves ovate-lanceolate, long-narrowed, apex acute or ± acuminate; perianth tube 1.5–2 mm long **2. C. leptostachya**

1. *Cansjera rheedei* J.F.Gmel., *Syst. Nat.* 2: 280 (1791) ('*Cansiera rheedii*')

Cansjera malabarica Lam., *Encycl.* 3: 433 (1792), nom. illeg.; *Daphne polystachya* Willd., *Sp. Pl.* 2: 420 (1799), nom. illeg.; *Cansjera polystachya* (Willd.) M.Roem., *Fam. Nat. Syn. Monogr.* 1: 144 (1846). T: "Inde", *P.Somerat s.n.* in Herb. Jussieu 3926; holotype: (P-JU).

Daphne monostachya Willd., *Sp. Pl.* 2: 420 (1799); *Cansjera monostachya* (Willd.) M.Roem., *Fam. Nat. Syn. Monogr.* 1: 16 (1846). T: [*Cansjera malabarica* var. Lam., *Encycl.* 3: 433 (1792)] illustration in Rheede, *Hort. Malab.* 7 t. 4 (1688).

Cansjera scandens Roxb., *Pl. Coromandel* 2: 2, t. 103 (1799) ('*Cansiera*'). T: *Cansjera scandens* Roxb. *No. 1*; lectotype: E, *fide* P.Hiepko, *Willdenowia* 9: 45 (1979).

Cansjera lanceolata Benth., *London J. Bot.* 1: 491 (1842). T: Hongkong, 1841, *R.B.Hinds s.n.*; lectotype: K, *fide* P.Hiepko, *Willdenowia* 9: 45 (1979); isotype: LE.

Cansjera zizyphifolia Griff., *Calcutta J. Nat. Hist.* 4: 236 (1843) ('*Cansiera zizyphifolia*'). T: Malacca, s.d., *Herb. Griffith* 823; lectotype: K, *fide* P.Hiepko, *Willdenowia* 9: 45 (1979); isotype: C, CAL, FI, GH, GOET, LE, M, U).

Olex sumatrana Miq., *Fl. Ned. Ind., Suppl.* 342 (1861). T: Sumatra, Palembang, Ogan ulu, *J.E.Teysmann s.n.* (BO no. 3621); lectotype: BO, *fide* P.Hiepko, *Willdenowia* 9: 45 (1979); isotype: CAL, U.

Illustrations: P.Hiepko, *Willdenowia* 9: 44, fig. 17; 46, fig. 18, 1–3 (1979); *Fl. Males. ser. I*, 10: 48, fig. 14 a–c; 50, fig. 16 (1984).

Map: P.Hiepko, *Willdenowia* 9: 48, fig. 19 (1979); *Fl. Males. ser. I*, 10: 49, fig. 15 (1984).

Liana up to 8 m, or erect shrub with spiny stem; branches pendulous. Leaves with petiole 3–5 mm long, densely hairy; lamina glabrous, ovate to lanceolate or elliptic, usually 5–9 (–13) cm long, 1.5–4 cm wide; base shortly attenuate to attenuate, rarely rounded; apex acuminate; lateral veins mostly 5–7 per side, inconspicuous, rarely somewhat prominent beneath. Spikes 1–3 (–5) in leaf axil, 1.3–2.5 (–4) cm long, with usually more than 8 flowers; bracts ovate to triangular, 1 mm long. Flowers: perianth urceolate, the tube 2.5–3 mm long; disc scales slightly fleshy, ovate, acute, irregularly toothed, c. 0.7 mm long; ovary ± cylindrical, c. 1 mm long; style c. 1 mm long. Drupe orange, ellipsoidal (sometimes ± globular), 10–15 mm long, 7–9 (–12) mm wide. Fig. 13 A–C.

From India and Nepal to S China and western Malesia. 36: CHC, CHH, CHS. 40: IND, NEP, SRL. 41: AND, CBD, LAO, MYA, NCB, THA, VIE. 42: BOR, MLY, PHI, SUM. In deciduous and in evergreen forest up to 1400 m; often on sandy soil. Flowers throughout the year. Map 28.

36. CHINA: Hainan, Ngai distr., Wong Kam Shan, *S.K.Lau* 553 (A, B, BM, E, G, K, MICH, NY, P, US); Hongkong, Macao, *H.F.Hance* 8932 (BM, FI, GH, P); Yunnan, Mengzi, *A.Henry* 9709 (A, B, E, K, NY, US, Z). 40. INDIA: Mysore, Kanara, Mangalore, *R.F.Hohenacker* 281 (B, BM, C, FI, G, K, M, MEL, P). 41. CAMBODIA: Kompong Cham prov., Angkor Leap, *E.Poilane* 16291 (B, P, UC). THAILAND: Katok, *A.Kerr* 8204 (ABD, BK, BM, C, E, P, UC). VIETNAM: Tonkin, Ninh Binh prov., Cho Ganh, *P.A.Petelot* 1199 (A, BO, NY, P, UC, US). 42. BORNEO: Sarawak, Santubong, *P.Ashton* S21489 (K, L, SING). MALAYA: Pahang, Nanesi, *E.J.H.Cornier* SF 29881 (BO, K, KEP, SING). PHILIPPINES: Mindoro, Puerto Galera, *M.Ramos* BS 46387 (A, BO, L, NY, SING, US).

Form, size, and venation of the leaves are variable. Often a pair of arcuate side-nerves shortly above the base of the lamina are nearly as strong as the midrib; such 3-nerved forms have been named *Cansjera zizyphifolia*. The flowers are fairly uniform, but the fruits vary in size and form (sometimes more globular).

2. *Cansjera leptostachya* Benth., *London J. Bot.* 2: 231 (1843)

T: New Ireland, 1841, *R.B.Hinds s.n.*; lectotype: K, *fide* P.Hiepko, *Willdenowia* 9: 49 (1979); isotype: NY.

Cansjera timorensis Decne., *Voy. Venus, Bot.* 12 (1864) ('*Candjera*'). T: Timor, *Voy. Venus*; holotype: P; isotype: C, K.

Illustrations: P.Hiepko, *Willdenowia* 9: 46, fig. 18, 6 & 7 (1979); *Fl. Males. ser. I*, 10: 48, fig. 14 f & g; 51, fig. 17 (1984); *Fl. Australia* 22: 26 (1984).

Maps: P.Hiepko, *Willdenowia* 9: 48, fig. 19 (1979); *Fl. Males. ser. I*, 10: 49, fig. 15 (1984).

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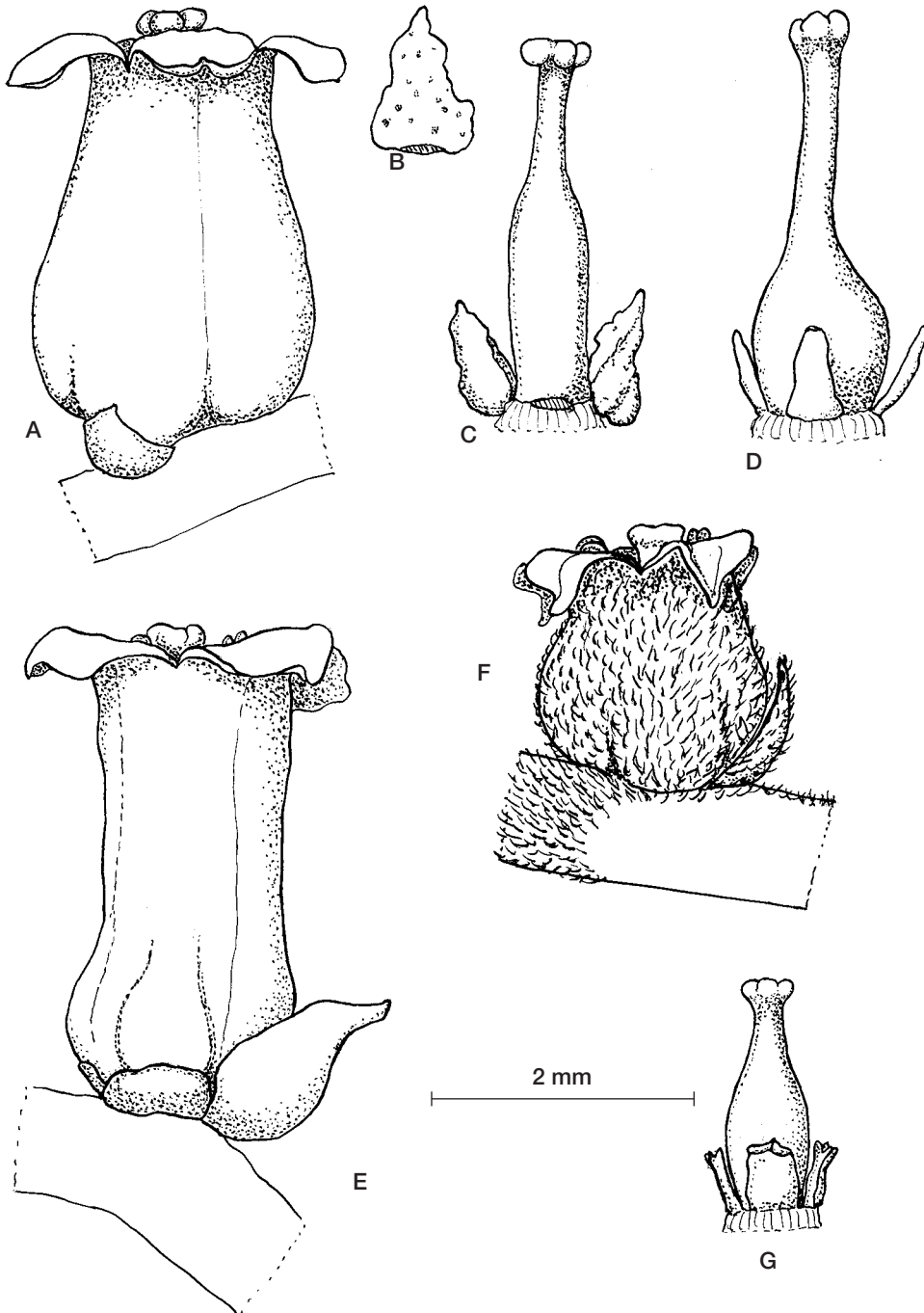


Figure 13. *Cansjera*. **A-C**, *C. rheederi*: **A**, flower with bract, without indumentum; **B**, disc-scale, adaxial view; **C**, pistil and disc, one scale removed; **D-E**, *C. parvifolia*: **D**, pistil with disc-scales; **E**, flower with bract, without indumentum; **F-G**, *C. leptostachya*: **F**, flower with bract; **G**, pistil with disc-scales (**A-C**, *R. Geesink & P. Hiepko* 7831, **B**; **D-E**, *J.W. Helfer s.n.*, **B**; **F-G**, *NGF 30718*, **M**). Drawn by Paul Hiepko. Reproduced with permission from P.Hiepko, *Willdenowia* 9: 46, fig. 18 (1979).

Liana up to 6 m, or erect shrub; branches pendulous, glabrescent. Leaves with petiole 4–6 mm long, hairy; lamina glabrous, ovate-lanceolate, long-narrowed, usually 4–9 cm long, 1.5–4 cm wide; base attenuate to shortly attenuate; apex acute or ± acuminate; lateral veins mostly 7–9 per side, inconspicuous, rarely somewhat prominent beneath. Spikes 1–4 in leaf axil, 1–3 cm long, with usually more than 8 flowers; bracts lanceolate, 0.5–1 mm long. Flowers: perianth urceolate, the tube 1.5–2 mm long; disc scales slightly fleshy, oblong, 3-toothed, c. 0.5 mm long; ovary ovoid, c. 1 mm long; style c. 0.5 mm long. Drupe orange-red, ellipsoidal to nearly globular, 11–15 mm long, 9–13 mm wide. $2n = 20$, K.Oginuma *et al.*, *Acta Phytotax. Geobot.* 50: 34 (1999). Fig. 13 F & G.

From E Jawa to New Guinea and Bismarck Arch.; in Australia scattered through Western Australia, Northern Territory, and Cape York Peninsula. 42: JAW, LSI, MOL. 43: BIS, NWG. 50: NTA, QLD, WAU. In evergreen forest up to 700 m, or in semi-deciduous thickets on sandy soil or on calcareous rocks. Flowers and fruits throughout the year. Map 29.

42. JAWA: Surabaya, NW of Sidaju, *J.D.Dorgelo 2107* (BO, L). LESSER SUNDA IS.: Timor, Asumanu, Belu, *M.E.Walsh 429* (BM, BO, L, Z). MOLUCCAS: Kai Is., Tual, *H.Jensen 288* (A, BO, C, L). 43. BISMARCK ARCHIPELAGO: New Ireland, Port Carteret, *G.W.Barclay 3537* (BM, GH); NEW GUINEA: Papua Jaya, Temana, W of Hollandia [Jayapura], *Atasrip 182* (BO, L); Papua New Guinea, Finschhafen, Jul. 1890, *K.A.F.Weinland s.n.* (BO, BRI, M, SING). 50. AUSTRALIA, NORTHERN TERRITORY: Groote Eylandt, Bartalumba Bay, *C.R.Dunlop 2637* (NT); QUEENSLAND: Red I. Point, 12.5 miles SW of Cape York, *L.S.Smith 12552* (BRI); WESTERN AUSTRALIA: Mt. Trafalgar, Prince Regent River Reserve, *A.S.George 12654* (NT).

Cansjera leptostachya is undoubtedly closely allied to *C. rheedei*. It differs from this species in several floral and vegetative characters: inflorescence more lax, perianth tube clearly shorter; leaves smaller, lanceolate; spines never reported.

Fruits edible [C.R.Dunlop *et al.*, *Northern Territory Bot. Bull.* 1: 59 (1976)].

3. *Cansjera parvifolia* Kurz, *J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist.* 41: 298 (1872)

T: [Myanmar], Tenasserim, *J.W.Helfer s.n.*; lecto: K, *vide* P.Hiepko, *Willdenowia* 9: 44 (1979); iso: B, C, GH, M).

Cansjera helferiana Valetton, *Crit. Overz. Olacin.* 159 (1886). T: [Myanmar], Tenasserim, *J.W.Helfer s.n.*; holo: L; iso: see above.

Illustrations: P.Hiepko, *Willdenowia* 9: 46, fig. 18, 4 & 5 (1979); *Fl. Males. ser. I*, 10: 48, fig. 14 d & e (1984).

Maps: P.Hiepko, *Willdenowia* 9: 48, fig. 19 (1979); *Fl. Males. ser. I*, 10: 49, fig. 15 (1984).

Shrub; twigs and leaves densely covered with branched hairs. Leaves with petiole 1–2 mm long; lamina broadly ovate, usually 10–30 mm long, 10–20 mm wide; base rounded or subcordate; apex obtuse or retuse; lateral veins 4–5 per side, inconspicuous. Spikes 1–2 in leaf axil, rachis stiff, 3–10 mm long, with 3–6 (–8) flowers in the upper half of the rachis only; bracts broadly ovate, 1.5 mm long. Flowers: perianth tube narrowly campanulate, the tube 3 mm long, the spreading lobes c. 1 mm long; disc scales thin and narrow, 0.7 mm long; ovary ovoid, 1.3 mm long; style distinct, 1.5 mm long; stigma 4-lobed. Fruit unknown. Fig. 13 D & E.

Myanmar. 41: MYA. Flowers and fruits ± throughout the year. Map 30.

41. MYANMAR: Upper Burma, Meiktila, *H.Collett 519* (K); Yamethin distr., *A.E.English 14* (E).

Excluded names

Cansjera grossularioides Blanco, *Fl. Filip.* 73 (1837) ('*Cansiera*') = *Antidesma ghaesembilla* Müll.Arg. var. *paniculatum* Müll.Arg. (Euphorbiaceae).

Cansiera madagascariensis Spreng., *Syst. Veg.* 1: 453 (1825) = *Potameia madagascariensis* Thouars ex Spreng. (Lauraceae).

Cansjera pentandra Blanco, *Fl. Filip.* 73 (1837) ('*Cansiera*') = *Antidesma cumingii* Müll.Arg. (Euphorbiaceae).

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10. AGONANDRA

Agonandra Miers ex Benth. & Hook.f., *Gen. Pl.* 1: 349 (1862)

Type: *Agonandra brasiliensis* Miers ex Benth. & Hook.f.

Dioecious trees or shrubs, rarely vinelike; branchlets glabrous, papillate or pubescent. Leaves usually glabrous, base of lamina decurrent onto petiole. Inflorescence an axillary or terminal raceme with 1–3 (–4) flowers per bract; bracts ± peltate, caducous; bracteoles (if present) minute; rachis glabrous, papillate or puberulous. Flowers green to yellow-green or white, pedicellate, 4 or 5-merous; tepals free, glabrous, papillate or puberulous. Male flowers: stamens with filiform filaments, exceeding perianth; disc lobed or annular to urceolate; pistil rudimentary. Female flowers: perianth caducous; stamens absent; disc usually annular and much smaller; pistil with sessile, entire or shallowly lobed stigma. Drupe ellipsoid, sometimes more or less globular, to 30 mm long; pedicel cylindrical or thicker toward apex.

Ten species in Mexico, Central America, and South America.

P.C. Standley, *The North American species of Agonandra*, *J. Wash. Acad. Sci.* 10: 505–508 (1920); L.O. Williams, *The Agonandras (Opiliaceae) of Mexico and Central America*, *Ciencia (Mexico)* 24: 227–228; W. Burger, *Opiliaceae, Fl. Costaric., Fieldiana, Bot., n.s.* 13: 27–29 (1983); P. Hiepko, *Opiliaceae, Fl. Guianas, Ser. A*, 14: 36–39 (1993); R. Acevedo Rossas & J.L. Martínez y Pérez, *Opiliaceae, Fl. Veracruz* 84: 1–6 (1995); P. Hiepko, *Opiliaceae, Fl. Neotrop.* 82: 1–55 (2000); P. Hiepko, *Opiliaceae, Fl. Ecuador* 69: 49–57 (2002); P. Hiepko, *Opiliaceae, Fl. Mesoamer.* (accepted).

- 1 Racemes bearing 3 (–4) flowers in axils of at least some bracts, rachis of inflorescence glabrous, minutely papillate or puberulous (if all bracts bear only 1 flower, then rachis of inflorescence, pedicels, and perianth densely puberulous)
 - 2 Tree, to 50 m tall, in wet forest; racemes glabrous but minutely papillate
 - 3 Male racemes 5–10 (–15) cm long; apex of disc lobes of male flowers not toothed **1. A. silvatica**
 - 3: Male racemes 10–25 mm long; apex of disc lobes of male flowers extrorsely toothed **4. A. goldbergiana**
 - 2: Small tree or shrub, 3–12 (–30) m tall, in savanna or dry deciduous forest; racemes glabrous, puberulous or minutely papillate
 - 4 Racemes and flowers densely puberulous **2. A. brasiliensis**
 - 4: Racemes and flowers glabrous, (sometimes partly minutely papillate)
 - 5 Racemes terminal and axillary; 1–3 flowers per bract; branches often drooping **7. A. racemosa**
 - 5: Racemes all axillary; 2–3 flowers per bract; branches not drooping **3. A. fluminensis**
- 1: Racemes bearing only 1 flower per bract; rachis of inflorescence glabrous, minutely papillate, or very finely puberulous (if densely puberulous try 4)
 - 6 Racemes glabrous or minutely papillate
 - 7 Tree, 8–30 (–35) m tall; lamina (7–) 10–12 cm long, (3–) 4–6 cm wide; racemes glabrous, the males (3–) 7–10 cm, the females 1.5–3 cm long; disc lobes of male flowers fused, forming an irregularly toothed cup **5. A. peruviana**
 - 7: Small tree or shrub, 3–10 (–15) m tall; lamina (2–) 3–5.5 (–7) long, 1–3 cm wide; racemes minutely papillate or glabrous, the males 10–25 mm, the females 5–10 mm long; disc lobes of male flowers free **8. A. macrocarpa**

- 6: Racemes more or less puberulous (rarely glabrous)
- 8 Small tree or shrub, 3–11 (–15) m tall; disc lobes of male flowers united in the lower half, the free lobes \pm acute; pedicel of fruit obconical and very short, 1–2 mm long **6. A. excelsa**
- 8: Shrub or small tree, 1–5 (–10) tall; disc lobes of male flowers free, irregularly toothed at apex
- 9 Shrub or small tree, 1–5 (–8) m tall, often compact with thornlike branches; lamina usually 30–40 mm long, 10–20 mm wide **9. A. obtusifolia**
- 9: Tree, c. 10 m tall, without thornlike branches; lamina 5–8 cm long, 3–6 cm wide **10. A. ovatifolia**

1. Agonandra silvatica Ducke, *Arch. Jard. Bot. Rio de Janeiro* 3: 41 (1922)

T: Brazil. Pará: Obidos, above Rio Curuçambá, *A.Ducke RB 10564*; lecto: B, *fide* P. Hiepko, *Fl. Guianas*, ser. A, 14: 39 (1993); isolecto: S, U, US.

Illustration: P.Hiepko, *Fl. Neotrop.* 82: 8, fig. 4A; 25, fig. 13 (2000).

Map: P. Hiepko, *Fl. Neotrop.* 82: 26, fig. 14 (2000).

Tree, to 40 m tall; bark more or less smooth; branchlets glabrous. Leaves with petioles 2–5 (–8) mm long; lamina ovate to elliptic, 6–12 (–15) cm long, 2.5–5 (–7) cm wide; base rounded to attenuate; apex acute to shortly acuminate; midrib flat above, prominent beneath; lateral veins 4–7 per side. Racemes axillary, 1–2 per axil, rarely on defoliated nodes, glabrous, minutely papillate; male racemes 5–10 (–15) cm; female racemes 15–35 mm long; bracts broadly ovate, c. 2 mm diam.; flowers usually 3 per bract with 2 very small bracteoles at the base of the pedicels of the lateral flowers. Pedicels and flowers glabrous; pedicels 0.5–2 (–3) mm long in flower, up to 7 (–12) mm long in fruit. Male flowers: tepals oblong, 2–3 mm long; stamens 3 mm long; disc lobes fleshy, 1–1.5 mm long, the apex \pm rounded; rudimentary pistil thinly cylindrical, 0.7 mm long. Female flowers: tepals 1 mm long; disc annular, c. 0.5 mm high, the margin undulating; pistil cylindrical, 1 mm long. Drupe yellow to orange, 25–30 mm long, 20 (–24) mm wide, the juicy mesocarp in ripe fruits 3–4 mm thick. $n = 20$, P.Hiepko, *Fl. Neotrop.* 82: 23 (2000). Fig. 14 A, 15.

Northern South America, Western South America, and Brazil. 82: FRG, GUY, SUR. 83: BOL, ECU, PER. 84: BZN. Grows in rain forest on terra firme. Flowers and fruits May–Dec. Map 31.

82. FRENCH GUIANA: Sinnamary, rd. to St. Elie, *D.Sabatier 101* (CAY); Haut Oyapock, Mt. St. Marcel, *C.Sastre 4476* (NY, P). GUYANA: Potaro-Siparuni, Ebini Mt., *C.L.Kellogg et al. 720* (B, US). SURINAM: Jodensavanne, Mapane Cr. area, *J.C.Lindeman 4995* (A, AAU, NY, U). **83.** BOLIVIA: W bank of Rio Madeira, 10 km above Abunã, *G.T.Prance et al. 8743* (B). ECUADOR: Napo, Aguatico, Reserva Etnica Huaorani, Plataforma del Pozo Ginta, *M.Aulestia 3613* (B, MO, QCNE). PERU. Loreto: Mishuyacu, near Iquitos, *G.Klug 397* (F, NY, US). **84.** BRAZIL North: Pará, Obidos, E of lake Mamauri, *A.Ducke RB 19555* (G, K, RB, S, U, US); Amazonas, Mun. São Paulo de Olivença, basin of creek Belem, *B.A.Krukoff 9006* (A, B, BM, BR, F, G, K, MICH, MO, NY, P, S, U, US); Rondônia, Trail from Fortaleza, Rio Abunã 20 km above mouth to São Sebastião mines, *G.T.Prance et al. 8493* (B, NY).

Agonandra silvatica is characterized by its smooth bark, glabrous or minutely papillate rachises of the inflorescences, and ternate, glabrous flowers. Its leaves are rather variable and often similar to those of *A. brasiliensis*, which is also distributed in eastern Amazonia but grows in dry forest or savanna. *Agonandra brasiliensis* can be distinguished by the thick corky bark of the stem and the puberulous inflorescences and flowers. There is an additional difference between these species in the longer disc lobes of *A. silvatica* that are not irregularly toothed at apex as in *A. brasiliensis*. For the identification of fruiting material of these two species, the indumentum of the axis of the infructescence and the pedicels is crucial. *Agonandra peruviana* is partly sympatric with *A. silvatica* in the rain forests of the southwestern Amazonia and is characterized by its single, glabrous flowers with longer pedicels and the cup-shaped disc of the male flowers formed by the fused disc lobes. Fruits eaten by monkeys [P.Hiepko, *Fl. Neotrop.* 82: 24 (2000)].

2. *Agonandra brasiliensis* Miers ex Benth. & Hook.f., *Gen. Pl.* 1: 349 (1862)

T: Brazil: Ceará, Villa do Crato, *G.Gardner 1503*; lecto: K, *vide* P.Hiepko, *Fl. Guianas*, ser. A, 14: 37 (1993); isolecto: BM, G, NY, P. Syn: Brazil, Piauí, *G.Gardner 2506*; BM, K, NY; the other syntypes belong to *Agonandra excelsa* Griseb. (Brazil, Ceará, *G.Gardner 1519*, and Brazil, *J.E.Pohl 1721*).

Small tree, (1–) 3–12 (–30) m tall; bark thick corky, longitudinally furrowed, pale yellow-grey; branchlets minutely papillate to puberulous. Leaves with petioles (3–) 5–20 (–30) mm long; lamina broadly ovate to narrowly elliptic, 4–9 (–11) cm long, 2–5 (–6) cm wide; base rounded to attenuate; apex acute to shortly acuminate; midrib flat above, prominent beneath, lateral veins 6–8 per side. Racemes axillary, 1–2 (–6 in male specimens only) per axil, often on defoliated

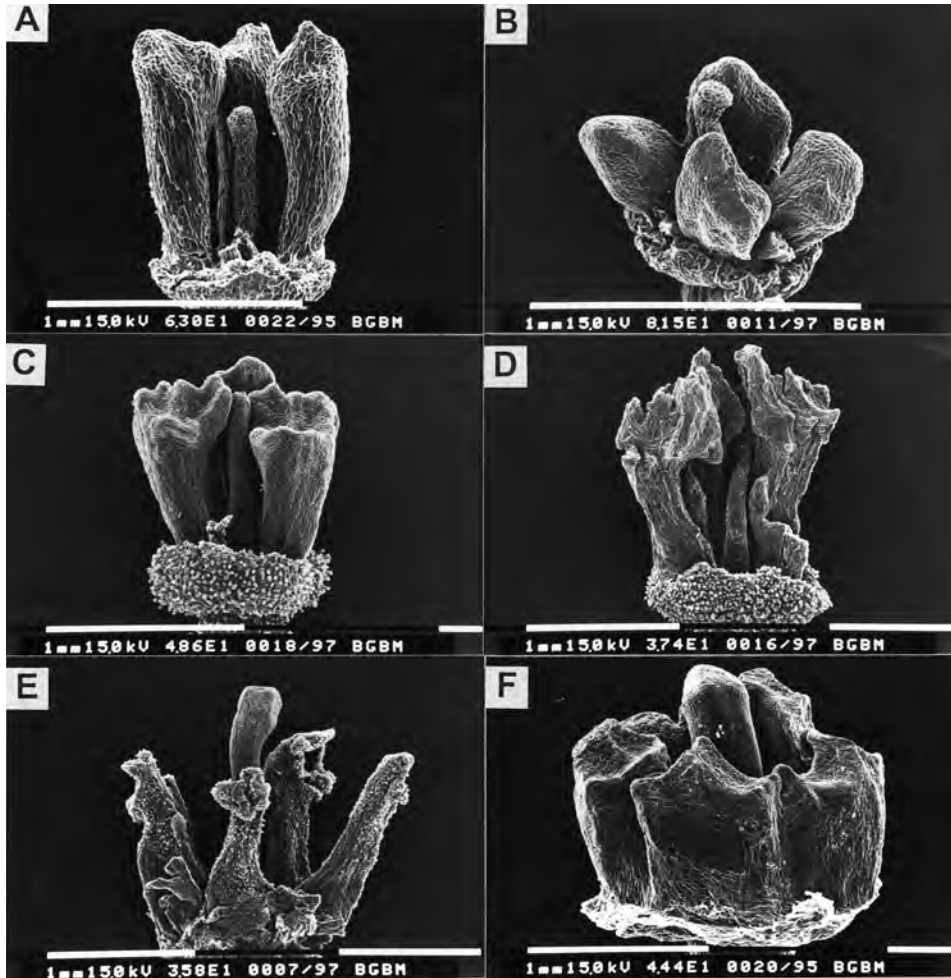


Figure 14. Disc of male flowers in *Agonandra*. **A**, *A. silvatica*, front lobe removed; **B**, *A. fluminensis*; **C**, *A. brasiliensis* subsp. *brasiliensis*, lobes with irregularly dentate apex, front lobe removed; **D**, *A. brasiliensis* subsp. *brasiliensis*, apex of disc lobes more dentate, front lobe removed; **E**, *A. goldbergiana*, apex of disc lobes extrorsely irregularly toothed and fissured; **F**, *A. peruviana*, disc lobes fused to a cupula with dentate margin (**A**, *B.A.Krukoff 9006*, **B**; **B**, *P.Occhioni 7609*, RFA; **C**, *P.W.Richards 6583*, K; **D**, *E.Hassler 7247*, NY; **E**, *E.Contreras 6791*, NY; **F**, *J.Schunke V. 2552*, NY). Scale bars: 1 mm. SEM photographs by Monika Lüchow. Reproduced with permission from P.Hiepko, *Fl. Neotrop.* 82: 9, fig. 5 (2000).

nodes, puberulous; male racemes 3–6 (–7) cm; female racemes (15–) 20–40 mm long; bracts broadly ovate, c. 2 mm long; flowers 1 or 3 (rarely 4) per bract (in female inflorescences often only in the lower half in groups of 3) with 2 very small bracteoles at the base of the pedicels of the lateral flowers. Pedicels and flowers puberulous; pedicels 1–2.5 mm long in flower, up to 14 mm long in fruit. Male flowers: tepals oblong, acute, 2–3 mm long; stamens 2.5–3.5 mm long; disc lobes fleshy, 0.5–0.7 mm long, the apex irregularly toothed; rudimentary pistil cylindrical, c. 1 mm long. Female flowers: tepals 0.5 mm long; disc annular, up to 0.2 mm high; pistil conical, 0.5 mm long; stigma shallowly 3-lobed. Drupe olive green, 23 (–30) mm long, 17 mm wide.

From Panama and Guyana to Bolivia and Paraguay. In savanna and deciduous forest, sometimes in riparian forest.

Agonandra brasiliensis is characterized by its very thick, corky bark which has been described as longitudinally fissured with c. 4 cm thick horizontal cracks. The puberulous flowers are rather uniform, and only the apically toothed disc lobes of the male flowers show some variation. The morphology of inflorescences is of some taxonomic importance in *Agonandra*, but is rather variable in *A. brasiliensis*. Normally the lateral cymes formed in the axil of one bract consist of three pedicellate flowers, but the number of flowers per bract is often reduced to two or one in the upper part of the same inflorescence of *A. brasiliensis*. Several specimens from Colombia and Venezuela, which otherwise match *A. brasiliensis*, consistently have true racemes with only one flower per bract. Because of this clear-cut difference, two subspecies are distinguished [P.Hiepkko, *Fl. Neotrop.* 82: 29 (2000)].

Male inflorescences with 3 (–4) flowers per bract, female inflorescences at least in the lower half with 3 flowers per bract **2a. subsp. brasiliensis**

Male and female inflorescences with one flower per bract **2b. subsp. racemigera**

2a. *Agonandra brasiliensis* Miers ex Benth. & Hook.f. subsp. *brasiliensis*

Agonandra granatensis Rusby, *Descr. S. Amer. Pl.* 14 (1920). T: Colombia: Santa Marta, trail from Don Amo to the Sierra Nevada, 600 m, *H.H.Smith 1950*; lecto: NY, *fide* P.Hiepkko, *Fl. Guianas*, ser. A, 14: 37 (1993); isolecto: A, B, BM, BR, F, G, GH, K, MICH, MO, P, S, U, US. Syn: Colombia, Bonda, *H.H.Smith 1771*; in the same herbaria.

Agonandra lacera Toledo, *Arq. Bot. Estado São Paulo* 3: 14, tab. 4 (1952). T: Brazil: Minas Gerais: Ituiutaba, *A.Macedo 466* (= *SP 53207*); lecto: SP, *fide* P.Hiepkko, *Fl. Neotrop.* 82: 27 (2000); isolecto: K, MO, US. Toledo cited this collection number as type, but since there is a second collection under the same number with female flowers and different dates it was necessary to select a lectotype.

Agonandra macedoi Toledo, *Arq. Bot. Estado São Paulo* 3: 13, tab. 3 (1952). T: Brazil: Minas Gerais: Ituiutaba, *A.Macedo 728* (= *SP 53209*); lecto: SP, *fide* P.Hiepkko, *Fl. Neotrop.* 82: 27 (2000); isolecto: K, S, US. Toledo cited this collection number as type, but since there is a second collection under the same number with female flowers and different dates it was necessary to select a lectotype.

[*Agonandra duckei* Huber ex Ducke, *Bol. Mus. Paraense Hist. Nat.* 7: 108 (1913), nom. inval. (pro. syn.)]

Illustrations: L.I.Nevling Jr., *Fl. Panama, Ann. Missouri Bot. Gard.* 47: 291, fig. 83 (1960); P.Hiepkko, *Fl. Neotrop.* 82: 8, fig. 4C; 9, fig. 5C & D (2000).

Map: P.Hiepkko, *Fl. Neotrop.* 82: 28, fig. 15 (2000).

Small tree to 12 (–30) m tall. Male inflorescences with 3 (–4) flowers per bract; female inflorescences at least in the lower half with 3 flowers per bract (in the upper half flowers often in twos or single). Fig. 14 C & D.

Distribution as for the species. 80: PAN. 82: GUY, VEN. 83: BOL, CLM. 84: BZC, BZE, BZL, BZN. 85: PAR. Flowers and fruits throughout the year. Map 32.

80. PANAMA: Vic. of Penonomé, *R.S.Williams 368* (F, NY, US). **82.** GUYANA: South Rupununi, Toot R., 40 km SE Aishalton village along Marudi Rd., 250 m, *T.W.Henkel & R.James 3781* (B, NY, US). VENEZUELA: Delta Amacuro, ENE of El Palmar, *C.Blanco 508* (MO, NY, US, VEN). **83.** BOLIVIA: Santa Cruz, Prov. Sara, Portachuelo, 400 m, *J.Steinbach 6467* (F, G, K, MO, S). COLOMBIA: Magdalena, Santa Marta, near Bonda, *H.H.Smith 783* (BM, BR, E, F, G, GH,

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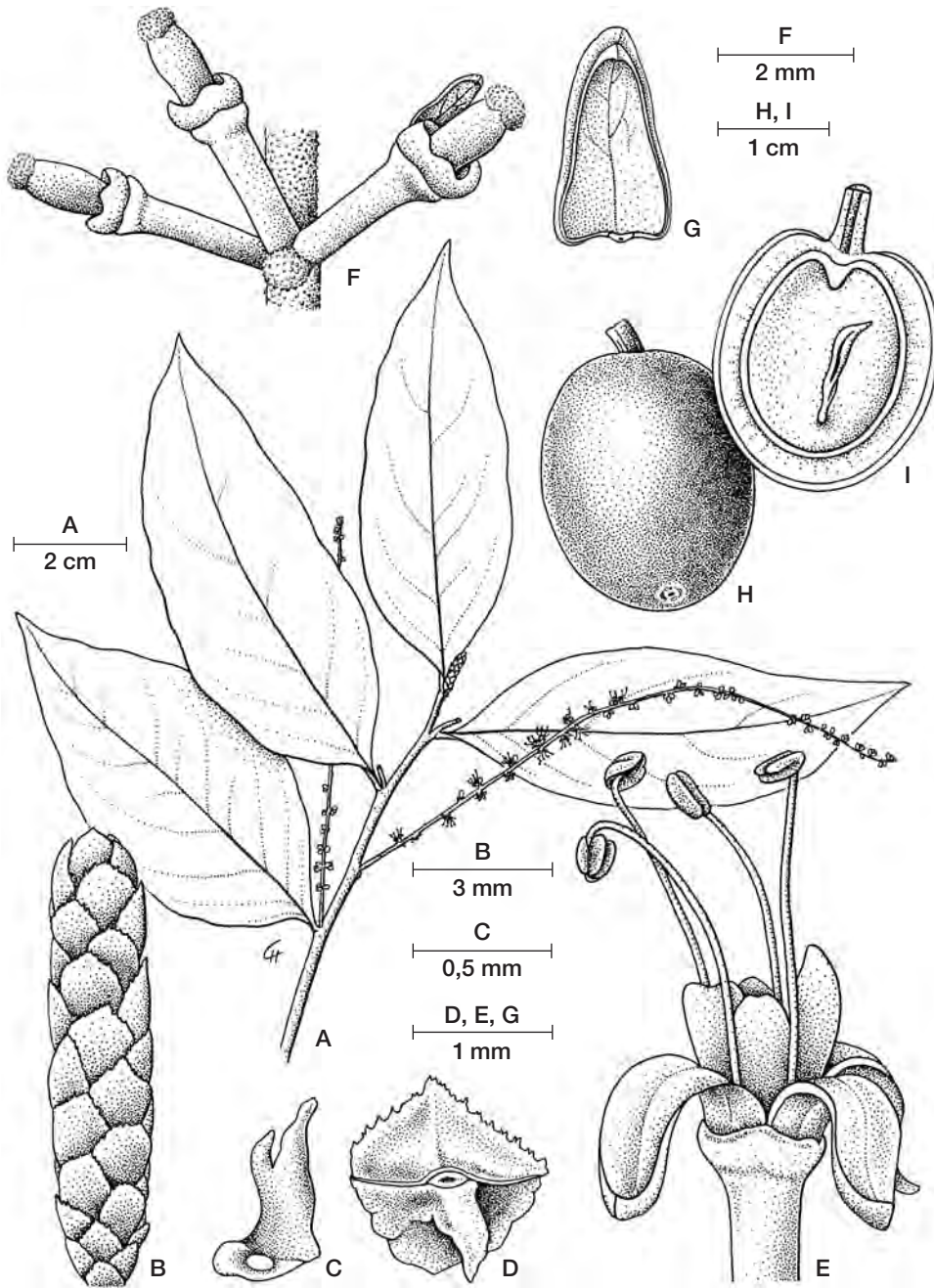


Figure 15. *Agonandra silvatica*. **A**, twig with male inflorescences; **B**, young male inflorescence; **C**, bracteole of a flower from **B**; **D**, adaxial view of a bract; **E**, male flower; **F**, group of 3 female flowers after anthesis, only one tepal left; **G**, tepal of a female flower; **H**, drupe; **I**, drupe, longitudinally cut in half (**A**, **E**, *B.A.Krukoff* 9006, **B**; **B-D**, *N.T. da Silva* 1348, **B**; **F-G**, *L.B.B. 11195*, **U**; **H-I**, *D.Loubry s.n.*, **B**, *alc.*). Drawn by Christine Hillmann-Huber. Reproduced with permission from P.Hiepko, *Fl. Guianas*, ser. A, 14: 38, fig. 10 (1993).

K, LL, MICH, MO, NY, P, S, U, US). **84.** BRAZIL West-Central: Mato Grosso, Cuyabá, *G.A.Malme 1917* (G, GH, K, NY, R, S, US). BRAZIL Northeast: Ceará, Serra de Ibiapaba, *M.A.Lisbôa MG 2427* (BM, RB, US). BRAZIL Southeast: São Paulo, Pádua Sales, *O.Handro 612* (LL, K, S, US, SP). BRAZIL North: Pará, Faro, *A.Ducke MG 10552* (BM, G, P, R, RB, US). **85.** PARAGUAY: Concepción, *E.Hassler 7247* (A, BM, C, G, K, MICH, MO, NY, P, RB, S, US).

The straw-colored wood (satin wood) is used for furniture and carving. The fruits are edible and in Venezuela are used to prepare marmalade; the fruits also are a favorite food of deer. The Tupi-Guaraní Indians in Brazil (Maranhão) use a decoction of the bark for skin infections. In Piauí the roots are used as a purgative. In Paraguay the bark is used for colds, diarrhea, and malaria in decoction [P.Hiepko, *Fl. Neotrop.* 82: 29 (2000)]. Extract of bark is strongly molluscicidal [W.B.Mors, C.Toledo Rizzini & N.Alvares Pereira, *Medicinal Plants of Brazil* (2000)].

2b. *Agonandra brasiliensis* subsp. *racemigera* Hiepko, *Bot. Jahrb. Syst.* 117: 498 (1995)

T: Colombia: Magdalena, near Fonseca, c. 175 m, *O.Haught 3994*; holo: US; iso: F, K.

Map: P.Hiepko, *Fl. Neotrop.* 82: 28, fig. 15 (2000).

Small tree (2–) 4–8 (–14) m tall. Male and female inflorescences with 1 flower per bract.

Colombia and Venezuela. 82: VEN. 83: CLM. In dry deciduous forest. Flowers Mar.–July; fruits May–Nov. Map 33.

82. VENEZUELA: Bolívar, between San Félix and Puerto Ordaz, *J.A.Steyermark 94230* (NY, US, VEN). Zulia, Dept. Páez, at Misión de Guana, 4 km from Guarero, *G.S.Bunting 5264* (NY). **83.** COLOMBIA. Atlántico, Puerto Colombia, *Bro.Elias 1413* (A, F, G, NY, US).

3. *Agonandra fluminensis* Rizzini & Occhioni, *Leandra* 6: 108 (1975)

T: Brazil: Rio de Janeiro, Magé, Vale das Pedrinhas, *P.Occhioni 7609 = R.F.A. 17171*; holo: RFA.

Illustration: P.Hiepko, *Fl. Neotrop.* 82: 9, fig. 5B (2000).

Map: P.Hiepko, *Fl. Neotrop.* 82: 28, fig. 15 (2000).

Shrub, 3–5 m tall. Leaves with petiole 2–5 mm long; lamina narrowly elliptic to oblong, 5–10 cm long, 15–27 mm wide; base cuneate; apex acuminate to acute; midrib prominulous above, at least in the lower half of the lamina, prominent beneath; lateral veins 5–8 per side, curved-ascending, very slender and inconspicuous on both sides. Racemes axillary, 1–2 per axil, 15–25 mm long; rachis glabrous to partly minutely papillate, (2–) 3 flowers per bract; bracts very broadly angular-ovate, 0.7 mm long, 1 mm broad, with 2 minute bracteoles at the base of the pedicels of the lateral flowers. Pedicels and flowers glabrous, pedicels 1–1.5 mm long. Male flowers: tepals oblong, c. 1 mm long; stamens 1.5 mm long; disc lobes obtuse, 0.5 mm long, sometimes fused at the base; rudimentary pistil thinly cylindrical with slightly capitate stigma, slightly longer than the disc lobes. Female flowers: not seen. Drupe not seen. Fig. 14 B.

Known only from the type. 84: BZL. In somewhat disturbed primary deciduous forest Flowers June. Map 34.

Agonandra fluminensis is characterized by a combination of several characters. The inflorescences are composed of 3(–2) flowers per bract like those of *A. brasiliensis* subsp. *brasiliensis* but differ through the absence of pubescence of rachis and flowers typical for *A. brasiliensis*. The glabrous (or partly papillose) rachis of the inflorescence of *A. fluminensis* is a feature reminiscent of *A. silvatica*. The flowers of *Agonandra fluminensis* are rather similar to those of *A. excelsa*, but the obtuse disc lobes are mostly totally free, and in *A. excelsa*, we always find only one flower per bract. [P.Hiepko, *Fl. Neotrop.* 82: 30 (2000)].

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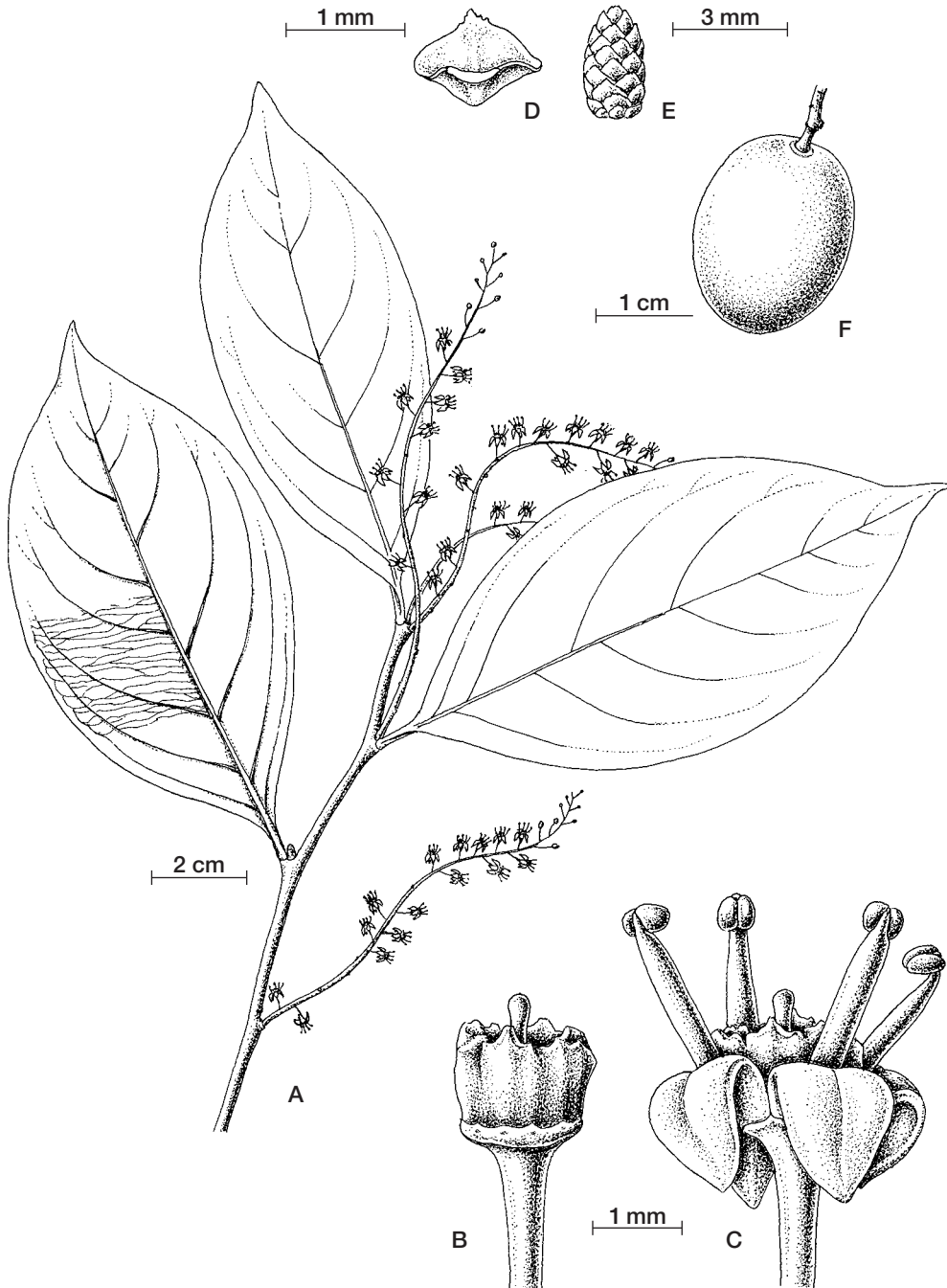


Figure 16. *Agonandra peruviana*. **A**, twig with male inflorescences; **B**, disc of male flower with rudimentary pistil, tepals and stamens removed; **C**, male flower; **D**, bract, adaxial view; **E**, young inflorescence; **F**, drupe (**A-E**, *J.Schunke V. 2552*, F, NY; **F**, *M.Timaná 20*, B). Drawn by Ingo Haas. Reproduced with permission from P.Hiepko, *Bot. Jahrb. Syst.* 117: 496, fig. 1 (1995).

4. *Agonandra goldbergiana* Hiepko, *Willdenowia* 27: 225 (1997)

Izabalaea excelsa Lundell, *Wrightia* 4: 154 (1971) [non *Agonandra excelsa* Griseb. (1879)]. T: Guatemala: Izabal, Cadenas, in high forest bordering Rio Sarstun, *E. Contreras* 6791; holo: LL; iso: LL, NY.

Illustration: P.Hiepko, *Fl. Neotrop.* 82: 9, fig. 5E; 31, fig. 16 (2000).

Map: P.Hiepko, *Fl. Neotrop.* 82: 43, fig. 24 (2000).

Tree, to 50 m tall and 1 m diam.; branchlets minutely papillate. Leaves with petiole 2–5 mm long, minutely papillate at base adaxially; lamina elliptic to narrowly elliptic, 7–10 (–12) cm long, 2–4.5 cm wide; base attenuate; apex obtuse to acute; midrib flat above, prominent beneath; lateral veins 5–7 per side. Racemes axillary, 1–3 per axil, mostly on defoliated nodes; rachis densely papillate; male racemes 10–25 mm; female racemes 20–25 mm long; bracts depressed-orbicular, distinctly peltate, c. 3 mm wide; flowers usually 3 per bract, without bracteoles. Pedicels papillate like the rachis; flowers glabrous; pedicels 2–2.5 mm long in flower, 7–11 mm long in fruit. Male flowers: tepals oblong, 2–2.5 mm long; stamens 4 mm long; disc lobes thinly fleshy, 1–1.5 mm long, with short, more or less papillate hairs, the apex extrorsely irregularly toothed and fissured; rudimentary pistil cylindrical, c. 1 mm long. Female flowers: tepals 1 mm long; disc annular, 0.3 mm high; pistil conical, 1 mm long; stigma cushion-shaped. Drupe (not yet ripe) 25 mm long, 17 mm wide. Fig. 14 E.

E Guatemala, Izabal and Petén. 80: GUA. In tall (riparian) forest. Flowers March; fruits Apr. Map 35.

80. GUATEMALA: Petén, La Cumbre, Las Canas, E of km 142 of the Petén-Izabal rd., *E. Contreras* 19065 (LL); La Cumbre, in Sapurul, *E. Contreras* 20803 (LL).

The morphology of inflorescences, flowers, and fruits clearly resembles that of other *Agonandra* species. *Agonandra goldbergiana* shows some similarities with *A. silvatica*, especially with regard to the papillate surface of the rachis of the racemes, but the inflorescences are much shorter than those of *A. silvatica*. The most definite difference between the male flowers of both species appears to be in the papillate indumentum and the extrorsely toothed and fissured apex of the disc lobes of *A. goldbergiana*.

Because there are many threats to the vegetation and flora of the Petén, *A. goldbergiana* is apparently an endangered species [P.Hiepko, *Fl. Neotrop.* 82: 30 (2000)].

5. *Agonandra peruviana* Hiepko, *Bot. Jahrb. Syst.* 117: 495 (1995)

T: Peru: Huánuco, Prov. Pachitea, Distr. Honoria, Isla del Pacanase, 5 km above Campamento del Bosque Nacional de Iparía, W of Pachitea, 300–400 m, *J. Schunke* V. 2552; holo: F; iso: G, GH, K, MO, NY, US.

Illustration: P.Hiepko, *Fl. Neotrop.* 82: 9, fig. 5F; 33, fig. 17 (2000).

Map: P.Hiepko, *Fl. Neotrop.* 82: 34, fig. 18 (2000).

Tree, 8–30 (–35) m tall, to 45 cm diam.; branchlets glabrous. Leaves with petioles (5–) 7–10 mm long; lamina oblong-elliptic or ovate, (7–) 10–12 cm long, (3–) 4–6 cm wide; base attenuate; apex acute to shortly acuminate; midrib flat or slightly raised above, prominent beneath; lateral veins 5–6 (–8) per side, curved-ascending; secondary venulation scalariform, more or less perpendicular to the midrib. Racemes axillary, 1 (–3) per axil, glabrous; male racemes (3–) 7–10 cm; female racemes 1.5–3 cm long; 1 flower per bract; bracts broadly angular-ovate, c. 1 mm diam.; bracteoles linear. Pedicels and flowers glabrous. Male flowers: pedicels (1.5–) 3–5 mm long; tepals 4 (–5), oblong, reflexed, c. 2 mm long; stamens 2–2.5 mm long; disc lobes fused and forming a cup, c. 1 mm high, irregularly toothed; rudimentary pistil cylindrical, exceeding the disc. Female flowers: pedicels 1.5–2 mm long in flower, 3–4 mm long in fruit; tepals 4 (–5), caducous, ± triangular, c. 1 mm long; disc annular, margin undulating, c. 0.5 mm high; pistil ovoidal, c. 1 mm long, stigma cushion-shaped. Drupe yellow to reddish purple, 20–25 mm long, 18–20 mm wide. Fig. 14 F, 16.

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E Ecuador, NE and N Peru, and SW Brazil. 83: ECU, PER. 84: BZN. In tall forest on terra firme and in upland humid forest on sandy clay or sand, rarely in temporarily flooded forest, at 100–900 m elev. Flowers Jan.–Aug.; fruits March–Sept. Map 36.

83. ECUADOR: Napo, Río Napo, 8 km below Misahuallí, Reserva Biol. Jatún Sacha, 450 m, *W.Palacios & D.Neill* 962 (MO, NY, QAME, QCNE); Pastaza, Via Auca, 115 km S of Coca, 5 km S of Río Tigüino, 320 m, *V. Zak* 4070 (MEXU, MO). PERU: Cajamarca, Pucará, 900 m, *F.Woytkowski* 5681 (C, G, GH, MO, US); Huánuco, Prov. Pachitea, Honoria, Río Pachitea, c. 20 km from the confluence with Río Ucayali, *J.Schunke* V. 2524 (F, G, GH, MO, NY, US); Loreto, Dept. Iquitos, Río Momón, tributary of Río Nanay, trail from caserío of San Andrés, *M.Rimachi* Y. 2935 (F, MO, NY, RSA); Madre de Dios, Prov. Manú, Manú National Park, Cocha Cashu Biol. Station, 400 m, *P.Núñez et al.* 14311 (B, MO n.v.); Pasco, Prov. Oxapampa, 5 km SE of Oxapampa, *D.N.Smith* 3192 (MEXU, MO). **84.** BRAZIL: Acre, Río Purus, near mouth of Río Macauhan, *B.A.Krukoff* 5703 (F, G, MO, U); Rondônia, BR 364, linha 206, 48 km from Ji-Paraná, *C.A.Cid et al.* 4912 (K, NY, US).

Agonandra peruviana is characterized by its inflorescences, which are true racemes with only one flower per bract. Another striking feature is the cup-shaped disc of staminate flowers, which contrasts with the lobed disc of *A. silvatica* and *A. brasiliensis*. In *A. excelsa*, the disc-lobes are fused only in the lower half. Thus, *A. peruviana* may be more closely related to that species, particularly because the leaves of both species have a similar dense scalariform secondary venation usually prominulous on both sides of the lamina in the dry state.

6. *Agonandra excelsa* Griseb., *Symb. Fl. Argent.* 149 (1879)

T: Argentina: Salta, near Rosario, at Bermejo river, Laguna del Palmar, *P.G.Lorentz & G.Hieronymus* 653; lecto: GOET, *fide* P.Hiepko, *Fl. Neotrop.* 82: 34 (2000); isoleccto: B.

Agonandra spegazzinii Molfino, *Anales Soc. Ci. Argent.* 108: 140 (1929). T: Argentine: Misiones, Loreto, *A.A.Muniez s.n.*; lecto: BAF, photo at B, *fide* P.Hiepko, *Fl. Neotrop.* 82: 34 (2000); Molfino (1929) mentions two specimens, namely *Muniez s.n.* (“invierno 1921”) and *Molfino s.n.* (“verano 1922”) as syntypes. The specimen collected by Muniez is labeled as holotype which does not concur with the protologue.

Agonandra engleri Hoehne, *Arq. Bot. Estado São Paulo* 1: 136, tab. 153 (1944) (*‘Englerii’*). T: Brazil: São Paulo, Capital, Agua Funda, area of Depart. da Produção Animal, *A.Gehrt* SP 47418; lecto: SP, *fide* P.Hiepko, *Fl. Neotrop.* 82: 34 (2000).

Illustration: P.Hiepko, *Fl. Neotrop.* 82: 4, fig. 1; 10, fig. 6A, B; 35, fig. 19; 36, fig. 20 (2000).

Map: P.Hiepko, *Fl. Neotrop.* 82: 34 (2000).

Small tree or shrub, 3–11 (–15) m tall; trunk to 40 cm diam.; bark rough and black; branchlets glabrous, sometimes puberulous. Leaves with petioles often puberulous, 2–5 mm long; lamina elliptic to ovate, obovate or more or less orbicular, 3–7 (–9) cm long, (1–) 2–4 (–5) cm wide, base cuneate; apex obtuse and mucronulate, sometimes retuse or acute; midrib flat above, prominent beneath; lateral veins 5–8 per side, curved-ascending; tertiary venation dense, \pm parallel to the lateral veins. Racemes axillary, 1–3 (–4) per axil, (2–) 3–4 cm long; rachis puberulous to minutely papillate; 1 flower per bract; bracts very broadly angular-ovate, 0.5 mm long, 0.7 mm broad, 2 minute bracteoles. Pedicels and flowers puberulous or minutely papillate; pedicels 1–2 mm long in flower, very short and distinctly thicker toward apex in fruit. Male flowers: tepals oblong, c. 1.5 mm long; stamens 2.5 mm long; disc lobes 0.5 mm long, in the lower half united, free lobes \pm acute; rudimentary pistil cylindrical, slightly longer than the disc lobes. Female flowers: tepals 1 mm long; disc annular, to 0.3 mm high; pistil conical to barrel-shaped, 1 mm long; stigma broad, irregularly cushion-shaped. Drupe yellowish-orange, 20 mm long, 15 mm wide. Fig. 17.

SW Ecuador, NW Peru, eastern and southern Brazil, Bolivia, Paraguay, and northern Argentina. 83: BOL, ECU, PER. 84: BZC, BZE, BZL, BZS. 85: AGE, AGW, PAR. In riparian or periodically flooded forest, in subtropical semideciduous or deciduous forest, and on pasture land. 0–1000, rarely to 1800 m elev. Flowers (Mar.–) July–Oct.; fruits Sept.–Jan. Map 37.

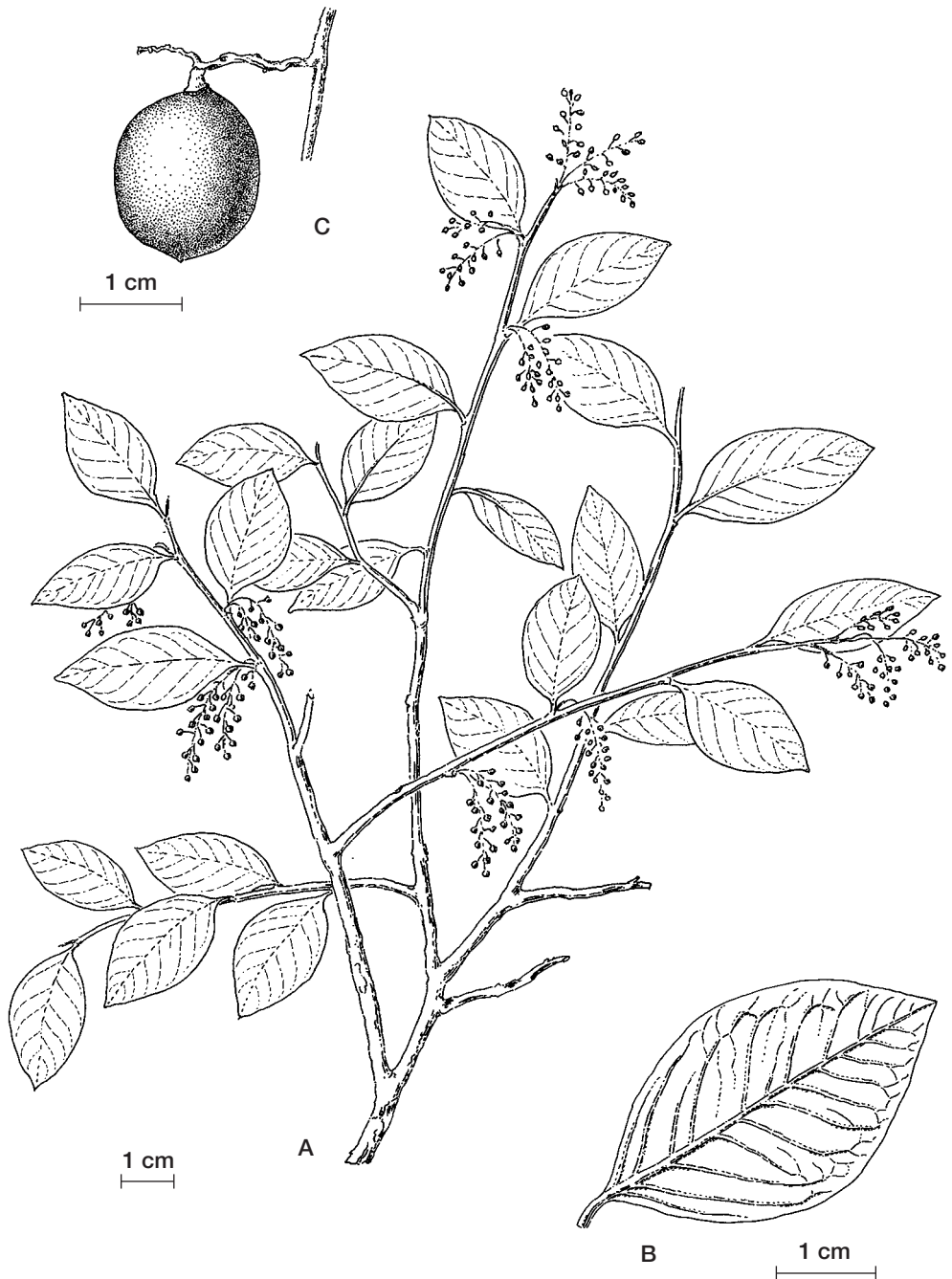


Figure 17. *Agonandra excelsa*. **A**, habit with male inflorescences; **B**, leaf; **C**, drupe (**A**, *M.Nee* 35634, **B**; **B**, *E.Hassler* 12283, **A**; **C**, *S.G.Beck* 2681, **B**). Drawn by Michael Rodewald. Reproduced with permission from P.Hiepko, *Fl. Neotrop.* 82: 35, fig. 19 (2000). © 2000, The New York Botanical Garden.

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83. BOLIVIA: Santa Cruz, 12 km E of center of Santa Cruz, *M.Nee 35634* (B, NY, RSA, TEX). ECUADOR: Guayas, Isla Puná, Cerro Ramón and N along trail towards Campo Alegre, *J.E.Madsen 86014* (AAU, QCA, QCNE). **84.** BRAZIL West-Central: Mato Grosso, 50 km N of Chavantina, *G.T.Prance & N.T.Silva 59329* (A, K, NY, US). Northeast: Ceará, Crato, *G.Gardner 1519* (BM, K). Southeast: Minas Gerais, Poços de Caldas, *J.Mattos & N.Mattos 16386* (SP). South: Rio Grande do Sul, Sapucaia nr S. Leopoldo, *Rambo 48713* (C, K, LIL, S, US). **85.** ARGENTINA NORTHEAST: Chaco, Las Palmas, *P.M.Joergensen 2148* (GH, MO, US). Northwest: Salta, Tartagal, 500 m, *R.Schreiter 11484* (A, BM, F, LIL, U). PARAGUAY: Central, vic. of Laguna Ypacaraí, *E.Hassler 12283* (A, BM, C, E, F, G, K, MICH, MO, NY, S, US, Z).

Agonandra excelsa is characterized by its inflorescences (only one flower per bract), the partly fused disc of male flowers and the short, distinctly obconical pedicels of the relatively small fruits. Form, size, and texture of the leaves vary considerably, as does the indumentum of young branches and inflorescences. In the central part of the range of the species, the leaves are broadly elliptic, ovate, or obovate and sometimes more or less orbicular. In the eastern (type of *A. engleri*) and the southeastern part of the range, the leaves are often narrowly elliptic with a mucronulate apex, and the indumentum of the inflorescences is mostly reduced to minute papillae. In the northwestern part of the range (Ecuador and Peru), the leaves tend to be smaller and narrowly elliptic with an acute apex. These are all intergrading characters, and it is impossible to find sharp boundaries for the definition of infraspecific taxa. Fruits eaten by game [P.Hiepkó, *Fl. Neotrop.* 82: 37 (2000)].

7. *Agonandra racemosa* (DC.) Standl., *J. Wash. Acad. Sci.* 10: 506 (1920)

Schaefferia racemosa DC., *Prodr.* 2: 41 (1825). T: Mexico: holo: "*Schweinizia racemosa*", unpublished illustration, Sessé & Mociño, at Hunt Institute for Botanical Documentation, Torner Collection no. 6331.0712, copies at G, photo IDC 713, vol.1, tab. V).

Loranthus anomalus M.E.Jones, *Contr. W. Bot.* 18: 56 (1933). T: Mexico: Guadalajara, La Barranca, *M.E.Jones 27330*; holo: POM, in RSA; iso: A.

Illustration: P.Hiepkó, *Fl. Neotrop.* 82: 10, fig. 6C & D; 39, fig. 22 (2000).

Map: P.Hiepkó, *Fl. Neotrop.* 82: 41, fig. 23 (2000).

Small tree or shrub, 2.5–10 (–15) m tall; branches drooping; trunk to 25 cm diam.; bark brown-black, slightly corky and fissured; branchlets glabrous. Leaves with petioles 5–10 (–12) mm long; lamina narrowly ovate to elliptic, rarely broadly ovate, 4–8 (–10.5) cm long, (1–) 2–3 (–4.5) cm wide; base cuneate to rounded; apex acute to shortly acuminate; midrib flat above, slightly prominent beneath; lateral veins 4–6 per side, curved-ascending. Racemes terminal and axillary, 1 per axil, 1.5–4 (–5.5) cm long (terminal inflorescences often forming a double raceme); rachis glabrous, 1–3 flowers per bract; bracts broadly cordate, 1 × 1 mm; bracteoles linear. Pedicels and flowers glabrous. Male flowers: pedicels 1.5–3 mm long; tepals oblong, c. 2 mm long; stamens 2.5–3 mm long; disc lobes 1 mm long, apex irregularly toothed; rudimentary pistil cylindrical with capitate stigma, not exceeding the disc lobes. Female flowers: pedicels 1.5–3 mm long in flower, 5–10 (–12) mm long in fruit; tepals c. 1 mm long; disc annular, 0.5 mm high, often irregularly lobed; pistil ovoidal, c. 1 mm long; stigma shallowly 3- to 4-lobed. Drupe yellow to whitish with purple, (7–) 9–11 mm long, 6–8 mm wide. *n* = 10, S.Seavey, *Taxon* 24: 671 (1975). Fig. 18.

Mexico (Sonora and Chihuahua to Chiapas) to Guatemala, Honduras and El Salvador. 79: MXC, MXE, MXN, MXS, MXT. 80: ELS, GUA, HON. In seasonally dry deciduous forest and in gallery forest. (10–)200–3500 m elev. Flowers Oct.–June; fruits Dec.–June. Map 38.

79. MEXICO CENTRAL: Mexico State, Temascaltepec, Telpincla, 1840 m, *G.B.Hinton 2423* (BM, G, NY, US, Z). MEXICO NORTHEAST: Durango, Mun. El Mezquital, 1.5 km from Temohaya, 1350–1400 m, *S.González & J.Rzedowski 2970* (MEXU, TEX). MEXICO NORTHWEST: Sinaloa, Dept Badiraguato, near Alicama, 150 m, *H.S.Gentry 5935* (CAS, GH, MEXU, MICH, MO, NY, RSA); Sonora, Río Mayo, Tepopa, *H.S.Gentry 1432* (A, F, G, MEXU, MO). MEXICO SOUTHEAST: Chiapas, Mun. Arriaga, 13 km N of Arriaga, along Mexican Highway 195, 830 m, *D.E.Breedlove 30577* (CAS, LL, MEXU, MICH, MO, NY, RSA). MEXICO SOUTHWEST: Nayarit, Mun. Jala, Volcán del Ceboruco, 1800 m, *M.Cházaro B. et al. 6960* (MEXU, TEX). Oaxaca, Poblado Limón, 17 km W of Tehuantepec, *C.Martínez R. 411* (MEXU). **80.** EL SALVADOR: Dept Ahuachapán, Mun. San Fco. Menéndez, El Imposible, *Sandoval 138* (B, LAGU, MO). GUATEMALA: Dept. Quiché, *J.I.Aguilar 1032* (F). HONDURAS: Dept. Comayagua, Río Selguapa, 700 m, *J.V.Rodríguez 2569* (F, GH, MEXU, MICH).



Figure 18. *Agonandra racemosa*. **A**, habit with male inflorescences; **B**, part of male inflorescence showing ternate groups of flowers; **C**, male flower; **D**, habit with young fruits (**A-C**, *D.E.Breedlove* 19122, MICH; **D**, *R.McVaugh* 22277, MICH). Drawn by Michael Rodewald. Reproduced with permission from P.Hiepko, *Fl. Neotrop.* 82: 39, fig. 22 (2000). © 2000, The New York Botanical Garden.

Agonandra racemosa is characterized by its glabrous inflorescences with a rather variable number of flowers per bract: in the axils of the basal bracts usually three flowers are born, but in the upper part of the racemes this number is reduced to two or even one. In this species, terminal inflorescences are often found which usually show smaller racemes instead of flowers in the lower part thus forming double racemes. The drupes of *A. racemosa* are relatively small.

Fruits eaten by magpie jays. In Mexico (Guerrero) used to treat fractures. [P.Hiepko, *Fl. Neotrop.* 82: 42 (2000)].

8. *Agonandra macrocarpa* L.O.Williams, *Ciencia (Mexico)* 24: 227 (1966)

T: Honduras: Francisco Morazán, Río de La Orilla, SW of El Zamorano, base of Cerro Majicarán, 750–800 m, *P.C.Standley* 25878; holotype: F1374805; isotype: F, MO, NY, U.

Agonandra loranthoides L.O.Williams, *Ciencia (Mexico)* 24: 227 (1966). T: Honduras: Comayagua, vic. of Comayagua, c. 600 m, *P.C.Standley* & *J.Chacón* P. 5454; holotype: F; isotype: EAP n.v.

Illustrations: W.Burger, *Fl. Costaric., Fieldiana Bot., n.s.* 13: 15, fig. 3 (1983); P.Hiepko, *Fl. Neotrop.* 82: 10, fig. 6E (2000).

Map: P.Hiepko, *Fl. Neotrop.* 82: 43, fig. 24 (2000).

Small tree or shrub, 3–10 (–15) m tall; bark gray-brown with deep fissures; branchlets obscurely papillate-pulverulent. Leaves with petiole glabrous, 4–7 (–10) mm long; lamina often hard and wrinkled when dry, elliptic to narrowly ovate to rhombic, (2–) 3–5.5 (–7) cm long, 10–30 mm wide; base attenuate; apex obtuse; midrib flat above, prominulous beneath; lateral veins 3–4 per side, steeply ascending. Racemes axillary, often on defoliated nodes, 1–4 per axil; male racemes 10–25 mm, female racemes 5–10 mm long, rachis minutely papillate or glabrous, 1 flower per bract; bracts crescent-shaped, 1.5 mm wide, without bracteoles. Pedicels minutely papillate like the rachis; flowers glabrous. Male flowers: pedicels 1.5–2 mm long; tepals oblong, 2–2.5 mm long; stamens 3–4 mm long; disc lobes c. 1 mm long, the apex irregularly toothed; rudimentary pistil cylindrical with capitate stigma, c. 1 mm long. Female flowers: pedicels 1.5–2 mm long in flower, 5–7 mm long in fruit; tepals more or less triangular, c. 1 mm long; disc annular, the margin undulating, c. 0.3 mm high; pistil ovoidal, c. 1 mm long; stigma cushion-shaped. Drupe greenish, 18–25 mm long, 14–19 mm wide.

Mexico (Yucatán Peninsula), central Honduras, W Nicaragua, and NW Costa Rica. 79: MXT. 80: COS, HON, NIC. In seasonally very dry deciduous or semideciduous forest. 50–900 m elev. Flowers Dec.–Apr.; fruits Feb.–May. Map 39.

79. MEXICO SOUTHEAST: Quintana Roo, 2 km S of Puerto Morelos, *O.Téllez V. et al.* 1817 (MEXU, MO); Yucatán, SE Kancabsonot, *G.F.Gaumer et al.* 23870 (A, BM, C, F, G, MO, NY, US). 80. COSTA RICA: Guanacaste, La Cuesta, Santa Rosa Nat. Park, 200 m, *J.Gómez-Laurito* 10036 (CR, F); Finca La Pacifica, 100 m, *P.A.Opler* 508 (CR, F). HONDURAS: Francisco Morazán, Drainage of the Río Yeguaré, 900 m, *A.Molina R.* 2724 (BM, F, GH, MO, US). NICARAGUA: Managua, km 51 of the Carretera Panamericana, *A.Laguna* 232 (HNMN, MO).

Agonandra macrocarpa is characterized by its glabrous or finely papillate racemes forming consistently only one flower per bract. The drupes are much bigger than those of *A. racemosa* and the apex of the leaves is obtuse rather than acute or shortly acuminate as in *A. racemosa*. The fruit of *A. macrocarpa* is much sought for by deer [P.Hiepko, *Fl. Neotrop.* 82: 43 (2000)].

9. *Agonandra obtusifolia* Standl., *J. Wash. Acad. Sci.* 10: 507 (1920)

T: Mexico: Tamaulipas, vic. of Victoria, 320 m, *E.Palmer* 421; holotype: US572649; isotype: K, MO, NY.

Shrub or small tree, 1–5 (–8) m tall, often compact with many lateral branches and stiff, thorn-like branchlets; bark dark gray, fissured; branchlets glabrous to pubescent. Leaves with petiole pubescent to more or less glabrous, 2–4 mm long; lamina often hard and wrinkled when dry, elliptic to ovate or obovate, (2–) 3–4 (–6) cm long, (7–) 10–20 mm wide; base attenuate; apex obtuse; midrib prominulous on both sides; lateral veins 2–3 (–4) per side, steeply ascending.

Racemes axillary, 1–2 (–3) per axil; male racemes 5–15 mm; female racemes 4–7 mm long, rachis finely puberulous to minutely papillate; flower 1 per bract; bracts broadly ovate, 1–1.5 mm wide, without bracteoles. Pedicels papillate to finely puberulous or glabrous; flowers glabrous. Male flowers: pedicels 1–1.5 mm long; tepals oblong, 2 mm long; stamens 2.5–3 (–4) mm long; disc lobes c. 1 mm long, the apex irregularly toothed; rudimentary pistil cylindrical with capitate stigma, c. 1 mm long. Female flowers: pedicels 1–1.5 mm long in flower, 3–4.5 (–6) mm long in fruit; tepals narrowly triangular, c. 1 mm long; disc annular, margin slightly undulating, c. 0.3 mm high; pistil ovoidal, c. 1 mm long; stigma cushion-shaped. Drupe dark yellow, 8–18 mm long, 5–12 mm wide.

Agonandra obtusifolia is usually much smaller than *A. racemosa*, and often grows as a compact shrub with stiff, thornlike branches. The racemes are very short and the rachis is usually finely puberulous, whereas the flowers are glabrous. The variant segregated as *A. conzattii* differs chiefly in the size of the fruit and occurs only in the southern part of the range, usually at higher altitudes, of this widely distributed species. Since both taxa intergrade in the contact zone, they are treated as subspecies of a single species.

Mexico (from Tamaulipas and Guanajuato to Veracruz, Puebla, Oaxaca, and Chiapas).

Lamina usually larger than 30 × 10 mm, branchlets and petioles puberulous to glabrous; the midrib glabrous; fruits 8–10 mm long, 5–7 mm wide; pedicels in fruit cylindrical, c. 1 mm thick; growing from 0 to 500 m elev. **9a.** subsp. **obtusifolia**

Lamina usually smaller than 30 × 10 mm, branchlets, petioles, and lower part of midrib beneath pubescent; fruits 15–18 mm long, 10–12 mm wide; pedicels in fruit slightly thicker toward apex, up to 2 mm thick below drupe; growing above 1000 m elev. **9b.** subsp. **conzattii**

9a. *Agonandra obtusifolia* Standl. subsp. *obtusifolia*

Illustrations: R.Acevedo Rosas & J.L.Martínez y Pérez, *Fl. Veracruz* 84: 5, fig. 1 (1995); P.Hiepko, *Fl. Neotrop.* 82: 10, fig. 6F (2000).

Map: P.Hiepko, *Fl. Neotrop.* 82: 43, fig. 24 (2000).

Branchlets puberulous to glabrous. Leaves with petiole puberulous to more or less glabrous; lamina elliptic to narrowly oblong, ovate or obovate, (2–) 3–4 (–6) cm long, 10–20 mm wide, glabrous. Pedicel 3–4.5 mm long, c. 1 mm thick in fruit, cylindrical. Drupe 8–10 mm long, 5–7 mm wide.

Mexico (from Tamaulipas and Guanajuato to Veracruz, Oaxaca, and Chiapas). 79: MXE, MXG, MXS, MXT. On sand dunes and in seasonally dry deciduous forest or thorny thickets, often in hedgerows. 0–500 m elev. Flowers Oct.–June; fruits Mar.–July. Map 40.

79. MEXICO NORTHEAST: Tamaulipas, S of Lomas de Real, just N of Altamira, *M.C.Johnston et al.* 4543 (MEXU, MICH, TEX); vic. of Tampico, *E.Palmer 507* (paratype: BM, CAS, F, GH, K, MO, NY, US). MEXICO GULF: Veracruz, vic. of Cotaxtla, *J.González G.* 73 (CAS, F, GH, MEXU); vic. of Pueblo Viejo, 2 km S of Tampico, *E.Palmer 423* (BM, G, GH, K, MO, US). MEXICO SOUTHEAST: Chiapas, Mun. Tonalá, sand dunes NW of Puerto Arista, 3 m, *D.E.Breedlove et al.* 54190 (CAS, LL, NY). MEXICO SOUTHWEST: Oaxaca, Cueva Redonda near Mitla, *W.R.Ernst 2661* (MEXU, US); 5 km SW of Tehuantepec, 40 m, *R.Torres C. et al.* 683 (CAS, MEXU).

Often used for living fences [P.Hiepko, *Fl. Neotrop.* 82: 44 (2000)].

9b. *Agonandra obtusifolia* subsp. *conzattii* (Standl.) Hiepko, *Willdenowia* 27: 226 (1997)

Agonandra conzattii Standl., *J. Wash. Acad. Sci.* 10: 508 (1920). T: Mexico: Oaxaca, Distr de Cuicatlán, Portillo de Coyula, 1600 m, *C.Conzatti 3558*; holo: US 1012311; iso: US 989655.

Map: P.Hiepko, *Fl. Neotrop.* 82: 43, fig. 24 (2000)

Branchlets pubescent. Leaves with petiole and lower third of midrib beneath pubescent; lamina 20–30 (–35) mm long, 7–10 (–15) mm wide, glabrous. Pedicel 3–6 mm long in fruit, slightly thicker toward apex, base c. 1 mm, apex 2 mm thick. Drupe 15–18 mm long, 10–12 mm wide.

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Mexico (Puebla, Oaxaca, and Chiapas). 79: MXC, MXS, MXT. In seasonally dry deciduous forest or thorny thickets. 1000–1900 m elev. Flowers Feb.–May; fruits Apr.–June. Map 41.

79. MEXICO CENTRAL: Puebla, 2 km NE of Cerro Patlanco, *F.Chiang C. et al. F-2488* (RSA, TEX); Valle de Tehuacán-Cuicatlan, Cerro de Petlanco, 9.5 km SW of Axusco, 1050 m, *A.Salinas T. et al. F-3220* (RSA, TEX). MEXICO SOUTHEAST: Chiapas, Coatis, NNW of Tuxtla Gutiérrez, *F.Miranda 6034* (F, DS, MEXU, US). MEXICO SOUTHWEST: Oaxaca, Mun. Chazumba, 5.5 km NW of San Sebastián Frontera, 1775 m, *F.Chiang C. 1889* (RSA).

10. *Agonandra ovatifolia* Miranda, *Anales Inst. Biol. Univ. Nac. México* 24: 71 (1953)

T: Mexico: Chiapas, rd. from Jericó to Parral, 1700 m, *F.Miranda 6906*; lecto: F (*vide* P.Hiepko, *Fl. Neotrop* 82: 45 (2000)); isolecto: MEXU, US.

Illustration: Miranda, *Anales Inst. Biol. Univ. Nac. México* 24: 72, fig. 2 (1953).

Map: P.Hiepko, *Fl. Neotrop.* 82: 43, fig. 24 (2000).

Tree, c. 10 m tall; branchlets pubescent. Leaves with petiole hairy below, glabrous above, c. 8 mm long; lamina hard and wrinkled when dry, broadly ovate to elliptic, 5–8 cm long, 3–6 cm wide; base rounded to attenuate; apex obtuse; midrib flat above, prominent beneath, hairy in the lower third beneath; lateral veins 3–5(–6) per side, rather obscure on both sides. Racemes axillary, usually on defoliated nodes, 1–3 per axil; male racemes not known; female racemes 5–7 mm long, the rachis papillate, 1 flower per bract; bracts broadly ovate, 1.5 mm wide. Pedicels minutely papillate like the rachis, 1.5–2 mm long. Male flowers: not known. Female flowers: tepals c. 1 mm long; disc annular, c. 0.3 mm high; pistil ovoid, c. 1 mm long. Drupe not known.

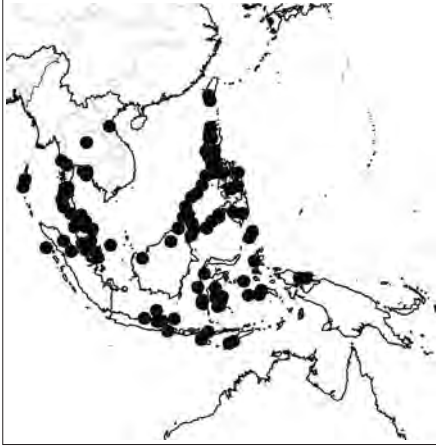
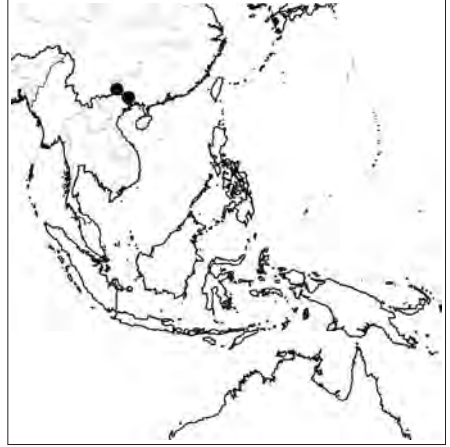
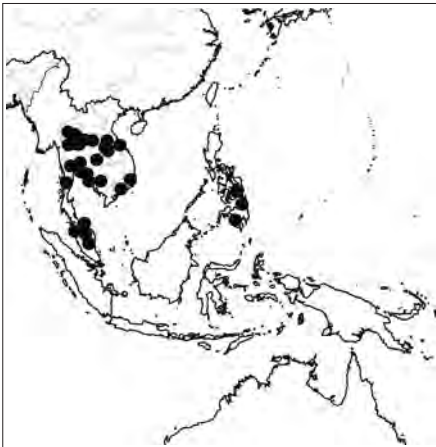
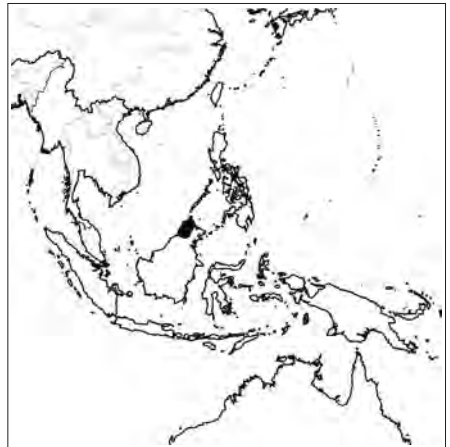
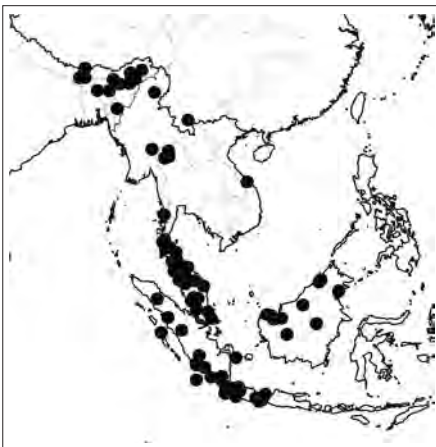
Known only from the type. 79: MXT. In semideciduous forest up to 1700 m elev. Flowers Feb. Map 42.

The female flowers and inflorescences, the indumentum of the petioles, and the lower third beneath of the midrib of *Agonandra ovatifolia* resemble those of *A. obtusifolia* subsp. *conzattii*, but *A. ovatifolia* is a much bigger tree, and the shape and size of the leaves is also different.

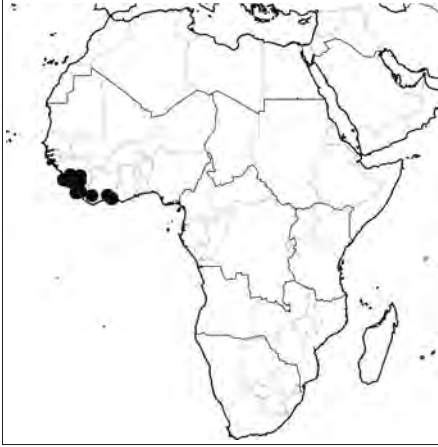
The very hard, yellowish wood is used as timber. [P.Hiepko, *Fl. Neotrop.* 82: 44 (2000)].

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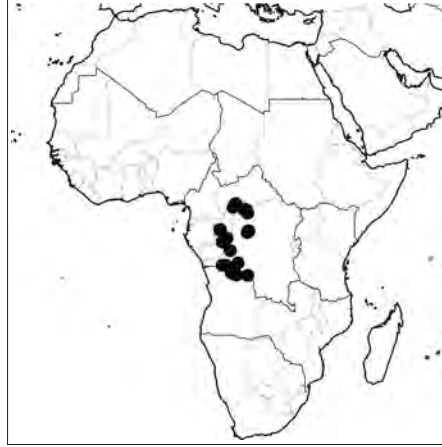
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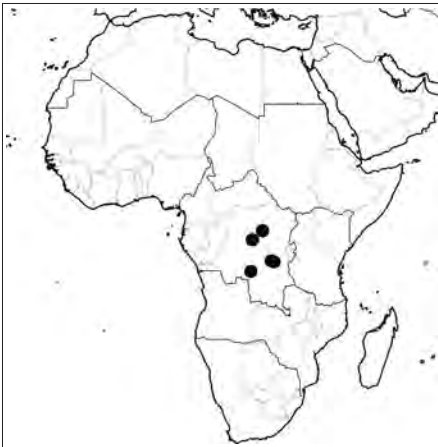
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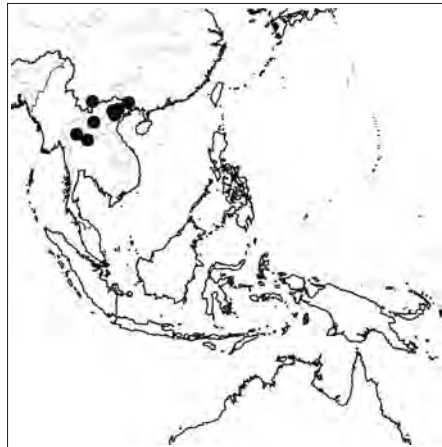
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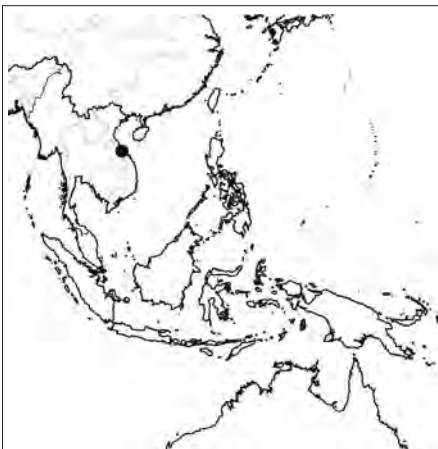
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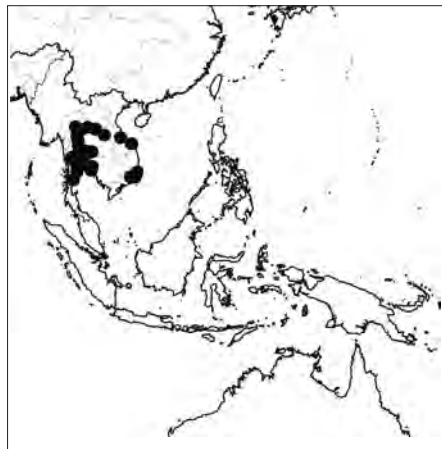
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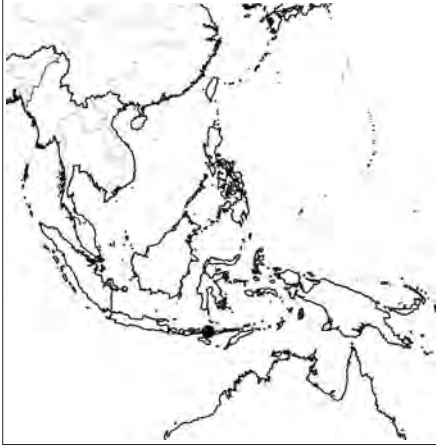
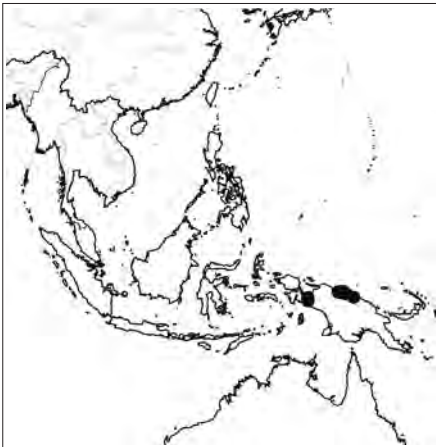
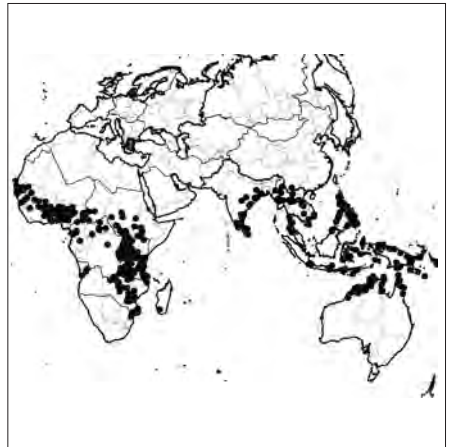
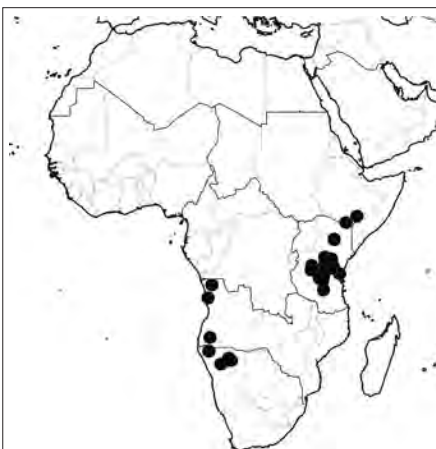
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11. *Urobotrya longipes* (18)



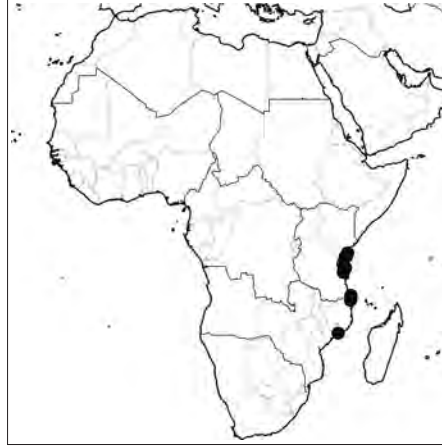
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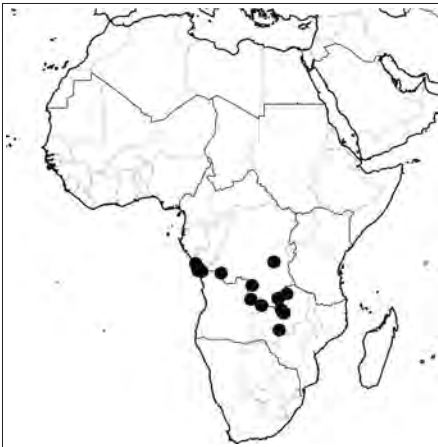
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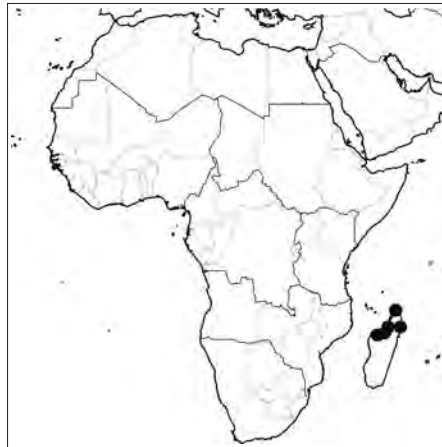
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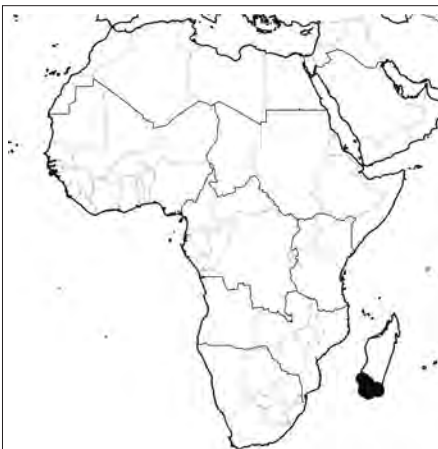
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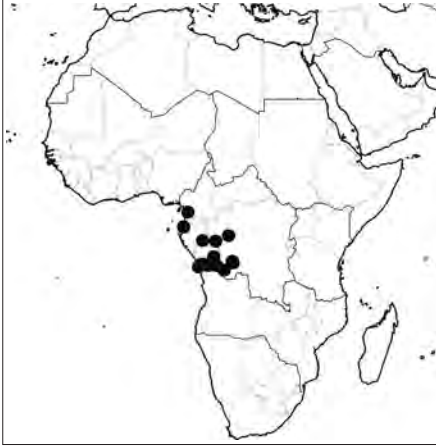
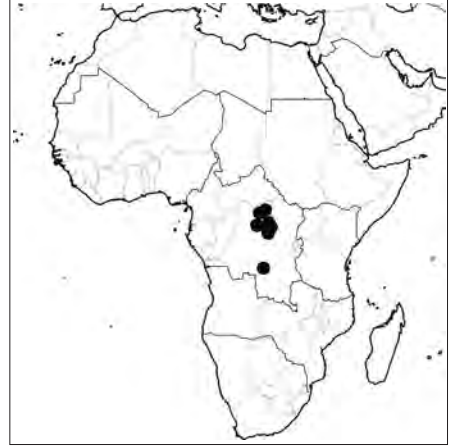
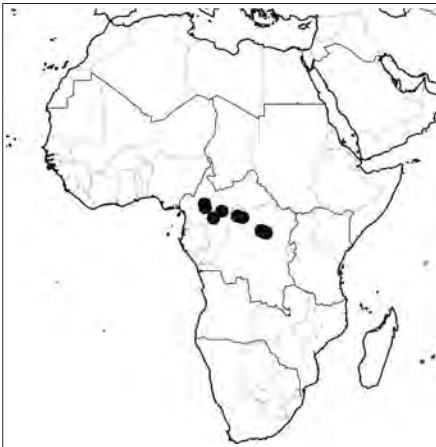
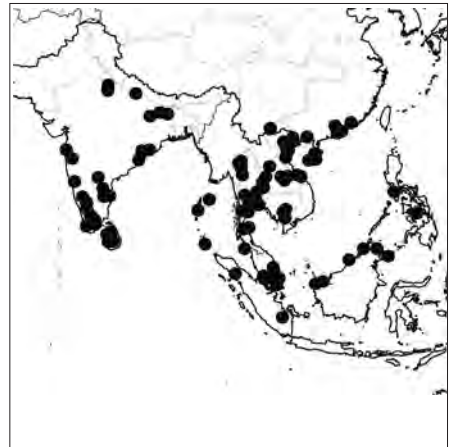
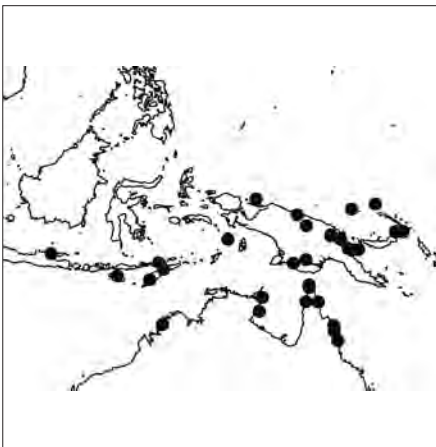
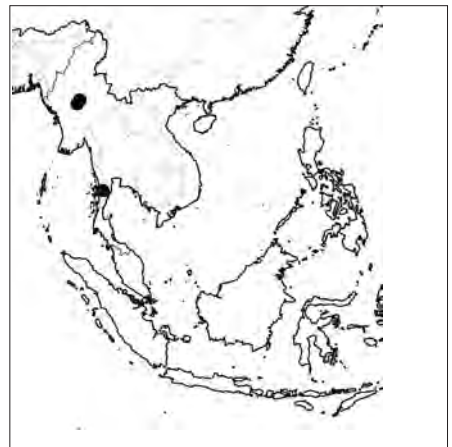
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