

A TAXONOMIC REVISION OF MALLOTUS SECTION POLYADENII (EUPHORBIACEAE)

S.M. BOLLENDORFF, P.C. VAN WELZEN, J.W.F. SLIK

Nationaal Herbarium Nederland, Universiteit Leiden branch, P.O. Box 9514,
2300 RA Leiden, The Netherlands

SUMMARY

Mallotus sect. *Polyadenii* comprises eight species. It includes the former genus *Coccoceras*. *Mallotus leucodermis* var. *puberulus*, endemic to the Solomon Islands, is recognised on the species level as *M. puber*. *Mallotus anisopodus*, from Indochina, is synonymised with *M. plicatus* from Myanmar. The identification of species is difficult, especially of *M. leucodermis* and *M. muticus*. The two species are partly sympatric and only pistillate flowers or fruits provide reliable characters; specimens with staminate flowers are very difficult to identify.

Key words: *Coccoceras*, *Mallotus*, Malesia, phylogeny.

INTRODUCTION

Mallotus Lour. (1790) is a large genus, comprising c. 150 species, with the majority of species present in Asia and only a few representatives in Africa. Müller (Argoviensis) (1865) was the first to subdivide the genus into sections. Pax & Hoffmann (1914) did not accept Müller's classification and redivided the genus into 10 sections using characters like phyllotaxis, leaf structure, flower, and fruit morphology. One of the sections recognised is *Polyadenii*. Airy Shaw, in turn, criticised their classification; he united several sections (1963) and raised one section to generic level (1965), but he maintained section *Polyadenii*.

Characteristic for section *Polyadenii* are the glabrous capsules and the presence of discoid glands on the lower as well as the upper leaf surface. In Pax & Hoffmann's view the section comprised five species: *Mallotus atrovirens* Wall. ex Müll. Arg., *M. borneensis* Müll. Arg. [= *M. muticus* (Müll. Arg.) Airy Shaw], *M. fuscescens* (Thwaites) Müll. Arg., *M. polyadenos* F. Muell., and *M. wallichianus* Wall. ex Müll. Arg. [= *M. plicatus* (Müll. Arg.) Airy Shaw].

Miquel (1860) established the genus *Coccoceras* based on *C. sumatranum*. Müller (1864) added *C. muticum* and *C. plicatum*, while *C. anisopodum* was described by Gagnepain (1924). The genus is characterised by the winged capsules. Airy Shaw (1963) united *Coccoceras* with section *Polyadenii*, because the presence of discoid glands on the upper leaf surface is unique to all species. Airy Shaw also added *M. leucodermis* Hook. f. to section *Polyadenii*, which was formerly placed in section *Philippinensis* by Pax & Hoffmann (1914). Webster (1994), in his classification of the Euphorbiaceae, still recognises *Coccoceras* in its original delimitation, though he adds a critical note that Airy Shaw may be correct in uniting *Coccoceras* with section

Polyadenii. Presently, the distribution of section *Polyadenii* extends from S India to NW Australia and the Solomon Islands.

The species delimitation in section *Polyadenii* is very difficult. The differences between the species are often very small. *Mallotus leucodermis* var. *puberulus* Airy Shaw, therefore, is raised to species rank, because it is quite distinct from all other taxa. Several taxa could not be separated and are united, e. g., *M. anisopodus* (Gagnep.) Airy Shaw with *M. plicatus* (Müll. Arg.) Airy Shaw. Other species can only be separated when pistillate or fruiting material is present, e. g., *M. leucodermis* and *M. muticus* are almost indistinguishable when only staminate flowers are present. A phylogenetic analysis of the section is very problematic, because only eight characters proved to be reliable in such an analysis: these characters and their states could be defined unequivocally and the species did not show (much) polymorphism. However, eight characters are not enough for a reliable cladistic analysis with a data set of 12 species (*Neotrewia*, *Trewia*, and several *Mallotus* species of other sections included). The results showed very unstable cladograms with quite some homoplasies and no significant statistical support (bootstrap and decay indices). The cladograms usually showed a monophyletic section *Polyadenii*, based on free pistillate calyx lobes and smooth fruits, though *M. floribundus* was often included. The latter species also has leaves with discoid glands on the adaxial surface, though far less than the species in section *Polyadenii*. The former genus *Coccoceras* was always present as an monophyletic group within section *Polyadenii* (indehiscent, appendaged fruits). From these insufficient analyses the following tentative conclusions are possible:

- The monophyly of section *Polyadenii* has not been proved yet, because adaxial discoid glands are also found in *M. floribundus* (more elaborate analyses may show that this is probably due to parallel development as the glands look different) and the other two supporting characters are relatively weak: *M. leucodermis* and *M. muticus* show a tendency to united sepals (a reversal); and the smooth fruits are also found in other sections of *Mallotus*.
- The union of *Coccoceras* and section *Polyadenii* seems correct, because *Coccoceras* is nested in *Polyadenii* and the species in both taxa are strongly alike and can only be separated easily by using geography.

Section *Polyadenii*

Mallotus Lour. sect. *Polyadenii* Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii (1914) 197; Airy Shaw, Kew Bull. 16 (1963) 350; 20 (1966) 39, 43; 21 (1968) 388, 397; 26 (1972) 292, 299; 27 (1972) 87; Kew Bull. Add. Ser. 4 (1975) 160, 166; Kew Bull. 31 (1976) 392; 35 (1980) 162; 36 (1981) 323. — Type species: *Mallotus polyadenos* F. Muell.

Coccoceras Miq., Fl. Ned. Ind., Eerste bijv. (1860) 455; Müll. Arg. in DC., Prodr. 15, 2 (1866) 949; Benth. in Benth. & Hook. f., Gen. Pl. 3 (1880) 318, 319; Pax in Engl. & Prantl, Nat. Pflanzenfam. 3, 5 (1890) 55; Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii (1914) 209; G.L. Webster, Ann. Missouri Bot. Gard. 81 (1994) 90. — Type species: *Coccoceras sumatranum* Miq. [= *Mallotus sumatranus* (Miq.) Airy Shaw].

Shrubs to trees, occasionally with buttresses, dioecious, rarely monoecious; branchlets terete to flattened, usually lenticellate. *Indumentum* consisting of simple and stellate, white hairs, sometimes also villose red hairs; all parts with transparent to yellow to orange-red discoid glands, highest density on young parts and lower leaf surface,

fewest on branchlets. *Bark* smooth, sometimes finely fissured; sapwood often pink turning dark after exposure. *Leaves* petiolate, simple, opposite to alternate, unequal in size when opposite; stipules small, triangular, margin entire, caducous; blade elliptic to obovate, chartaceous to coriaceous, never entirely symmetric, base acute to slightly cordate, margin entire to slightly crenate with marginal glands in the crenations, glands protruding in young leaves, apex rounded to obtusely cuspidate, often ending in a gland, upper surface dull, usually glabrous, basally (and submarginally and apically) with impressed glands, lower surface dull, pubescent or glabrous except for hair-tuft (or pocket) domatia in axils between midrib and nerves; venation pinnate, basally often triplinerved, nerves brachiodromous to eucamptodromous, clearly raised below, slightly raised above, veins scalariform to sometimes reticulate, veinlets reticulate. *Inflorescences* catkin-like when young, raceme-like thyrses, axillary though staminate ones often terminal, solitary or in groups of 2 or 3, unbranched (except sometimes in *M. polyadenos*), straight. *Bracts* persistent, triangular, margin entire, apex acute to acuminate. *Flowers* small, actinomorphic, white, yellow to green; calyx lobes unequal in width, margin entire; petals, disc, and pistillode absent. *Staminate flowers* in clusters of 3–7 per node, shortly pedicellate; calyx lobes 3–5, basally connate, generally ovate, membranous; stamens numerous, inserted on a dome-shaped receptacle, filaments filiform, elongating at anthesis, anthers ovoid to ellipsoid, basifixed to dorsifixed, thecae 2, parallel, opening lengthwise with slits, connective slender to broad, sometimes split. *Pistillate flowers* usually solitary per node; pedicels elongating in fruit, articulate, abscission zone sometimes geniculate; calyx lobes 3–6, basally to halfway connate, triangular (to ovate), base thickened; ovary ovoid to ellipsoid, (2- or) 3- (or 4-)locular, uniovulate, placentation axillary; ovules anatropous, descending, epitropous; stigmas sessile or not, strongly plumose with long, branched glandular-granular papillae. *Fruits* mainly tricocoid, dehiscent woody capsules, first splitting septically from base to apex, then loculicidally from base to apex, or indehiscent (or tardily dehiscent) and winged or ridged, smooth; column bell- to anchor-shaped from lateral view. *Seeds* globose to ovoid, shiny or dull, smooth or sometimes with white protuberances, light to dark brown.

Distribution — Eight species in Sri Lanka, S India, SE Asia (Myanmar, Laos, Cambodia, Vietnam, Thailand), W Malesia (Peninsular Malaysia, Sumatra, Borneo), New Guinea, Australia (NE Queensland), and the Solomon Islands. Unknown from Central Malesia.

KEY TO THE SPECIES

- 1a. Venation penninerved (nerves not originating at the base of the midrib) 2
- b. Venation triplinerved or palmatinerved (several basal nerves originating at the base of the midrib) 4
- 2a. Stamens 20 to over hundred. Stigmas subsessile. Staminate and pistillate inflorescences up to 21 cm long. — New Guinea, Australia **6. *M. polyadenos***
- b. Stamens 20–40. Stigmas sessile. Staminate and pistillate inflorescences never longer than 10 cm. — S India, Sri Lanka 3
- 3a. Leaves: apex rounded to obtusely acuminate. Ovaries in majority 2-locular. — S India **1. *M. atrovirens***

- b. Leaves: apex acute to obtusely cuspidate. Ovaries 3-locular. — Sri Lanka **2. *M. fuscescens***
- 4a. Basal pair of nerves always ending in the margin below middle of blade. — S India, New Guinea, Australia **5**
- b. Basal pair of nerves ending in the margin above or below middle of blade. — SE Asia, W Malesia, Irian Jaya, Solomon Islands **6**
- 5a. Glands on upper leaf surface impressed along the margin (Fig. 1a). Majority of ovaries 2-locular. Leaf base always acute to attenuate. — S India **1. *M. atrovirens***
- b. Glands on upper leaf surface impressed on first pair of basal nerves (Fig. 1c). Majority of ovaries 3-locular. Leaf base acute to rounded and slightly emarginate. — New Guinea, Australia **6. *M. polyadenos***

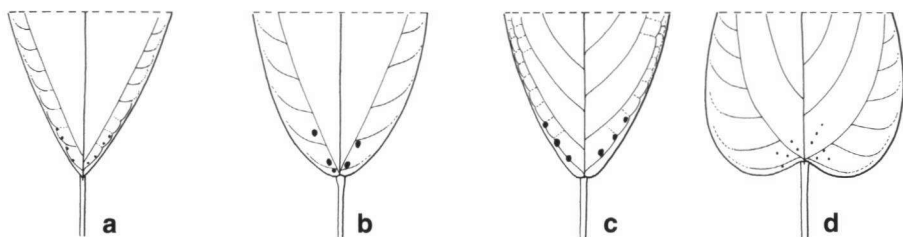


Fig. 1. Distribution of glands on upper leaf surface. — a. *Mallotus atrovirens* Wall. ex Müll. Arg., glands along margin. — b. *M. leucoderms* Hook. f., glands on basal nerves near leaf insertion. — c. *M. polyadenos* F. Muell., glands on basal nerves. — d. *M. puber* Bollendorff, glands scattered near leaf insertion [a: *Ridsdale* 632; b: *Achmad* 30; c: *Brass* 7469a; d: *BSIP (Susui)* 8325; all L].

- 6a. Fruit locules with long pointed wings (Fig. 2c, d). Leaf margin often slightly crenate. Usually only petioles pubescent, otherwise glabrous **7**
- b. Fruit locules ridged or not, without wings (Fig. 2a, b). Leaf margin generally entire. Entire plant either pubescent or glabrous **8**
- 7a. Leaves opposite (rarely alternate), up to 11 nerves per leaf side. Fruit up to 1 cm high with wings spreading horizontally, wings up to 3 cm long (Fig. 2d). — Sumatra, Borneo **8. *M. sumatranus***
- b. Leaves alternate and only apically opposite; up to 8 nerves per leaf side. Fruit up to 3 cm high with wings pointing upwards, wings up to 1 cm long (Fig. 2c). — SE Asian mainland **5. *M. plicatus***
- 8a. Fruit locules ridged lengthwise giving them an angular aspect (Fig. 2b). Pistillate inflorescences with relatively short pedicels, 1–7(–12) mm long. — W Malesia **4. *M. muticus***
- b. Fruit locules without ridges, subglobose (Fig. 2a). Pistillate inflorescences with relatively long pedicels, 6–55 mm long. — W Malesia, New Guinea, Solomon Islands **9**
- 9a. Upper surface of leaves basally with impressed glands on first pair of nerves (or veins) (Fig. 1b). Fruits 8–15 by 10–25 mm diam. Entire plant usually glabrous. Leaf base acute to obtuse and sometimes slightly emarginate; petiole often more or less pulvinate at both ends. — W Malesia, Irian Jaya . . . **3. *M. leucoderms***

- b. Upper surface of leaves basally with numerous small glands randomly distributed around petiole attachment (Fig. 1d). Fruits 5–8 by 7–10 mm diam. Entire plant usually pubescent (sometimes glabrous). Leaf base broadly rounded to cordate; petiole usually not pulvinate at both ends. — Solomon Islands . . . **7. *M. puber***

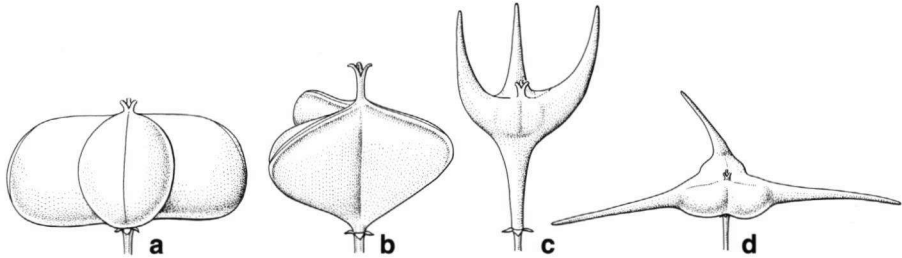


Fig. 2. Fruit types. — a. *Mallotus leucodermis* Hook.f., obovoid lobes without wings or ridges. — b. *M. muticus* (Müll.Arg.) Airy Shaw, lobes with longitudinal ridges. — c. *M. plicatus* (Müll.Arg.) Airy Shaw, lobes winged, wings pointing upwards, curling. — d. *M. sumatranus* (Miq.) Airy Shaw, lobes winged, wings horizontal, straight [a: Achmad 30; b: Ambriansyah & Arifin AA 400; c: d'Alleizette s.n., 27 June 1909; d: Posthumus 1077; all L].

1. *Mallotus atrovirens* Wall. ex Müll.Arg. — Fig. 1a; Map 1

Mallotus atrovirens Wall. ex Müll.Arg., *Linnaea* 34 (1865) 195; in DC., *Prodr.* 15, 2 (1866) 978; Hook.f., *Fl. Brit. India* 5 (1887) 440. — [*Croton atrovirens* Wall., *Cat.* (1847) 7771, nom. nud.] — Type: *Wallich 7771* (holo K-W), India orientalis.

Shrub to small tree; branchlets deeply ribbed, glabrous, grey to brown, sometimes with globose protuberances, c. 0.2 by 0.3 mm. *Leaves* (alternate to sub)opposite, pairs unequal in size; stipules 1–1.5 by 0.5–1 mm, membranous, apex acuminate to cuspidate with few short pilose hairs at tip; petiole angular, dorsoventrally flattened, 5–22 by 0.5–1.5 mm, reniform to deeply reniform in transverse section, glabrous to few hirsute hairs adaxially, base and apex slightly pulvinate, sometimes with transversal cracks; blade ovate to obovate, 4.4–15 by 2–6.8 cm, index 2–2.3, chartaceous to subcoriaceous, base acute to attenuate, sometimes oblique, margin entire, 3–7 marginal glands per leaf side, apex rounded to obtusely acuminate, ending in a gland, upper surface glabrous, dark brown to black, 0–5 subbasal glands on each leaf side, glands circular to elliptic, submarginal, impressed, 0.8–1.2 by c. 0.5 mm, 3–5 mm from petiole attachment, no apical glands, lower surface with some hair tuft domatia (simple hairs), glabrescent, light brown to green; venation (rarely pinnate to) triplinerved with basal nerves ending in margin below middle, 4 or 5(–8) nerves per side, brachidodromous, veins scalariform to slightly reticulate, veinlets articulate. *Inflorescences* axillary to terminal, rachis angular to flattened. *Bracts* ciliate with villose hairs, apex acute to acuminate, patent. *Flowers*: calyx lobes 4 or 5. *Staminate inflorescences* 2.5–6 cm by 0.2–1.2 mm, hairs stellate and simple, 13–23 nodes per inflorescence with 2 or 3 flowers per node; bracts c. 0.2 by 0.2 mm; pedicels up to 2.5 by c. 0.1 mm, abscission zone at very base, pilose to stellate indumentum especially between bracts and pedicels; flower 2.5–3 mm diam.; calyx lobes connate at base, 1.2–2 by 0.4–1 mm, margin ir-

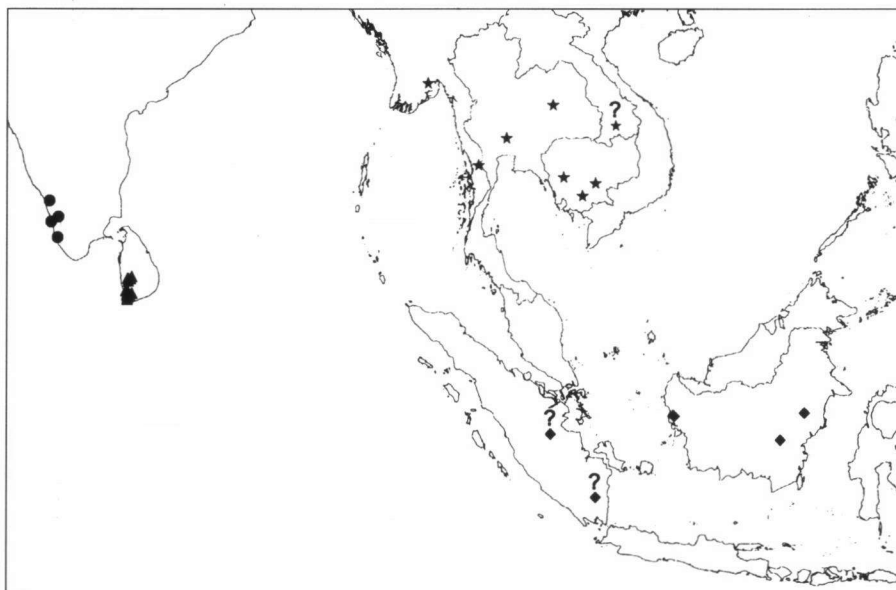
regular, few simple hairs, apex acute, reddish brown; stamens 35–40, filaments up to 2 mm long, anthers ellipsoid, c. 0.3 by 0.1 mm, basifixed, splitting extrorse, connective not split. *Pistillate inflorescences* 3.7–7.5 cm by 0.7–1 mm, 13–30 nodes per rachis, 1 flower per node; bracts 0.4–0.8 by 0.8–1.1 mm, thickened, black, bracteoles absent; pedicels terete to angular, 2–4 by 0.2–0.8 mm, abscission zone 0.3–0.5 mm from apex; flowers 1.5–3 mm diam.; calyx lobes triangular, sometimes ridged, 1.2–1.5 by 0.4–1 mm, central basal part (c. 0.2 by 0.2 mm) thickened and darker, rest light, red-yellowish, glabrous except for a few short villose hairs at the apex; ovary ovoid, 2- (or 3-)locular, covered with discoid glands, apically with some simple hairs outside and basally with some inside; obturator present; stigmas sessile, persistent, 2–3 by 0.2–1 mm, decurrent. *Fruits* unknown.

Distribution — S India.

Habitat & Ecology — Disturbed gallery forest. Altitude 30–150 m. Flowering: Feb.– Aug.

2. *Mallotus fuscescens* (Thwaites) Müll. Arg. — Map 1

Mallotus fuscescens (Thwaites) Müll. Arg., *Linnaea* 34 (1865) 195; in DC., *Prodr.* 15, 2 (1866) 978; Hook. f., *Fl. Brit. India* 5 (1887) 441; Trimen, *Handb. Fl. Ceylon* 4 (1898) 67. — *Rottlera fuscescens* Thwaites, *Enum. Pl. Zeyl.* (1859) 273. — Lectotype (selected here): *Thwaites C.P.* 2105 (holo K; iso A, BM, G, GH, NY), Ceylon.



Map 1. Distribution of *Mallotus atrovirens* Wall. ex Müll. Arg. (●), *M. fuscescens* (Thwaites) Müll. Arg. (▲), *M. plicatus* (Müll. Arg.) Airy Shaw (★, also present in Laos, exact position unknown), and *M. sumatranus* (Miq.) Airy Shaw (◆, also present in the provinces Jambi and Lampung on Sumatra, exact localities unknown).

Small tree up to 15 m high, dioecious, mainly glabrous; branchlets ribbed, finely fissured, grey brown to brown to black. *Leaves* opposite to subopposite, pairs unequal in size; stipules 1.2–2 by 0.6–0.8 mm, glabrous, apex obtuse to acute, sometimes stipules of opposite leaves grown together; petiole terete to angular, 0.9–3.5 cm by 0.6–1.5 mm, adaxially channelled, with a dense basal indumentum, basally and apically pulvinate, often twisted, rugose, with transversal cracks, black; blade ovate to obovate, 5–20.7 by 2.4–8 cm, index 2.1–3.7, coriaceous, base obtuse to attenuate, margin entire to slightly crenate, with 0–5 glands per leaf side in sinuses, apex acute to bluntly cuspidate, sometimes ending in a gland, upper surface dark reddish brown when young, greyish brown when older, lower surface brown to pale brown, with white to yellowish hair tuft domatia, venation basally pinnate, basal nerves ending in margin below middle, 4–6 nerves per side, brachidodromous, midrib basally raised on upper leaf side, basal pair of nerves often with elliptic or circular glands on upper surface, 0.7–0.8 by 0.2–0.5 mm, situated at 5–7 mm from petiole attachment, often associated with a slight crenation; veins scalariform. *Inflorescences* axillary and staminate inflorescences also terminal, erect, rachis angular with many simple and stellate hairs, mainly simple hairs between pedicels and bracts. *Bracts* usually persistent, triangular, 0.5–0.8 by 0.5–1 mm, base amplexicaul, margin entire, ciliate, apex acute. *Staminate inflorescences* 2.3–5.5 cm by c. 0.6 mm, hairs stellate, c. 16 nodes per inflorescence with 3–5 flowers per node; pedicels slender, 1–3 by c. 0.2 mm, abscission zone 0.6–1.2 mm from apex, indumentum puberulous and stellate; flowers 2–2.5 mm diam.; calyx lobes 3–5, ovate, decurrent, c. 1.6 by 1–1.2 mm, apically with few stellate hairs, reddish brown; stamens 20–34, filaments 1–1.5 mm long, anthers subglobose, c. 0.2 by 0.3 mm diam., with discoid glands on the outer side, dorsifixed, extrorse, connective broad, receptacle c. 0.2 by 0.2 mm. *Pistillate inflorescences* often in pairs with one inflorescence developing before the other, 1.2–10 cm by 0.5–1.5 mm, 11–16 nodes per rachis, 1 flower per node; bracts convex, patent; pedicels terete to angular, ribbed, puberulous, 2.5–6 by c. 0.5 mm, elongating up to 22 mm in fruit, basally widening to 1.5 mm, abscission zone 0.8–1.2 mm from apex, with many discoid glands, sometimes pedicel curved above abscission zone; flowers 2–3 mm diam., calyx lobes 4 or 5, 1.2–1.5 by 0.5–0.6 mm, persistent, ovate, reddish brown, membranous except for basal thickened part of c. 0.5 by 0.4 mm, latter darker than rest, apically sparsely pilose; ovary ovoid, flattened, 3-locular, covered with discoid glands, few glands inside locules, obturator present; stigmas sessile, caducous, curling outwards, 1.2–1.5 by 0.1–0.6 mm, decurrent, with papillae up to 0.5 mm long, light brown. *Fruits* subglobose, 5–6 by 8–10 mm diam., woody, dehiscent capsules, deeply trigonous, glabrous, dehiscent septicidally first, then loculicidally, latter often basally incomplete; locules subglobose, c. 6 by 5 mm, brown, dull, with yellow discoid glands especially along ridges; column c. 4.5 by 4 mm, septal remnants roughly triangular, narrow at base (c. 0.5 mm), widening towards rounded apex (c. 2 mm). *Seeds* ± globose, c. 4 mm diam., flattened on both sides of the raphe, shiny, smooth, reddish brown.

Distribution — Sri Lanka.

Habitat & Ecology — Wet primary or often riparian forest. Altitude: sea level up to 785 m. Flowering: Feb.–Apr., Aug.–Nov. Fruiting: Feb.–Apr., Sept.–Nov.

3. *Mallotus leucodermis* Hook. f. — Fig. 1b, 2a, 3; Map 2

Mallotus leucodermis Hook. f., Fl. Brit. India 5 (1887) 441; Pax & K. Hoffm. in Engl., Pflanzern. IV.147.vii (1914) 180; Ridl., Fl. Malay Penins. 3 (1924) 291; Airy Shaw, Kew Bull. 16 (1963) 350, 352; 20 (1966) 39; Meijer, Bot. News Bull. Forest Dept., Sabah 7 (1967) 53; Airy Shaw, Kew Bull. 21 (1968) 397; Whitmore, Tree Fl. Malaya 2 (1973) 116, f. 10; Airy Shaw, Kew Bull. Add. Ser. 4 (1975) 167; Kew Bull. 36 (1981) 326. — *Mallotus leucodermis* Hook. f. var. *leucodermis* Airy Shaw, Kew Bull. 21 (1968) 397. — Lectotype (selected here): *Maingay KD 1433* (holo K; iso K), Malacca.

Coccoceras muticum Müll. Arg. var. *pedicellatum* Hook. f., Fl. Brit. India 5 (1887) 424 (*'pedicellata'*); Pax & K. Hoffm. in Engl., Pflanzern. IV.147.vii (1914) 210; Ridl., Fl. Malay Penins. 3 (1924) 291. — Lectotype (selected here): *Griffith KD 4789* (holo K; iso K, P), Malacca, Alor Gajah.

Shrub to tree, up to 35(–54) m high, dioecious, more or less glabrous; branchlets not to finely ribbed, rarely lenticellate, white to grey with conspicuous discoid glands to brown. *Leaves* subopposite to alternate and each pair unequal in size; stipules early caducous, rarely falcate, 1.5–2 by 0.8–2 mm, sometimes ridged, glabrous, margin entire or rarely slightly dentate, apex acute; petiole terete to angular, sometimes adaxially channelled, 10–130 by 0.5–3 mm, glabrous or rarely with stellate hairs basally and distally, base and apex more or less pulvinate; blade elliptic to obovate, 5–22 by 2.3–11.5 cm, index 1.6–2.7, chartaceous to coriaceous; base obtuse to acute and sometimes slightly emarginate; margin entire to slightly irregularly crenate with 0–16 glands per leaf side in sinuses; apex acuminate to obtusely cuspidate, sometimes ending in a marginal-type of gland; upper surface glabrous, grey-green to reddish brown to dark brown, 0–4 basally, impressed glands on each leaf side, elliptic, 1–5 by 0.5–0.8 mm, brown to black, 1–5 mm from petiole attachment, apically none to numerous circular impressed glands among the margin; lower surface olive green to pale- to red- to dark brown, rarely villose hair tuft domatia, sometimes in excavations; venation basally triplinerved, basal nerves mainly ending in margin above middle of blade, 2–6 nerves per leaf side, mainly eucamptodromous, veins scalariform. *Staminate inflorescences* axillary and terminal, solitary or often 2–4 together, rachis terete to angular, 4–22 cm by 0.4–1.3 mm, 22–79 nodes per rachis with 3–6 flowers per node; bracts triangular to rhomboid, 0.5–0.8 by 0.5–1.5 mm, margin glabrous to ciliate, apex acute to acuminate; pedicels terete to flattened, 2–4 by 0.2–0.3 mm, stellate hairs or glabrous, abscission zone at very base; flowers 3–5 mm diam., calyx lobes 2–4, ovate to obovate, 2–3 by 1–2 mm, villose to stellate, white to yellow to pinkish to reddish brown, recurved, apex acute, stamens 17–41, filaments 1–4 mm long, anthers reniform to oblong, 0.5–0.8 by 0.2–0.3 mm, dorsifixed to rarely basifixed, glabrous, connective slender, rarely split basally, receptacle c. 0.3 by 0.5 mm diam. *Pistillate inflorescences* axillary to rarely terminal, solitary or 2–4 together, rachis angular, 3–32.5(–60) cm by 0.8–2.5 mm, 14–53 nodes per rachis, 1 flower per node; bracts triangular to rhomboid, 0.5–1.5 by 0.5–1.6 mm, basal part sometimes thickened, blade glabrous to ciliate, apex acute to acuminate; pedicels terete to angular, sometimes pubescent, 6–55 by 0.3–1.3 mm, abscission zone 0.5–4 mm from apex; flowers 2–5 mm diam., calyx lobes 4–6, up to halfway connate, triangular to narrowly triangular, 2–2.6 by 0.5–1.5 mm, persistent, yellow to reddish brown, basally thickened, apically recurved, some villose hairs inside, ovary globose, 2–4-locular, style 0.5–1.5 by 0.5–0.6 mm, stigmas

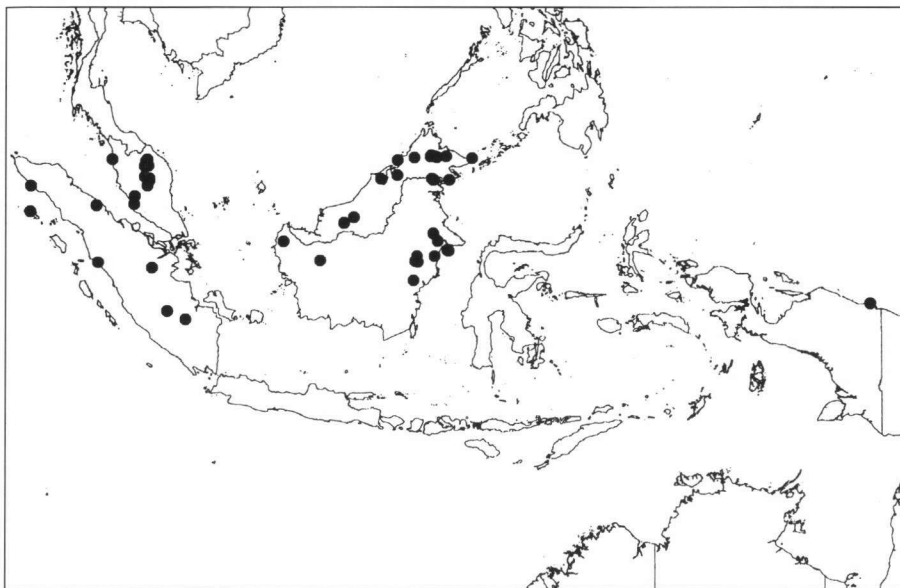


Fig. 3. *Mallotus leucodermis* Hook.f. Habit [Ambriansyah & Arifin AA 297, WAN].

2–4 by 0.3–1 mm, basally erect, apically recurving. *Fruits* woody, dehiscent capsules, 8–15 by 10–25 mm diam., locules globose to ovoid, without wings, 8–9 mm wide; column bell-shaped in lateral view, 6–8 by 5–7 mm. *Seeds* globose to ovoid, 5–8 mm diam., shiny to dull, surface smooth or sometimes with white protuberances, light to dark brown.

Distribution — Disjunct in W Malesia (Sumatra, Peninsular Malaysia, Borneo) and Irian Jaya.

Habitat & Ecology — Primary mixed Dipterocarp forest, secondary forest, forest edges, logged areas, often riparian, in swampy areas. Altitude: sea level up to 1440 m. Flowering and fruiting: March–Nov.



Map 2. Distribution of *Mallotus leucodermis* Hook. f.

Vernacular names — Peninsular Malaysia: Teropok (Temuan). Sumatra: Toebo-lat-oeding, toebobalie pajo, toebo-lala, suruchon pajo. Borneo: Galungan.

Notes — 1. Whitmore's (1973) fruit description does not correspond with the fruits of *M. leucodermis*. He probably described the winged, beaked fruits of *M. sumatranus*. The corresponding figure, however, shows a coccus without wings which could be *M. leucodermis*.

2. The three specimens from Irian Jaya differ from the W Malesian specimens in their relatively thick petioles, very rare marginal glands, their more conspicuous veins and their (fuchsia) red discoid glands on the inflorescences.

3. *Mallotus leucodermis* and *M. muticus* are sympatric and impossible to identify with certainty without pistillate flowers or fruits. The following list of vegetative characters may be helpful for identification:

Mallotus leucodermis

1. Petioles up to 13 cm long, often 0.5–1.5 mm thick and clearly pulvinate at both ends.
2. Leaves more elliptic, min. index 1.6.
3. Leaf base more acute.
4. Hair tuft domatia rare.
5. Basal nerve pair nearly always ending in margin above middle of the blade.
6. 4 or 5 pairs of nerves next to the basal ones.
7. Veins less conspicuously scalariform.

Mallotus muticus

- Petioles up to 8.5 cm long, often 2–3 mm thick and not pulvinate.
- Leaves more obovate, min. index 1.3.
- Leaf base more rounded.
- Hair tuft domatia often present.
- Basal nerve pair ending in the margin below and above the middle.
- 5 or 6 pairs of nerves next to the basal ones.
- Veins more conspicuously scalariform.

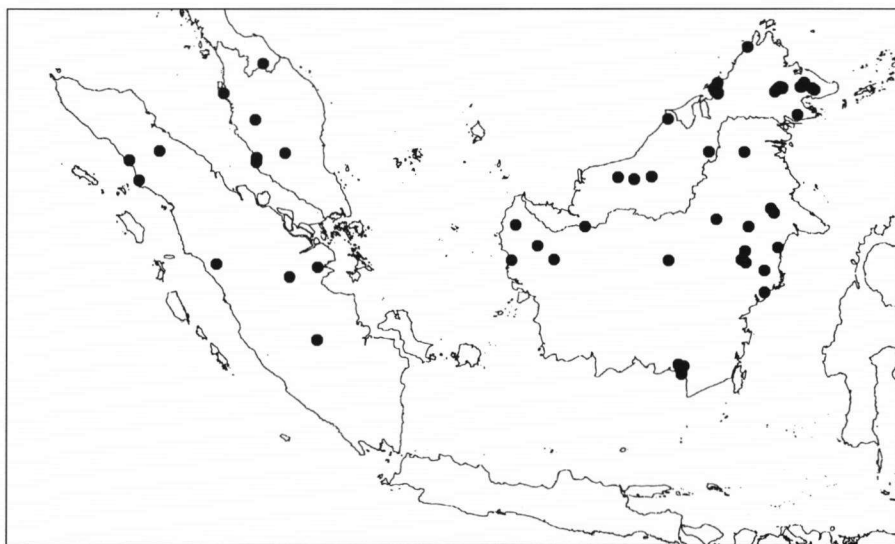
4. *Mallotus muticus* (Müll. Arg.) Airy Shaw — Fig. 2b, 4; Map 3

Mallotus muticus (Müll. Arg.) Airy Shaw, Kew Bull. 16 (1963) 351; 20 (1966) 39; Meijer, Bot. News Bull. Forest Dept., Sabah 7 (1967) 53; Whitmore, Tree Fl. Malaya 2 (1973) 116, 117, f. 10; Airy Shaw, Kew Bull. Add. Ser. 4 (1975) 167; Kew Bull. 36 (1981) 327. — *Coccoceras muticum* Müll. Arg., Flora 47 (1864) 470; in DC., Prodr. 15, 2 (1866) 950; Hook.f., Fl. Brit. India 5 (1887) 424; Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii (1914) 210; Ridl., Fl. Malay Penins. 3 (1924) 294. — *Coccoceras muticum* Müll. Arg. var. *muticum* Müll. Arg., Flora 47 (1864) 470; in DC., Prodr. 15, 2 (1866) 950; Hook.f., Fl. Brit. India 5 (1887) 424; Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii (1914) 210; Ridl., Fl. Malay Penins. 3 (1924) 294. — Type: *Griffith KD 4770* (K), Malacca.

Mallotus borneensis Müll. Arg. in DC., Prodr. 15, 2 (1866) 980; Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii (1914) 198. — *Rottlera borneensis* (Müll. Arg.) Scheff., Ann. Mus. Bot. Lugd.-Bat. 4 (1868) 125. — Lectotype (selected here): *Korthals s.n.*, L sheet no. 905.105-21 (holo L), Indonesia, Borneo.

Coccoceras borneense J.J. Sm., Bull. Jard. Bot. Buitenzorg III, 6 (1924) 94. — Lectotype (selected here): *Teijsmann s.n.*, L sheet no. 914.150-496 (holo L), Indonesia, Borneo, Soengai Landak.

Tree up to 35 m high, dioecious, mainly glabrous; branchlets finely ribbed, not to rarely lenticellate, glabrous, with white to greyish bark with conspicuous discoid glands. *Leaves* subopposite to alternate, pairs unequal in size; stipules early caducous; petiole terete to angular, adaxially channelled, 18–83 by 0.7–3 mm, glabrous to sometimes puberulous at ends, base and apex usually not pulvinate; blade elliptic to obovate, 8.2–24.8 by 3.7–14 cm, index 1.3–2.4, chartaceous to coriaceous, base rounded to obtuse and often minutely auriculate, margin entire to slightly irregularly crenate, 6–16 marginal glands per leaf side, usually in sinuses, triangular to globose, thickened, c. 0.7 by 0.3 mm, protruding especially in young leaves, apex acuminate to obtusely cuspidate, sometimes ending in a margin-type of gland, upper surface green to grey to brown, 0–3(–8) basal glands on each side, elliptic, impressed, c. 1.5 by 0.8 mm, grey or brown, 0–8 mm from petiole attachment, apically none to 5 circular, impressed



Map 3. Distribution of *Mallotus muticus* (Müll. Arg.) Airy Shaw.



Fig. 4. *Mallotus muticus* (Müll. Arg.) Airy Shaw. Habit [Ambriansyah & Arifin AA 400, WAN].

glands on last pair of nerves, lower surface pale green to brown, domatia with villose to long stellate white hairs in nerve axils; venation basally triplinerved, basal nerves ending in margin below and above middle, further pinnate, with 3–5(–7) nerves per side, eucamptodromous, veins conspicuously scalariform. *Staminate inflorescences* and *flowers* as those of *M. leucodermis*, see there. *Pistillate inflorescences* axillary to rarely terminal, solitary or 2 or 3 together, rachis angular, 3.5–23.5 cm by 0.5–2 mm, 10–35 nodes per rachis, 1 flower per node; bracts 1–1.5 by c. 1 mm, margin glabrous to sometimes ciliate, apex acuminate to cuspidate, patent to reflexed; pedicels terete and often angular near abscission zone, 1–7(–12) by 0.5–1 mm, often geniculate, abscission zone 1–2 mm from apex; flowers 3–4 mm diam., calyx lobes (4 or) 5, connate to up 0.5 mm from base, triangular to narrowly triangular, 2–2.5 by 0.5–1.2 mm, long white villose hairs on the inside, reddish brown, margin sometimes villosely

ciliate, recurved when old, apically acuminate to cuspidate, basally thickened, ovary ovate in lateral view, 2- or 3-locular, covered with discoid glands, style 1.5–2 by c. 0.5 mm, stigmas 2–2.5 by 0.5–1 mm, basally erect, apically recurving. *Fruits* indehiscent, woody capsules, broadly angular-ovate to obovate in lateral view, 12–25 by 11–22 mm diam., apically style remnant often bent; locules 0.7–1 cm wide, slightly to clearly ridged over valve joints; column narrowly rhomboid with basal part slightly longer than apical one, c. 15 by 6 mm. *Seeds* ovoid, 6–7 by 4–5 mm diam., shiny to dull, smooth, brown.

Distribution — W Malesia: Sumatra, Peninsular Malaysia, and Borneo.

Habitat & Ecology — Primary and secondary forest, in periodically inundated forest, forest edges, logged plains, often in riparian forests, and swampy areas. Altitude: sea level up to 500 m. Flowering: March–Oct. Fruiting all year round.

Vernacular names — Sumatra: Senggawan. Borneo – Kalimantan: Kelepuek, perupuk (Modang Dayak); – Sabah: Randang jangun, salungapit, suko lapit (Kedayan); salung api, sandanaap; tapai longan (Murut).

Note — Whitmore's (1973) fruit description does not correspond with the fruits of *M. muticus*. He described the fruits as spiny, which they are not. He correctly described them as indehiscent, however, the corresponding figure shows a split-open capsule.

5. *Mallotus plicatus* (Müll. Arg.) Airy Shaw — Fig. 2c; Map 1

Mallotus plicatus (Müll. Arg.) Airy Shaw, Kew Bull. 16 (1963) 351. — *Coccoceras plicatum* Müll. Arg., Flora 47 (1864) 539; in DC., Prodr. 15, 2 (1866) 950; Hook. f., Fl. Brit. India 5 (1887) 424; Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii (1914) 210. — Type: *McClelland s.n.* (K), Burma, Marabanica prope Rangoon.

[*Croton eriocaroides* Wall., Cat. (1847) 7728, nom. nud.] — *Mallotus eriocaroides* Wall. ex Müll. Arg., Linnaea 34 (1865) 185. — Type: *Wallich 7728* (K-W), India orientalis.

[*Croton castanifolius* Wall., Cat. (1847) 7760, nom. nud.] — *Mallotus wallichianus* Müll. Arg., Linnaea 34 (1865) 196; in DC., Prodr. 15, 2 (1866) 980; Hook. f., Fl. Brit. India 5 (1887) 434; Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.iii (1914) 199. — Type: *Wallich 7760* (K-W), India orientalis.

Hymenocardia plicata Kurz, Fl. Brit. Burma 2 (1877) 395. — Lectotype (selected here): *Kurz 1554* (K), Burma, Tomkgeghat, 7 Pagodas.

Coccoceras anisopodum Gagnep., Bull. Soc. Bot. Franc. 71 (1924) 1021; in Lecomte, Fl. Gén. Indo-Chine 5 (1926) 378, f. 43: 2, 3. — *Mallotus anisopodus* (Gagnep.) Airy Shaw, Kew Bull. 16 (1963) 351; 26 (1972) 299. — Lectotype (selected here): *Thorel 2139* (holo P; iso A, K), Laos, Stung-streng.

Shrub to small tree, up to 15 m high, dioecious, mainly glabrous; branchlets red with tomentose to woolly indumentum. *Leaves* alternate to opposite apically, pairs more or less equal in size; stipules early caducous; petiole terete to angular, 1.2–40 by 0.8–2 mm, tomentose to hirsute, base and apex not pulvinate, slightly channelled adaxially; blade oblong to elliptic, 5.5–16 by 2.5–8.5 cm, index 1.7–2.8, chartaceous, base slightly emarginate to obtuse, margin (sub)crenate, with 8–18 marginal glands per side in sinuses, apex rounded to obtusely acuminate, usually ending in a marginal-type gland, upper surface glabrous, grey to dark reddish brown, 1–3 glands basally on each side, impressed, elliptic to elongated, 1.5–2.5 by c. 0.5 mm, 2–20 mm from petiole attachment, brown to black, apically 0–8 circular submarginal impressed glands per side on veins, lower surface olive-green to brown, few to many stellate hairs on venation and

isolated simple hairs in axils, no hair tufts; venation basally triplinerved, basal nerves ending in margin below to above middle, 3–8 nerves per leaf side, brachidodromous, veins scalariform. *Inflorescences* axillary, staminate inflorescences also terminal, solitary or 2 or 3 together, rachis angular and deeply ribbed, straight to rarely sinuous; bracts triangular to rhomboid, with stellate and villose hairs, rarely decurrent, apex acute to acuminate. *Staminate inflorescences* 8–18 cm by 0.5–1.5 mm, 27–64 nodes per rachis, 3–5 (–7) flowers per node; bracts c. 1.5 by 1 mm, margin ciliate; pedicels flattened, c. 2.5 by 0.3 mm with hirsute, stellate hairs; flowers c. 4 mm diam., calyx lobes 3 or 4, ovate to elliptic, 2–3 by 1.4–2 mm, few villose hairs, sometimes tomentose, apex acute, yellow to reddish brown, stamens 20–25, filaments 0.5–1.5 mm long, basally broader, anthers ellipsoid to reniform, 0.3–0.5 by 0.3–0.4 mm, brown-yellow, connective slender; receptacle c. 0.4 by 0.5 mm diam. *Pistillate inflorescences* 7–21 cm by 0.5–2 mm, 12–38 nodes per rachis, 1 or 2 flowers per node; bracts 1.2–1.8 by 0.8–1.2 mm, margin sometimes concave; pedicels terete, 1–3 by 0.5–1 mm, abscission zone 0.5–1 mm from apex, stellate hairs dense; bracteoles rare (caducous?), narrowly triangular; flowers 3–4 mm diam., calyx lobes 5 or 6, narrowly triangular, 2–2.5 by 0.3–1 mm, stellate hairs on the outside, yellow to reddish brown, base thickened, apex acute to acuminate, not recurving; ovary ellipsoid to cordate in lateral view, (2- or) 3- (or 4-)locular, covered with discoid glands and some stellate hairs, stigmas sessile, persistent, 2–2.5 by 0.5–0.8 mm, decurrent. *Fruits* obpyramidal, winged, indehiscent woody capsules, 3–30 by 3–28 mm, each locule roughly triangular, narrow at base, c. 1.5 mm wide, towards apex up to 14 mm wide, up to 1 cm long; wing apices pointed and often twisted, curved and hook-like towards the style, exceeding it by up to 7 mm; surface deeply wrinkled when dry, especially the upper half, between the tips and upper fruit body, the lower half often channelled between 2 lobes. *Seeds* subglobose, 4–5 mm diam., shiny, smooth, dark brown.

Distribution — Myanmar, Thailand, Laos, Cambodia, and Vietnam.

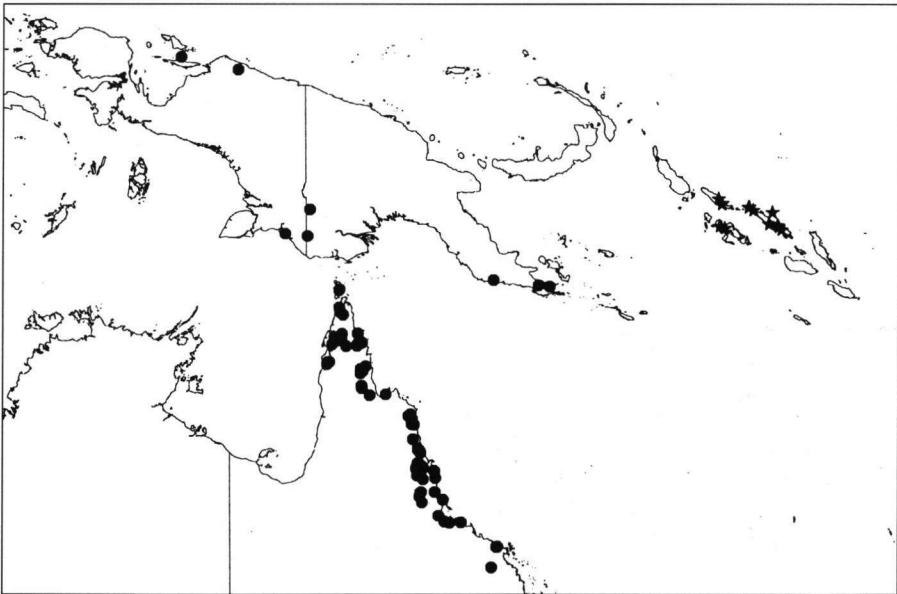
Habitat & Ecology — Common in evergreen forest, mixed deciduous forest, forest edges, and on river banks. Altitude: 40–150 m. Flowering: May–Sept. Fruiting: May–July.

6. *Mallotus polyadenos* F. Muell. — Fig. 1c; Map 4

Mallotus polyadenos F. Muell., Fragm. 6 (1868) 184; Benth., Fl. Austr. 6 (1873) 142; Bailey, Syn. Queensl. Fl. (1883) 479; Queensl. Fl. 5 (1902) 1448; Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii (1914) 198; Airy Shaw, Kew Bull. 20 (1966) 43; Kew Bull. Add. Ser. 8 (1980) 170; Kew Bull. 35 (1980) 655; P.I. Forst., Austrobaileya 5, 3 (1999) 481. — Lectotype: *Dallachy s.n.*, MEL sheet no. 708712 (holo MEL), Australia, Cook District, Sea View Range, 11 Nov. 1864.

Shrub to tree, up to 28 m high, dioecious or rarely monoecious, mainly glabrous; branchlets sometimes lenticellate, ribbed, whitish grey and reddish brown mottled to dark brown. *Leaves* opposite to subopposite to rarely alternate, pairs unequal in size; stipules (late) caducous, triangular, half conical, 0.8–1.5 by 0.4–1 mm, dark red to brown, apex acute; petiole terete and deeply channelled to reniform in transverse section, 0.4–2.5 by 0.4–2 mm, glabrous to glabrescent, base and apex slightly to clearly pulvinate with transversal cracks; blade ovate to obovate, 4–17.8 by 1.4–7.8 cm, index 1.5–4.3, coriaceous to rarely chartaceous, base acute to rounded and slightly

emarginate, margin entire, rarely dentate, 0–5 marginal glands per side, protruding in young leaves, intruding in old ones, triangular to round, apex obtusely acute to acuminate, rarely ending in a margin-type gland, upper surface green to silvery grey to brown, basally 0–10 impressed elliptic glands per side, c. 1 by 0.5 mm, brown or black, 0–45 mm from petiole attachment, on first pair of nerves and veins, lower surface green to olive-green to brown, domatia sometimes pocket-like with simple villose to velutinous white hairs; venation pinnate to often basally triplinerved, basal nerves ending in margin below middle, rare above, 4–9 nerves per side, brachidodromous, veins scalari-form close to midrib, gradually becoming reticulate towards margin. *Inflorescences* axillary to terminal, solitary or 2 or 3 together, straight to rarely sinuous; bracts triangular to rhomboid, margin ciliate towards base, apex acute to acuminate, sometimes patent. *Staminate inflorescences* 2.8–20.7 cm by 0.3–0.8 mm, 20–47 nodes per rachis, 3–5 flowers per node; bracts 0.5–2 by 0.5–1.2 mm, basally often thickened; pedicels terete to angular, 0.8–4 by 0.3–0.5 mm, abscission zone at very base, densely covered with stellate hairs; flowers 4–7 mm diam., calyx lobes 3–5, ovate to elliptic, 2.5–4.5 by 0.8–2.8 mm, margin rarely ciliate, apex occasionally recurved with few villose hairs, yellow to reddish brown, stamens 20 to over 100, filaments 1.5–3 mm long, anthers ellipsoid to reniform, 0.3–0.5 by 0.2–0.8 mm, basifixed to dorsifixed, margin occasionally brown mottled, connective basally broad, deeply to entirely split, receptacle c. 0.3 by 0.5 mm diam. *Pistillate inflorescences* 3–21 cm by 0.5–2 mm, 12–45 nodes per rachis, 1–3 flowers per node; bracts 0.5–1.2 by 0.8–1.3 mm, base decurrent, margin concave; pedicels terete to flattened, 1–28 by 0.1–0.6 mm, abscission zone 0–1.2 mm from apex; flowers 1–4 mm diam., calyx persistent, inside basally ring of villose hairs, lobes 3–5, ovate to triangular, 1.5–4 by 0.5–3 mm, yellow to



Map 4. Distribution of *Mallotus polyadenos* F. Muell. (●) and *M. puber* Bollendorff (★).

reddish brown, basally thickened, margin ciliate, apex acute with few villose hairs, ovary ovoid (2- or) 3- (or 4-)locular, covered with discoid glands, inside basally often with some villose hairs, stigmas sessile, persistent, 0.8–4 by 0.4–1.2 mm, decurrent. *Fruits* subglobose, dehiscent, woody capsules, deeply trigonous, 4–6 by 7–10 mm diam., surface rarely with some stellate hairs, cocci twisting apically after dehiscence, each locule 3–6 by 2–5 mm wide; column more or less anchor-shaped in lateral view, c. 3 by 3–4.5 mm. *Seeds* globose to subglobose, 3–4 mm diam., with a few granular dots, light to dark brown.

Distribution — New Guinea, Australia (NE Queensland).

Habitat & Ecology — Dry, open or closed, often riparian rain forest, in *Melaleuca-Eucalyptus-Tristania* forest as well as in secondary swamps or in cleared dune woodland, on moderate slopes, on coral limestone. Altitude: sea level up to 800 m. Flowering: May–Dec. Fruiting: Aug.–Dec.

Note — One specimen only had branched staminate inflorescences which are terminal and sinuous (*Clemens s.n.*, Australia, Queensland, Mount Fox; GH).

7. *Mallotus puber* Bollendorff, *nom. & stat. nov.* — Fig. 1d, 5; Map 4

Mallotus leucodermis Hook. f. var. *puberulus* Airy Shaw, Kew Bull. 21 (1968) 396. — Type: *BSIP* (Whitmore) 2998 (holo K; iso L), Solomon Islands, Choiseul.

Small tree, up to 15 m high, dioecious, pubescent to glabrous; branchlets sometimes lenticellate, glabrous to puberulous to hirsute, ribbed, reddish to greyish to dark brown. *Leaves* alternate to rarely opposite, pairs unequal in size; stipules mainly early caducous, ridged, 2–2.5 by c. 1 mm, glabrous, apex acute to acuminate; petiole terete to angular and often narrowly channelled adaxially, 14–90 by 1–3 mm, glabrous to hirsute, base and apex usually not to slightly pulvinate, sometimes twisted; blade elliptic to ovate, 12–27 by 7.2–14.3 cm, index (1.1–)1.5–2.1, chartaceous to rarely subcoriaceous, base broadly rounded to cordate, margin entire, sometimes with a few irregular teeth, (0–)3–11 inconspicuous marginal glands per side in sinuses, apex acute to obtusely acuminate, ending in a margin-type of gland (sometimes giving a mucronate aspect), upper surface glabrous to hirsute, simple and stellate hairs on venation, dark green to brown, basally 0–13 circular, randomly distributed glands, c. 0.5 mm diam., brown or black, lower surface olive green to brown, domatia with long simple and short stellate hairs, venation basally triplinerved to almost palmate with basal nerves ending in margin at or above middle, further pinnate, with 3–5 nerves per side, veins scalariform with 4–6 mm wide intervals, veinlets reticulate to scalariform. *Inflorescences* axillary, solitary or 2 or 3 together, rachis angular; bracts basally decurrent, margin ciliate, apex acute, patent. *Staminate inflorescences* 3–8.5 cm by 0.5–1 mm, 39–46 nodes per rachis, mainly 3 flowers per node; bracts c. 1 by 1 mm; pedicels terete to flattened, 1.5–2 by 0.4–0.5 mm, abscission zone 1–1.5 mm from apex, indumentum dense; flowers only seen in bud, calyx lobes 4, elliptic, c. 2 by 1.5 mm, discoid glands inside, apex acute, yellowish brown, stamens c. 50, anthers ellipsoid, dorsifixed, connective splitting. *Pistillate inflorescences* 8–38.5 cm by 0.8–3 mm, 13–36 nodes per rachis, 1 flower per node; bracts 0.8–1.2 by c. 1 mm; pedicels terete or angular, 7–48 by 0.5–0.7 mm, generally geniculate at abscission zone, latter 0.5–7 mm from apex; flowers 3–4 mm diam., calyx lobes 6, triangular to narrowly triangular, 1.5–1.8 by

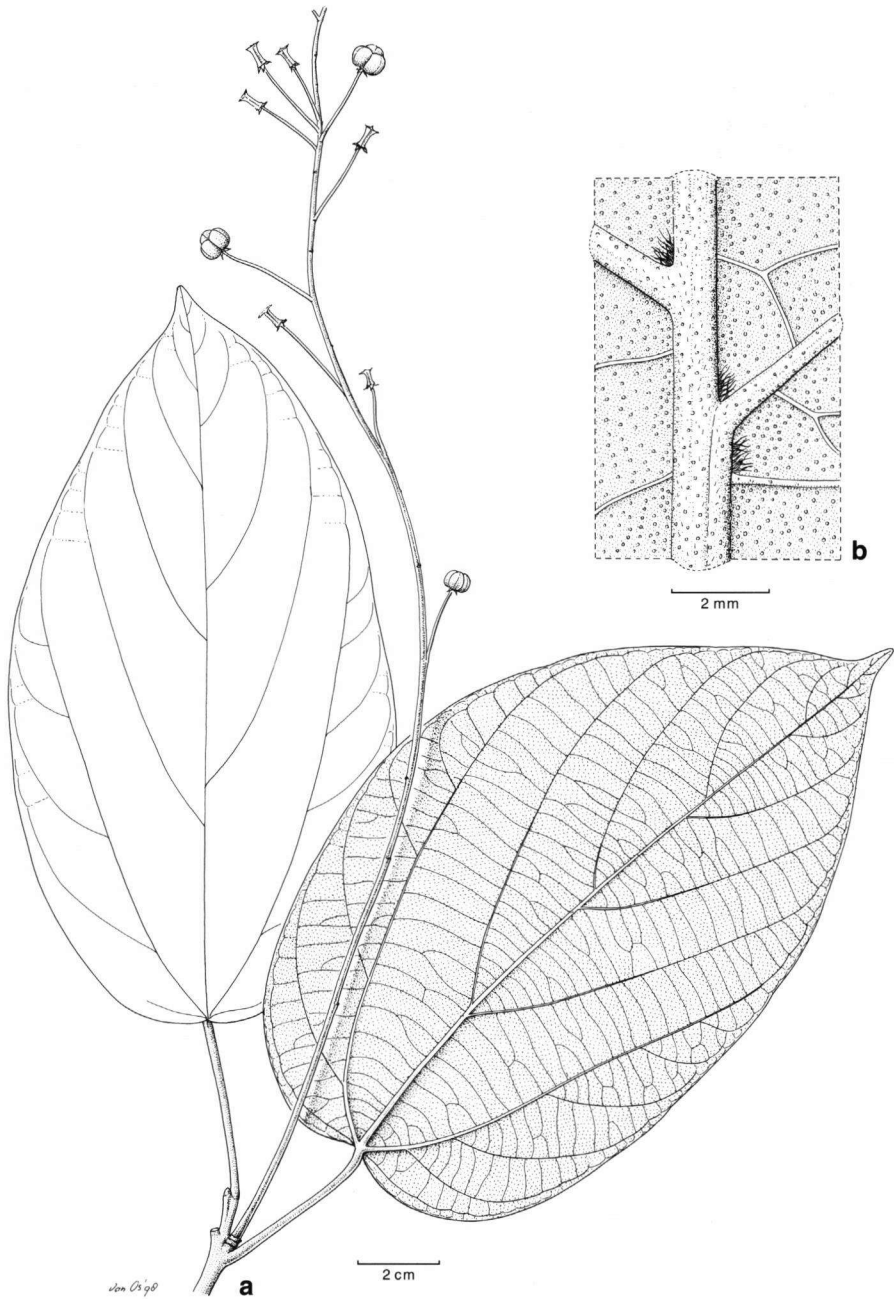


Fig. 5. *Mallotus puber* Bollendorff. a. Habit; b. detail of domatia [Corner RSS 2777, L].

0.3–0.5 mm, subcoriaceous, apex acute, few to densely hirsute hairs on the outside, dark reddish brown, ovary reniform to ellipsoid, c. 2.5 by 2 mm, 2- (or 3-)locular, covered with discoid glands and rarely with hairs, stigmas sessile, 2–4 by 0.5–1 mm, decurrent, few hairs. *Fruits* subglobose, woody, dehiscent capsules, 5–8 by 7–10 mm diam., without wings; locules globose to ovoid, c. 5 mm wide, inside basally with stellate and simple hairs; column anchor- to bell-shaped in lateral view, 4–5 by 3.2–5 mm. *Seeds* globose to ovoid, 4–5 mm diam., dull, sometimes with a few granular dots, light to dark brown with darker venation; micropyle protruding conspicuously.

Distribution — Solomon Islands (Choiseul, Kolombangara, New Georgia, San Isabel).

Habitat & Ecology — Lowland primary forest, mostly well drained hills, rare in swamp forest. Altitude: up to 130 m. Flowering: July–Nov. Fruiting: Dec.–Feb., Aug.–Sept.

Vernacular names — Ketonwane, faiketo, raumomote, malaketo (Kwara'ae).

Note — The epithet *puber* is used, because *puberulus* already exists on the species level (*M. puberulus* Hook. f.).

8. *Mallotus sumatranus* (Miq.) Airy Shaw — Fig. 2d, 6; Map 1

Mallotus sumatranus (Miq.) Airy Shaw, Kew Bull. 16 (1963) 351; Kew Bull. Add. Ser. 4 (1975) 167; Kew Bull. 36 (1981) 329. — *Coccoceras sumatranum* Miq., Fl. Ned. Ind., Eerste bijv. (1860) 456; Müll. Arg. in DC., Prodr. 15, 2 (1866) 950; Pax & K. Hoffm. in Engl., Pflanzenr. IV.147.vii (1914) 209; in Engl. & Harms, Nat. Pflanzenfam., ed. 2, 19c (1931) 118. — Type: *Teijsmann s.n.* (holo U; iso L), Sumatra, Prov. Lampong, prope Siringkebau.

Small tree, up to 12 m high, dioecious; branchlets sometimes lenticellate, glabrescent, finely ribbed, light brown to grey, sometimes mottled with black. *Leaves* opposite to rarely alternate, pairs more or less equal in size; stipules caducous, triangular, rarely falcate, 1.5–2.5 by 0.5–1 mm, ridged, apex acute to acuminate, with some simple hairs; petiole terete to flattened, 5–62 by 0.8–2.1 mm, sometimes with transversal cracks, hirsute, sometimes with (stalked) stellate hairs, base and apex not pulvinate, sometimes wrinkled; blade ovate to obovate, rarely narrowly elliptical, 5.5–18.5 by 2–8 cm, index 1.6–4.3, chartaceous to rarely subcoriaceous, base emarginate to cordate, margin slightly to clearly crenate, with 7–15 marginal glands per side in sinuses, rarely pubescent, apex acute to bluntly acuminate, rarely ending in a margin-type of gland, upper surface glabrous or with many stellate hirsute hairs on petiole attachment, pale- to red- to dark brown, basally 1–6 impressed elliptic glands per side, up to 1.5 by 0.8 mm, brown to grey, lowermost pair 0.5–3 mm from petiole attachment, apically 2–4 more circular glands per side, submarginal on veinlets, lower surface reddish brown to brown, domatia with long stellate hairs in axils, venation basally triplinerved, basal pair ending in margin below to above middle, 4–11 nerves per leaf side, eucamp-todromous, apically occasionally brachidodromous, raised below, veins conspicuously scalariform with 2–3 mm intervals. *Inflorescences* axillary, staminate inflorescences also terminal; bracts triangular to rhomboid, 1–1.3 by 0.8–2 mm, base sometimes thickened and decurrent, margin not to slightly ciliate, apex acute. *Staminate inflorescences* 2 or 3 together, 6–16.2 cm by 0.8–1.5 mm, 32–37 nodes per rachis, 3–6 flowers per node; pedicels terete to flattened, 2–5 by 0.1–0.2 mm, abscission zone at the

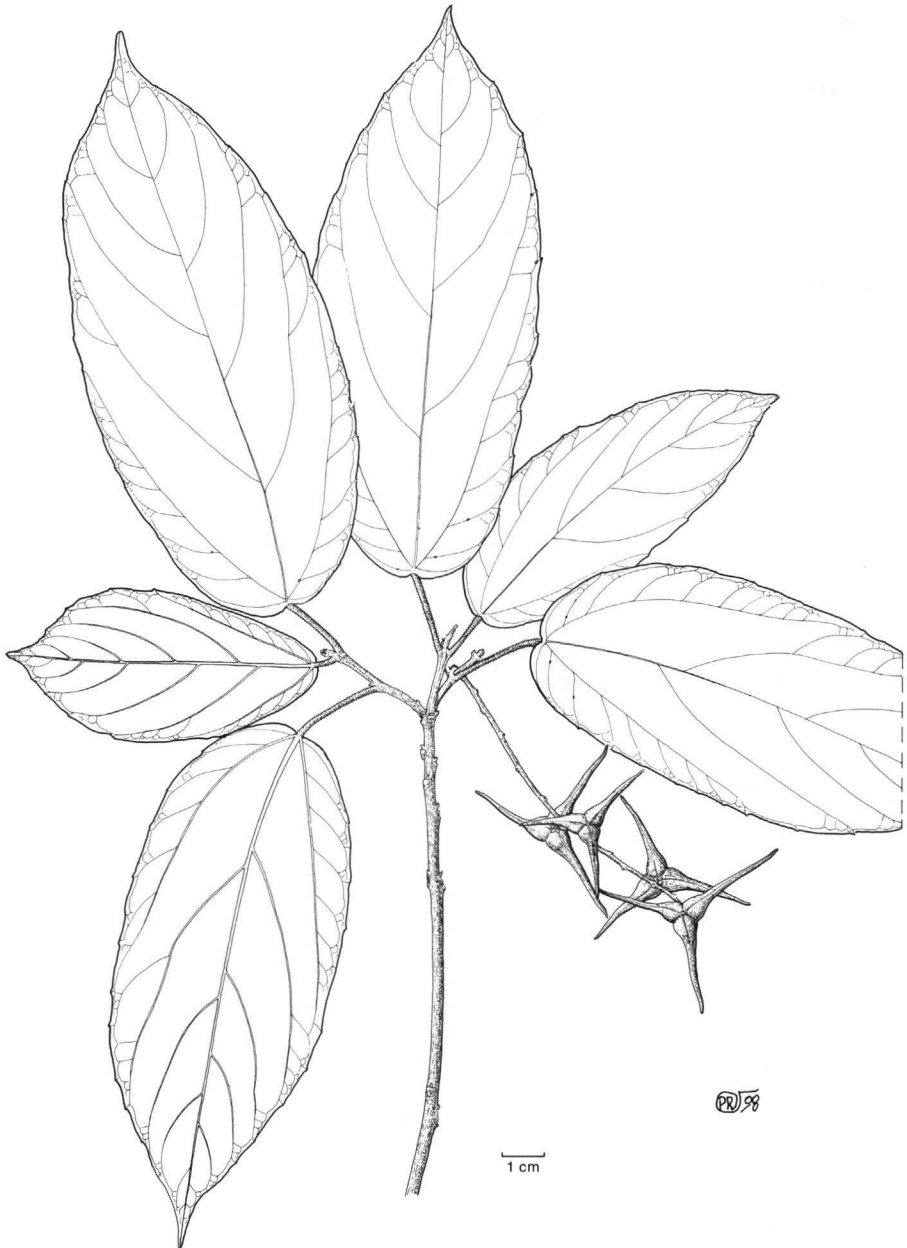


Fig. 6. *Mallotus sumatranus* (Miq.) Airy Shaw. Habit [Ambriansyah & Arifin AA 446, WAN].

very base, stellate hairs rare, red; flowers 3.5–4 mm diam., calyx lobes (2 or) 3 or 4, ovate, 1.6–3 by 1.2–1.5 mm, recurving, apex acute, with few villose hairs, reddish brown, stamens 30–42, filaments 1.5–3 mm long, anthers oblong, 0.5–0.8 by c. 0.2 mm, basifixed, reddish brown, connective slender, not split, receptacle c. 0.2 by 0.5 mm diam. *Pistillate inflorescences* solitary, 4.2–19.5 cm by 0.8–1.5 mm, 8–24 nodes per rachis, 1 or 2 flowers per node; pedicels terete to flattened, 2–4.2 by 0.5–0.8 mm, abscission zone 1–2 mm from apex; flowers c. 4 mm diam., calyx lobes 4–6, connate at base, 2–3 by 0.6–1 mm, basally thickened, reddish brown, apex acute to acuminate, with few villose or long, multicellular, uniseriate hairs, ovary winged, elongated ovoid in lateral view, (2- or) 3- (or 4-)locular, covered with discoid glands, ovules taking up only a third of the wing, style 0.8–2 by c. 0.8 mm, stigmas persistent 2–3.5 by 0.4–1 mm, spreading horizontally, recurved at the apex. *Fruits* woody, winged, indehiscent to tardily dehiscent capsules, fruit body roughly equilateral triangular from above, each side measuring 6–10 mm, smooth or with some hook-like protuberances, lower fruit body hirsute, wings spreading horizontally, 1.5–3 cm long, basally 2–5 mm wide, often slightly twisted, ribbed lengthwise; locules 3–6 by 3–5 mm wide; column bell-shaped, c. 4 by 3 mm. *Seeds* subglobose, c. 3 mm diam., shiny, brown.

Distribution — Indonesia (Sumatra and Borneo).

Habitat & Ecology — Primary rain forest on river banks, swamp forest. Altitude: 10–30 m. Flowering: June, Oct. Fruiting: Feb.–Nov.

Vernacular names — Kalimantan: Belanti, peroepoek.

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IDENTIFICATION LIST

The numbers after collector and collector number refer to the following species:

1 = <i>Mallotus atrovirens</i>	5 = <i>Mallotus plicatus</i>
2 = <i>Mallotus fuscescens</i>	6 = <i>Mallotus polyadenos</i>
3 = <i>Mallotus leucodermis</i>	7 = <i>Mallotus puber</i>
4 = <i>Mallotus muticus</i>	8 = <i>Mallotus sumatranus</i>

- A series 4675: 4 — Abor bin Adan Z.O.B. 2467: 8 — Achmad 30: 3; 493: 3; 555: 3; 1085: 3; 1208: 3; 1248: 3 — Aet & Idjan 662: 6 — Agama 1068: 3 — Ambriansyah & Arifin AA 297: 3; AA 400: 4; AA 446: 8 — Angian 10296: 4 — Arifin & Arbainsyah AA 1653: 4 — Arsat 1285: 4. Balakrishnan NBK 984: 2 — bb series 2060: 8; 2119: 4; 3086: 4; 7692: 8; 8057: 4; 11895: 3; 14702: 4; 15867: 3; 16194: 3; 16673: 4; 16674: 4; 17733: 4; 17750: 4; 18436: 4; 18545: 3; 18599: 3; 18837: 3; 24749: 3; 25621: 3; 25628: 3; 25790: 4; 25798: 3; 28669: 4; 31718: 3; 31966: 3; 32003: 3; 32040: 3; 33097: 3; 34765: 3; 34785: 3 — Bean 1999: 6; 3608: 6; 5056: 6; 5106: 6; 5238: 6 — Beccari PB 2829: 4 — Bejaud 109: 5; 187: 5 — Birch 14: 6; 64: 6 — Blake 14553: 6; 23386: 6 — Boschproefstation T.653: 4 — Boyland 635: 6 — Brass 3437: 7; 7469: 6; 7469a: 6; 19814: 6; 19815: 6 — Brass & White 200: 6; 332: 6 — Bremer & Bremer 812: 2 — Brooke 10654: 4 — Bruhl, Webster & Quinn 1055: 6 — BSIP series 2624: 7; 2676: 7; 2998: 7; 3605: 7; 6823: 7; 7361: 7; 7425: 7; 7690: 7; 7729: 7; 8143: 7; 8325: 7; 16016: 7; 16159: 7; 17593: 7; 18431: 7 — Burut 2997: 4 — BW series 4162: 3; 9280: 6.
- C.F. series 4769: 4 — Christensen 777: 6 — Clarkson 2706: 6; 4059: 6; 4128: 6; 4146: 6; 4543: 6; 5684: 6 — Corner RSS 2777: 5.
- Davids & Sumithraarachchi 8543: 2 — De Jong 575: 3 — De Silva 8: 2 — De Wilde & De Wilde-Duyfjes 19699: 4; 19749: 4; 20426: 4 — Dockrill 45: 6; 849: 6; 1325: 6 — Duke AIM 1270: 6. Endert 1415: 4; 1498: 8; 1513: 8; 1989: 8; 2050: 3; 2078: 4; 2089: 4; 5096: 4 — Evangelista 1036: 4.
- Fell DGF 739: 6; DGF 3780: 6; DGF 3829: 6; DGF 3944: 6; DGF 4461: 6 — Forster PIF 8282: 6; PIF 10077: 6; PIF 10226: 6; PIF 10528: 6; PIF 13090: 6; PIF 13458: 6; PIF 13487: 6; PIF 14306: 6; PIF 14334: 6; PIF 14395: 6; PIF 15388: 6; PIF 17975: 6 — Foxworthy 8352: 4.
- Giesen 17: 8 — Grashoff 1071: 4 — Gray 1046: 6; 1254: 6 — Griffith KD 4770: 4; KD 4789: 3. Halford Q 735: 6 — Hallier 182: 8; 822: 4; 828: 4 — Harmand 133: 5; 1366: 5; 297: 5; 688: 5 — Helfer KD 4963: 5 — Hose 329: 4; 362: 4 — Huber 351: 2 — Hyland 2940: 6; 3679: 6; 4860: 6; 6423: 6; 6458: 6; 6904: 6; 7718: 6; 7719: 6.
- Irvine 105: 6; 275: 6; 521: 6.
- Jaheri 90: 4; 1893: 4 — Jayasuriya 1530: 2; 1549: 2 — Jayasuriya & Kostermans 2357: 2 — Jessup GJM 2326: 6 — Jobson 806: 6.
- Kajewski 1356: 6 — Kanis 2002: 6 — KEP FRI series 4079: 3; 8502: 3; 8569: 3; 8596: 3; 14329: 3; 14402: 3; 15230: 3; 16309: 3; 17729: 3; 32644: 3 — Kerr 7026: 5 — KeBler et al. PK 1960: 4 — KL series 1495: 3; 3178: 4 — Kostermans 5686: 3; 12644: 4; 21010: 4; 21119: 4; 21132: 4; 21443: 4; 21716: 4; 24117a: 2; 24663: 2; 24729: 2; 25523: 2; 25623: 2; 25643: 2; 27264: 2; 27649: 2 — Kostermans & Soengeng 53: 3; 151: 3 — Kurz 1554: 5.
- Labohm 39b: 4 — LAE series 77069: 6 — Leighton 512: 3 — Lörzing 13241: 4 — Lütjeharms 4069: 3.
- Main 1903: 8 — Maingay KD 1433: 3 — McDonald 5524: 6 — Meh 17895: 4 — Meijer 536: 2; 882: 2 — Meijer & Gunatilleke 1394: 2; 1410: 2.
- Native Collector 5248: 3 — Neldner 2806: 6; 2807: 6; 2813: 6; 2827: 6; 2856: 6; 2858: 6 — NGF series 24069: 6; 33560: 6; 38584: 6; 38585: 6 — Niyomdham et al. 954: 4 — Nooteboom 3268: 2 — Nooteboom & Huber 3091: 2.
- O'Reilly 542: 6 — Orolfo 3223: 3.
- Perry 2: 6 — Pierre 2781: 5 — Posthumus 1077: 8 — Puaa 10108: 4.
- Ridsdale 632: 1; PBU 368: 4 — RSS series 2777: 7.
- S series 4455: 3; 16460: 4; 21923: 3; 22454: 3; 29959: 4; 43548: 4 — SAN series 18378: 4; 23003: 4; 23082: 4; 23591: 4; 24951: 3; 31081: 4; 33173: 4; 33196: 4; 34482: 3; 34757: 4; 36606: 3;

- 36948: 4; 37406: 3; 42955: 4; 46176: 3; 51627: 4; 53123: 3; 54570: 4; 59687: 3; 59767: 3; 60029: 4; 64776: 3; 65433: 3; 65827: 3; 66361: 4; 67651: 3; 77465: 3; 77740: 3; 81419: 3; 82237: 3; 87788: 3; 89942: 4; 95705: 3; 96423: 3; 107883: 4; 111703: 4; 111838: 4; 115733: 4; 117596: 4; 122494: 4; 124532: 3; 126003: 4; 126571: 4; 126961: 4; 126963: 4; 130713: 3; 132234: 3; 132451: 4; 132498: 4 — Sanderson 31: 6 — SF series 16805: 3; 29574: 3; 29671: 3; 32946: 4; 37307: 4 — Sharpe 4051: 6; 4052: 6 — L.S. Smith 3344: 6; 10675: 6; 11749: 6; 11963: 6; 11975: 6; 12404: 6 — Soepadmo & Mahmud 1184: 3; 1190: 3 — Sohmer & Waas 10311: 2 — Stocker 821: 6 — Sumithraarachchi & Fernando 123: 2; 124: 2.
 Teijsmann HB 4523: 8; HB 8396: 8; HB 10931: 4 — Thorel 2139: 5 — Thwaites 2105: 2 — Tirvangadum & Waas 682: 2 — Torquebiau YL 6740: 3.
 Van Altena 3625: 6 — Van Balgooy 2096: 4; 2727: 3 — Van Balgooy & Stone 2265: 3 — Van Royen 4685: 6.
 Waas 893: 2; 1522: 2; 1870: 2; 1918: 2; 2009: 2 — Wallich 7728: 5; 7760: 5; 7771: 1 — Webb & Tracey 5820: 6; 7054: 6; 7219: 6; 9620a: 6; 9657: 6; 9831: 6 — Webster & Hyland 18875: 6 — C.T. White 11745: 6 — Winkler 3221: 4 — Worthington 2016: 2; 2223: 2; 3163: 2; 3348: 2; 3502: 2.
 Yamada K 3484: 4.

INDEX

Numbers refer to accepted species. Accepted names are printed in roman, synonyms in *italics*, and new names in **bold**.

Coccoceras Miq. [p. 320]

- anisopodum* Gagnep. 5
borneense J.J. Sm. 4
muticum Müll. Arg. 4
 var. *muticum* Müll. Arg. 4
 var. *pedicellatum* Hook. f. 3
plicatum Müll. Arg. 5
sumatranum Miq. 8

Croton

- atrovirens* Wall. 1
castanifolius Wall. 5
eriocarpoides Wall. 5

Hymenocardia

- plicata* Kurz 5

Mallotus Lour.

- sect. *Polyadenii* Pax & K. Hoffm. [p. 320]
anisopodus (Gagnep.) Airy Shaw 5

(Mallotus)

- atrovirens* Wall. ex Müll. Arg. 1
borneensis Müll. Arg. 4
eriocarpoides Wall. ex Müll. Arg. 5
fuscescens (Thwaites) Müll. Arg. 2
leucodermis Hook. f. 3
 var. *leucodermis* Airy Shaw 3
 var. *puberulus* Airy Shaw 7
muticus (Müll. Arg.) Airy Shaw 4
plicatus (Müll. Arg.) Airy Shaw 5
polyadenos F. Muell. 6
puber Bollendorff 7
sumatranus (Miq.) Airy Shaw 8
wallichianus Müll. Arg. 5

Rottlera

- borneensis* (Müll. Arg.) Scheff. 4
fuscescens Thwaites 2