



Bischofia and *Hymenocardia* (Phyllanthaceae) in Malesia

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Key words

Bischofia
Euphorbiaceae
Hymenocardia
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Abstract The genera *Bischofia* and *Hymenocardia* both have a single species in Malesia. The two genera were always difficult to classify, both once formed their own family, but are now firmly embedded in the *Phyllanthaceae*. Of both genera a more complete nomenclature and biogeography is presented.

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INTRODUCTION

Bischofia Blume and *Hymenocardia* Wall. ex Lindl. have an interesting taxonomic past. Recent phylogenetic analyses based on five genes (*atpB*, *matK*, *ndhF*, *PHYC*, *rbcL*; Hoffmann et al. 2006, modified from Kathriarachchi et al. 2005) show that *Bischofia* and *Hymenocardia* are part of the *Phyllanthaceae* subfamily *Antidesmatoideae* Hurus. *Bischofia* occupies a basal position in the phylogeny (Hoffmann et al. 2006: f. 1) and forms the monotypic tribe *Bischofiaceae* Hurus. (Hoffmann et al. 2006). *Hymenocardia* is part of tribe *Antidesmateae* Benth. and within this tribe it is classified in subtribe *Hymenocardiinae* Petra Hoffm. together with *Didymocistus* Kuhl. Levin (1986) already showed in a cladistic analysis based on leaf morphology and leaf anatomical characters that both genera are Phyllanthoid.

In former times both genera have wandered around in the classification of the *Malpighiales*. *Bischofia* was regarded as a tribe of the *Euphorbiaceae* by Hurusawa (1954, as '*Bischoffiaceae*'), but in the same family the genus has also been classified as subtribe *Bischofiinae* (Müller 1865, as '*Bischoffiaceae*') or it was recognized as the separate family *Bischofiaceae* (Airy Shaw 1964) close to the *Euphorbiaceae* (Radcliffe-Smith 1987).

Hymenocardia has a comparable history, Hutchinson (1969) regarded it as tribe *Hymenocardiaceae* within the *Euphorbiaceae* and Airy Shaw (1964) gave it family status (*Hymenocardiaceae*), also close to the *Euphorbiaceae* (Radcliffe-Smith 1987). The status of tribe *Hymenocardiaceae* and the number of genera included were variable, the circumscription of Hutchinson was much wider (e.g., including *Aporosa* Blume, *Aporosella* Chodat (synonym of *Phyllanthus* L.), *Baccaurea* Lour., *Didymocistus* and *Martretia* Beille) than that of Webster (1994, 2014) and Radcliffe-Smith (2001), where only *Didymocistus* is still included in the tribe.

If the *Phyllanthaceae* are still regarded as part of the *Euphorbiaceae*, then both genera are classified in subfamily *Phyllanthoideae* Asch., *Bischofia* in tribe *Bischoffiaceae* (Müll.Arg.) Hurus. and *Hymenocardia* in tribe *Hymenocardiaceae* Hutch. (Webster 1994, 2014, Radcliffe-Smith 2001).

The two genera have several characters that are aberrant within the *Euphorbiaceae* s.l., which has caused their classification problems. *Bischofia* is exceptional because of its 3-foliolate leaves (in Malesia also found in – the introduced – *Hevea* Aubl. and *Annesijoa* Pax & K.Hoffm., with digitate leaves) and lack of a disc (also lacking in *Hymenocardia*). *Hymenocardia* has samara-like fruits (which are true regmas) and disc-like glandular hairs (resembling those of *Homonoia* Lour., *Macaranga* Thouars, *Mallotus* Lour., and *Pantadenia* Gagnep.).

BISCHOFIA

Bischofia is typified by the generally 3-foliolate leaves, flowers lacking petals and a disc, and drupaceous fruits. *Bischofia* was named by Blume (1826–1827) after G.W.T.G. Bischoff, a botanist from Heidelberg, Germany (1797–1854). Because of the double 'f' at the end of Bischoff's name and the use of a single 'f' by Blume, confusion arose about the correct spelling. Especially the earliest publications after Blume 'corrected' the name to *Bischoffia*.

The genus contains two species, *B. javensis* Blume, widespread in Asia, Australia and the Pacific; and from China *B. polycarpa* (H.Lév.) Airy Shaw (1972b, based on *Celtis polycarpa* H.Lév., *Ulmaceae*), including the synonym *B. racemosa* W.C.Cheng & C.D.Chu ex Yi F.Duan & X.R.Wang (Duan et al. 2016). *Bischofia polycarpa*, not treated here, differs from *B. javensis* in having thinner, more densely veined leaflets (vs more coriaceous, less densely veined in *B. javensis*) that are generally broadly elliptic to almost suborbicular (vs elliptic to oblong in *B. javensis*), delicate, (unbranched) racemose pistillate inflorescences (vs more sturdy and paniculate in *B. javensis*), and smaller fruits (bigger in *B. javensis*) (Airy Shaw 1972b). Some of the characters are difficult to interpret. Both species are deciduous with the leaves appearing during flowering. These young leaves are thin in both species, thus the texture can only be measured when they are in fruit. Also the size of the fruits is difficult, because the maturity of the fruits is not easy to assess from herbarium specimens. Likewise, the branching of the inflorescence is variable in *B. javanica*, more northern specimens often also have unbranched inflorescences. Character differences mentioned in the Flora of China (Li & Gilbert 2008) are partly also not applicable, both species are deciduous, also *B. javanica*, and the sole specimen of *B. polycarpa* in L does not really have a rounded leaf blade base. It seems that *B. polycarpa* is often 2-locular

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(vs 3-locular) and the Leiden specimen has an ovate (instead of elliptic) leaflet blade and the fruits have on top a short style (absent in *B. javanica*) and shorter stigmas than *B. javanica*.

One character not mentioned for *Bischofia* so far, is the presence of domatia on the lower leaf surface between midrib and secondary veins and/or in axils of secondary and tertiary veins. These are holes or more or less sac-like (walled and sometimes with roof).

Bischofia javanica, a pioneer species, is invasive in the Bonin Islands (Japan) due to its rapid germination in open places (Hata et al. 2006) and adaptability to dry periods via leaf shedding (Yazaki et al. 2015).

Bischofia Blume

Bischofia Blume (1826–1827) 1168; Endl. (1840) 1149; Decne. (1842) 580 ('*Bischoffia*'); Hassk. (1844) 250 ('*Bischoffia*'); Hook. (1852) t. 844; Baill. (1858) 594; Miq. (1859) 363; (1860) 178, 444; Müll.Arg. (1866) 478 ('*Bischoffia*'); Bedd. (1872) pl. 259 ('*Bischoffia*'); Brandis (1874) 445 ('*Bischoffia*'); Kurz (1877) 355 ('*Bischoffia*'); Gamble (1881) 355 ('*Bischoffia*'); Benth. (1880) 281; Hook.f. (1887) 344; Pax (1890) 33; J.J.Sm. (1910) 290; Pax & K.Hoffm. (1922) 312 ('*Bischoffia*'); Gagnep. (1927) 542; Pax & K.Hoffm. (1931) 78; Hurus. (1954) 339 ('*Bischoffia*'); Backer & Bakh.f. (1963) 473; Airy Shaw (1972a) 271; A.C.Sm. (1981) 494; Radcl.-Sm. (1987) 54; G.L.Webster (1994) 54; Govaerts et al. (2000) 264; Radcl.-Sm. (2001) 77; Welzen (2005) 122; P.T.Li (Li BT) & M.G.Gilbert (2008) 217; G.L.Webster (2014) 89.— Type: *Bischofia javanica* Blume.

Microelus Wight & Arn. (1833) 298. — Type: *Microelus roeperianus* (= *Bischofia javanica* Blume).

Stylodiscus Benn. (1840) 133. — Type: *Andrachne trifoliata* Roxb. (*Stylodiscus trifoliatus* (Roxb.) Benn.) (= *Bischofia javanica* Blume).

Tree, dioecious, deciduous (flowering when in young leaf), latex red. *Indumentum* simple hairs, only very locally present. *Stipules* falcate, early caducous. *Leaves* alternate, 3-foliolate (to 5-imparipinnate), usually crowded at end of branchlets, petiole long; leaflets symmetric, basally attached, margin (serulate to) serrate with sharp teeth, without glands, sometimes seemingly entire in old leaves, surfaces smooth, (sub)glabrous, lower surface usually with (sac-like or hole) domatia in axils of midrib and secondary veins and/or in the axils of secondary and tertiary veins; venation pinnate, nerves seemingly looped and closed near margin, veins indistinctly reticulate. *Inflorescences* axillary to pseudoterminal racemes (*B. racemosa*) or panicles (*B. javanica*), pendulous in fruit; flowers single per bract; bracts early caducous. *Flowers* actinomorphic; sepals 5, free; petals and disc absent. *Staminate flowers*: pedicel with sub-

basal abscission zone; sepals hooded around stamens when young, reflexing, valvate; receptacle torus-like, with stamens attached below pistillode; stamens 5, episealous, filament short, anthers large, latrorse, thecae two, connective narrow; pistillode 5-lobed, infundibuliform. *Pistillate flowers*: pedicel with abscission zone in ± middle; sepals imbricate, flat; staminodes absent or early caducous, small, strap-like; ovary 3(–4)-locular, globose; ovules 2 per locule; style short, stigmas long, apically entire, upper surface with stigmatic tissue. *Fruits* drupes, (sub)-globose, smooth, mesocarp fleshy, endocarp woody. *Seeds* obovoid, rather crescent-moon-shaped, smooth, naked.

Distribution — Two species, one locally in China, the other from India to the Pacific.

Bischofia javanica Blume — Fig. 1; Map 1

Bischofia javanica Blume (1826–1827) 1168; Hassk. (1844) 250 ('*Bischoffia*'); Decne. (1844) 153; Miq. (1859) 363; Müll.Arg. (1866) 478 ('*Bischoffia*'); Bedd. (1872) pl. 259 ('*Bischoffia*'); Brandis (1874) 446 ('*Bischoffia*'); Kurz (1877) 355 ('*Bischoffia*'); Gamble (1881) 355 ('*Bischoffia*'); Hook.f. (1887) 345; J.J.Sm. (1910) 291; Pax & K.Hoffm. (1922) 313, f. 26 ('*Bischoffia*'); Gagnep. (1927) 542, f. 66: 15–18; f. 67: 6–10; Hurus. (1954) 339 ('*Bischoffia*'); Backer & Bakh.f. (1963) 474; A.C.Sm. (1981) 495; Radcl.-Sm. (1987) 54, f. 7; Welzen (2005) 124, f. 26, pl. V: 2; (2007) 610, f. 1; P.T.Li (Li BT) & M.G.Gilbert (2008) 217. — *Bischofia javanica* Blume var. *genuina* Müll.Arg. (1866) 478 ('*Bischoffia*'), nom. illeg. — Lectotype (designated here): *Anonymous* (Blume) s.n., s.d. (L, L0448126), Java.

Andrachne trifoliata Roxb. (1832) 728. — *Stylodiscus trifoliatus* (Roxb.) Benn. (1840) 133, t. 29. — *Bischofia trifoliata* (Roxb.) Hook. (1852) t. 844. — *Bischofia javanica* Blume var. *lanceolata* Müll.Arg. (1866) 479 ('*Bischoffia*'). — Lectotype (designated here): Roxburgh plate 1698 (CAL), India (see note).

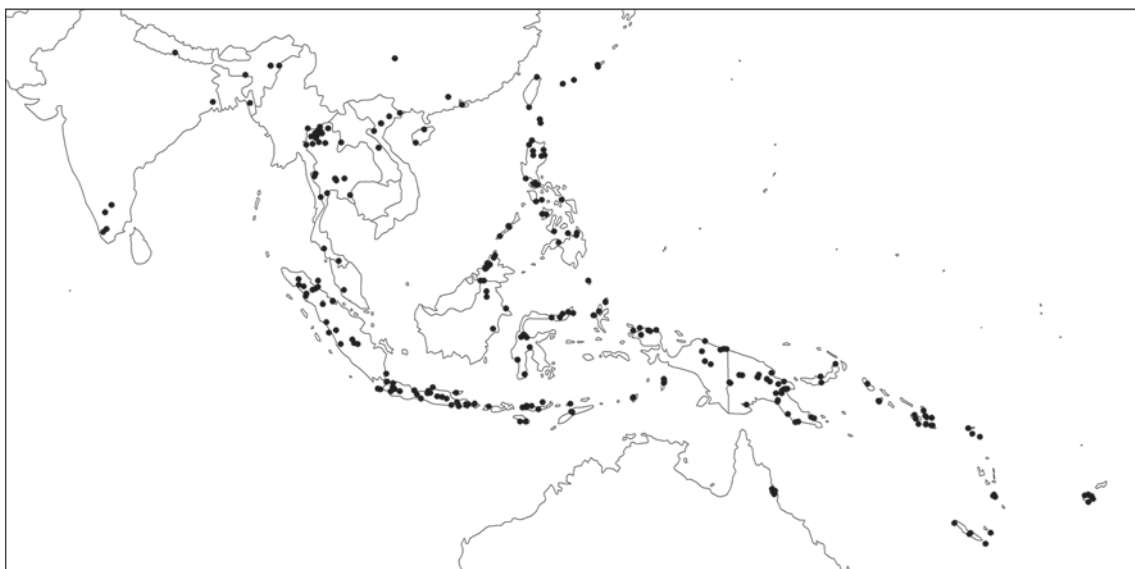
Microelus roeperianus Wight & Arn. (1833) 298; Wight (1852) t. 1880. — *Bischofia roeperiana* (Wight & Arn.) Decne. (1844) 153; Baill. (1858) 595, pl. 26, f. 25–32 ('*Bischoffia*'). — Lectotype (designated here, following Hooker 1887): *R. Wight 941* (E, E00179541; iso BR, E 4 sheets, G-DC, K 2 sheets), Peninsula Ind. orientalis.

Bischofia oblongifolia Decne. (1844) 152, t. 153 (in text 'tab. 154'). — *Bischofia javanica* Blume var. *oblongifolia* (Decne.) Müll.Arg. (1866) 479 ('*Bischoffia*'). — Type: Not indicated.

Bischofia toui Decne. (1844) 153. — *Bischofia javanica* Blume var. *toui* (Decne.) Müll.Arg. (1866) 478 ('*Bischoffia*'). — Type: Not indicated.

[*Andrachne apetala* Roxb. ex Wall. (1847) 7956A, nom. inval., nom. nud.] *Bischofia leptopoda* Müll.Arg. (1866) 479 ('*Bischoffia*'). — Type: *Herbarium of the U.S. Exploring Expedition under the command of Capt. Wilkes s.n.* 1865 (holo G-DC), Tonga.

Phyllanthus ? gymnanthus Baill. (1862) 240 — Type: *Vieillard 1162* (P), New Caledonia, Kanala.



Map 1 Distribution of *Bischofia javanica* Blume.

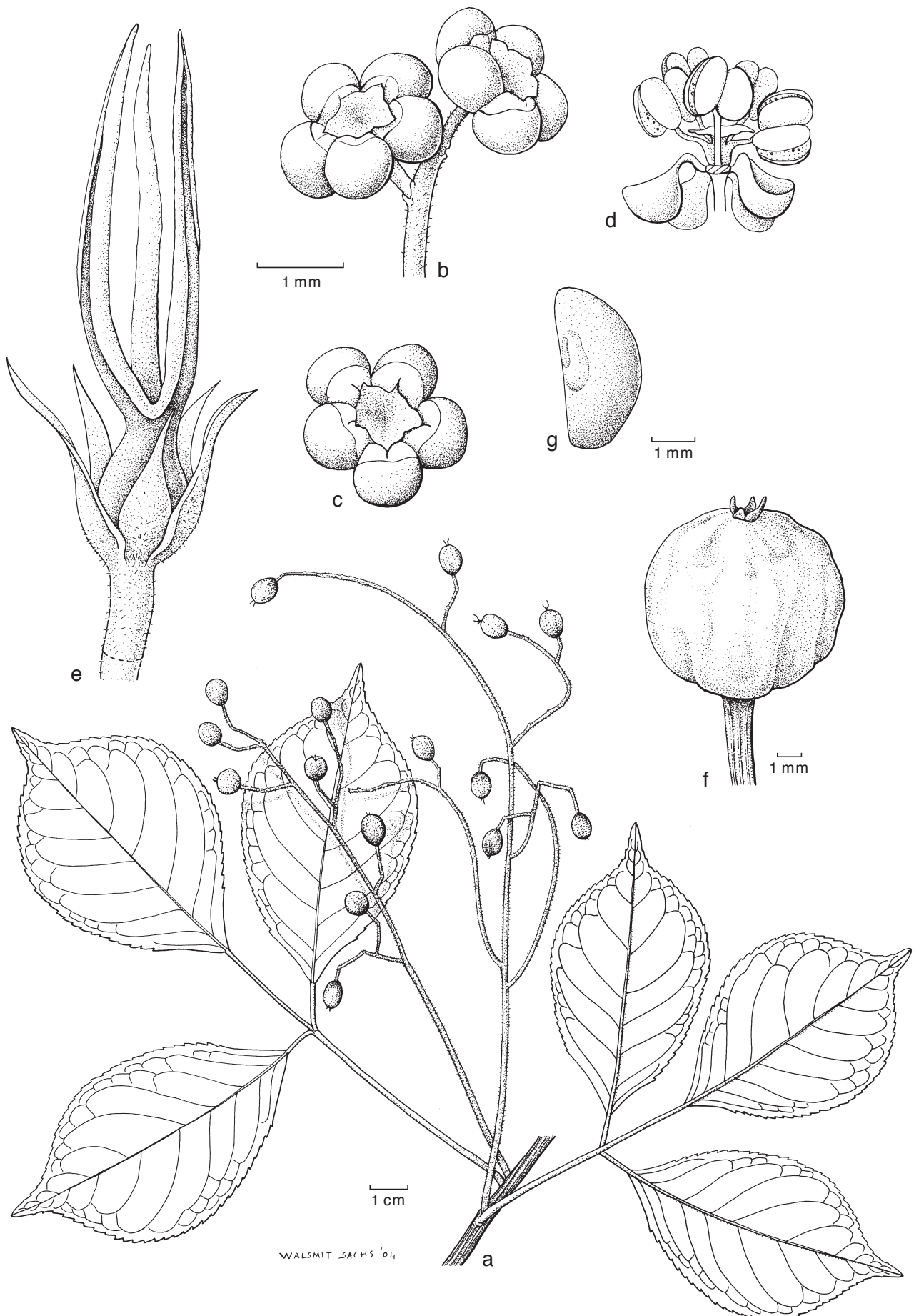


Fig. 1 *Bischofia javanica* Blume. a. Habit; b. young staminate flowers; c. staminate flower in apical view, sepals hooded over stamens, also pistillode visible; d. mature staminate flower with recurved sepals; e. pistillate flower; f. fruit; g. seed (a: *Kostermans Khwae Noi Exp. 757*; b–d: *J.F. Maxwell 75-17*; e: *J.F. Maxwell 75-130*; f, g: *J.F. Maxwell 89-1514*; all L). — Drawing by Anita Walsmit Sachs, 2004. Reproduced from *Flora of Thailand* 8, 2 with permission.

Tree up to 40 m high, dbh up to 2 m; buttresses often present, up to 0.5 m high, 1.5 cm out. *Outer bark* thin, up to 3 mm thick, slightly cracked to usually flaking with fibrous, thin strips (like *Eucalyptus*) or scaling, pale reddish to usually dark brown to grey-brown; inner bark up to 1 cm thick, red-brown to pink to light reddish to cream inside, soft; exudate red; sapwood white to light red, soft to hard; heartwood dark beefy red. *Stipules* c. 5 by 1.7 mm. *Leaves* 3-foliolate; petiole 5.5–17.5 cm long, petiolules up to 6.5 cm long, especially central one longer; leaflets mainly elliptic, 5–18 by 2.5–10 cm, length/width ratio 1.4–2.3, coriaceous when mature; base cuneate, occasionally with two glandular teeth at point of petiole insertion on upper surface, apex acuminate (to cuspidate), upper surface dark green, lower surface light green; nerves in 7–8 pairs. *Inflorescences* up to 32 cm long in fruit, branching often tomentose, glabrescent; bracts ovate, those to branches c. 4.3 by 1.8 mm, those to flowers 0.8–2.6 by 0.3–1.3 mm. *Staminate flowers* c. 2.5 mm diam; red in bud, yellowish when open; pedicel c. 2.6 mm long; sepals ovate to almost circular, 1.2–2 by 0.6–1.1 mm, light green, apex rounded, slightly hairy; torus c. 0.5 mm high; filaments 0.5–0.6 mm long, light green, anthers c. 1 by 0.8 mm, yellow-green to light yellow. *Pistillate flowers* quickly developing into fruits; pedicel in fruit up to 11 mm long; sepals ovate, 2.1–4 by 0.8–1 mm, apex acute; staminodes up to c. 0.5 mm high; ovary green; style c. 0.7 mm long, stigmas 4.5–5 mm long, whitish. *Fruits* dry 8–10 by 7–10 mm, wrinkled, dark red to brown. *Seeds* 4.2–4.8 by 3.2–3.4 by 2.5–3 mm, brown.

Distribution — India (Assam, Kerala), Nepal, Bangladesh, China (Guangdong, Guizhou, Hainan, Hong Kong), Taiwan, Japan (Ryukyu Islands), Laos, Vietnam, Thailand, Malay Peninsula, Sumatra, Java, Borneo, the Philippines, Sulawesi, Lesser Sunda Islands, the Moluccas, New Guinea, the Solomon Islands, E Australia, New Caledonia, Vanuatu, Fiji, Tonga, Cook Islands. Note the absence in Cambodia.

Habitat & Ecology — A pioneer species that occurs in many different, generally open habitats in primary wet evergreen to dry evergreen to deciduous to disturbed forest, beach forest, secondary montane forest, riparian forest, savannah, degraded scrub forest, thickets, village commons, fields; usually in wetter places, often along streams, mangrove edge, forest margins, roads; soils: on (peaty) sand, loam, clay, clay-loam, limestone, rock, coral reef, ultramafic. Altitude: sea level up to 1500 (–2350) m. Flowering: March till May, November; fruiting: throughout the year. Fruits eaten by Oriolus birds, an invasive species in the Bonin Islands.

Vernacular names — Sumatra: Bintoeng, Bintoengan, Gerondjing, Gradjing, Kajoe sikkam, Kalek oeba, Kroendjing, Madangbienoengan; Kerindjing (Malay); Sikam (Timor); Singkam (Toba); Tingkem, Tjikam, Tjingham, Tjinkam, Tjinkam (Karo). Java: Gadok (Sundanese); Gendungan, Genlungan, Gi(e)ntoeng, Gintoengan. Borneo: Kalimantan: Bato (Dayak); Betoh; Sabah: Bongkoi; Kapas-kapas (Dusun-Kinabatangan); Tungou (Dusun); Sarawak: Buah jelintik, Merbak (Iban); Bual tu-arur (Kelabit). Philippines: Alimunos (East Cagayan); Guilon; Tuwod, Tuwol an aguyae (Ifugao). Sulawesi: Boeroenga, Kayawoe; Marintek (Tontembuan); Mau hal (Bunaq); Peti mati. Lesser Sunda Islands: Alor: Aitait; Bali: Gintoengan; Flores: H. uwu, Na; Sumba: Memala (Wuijewa); Ternate: Simamo; Timor: Wattoeng. New Guinea: Papua (Indonesia): Dafoa (Itik & Mander); Defer (Berik); Goe (Karoön); Guddie (Kemtoek); Poem (Dani); Oewem, Wala (Mooi); Rikreu (Nemo); Senteroraar, Sentoroar, Sentroari, Toroep (Kebar); Sebie, Serbie, Siesemo (Manikiong); Papua New Guinea: Gugul (Utu); Gwek (Bembi); Keme (Kuman); Kena (Kopiago); Marramar (Miniafia, Utukap dial.); Morwar (Kaigorin); Nangum (Madang); Ruru (Wanigela); Simi (Rawa); Unai (Jal); Ur (Onjob, Koreaf dial.).

Uses — Medicinal use in China (Hainan); fruits eaten in Borneo (Sarawak); wood used for firewood in New Guinea

and for fencing (poles easily sprout!) in the Solomon Islands; in the latter and in Tonga the squeezed bark or the latex is used with charcoal as a brown or black dye and for tanning strings and fishing nets in New Guinea. In Tonga the stem is used for handicrafts.

Note — Forman (1997) does not list *Andrachne trifoliata* (or any of the synonyms) in his list of possible Roxburgh type specimens or drawings. Specimens in Kew showing the name *A. trifoliata* have no original Roxburgh handwriting and one of them can at best be a neotype. Sanjappa et al. (1994) provide a list of Roxburgh drawings present in CAL. In their table 1 (titled 'plates absent in Kew') no. 1698 is a plate of *A. trifoliata*. Forman (1997) states that most of the plates absent in Kew do not depict Roxburgh species, except those listed by him; unfortunately he missed *A. trifoliata*.

EXCLUDED SPECIES

Bischofia cummingiana Decne. (1844) 153. — Type: *Cuming 1174* (holo P, not seen; iso L, M), Philippines, Manila. = *Litsea* (Lauraceae). Identified as *L. glutinosa* (Lour.) C.B.Rob. var. *littoralis* Koord. & Valetton in L, and as *L. sebifera* Pers. in M.

Note — *Bischofia cummingiana* is generally regarded as a synonym of *B. javanica* (e.g., Govaerts et al. 2000). Vidal y Soler (1885) interpreted Cumings collections, and he indicates that *Cuming 1174* = *B. javanica*, and *Cuming 1185* = *Sterculia foetida* L (with an asterisk that it can be *B. javanica* based on Müller 1866). It may well be that other duplicates are indeed *Bischofia*, but when Decaisne's descriptions of the species are considered then a discrepancy appears, in most descriptions the leaflets ('foliolis') are mentioned, except for *B. cummingiana*, where Decaisne writes about leaves ('foliis'). Thus, obviously the type of *B. cummingiana* is likely not *Bischofia* with its 3(–5)-foliolate leaves. *Cuming 1173* in L has on the label 1174? next to 1173, but this is a true *B. javanica*.

HYMENOCARDIA

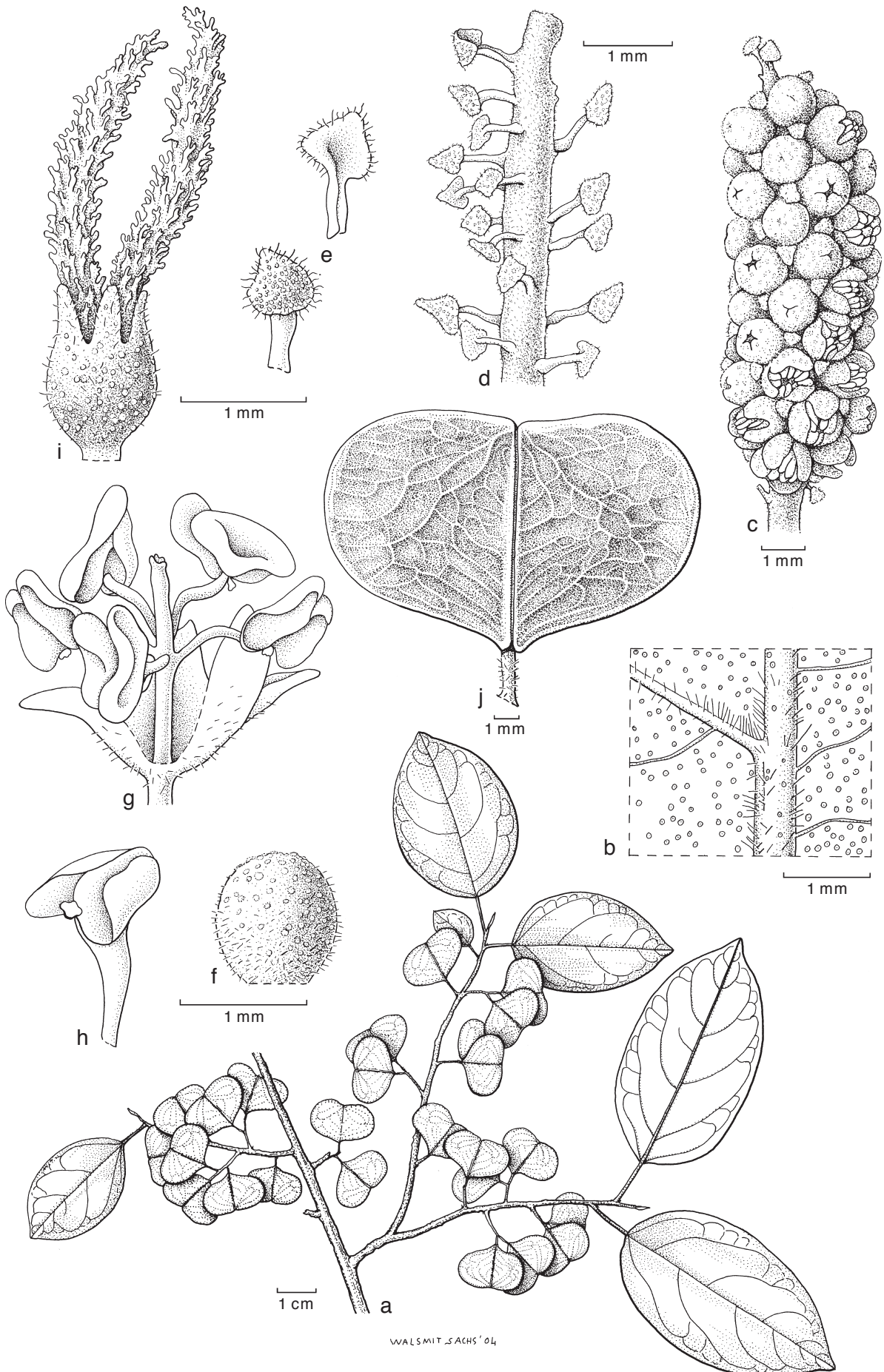
Typical for *Hymenocardia* is the presence of disc-like glandular hairs, the strange staminate bracts, the lack of a disc, stamens with a gland on the connective, and the very flat, 2-locular, samara-like fruits.

The genus name (Greek: humên, huménos = fleece; kardía = heart) refers to the very flat, heart-shaped fruits (Backer 2000).

Hymenocardia Wall. ex Lindl.

Hymenocardia Wall. ex Lindl. (1836) 441; Endl. (1837) 288 (nr. 1899); Tul. (1851) 256; Baill. (1857) 994; (1858) 599, pl. 27: f. 24, 25; Müll.Arg. (1866) 476; Kurz (1877) 394; Benth. (1880) 285; Hook.f. (1887) 376; Pax (1890) 30; Pax & K.Hoffm. (1922) 72; Gagnep. (1927) 543; Pax & K.Hoffm. (1931) 51; Airy Shaw (1964) 262; (1972a) 363; Whitmore (1973) 103; Radcl.-Sm. (1987) 52; G.L.Webster (1994) 53; Govaerts et al. (2000) 1013; Radcl.-Sm. (2001) 74; Welzen (2007) 341; G.L.Webster (2014) 82, f. 15. — Type: *Hymenocardia punctata* Wall. ex Lindl. *Samaropyxis* Miq. (1860) 464. — Type: *Samaropyxis elliptica* Miq. (= *Hymenocardia punctata* Wall. ex Lindl.).

Shrubs to trees, dioecious, deciduous, leaves appearing during flowering; branches hairy with scale-like hairs and simple hairs when young. *Indumentum* of simple and scale-like hairs (recorded as glandular). *Stipules* triangular, thick, early caducous. *Leaves* distichous (to opposite) on branches, simple; petiole not pulvinate, reniform in transverse section; blades elliptic, margin entire, glabrous above to hairy on midrib with simple hairs, hairy beneath, venation densely reticulate, few nerves, latter looped and closed near margin. *Inflorescences* dense spikes



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Fig. 2 *Hymenocardia punctata* Wall. ex Lindl. a. Habit; b. lower leaf surface with hair tuft domatium and glandular scales; c. staminate inflorescence; d. staminate inflorescence with only bracts; e. petioled bracts; f. staminate bud with scale hairs and normal hairs; g. staminate flower; h. stamen with dehiscent thecae and gland on connective; i. pistillate flower; j. fruit (a, b, j: *J.F. Maxwell 71-277*; c–h: *Koyama' Terao & Wongprasert T-33007*; i: *J.F. Maxwell 72-64*; all L). — Drawing by Anita Walsmit Sachs, 2004. Reproduced from *Flora of Thailand* 8, 2 with permission.

to panicles, axillary and catkin-like when staminate, terminal and few-flowered racemes when pistillate; flowers bracteate. *Flowers* actinomorphic; petals and disc absent. *Staminate flowers*: pedicel very short; calyx mainly 5-lobed, cupular, lobes triangular, imbricate to almost valvate; stamens mainly 5, episealous, basally united or free, anthers very large, 2-thecate, dorsifixed, horizontal when dehiscing extrorse via lengthwise slits, connective with subapical, dorsal gland; pistillode on top of androphore, a short cylinder, apically slightly 2-lobed. *Pistillate flowers* shortly pedicelled, sepals (4–)5(–8), free, long-triangular, valvate, soon caducous leaving cup-shaped scars; ovary 2-locular, flattened; ovules 2 per locule; style absent or minute, stigmas 2, unlobed, long papillate. *Fruits* flat, 2-lobed, usually heart-shaped, samara-like capsules (rhegmas), winged or not. *Seeds* usually 1 per locule developed, naked.

Distribution — A genus of six species (Govaerts et al. 2000), of which five in continental Africa and one in Southeast Asia main land and W Malesia.

Hymenocardia punctata Wall. ex Lindl. — Fig. 2; Map 2

Hymenocardia punctata Wall. [(1831) nr. 3549] ex Lindl. (1836) 441; Hook.f. (1877) 377; Pax & K.Hoffm. (1922) 72; Gagnep. (1927) 542; Airy Shaw (1972a) 363; Whitmore (1973) 103; Govaerts et al. (2000) 1013; Welzen (2007) 341, f. 10; pl. XIX: 1. — Lectotype (designated here): *Wallich no. 3549* (K, K001119695; iso G, G-DC 2 sheets, K, K001119696), Burma, Moolmyne, river Akan? at Salum.

Hymenocardia wallichii Tul. (1851) 256; Müll.Arg. (1866) 476; Kurz (1877) 394; Pax & K.Hoffm. (1922) 78, f. 8e; Gagnep. (1927) 544. — Type: *Wallich no. 3549* (G-DC; iso G 2 sheets, K 2 sheets), Burma, Moolmyne, river Akan? at Salum. N.B. same duplicates as for *H. punctata*.

Hymenocardia wallichii Tul. var. *dasycarpa* Gagnep. (1927) 546. — Type: *Thorel s.n.* (not seen), Cambodia, Compong-luong.

Samaropyxis elliptica Miq. (1860) 465. — Type: *Teijsmann HB 4248* (holo U), Sumatra, prov. Lampong, prope Marassa.

Hymenocardia laotica Gagnep. (1923) 436; (1927) 546, f. 68: 1. — Type: *Thorel 1283* (holo P; iso A), Laos, Stung-streng (A sheet: Me-Kong, Stong Treng).

Shrubs to trees up to 7 m high, dbh up to 9 cm; flowering branches 2–4.5 mm thick. *Bark* thin, smooth to finely roughened to roughly cracked and flaking, grey to grey-brown. *Indumentum*

present on most parts, scale-like hairs yellow, stipules and floral parts inside glabrous. *Stipules* 1–3 by 0.2–1 mm. *Leaves*: petiole 0.5–1.2 cm, hairy, especially above; blade elliptic, 2.2–9 by 1.4–5.2 cm, length/width ratio 1.7–2.1, base emarginate to rounded (to cuneate), apex acute to acuminate, upper surface shiny, green, lower surface densely scaly, at most hairy on nerves and midrib, with (indistinct) hair tuft domatia, dull light green; venation sunken to slightly raised above, raised underneath, nerves 6–8 per side. *Staminate inflorescences* axillary catkins, up to 2.5 cm long, axes dull light yellow-green; bracts pedicelled, pedicel up to 0.5 mm long, blade subpeltate, triangular, c. 0.5 by 0.4 mm. *Staminate flowers* c. 1.5 mm diam, red to purple; pedicel up to 0.5 mm long, calyx c. 1.5 mm long, lobes 0.4–0.7 by 0.4–0.7 mm, pale light greenish; stamens 4–5, united with pistillode, androphore 0.4–0.5 mm long, filaments pale pinkish white, c. 1 mm long, anthers c. 1 by 0.7 mm, dark red; pistillode c. 1.2 mm long. *Pistillate inflorescences* racemes, up to 2 cm long, axes grey-tan; bracts ovate, c. 1 by 1 mm, dull light greenish, early caducous. *Pistillate flowers* c. 1 mm diam, brown; pedicel up to 2 mm long; sepals 5, triangular, 0.7–1.2 by 0.3–0.5 mm; ovary flat, ± diamond-shaped, 0.3–1 by 0.3–1 mm, green to glossy dark maroon; stigmas 1–15 mm long (elongating with age), maroon. *Fruits* not winged, heart-shaped with horizontal lobes, 1.6–2.1 by 1.1–1.5 cm, changing from maroon to brownish green to yellowish; columella very slender, c. 13.5 mm long, apically hardly broadened. *Seed* unripe?, flat, obovate, c. 6 by 3.5 mm.

Distribution — Myanmar, Thailand, Laos, Cambodia, Malay Peninsula, Sumatra.

Habitat & Ecology — In primary to secondary dry dipterocarp forest to mixed deciduous forest, very often along water, like along beaches, rivers, lakes, but also very often in open scrubs, roadsides or at the border between cultivated and natural vegetations. The plant is considered to be a pioneer. Soils generally wet; bedrock sand, sandstone, rhyolite. Altitude: sea level up to 235 m. Flowering: October, December till May; fruiting: February till October.

Vernacular names — Sumatra: Mersepang, Sepang, Sese-pang, Serpang.

Uses — Cambodia: Fruits sour, used in cooking. Bark and roots used medicinally.

EXCLUDED SPECIES

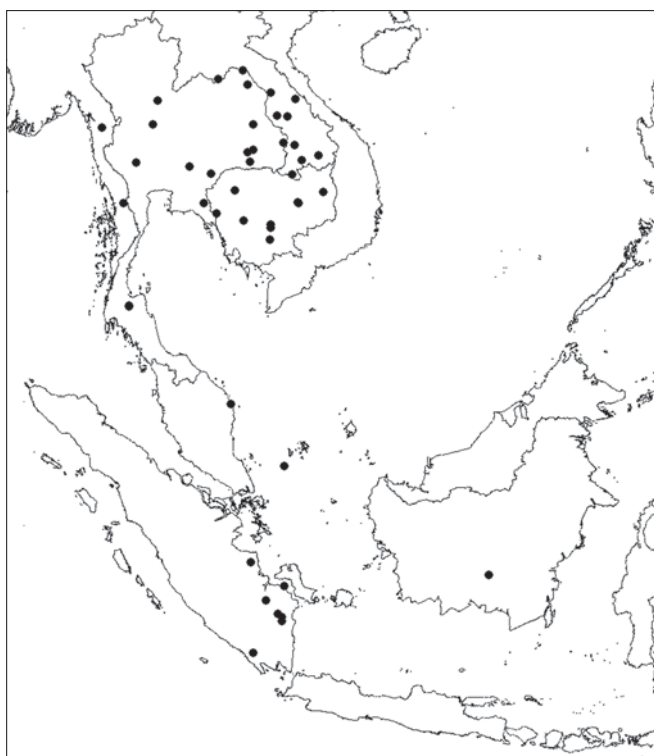
Hymenocardia plicata Kurz (1877) 395. — Lectotype (designated by Bollendorff et al. 2000: 331) *Kurz 1554* (K), Burma, Tomkgeghat, 7 Pagodas = *Mallotus plicatus* (Müll.Arg.) Airy Shaw (see Bollendorff et al. 2000).

Note — Probably described in *Hymenocardia* because of the heart-shaped, winged fruits and the presence of glandular, scale-like hairs. However, the indument (stellate hairs), and flowers are completely different, the fruits are 3-locular, instead of 2-locular, and the locules are thicker, not flat.

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Map 2 Distribution of *Hymenocardia punctata* Wall. ex Lindl.

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IDENTIFICATION LIST

1 = *Bischofia javanica* Blume

2 = *Hymenocardia punctata* Wall. ex Lindl.

Alston 15826: 1 – Arances, Amoroso & Ridsdale T/65: 1 – Atmodjo 434: 1; 453: 1 – Avé 4683: 1.

Backer 8082: 1 – Bakhuizen van den Brink Jr 3376: 1 – Balansa (New Caledonia) 1818: 1 – Baumann-Bodenheim 14761: 1 – bb series 1794: 1; 4163: 1; 4921: 1; 5352: 1; 5925: 1; 6082: 1; 8230: 1; 8420: 1; 8479: 1; 8931: 1; 9254: 1; 9301: 1; 15978: 1; 18775: 1; 19451: 1; 22479: 1; 23325: 1; 23774: 1; 23895: 1; 24396: 1; 24427: 1; 25005: 1; 25266: 1; 25422: 1; 28961: 1; 32489: 1 – Beccari PS 655: 1 – Becking 66: 1; 141: 1 – Béguin 696: 1 – Bennett RSNH 4003: 1 – Blume 154: 1 – Bouamanivong 1: 2 – Brass 7391: 1; 21768: 1; 32510: 1 – Brass & Versteegh 11165: 1 – BS series 1357:

1 – BSIP series 43: 1; 1721: 1; 4499: 1; 6311: 1; 9879: 1; 9914: 1; 10154: 1; 10342: 1; 10440: 1; 10807: 1; 11292: 1; 11757: 1; 12687: 1; 14339: 1; 15573: 1; 15667: 1; 15735: 1; 16632: 1; 19493: 1 – BW series 706: 1; 2757: 1; 3981: 1; 4640: 1; 5341: 1; 5680: 1; 7210: 1; 7853: 1; 7895: 1; 9364: 1; 9366: 1; 10943: 1; 11012: 1; 11644: 1; 12495: 1; 12522: 1; 12781: 1.

Carr 14128: 1; 15774: 1 – Chew et al. RSNB 2624: 1 – Chun & Tso 44266: 1 – Clemens 10875T: 1 – Clemens & Clemens 30305: 1 – Coode & Fernando 5265: 1 – Corner RSS 60: 1 – Craven & Schodde 935: 1 – Cuming 1173: 1. d'Alleizette 6437: 2 – Däniker 1340: 1 – De Vogel 5643: 1 – De Vogel & Vermeulen 6633: 1 – De Voogd 91: 2 – De Wilde & De Wilde-Duyffes

- 12783: 1; 14866: 1; 14867: 1; 16977: 1; 18082: 1; 18933: 1; 20325: 1 – De Wit 7: 1 – Degener 14297: 1; 14935: 1 – Dickason 6879: 2 – Diepenhorst 2137: 1 – Dockrill 94: 1.
- Elbert 4107: 1; 4107a: 1 – Elliott s004b4: 1 – Elmer 8474: 1; 8968: 1; 10125: 1; 13895: 1; 17619: 1 – Endert 267: 2; 268: 2; 269: 2; E822: 2; 1510: 1; 3507: 1.
- Falconer 942: 1 – FB series 3497: 1; 10680: 1; 10752: 1; 10986: 1; 12774: 1 – Florence 10383: 1 – Fosberg 38061: 1; 38370: 1 – Friedberg 266a: 1.
- Galih 1: 2 – Gallatly 457: 2; 567: 2 – Gardner & Sidisunthorn 2126: 1 – Geesink, Phanichapol & Santisuk 5899: 1 – Gillison RSNH 3504: 1 – Gray 1016: 1; 1388: 1; 2195: 1; 2787: 1; 3580: 1; 4863: 1 – Green RSNH 1078: 1 – Greenwood 345B: 1 – Greijmans 79: 2.
- Hartley 10945: 1; 10990: 1; 12268: 1 – Hatusima 17262: 1 – Hidayat 137: 1 – Hohenacker 1559: 1; 1573: 1 – Hoogland 4719: 1; 4939: 1 – Hotta 4528: 1 – Houtsoorten van den Gedeh (Java) 63: 1; 168: 1 – How 70481: 1 – Hu & But 20979: 1 – Huq et al. 10471: 1; 10822: 2 – Hyland 1523: 1; 7242: 1; 25229RFK: 1.
- Ja series 2003: 1 – Jaag 370: 1.
- Kairo 476: 1 – Kajewski 1877: 1 – Kalshoven 11: 1 – Keng 1064: 1 – KEP FRI series 29018: 1 – Kerr 2504: 1; 5119: 1; 9963: 1; 12438: 1; 17880: 2 – King 5426: 2 – Koelz 25528a: 1; 25583a: 1; 29848: 1; 29889: 1 – Koop 159: 1 – Koorders 1918: 1; 1919: 1; 1921: 1; 1922: 1; 1923: 1; 1924: 1; 1925: 1; 1927: 1; 1928: 1; 1929: 1; 1930: 1; 1931: 1; 1933: 1; 1934: 1; 1935: 1; 1937: 1; 1938: 1; 1939: 1; 1940: 1; 1941: 1; 1943: 1; 1945: 1; 1946: 1; 1947: 1; 1949: 1; 1950: 1; 1951: 1; 1952: 1; 1953: 1; 1956: 1; 10952: 1; 11254: 1; 11441: 1; 11442: 1; 12249: 1; 12278: 1; 12308: 1; 13305: 1; 13327: 1; 13962: 1; 13990: 1; 16817: 1; 16818: 1; 20128: 1; 21052: 1; 22117: 1; 22574: 1; 22749: 1; 24202: 1; 24704: 1; 26174: 1; 27152: 1; 27737: 1; 28726: 1; 28938: 1; 29920: 1; 30144: 1; 33199: 1; 37036: 1; 37037: 1; 37057: 1; 38362: 1; 38458: 1; 38687: 1; 38802: 1; 38883: 1; 38904: 1; 39346: 1 – Kooy 488: 1 – Kostermans (Khwaë) 757: 1; 1353: 1; 5969: 1; 6230a: 1; 7009: 1; 10482: 2 – Kostermans & Wirawan 468: 1 – Koyama, Terao & Wongprasert T-33007: 2 – Krukoff 4380: 1.
- LAE series 56766: 1 – Lam 2901: 1 – Larsen 8389: 2 – Lau 2038: 1 – Lécard 122B: 1 – Lei 208: 1 – Liao 10543: 1 – Libman, Souliya & Vanavong LAOS 552: 2 – Lörzing 5586: 1; 12837: 1; 15047: 1.
- MacKee 22574: 1; 22580: 1; 23569: 1; 34129: 1 – Mangen 367: 1 – Martin 21: 2; 154: 2 – Maxwell 01-116: 1; 01-185: 2; 01-237: 2; 07-125: 2; 07-151: 2; 07-715: 2; 71-277: 2; 72-64: 2; 74-683: 1; 75-17: 1; 75-130: 1; 75-525: 1; 76-490: 2; 87-1311: 1; 88-261: 1; 88-1252: 1; 89-1276: 1; 89-1514: 1; 90-1140: 1; 94-756: 1; 95-253: 1; 95-435: 1; 95-593: 1; 97-634: 1; 98-435: 2; 98-463: 2; 99-293: 1 – McDonald & Afriastini 3303: 1 – McDonald & Ismail 4967: 1 – Meijer 10533: 1 – Metzner 167: 1 – Middleton & Lamxay 274: 2 – Middleton et al. 3336: 1 – Mikage et al. 9612090: 1 – Mogeia 2497: 1 – Moran 5049: 1 – Moriarty 1932: 1 – Mousset 910: 1 – Murata et al. T-37776: 2; T-37789: 2; T-37810: 2; T-37827: 2.
- Newman et al. LAO 783: 1 – NGF series 1163: 1; 1248: 1; 1399: 1; 3338: 1; 4007: 1; 6500: 1; 14826: 1; 16742: 1; 17016: 1; 18344: 1; 19439: 1; 20596: 1; 21646: 1; 21906: 1; 35224: 1; 35385: 1; 38619: 1; 41022: 1; 41615: 1 – Noerkas 378: 1 – Nooteboom 1345: 1.
- Parakosonh, Kien & Sinh 166: 2 – Parham et al. 15375: 1 – Pereira et al. 151: 1; 152: 1 – Philipson 10104: 1 – Phusomsaeng 47a (1967): 2; 358 (1970): 1 – PNH series 78273: 1; 78712: 1; 80471: 1; 150031: 1 – Poilane 22858bis: 2 – Pooma et al. 2149: 2; 5169: 2; 6277: 2 – Posthumus 1044: 1 – PPI series 1575: 1; 3070: 1; 7139: 1; 10401: 1; 10467: 1; 17229: 1; 17232: 1; 17931: 1; 17932: 1; 18366: 1; 18694: 1; 19914: 1; 21808: 1; 22725: 1; 23728: 1; 23922: 1; 23952: 1; 24567: 1; 29625: 1.
- Rahmat Si Boeea 3558: 1 – Ramadhanil et al. 398: 1; 446: 1 – Ramos 1022: 1 – Rau 244: 1 – RHT series 11094: 1 – Ridsdale 13: 1; 479: 1 – Rijksen 13974B: 1; 28973: 1.
- S series 35541: 1; 71998: 1 – SAN series 16320: 1; 33146: 1; 44343: 1; 44575: 1; 51373: 1; 92523: 1; 116172: 1; 125913: 1; 128640: 1 – B. Sang-khachand 1372: 1 – Sanitjan 12: 1 – Schmutz 617a: 1 – Schodde & Craven 4688: 1 – Schürmann 132: 1 – Sidiyasa et al. 2304: 2 – Sinclair 9993: 1 – A.C. Smith 4110: 1; 6045: 1; 7223: 1; 9405: 1 – Soejarto & Southavong 10767: 2 – Soejarto et al. 5842: 1; 8300: 1; 9148: 1; 10190: 1; 10350b: 1; 10422: 1 – Soepadmo & Mahmud HUM 9187: 2 – Sohna et al. 715306: 1 – Sterly 80-218: 1 – Svengsuksa et al. BT 2: 2 – Sykes CI-1418: 1.
- Takeuchi 4596: 1 – Teijsmann HB 4248: 2 – Teng 90856: 1 – Thorel 1283: 2 – Ting & Chen 481: 1 – Tsang 29206: 1; 29933: 1; 30319: 1.
- Unknown HB 638: 1 – UPNG series 7501: 1.
- Van Beusekom & Phengkai 2664: 1 – Van Beusekom et al. 3570: 1 – Van Daalen 434: 1 – Van Schaik & van Noordwijk 191: 1 – Van Welzen 2003-7: 1 – Vannachak, Ridsdale & Satdhychanh BT 1049: 2 – Vannachak et al. BT 825: 1 – Varadarajan et al. 1534: 1 – Verheijen 1241: 1; 1242: 1; 1243: 1; 2950: 1; 2976: 1 – Vieillard 1162: 1.
- Waterhouse 914: 1 – Whitmore & Sidiyasa 3318: 1 – Wight (KD) 941: 1; KD 2600: 1 – Williams & Pooma 1527: 2 – Winckel 318: 1 – Wirawan 355: 1. Yuncker 15042: 1; 15313: 1; 15856: 1; 16122: 1.