

# MELIACEAE

楝科 lian ke

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Trees, shrubs, or sometimes shrublets, monopodial or sympodial, usually dioecious, less often monoecious or polygamodioecious. Stipules absent. Leaves in spirals, very rarely opposite, usually pinnate; leaflets opposite, subopposite, or alternate; leaflet blades with base somewhat oblique, margin usually entire or rarely lobed or serrate. Flowers usually in axillary thyrses, rarely racemose or spicate. Calyx small, 3–6-lobed or with distinct sepals, usually cup-shaped or tubular, imbricate or valvate in bud. Corolla contorted or imbricate, sometimes quincuncial. Petals (3 or)4 or 5(or 6), rarely more, distinct or connate, sometimes adnate to staminal tube and then valvate. Stamens 3–10 or more, hypogynous, mostly with a staminal tube (distinct stamens in *Cedrela* and *Toona*); anthers usually sessile on stamen tube, erect, included or exerted, 2-celled, longitudinally dehiscent. Disk tubular, annular, obsolete, or absent, free or adnate to ovary. Ovary usually free, 2–5(or more)-locular, with 1 to many collateral or superposed ovules per locule; style single or rarely absent; stigma disciform or capitate. Fruit a berry (dry but indehiscent with arillate seeds in some *Aglaiia* sect. *Aglaiia*), capsule, or rarely a drupe. Seeds winged or with a fleshy aril or sarcotesta wholly or partly covering seed; endosperm fleshy or usually absent.

About 50 genera and 650 species: tropical, subtropical, and occasionally warm temperate regions of both hemispheres; 17 genera (three introduced) and 40 species (two endemic, three introduced) in China.

Chen Pangyu. 1997. Meliaceae. In: Chen Shukun, ed., Fl. Reipubl. Popularis Sin. 43(3): 34–104.

- 1a. Fruit a capsule with winged seeds.
  - 2a. Filaments distinct; disk shortly columnar or cylindrical.
    - 3a. Disk shortly columnar, shorter than ovary; seeds winged at both ends or only at apical end ..... 1. *Toona*
    - 3b. Disk cylindrical, taller than ovary; seeds winged only at basal end ..... 2. *Cedrela*
  - 2b. Filaments connate into a staminal tube; disk cup-shaped, shallowly cup-shaped, or absent.
    - 4a. Anthers inserted on apical margin of staminal tube, exerted ..... 5. *Chukrasia*
    - 4b. Anthers inserted inside staminal tube, included.
      - 5a. Capsule septicidal from base when mature; seeds with long and broad wing at apex ..... 3. *Swietenia*
      - 5b. Capsule 4- or 5-valvate from apex when mature; seeds with round membranous wing ..... 4. *Khaya*
- 1b. Fruit a drupe or berry or with fibrous indehiscent pericarp and arillate seed or seeds, sometimes a capsule but seeds not winged.
  - 6a. Leaves simple or with at most 3 leaflets.
    - 7a. Disk absent ..... 11. *Aglaiia*
    - 7b. Disk present.
      - 8a. Disk annular or obsolete, ca. 1 mm high, surrounding only base of ovary; trees or shrubs more than 1 m tall ..... 6. *Turraea*
      - 8b. Disk tubular, completely surrounding ovary; shrublets, usually less than 50 cm tall ..... 7. *Munronia*
  - 6b. Leaves pinnate, with more than 3 leaflets.
    - 9a. Shrublets usually less than 50 cm tall ..... 7. *Munronia*
    - 9b. Trees or shrubs.
      - 10a. Filaments distinct or connate into a tube to half their length.
        - 11a. Filaments connate only at base; ovary usually 5-locular; fruit a drupe ..... 8. *Cipadessa*
        - 11b. Filaments connate for ± basal half into a staminal tube; ovary 2- or 3-locular; fruit a berry, capsule, or drupe.
          - 12a. Fruit a berry [rarely a capsule] ..... 9. *Walsura*
          - 12b. Fruit a capsule, dehiscent into 2 segments ..... 10. *Heynea*
      - 10b. Filaments completely or almost completely connate into a tube.
        - 13a. Ovary with 4–8 distichous superposed ovules per locule ..... 17. *Xylocarpus*
        - 13b. Ovary with 1 or 2 ovules per locule.
          - 14a. Staminal tube cylindrical; style elongate.
            - 15a. Disk tubular, as long or longer than ovary ..... 14. *Dysoxylum*
            - 15b. Disk annular, shallowly cup-shaped, or absent.
          - 16a. Leaves pinnate; leaflet blades with margin entire ..... 15. *Chisocheton*

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- 16b. Leaves bipinnate; leaflet blades with margin dentate, crenate, or rarely entire ..... 16. *Melia*
- 14b. Staminal tube subglobose, globose, urceolate, campanulate, or ovoid; style very short or absent.
- 17a. Fruit indehiscent with fibrous pericarp and arillate seeds.
- 18a. Anthers usually 5 or 6(–10), in 1 whorl ..... 11. *Aglaiia*
- 18b. Anthers 10, in 2 whorls ..... 12. *Reinwardtiodendron*
- 17b. Fruit a capsule.
- 19a. Flowers in thyrses; young leaves usually covered with stellate trichomes or peltate scalelike trichomes ..... 11. *Aglaiia*
- 19b. Male flowers in thyrses, female flowers or bisexual flowers in spikes; young leaves not covered with trichomes ..... 13. *Aphanamixis*

## 1. TOONA (Endlicher) M. Roemer, Fam. Nat. Syn. Monogr. 1: 131. 1846.

香椿属 *xiang chun shu*

Peng Hua (彭华); Jennifer M. Edmonds

*Cedrela* sect. *Toona* Endlicher, Gen. Pl. 2: 1055. 1840; *Surenus* Rumphius ex Kuntze, nom. illeg. superfl. (included type of *Toona*).

Trees to 50 m tall, monoecious, deciduous or semideciduous. Bark grayish brown, fissured, sometimes flaking irregularly; inner bark pink to red; sapwood cream-colored. Leaves spirally arranged, even-pinnate or occasionally odd-pinnate; leaflets usually more than 8 on each side of rachis; leaflet blades glabrous or pubescent with simple trichomes but with club-shaped glands often associated with veins, margin entire, serrate, or dentate; domatia (small deltate axillary pockets) usually present on proximal lateral veins of abaxial surface, often bordered with simple trichomes. Inflorescences much-branched pendent thyrses, often exceeding 1 m. Flowers 5-merous, unisexual with well-developed vestiges of opposite sex present, rarely hermaphrodite, small. Calyx 5(or 6)-lobed or 5(or 6) distinct sepals; sepals imbricate or cup-shaped in bud, margins always ciliate. Petals 5(or 6), white, cream-colored, or pink, distinct, longer than calyx in bud, imbricate (quincuncial), basally adnate to a short pulvinate androgynophore (disk). Stamens 5(or 6), distinct, arising from androgynophore, sometimes alternating with 1–5 filamentous staminodes; anthers in male flowers yellow, dehiscing laterally; antherodes in female flowers often sagittate, brown with abortive pollen. Ovary 5-locular, with 6–10 ovules per locule, vestigial in male flowers; style short in female flowers, pistillodes long and slender in male flowers; stylehead discoid with stigmatic papillae, usually 5-rayed. Fruit a capsule, ellipsoid or obovoid, pendulous, thinly woody, septifragal; valves 5, brown, smooth to verrucose, opening from apex; columella softly woody, concavely or convexly 5-angled, extending to capsule apex. Seeds numerous per locule, winged either at both ends when attached toward distal end of columella or at one end when attached by seed-end to proximal part of columella; wings membranous; endosperm residual; cotyledons collateral, flattened, leaflike; radicle laterally exerted.

About five species: E, S, and SE Asia, E Australia; four species (one endemic) in China.

This treatment of *Toona* largely follows J. M. Edmonds treatment (Fl. Males., Ser. 1, Spermat. 12(1): 358–371. 1995), in which a more complete synonymy can be found.

The timbers of *Toona* species are highly prized but now generally scarce through excessive logging activities throughout their distributional ranges. The genus is composed of only a few species, but phenotypic plasticity and genetic variation are responsible for much of the taxonomic complexity reflected in the literature. The species exhibit a phenomenal range of morphological variation, both within and between trees of the same population, and many of the features used by earlier authors to define their taxa have proved to be only slight morphological variants. Such vegetative characters include leaf and leaflet size; leaf and leaflet margin shape; indumentum type and trichome density. In particular, the velutinous pubescence, on which a number of *Toona* taxa have been based, occurs throughout the genus with the exception of *T. sinensis*, both inter- and infraspecifically, and even between seedlings of the same population. Both flowers and fruits are necessary for accurate identification of *Toona* species. This is especially relevant to *T. sureni* and *T. ciliata*, which are particularly difficult to differentiate in the herbarium.

- 1a. Flower buds conical; petals deep pink to purple and drying black, obpyriform; anthers exerted beyond petals in bud and appearing versatile; ovary and disk dark grayish brown with dense long brown trichomes clumping into strands ..... 1. *T. fargesii*
- 1b. Flower buds broadly ovate; petals white, cream-colored, or pale pink and drying white to brownish, broadly ovate; anthers not exerted beyond petals in bud when adherent to style and not appearing versatile; ovary glabrous or pilose with any trichomes translucent and not clumping into strands.
- 2a. Bark obnoxiously pungent; leaflet blade margins serrate or dentate; petal margins, ovary, and disk glabrous; capsule columella convex without apical scarring; seeds winged at one end ..... 2. *T. sinensis*
- 2b. Bark sweetly aromatic; leaf blade margins entire; petal margins ciliate, ovary and disk pilose; capsule columella concave with apical scarring; seeds winged at both ends.

- 3a. Twigs conspicuously lenticellate with warty lenticels; leaflet blades usually conspicuously pilose on adaxial midvein; petals in bud usually with dense ciliate bands on margin; style always pilose; capsule valves dark brown to blackish brown, verrucose with conspicuous rusty lenticels ..... 3. *T. sureni*
- 3b. Twigs inconspicuously lenticellate with minute lenticels; leaflet blades usually glabrescent on adaxial midvein but occasionally both surfaces pilose or velutinous; petals in bud glabrescent to sparsely ciliate with short trichomes on margin; style always glabrous; capsule valves red to reddish brown, smooth to minutely lenticellate with small inconspicuous lenticels ..... 4. *T. ciliata*

**1. *Toona fargesii*** A. Chevalier, Rev. Bot. Appl. Agric. Trop. 24: 158. 1944.

红花香椿 hong hua xiang chun

?*Cedrela febrifuga* Blume var. *assamensis* C. Candolle; ?*C. febrifuga* var. *verrucosa* C. Candolle, p.p. (as to all syntypes except those of Forbes from Sumatra); *C. rehderiana* H. L. Li; ?*Toona microcarpa* (C. Candolle) Harms var. *sahnii* Bahadur.

Trees to 30 m tall; trunk to 90 cm d.b.h. Bark grayish brown, longitudinally scaly. Leaves 26–66 cm or more; petiole 6–11 cm, pilose; rachis pilose; leaflets usually 5–11 pairs; petiolules 3–9 mm, pilose; leaflet blades ovate-lanceolate to lanceolate, 10–22 × 2.9–9 cm, glabrous to glabrescent but midveins and main veins moderately to densely pilose, base asymmetric, margin entire or sinuate, apex acute to acuminate. Inflorescences to 60 cm or sometimes more, pendent; rachis dark grayish brown, often densely villous-pilose with spreading simple trichomes. Flower buds distinctly conical, drying black. Flowers ca. 4.4 mm. Pedicel dark grayish brown, 0.5–0.8 mm. Calyx cup-shaped, 0.8–1.1 mm, outside pilose; sepals spatulate, 0.3–0.9 × ca. 1 mm, margins ciliate. Petals pink, red, or purple, obpyriform, ca. 5 × 2.5 mm, outside glabrous, margin not ciliate. Androgynophore ca. 4.8 mm; filaments ca. 2 mm (male flowers) or ca. 2.1 mm (female flowers), glabrous; anthers of male flowers 0.7–0.9 × ca. 0.5 mm, exerted beyond petals and somewhat versatile, apex apiculate; antherodes of female flowers somewhat sagittate, ca. 0.5 × 0.2–0.3 mm, apex apiculate. Disk dark grayish brown, 2.2–2.3 mm in diam., densely villous with long brown uniseriate trichomes (often more than 1 mm) clumping and adhering to style in long strands. Ovary dark grayish brown, ca. 3.2 mm in diam., densely villous as disk, with 5 ovules per locule; style 1.5–2 × ca. 0.5 mm (male) but shorter in female flowers, glabrous; stylehead clavate to discoid, 0.7–0.8 mm in diam. (male). Capsule elliptic, (2.2–)3–4 cm; columella (1.8–)2.2–4 × 1–1.2 cm, concave; valves dark yellow, brown, or reddish brown, 1.4–2.6 × 0.7–0.9 cm, verrucose with large prominent rusty lenticels, 0.6–0.9(–2.3) mm in diam., distributed evenly or becoming denser and smaller toward valve ends. Seeds 1.5–2.6 cm × 3–5.5 mm, winged at both ends; seed body 0.8–1.4 cm × 2–3 mm. Fl. Jun–Jul, fr. Sep–Dec.

• Dense forests, mixed woods, valleys, streamsides, often in moist habitats; 300–1900 m. Fujian, Guangdong, Guangxi, W Hubei, Sichuan, Yunnan [?Bhutan, ?NE India, ?Myanmar].

*Toona fargesii* has been overlooked in most treatments of Chinese *Toona* species. The recognition of it here is largely based on the work of J. M. Edmonds. Chevalier based this species on “Dode Ms. in Herb. Mus. Paris” in which it was placed in *Cedrela*. Chevalier correctly placed it in *Toona* and, describing it as *T. fargesii* Bahadur (Monogr. Genus *Toona* (Meliac.) 107. 1988), adopted this species; but, while recognizing that it was a distinct species, he muddled it with *T. sureni*. He cited only

three collections. Two were from the N Hemisphere and included the type collection of *T. fargesii* cited by Chevalier from China as well as a second specimen from Assam thought to be conspecific. The third cited specimen, from New Guinea in the S Hemisphere, is conspecific with *T. sureni*. Flowering herbarium material of this species, which is needed for definitive determination, is rare. Although this species could be endemic to China, where it is now known to occur in at least six provinces, there are a number of fruiting specimens collected from Bhutan, NE India, and Myanmar that seem to be conspecific, extending the range of this species westward from S China. They include types of *Cedrela febrifuga* var. *assamensis*, *C. febrifuga* var. *verrucosa*, and *T. microcarpa* var. *sahnii*.

“*Toona rubriflora*” (C. J. Tseng, Acta Sci. Nat. Univ. Amoiensis 9: 303. 1962) belongs here but was not validly published because two gatherings were indicated as types (*Vienna Code*, Art. 37.2).

**2. *Toona sinensis*** (A. Jussieu) M. Roemer, Fam. Nat. Syn. Monogr. 1: 139. 1846.

香椿 xiang chun

*Cedrela sinensis* A. Jussieu, Bull. Sci. Nat. Géol. 23: 241. 1830; *Ailanthus flavescens* Carrière [“*Ailantus*”]; *C. glabra* C. Candolle; *C. longiflora* Wallich ex C. Candolle, nom. illeg. superfl. (included type of *C. glabra*); *C. longiflora* var. *kumaona* C. Candolle; *C. serrata* Royle; *C. serrata* var. *puberula* C. Candolle; *C. serrulata* Miquel; *C. sinensis* var. *hupehana* C. Candolle; *C. sinensis* var. *lanceolata* H. L. Li; *C. sinensis* var. *schensiana* C. Candolle; *Mioptrila odorata* Rafinesque; *Surenus glabra* (C. Candolle) Kuntze; *S. serrata* (Royle) Kuntze; *S. serrulata* (Miquel) Kuntze; *S. sinensis* (A. Jussieu) Kuntze; *Toona glabra* (C. Candolle) Harms; *T. microcarpa* (C. Candolle) Harms var. *denticulata* A. Chevalier; *T. microcarpa* var. *grandifolia* A. Chevalier; *T. serrata* (Royle) M. Roemer; *T. serrulata* (Miquel) Harms; *T. sinensis* var. *grandis* Pampanini; *T. sinensis* var. *hupehana* (C. Candolle) A. Chevalier; *T. sinensis* var. *incarvillei* A. Chevalier; *T. sinensis* var. *schensiana* (C. Candolle) H. Li ex X. M. Chen.

Trees to 40 m tall; trunk to 20 m tall, to 1.5 m d.b.h., buttressed. Bark gray to dark brown, fissured; inner bark pink to red, fibrous; sap-wood cream-colored to red, fibrous, smelling strongly of garlic and pepper when cut. Leaves 32–120 cm; petiole 5.5–20 cm, glabrous or pilose; rachis often reddish, glabrous or pilose; leaflets usually 8–20 pairs; petiolules 3–9 mm, glabrescent; leaflet blades narrowly lanceolate to linear-lanceolate, 11–22 × 3–5.6 cm, glabrous or pilose especially on midvein and secondary veins, with club-shaped glandular trichomes conspicuous on adaxial midvein areas and junction between leaf rachis and petiolules, base asymmetric, margin serrate, serrulate, or rarely entire, apex acuminate. Inflorescences to 1 m, pendent; rachis pilose, villous, or glabrescent, with short appressed or spreading simple trichomes. Flowers 3.5–4.5 mm. Pedicel ca. 0.5 mm, pilose to glabrescent. Calyx cup-shaped, 1–1.5 mm, outside glabrous; sepals 0.5–1.1 × 0.6–1.8 mm, margins ciliate.

Petals white or flushed pink, 2.8–4.2 × 1.1–2.9 mm, outside glabrous, margin not ciliate. Androgynophore 2.5–4 mm, glabrous; staminodes always present, (1–)5, 0.7–1.8 mm, glabrous; filaments 1.3–1.8 mm (male flowers), 1–1.5 mm (female flowers), glabrous; anthers of male flowers 0.8–1.2 × 0.5–0.8 mm; antherodes of female flowers 0.3–0.8 × 0.3–0.5 mm, apex apiculate and sometimes extended. Disk orange, 1–1.5 mm in diam., glabrous. Ovary 1.6–2.3 mm in diam., glabrous, with 6 ovules per locule; style 1.1–1.5 × ca. 0.5 mm (male), 0.5–0.8 × 0.3–0.4 mm (female), glabrous; stylehead 0.5–1 mm in diam. Capsule 1.5–3 cm; columella 1.2–2.9 × 0.6–1.1 cm, convex; valves reddish to dark brown, 1.5–3 × 0.4–0.7 cm, smooth or occasionally punctate but not conspicuously lenticellate, with only 0.3–0.5 mm in diam. scattered lenticels. Seeds 0.8–1.6 cm × 3.5–6.2 mm, winged at one end; seed body 0.8–1 cm × 1.7–4 mm. Fl. May–Oct, fr. Aug–Jan.

Primary montane forests, especially on steep hillsides or open slopes, sometimes near streams; also occurring in ravines, mixed or secondary forests, disturbed areas; below 100–2900 m. Anhui, Fujian, S Gansu, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, Sichuan, SE Xizang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Thailand].

This is generally an upland species but also occurs at lower altitudes in China. It is planted in India and Sri Lanka for shade, and in various European cities (e.g., Paris) as an ornamental.

The timber is used for furniture and sieve hoop-making, and in bridge construction. The leaves are used as a vegetable in China and Malaysia, and as animal fodder in India. The trees are widely used medicinally, with the bark being used as an astringent and depurative, powdered root as a refreshment and a diuretic, and tender leaves as a carminative.

The leaf morphology and indumentum types and density are particularly variable in this species, with capsule valve form also showing some variability. On the basis of such features, up to eight infraspecific variants have been recognized by other authors.

**3. *Toona sureni*** (Blume) Merrill, Interpr. Herb. Amboin. 305. 1917.

紫椿 *zi chun*

*Swietenia sureni* Blume, Catalogus, 72. 1823; *Cedrela febrifuga* Blume; *C. febrifuga* var. *pealii* C. Candolle; *C. febrifuga* var. *verrucosa* C. Candolle, p.p. (as to *Forbes 118* and *Forbes s.n.* from Sumatra); *C. microcarpa* C. Candolle var. *grandifoliola* C. Candolle; *C. sureni* (Blume) Burkill; *C. toona* Roxburgh ex Rottler var. *henryi* C. Candolle; *C. toona* var. *pilistila* C. Candolle; *C. toona* var. *warburgii* C. Candolle; *Surenus febrifuga* (Blume) Kuntze; *Toona ciliata* M. Roemer var. *candollei* Bahadur; *T. ciliata* var. *grandifoliola* (C. Candolle) Bahadur; *T. ciliata* var. *henryi* (C. Candolle) Harms; *T. febrifuga* (Blume) M. Roemer.

Trees, medium sized to 40 m tall; trunk to 25 m tall, to 3 m d.b.h., with or without buttresses (to 2 m); crown fairly wide, spreading, occasionally dense. Bark whitish, grayish brown, gray, or light brown, usually vertically fissured and flaking; inner bark pinkish white, pinkish brown, reddish brown, or orange, fibrous; sap-wood white, pink, or pale red, sweetly aromatic when cut. Twigs pilose and often densely and prominently lenticellate with conspicuous verrucose lenticels. Leaves

29–84 cm; petiole 7–12 cm, pilose to glabrescent, often lenticellate; rachis moderately pilose to glabrescent, occasionally velutinous; leaflets usually 6–9(–12) pairs; petiolules (2–)4–12 mm, pilose/villous to glabrescent; leaflet blades lanceolate to ovate-lanceolate, 7–14(–19.5) × 3.1–6(–7) cm, often dark grayish brown, moderately pilose to glabrescent, usually with short trichomes and club-glands apically on midveins, veins basally pilose to villous/velutinous, base symmetrical to asymmetrical, margin entire, apex acuminate to occasionally acute. Inflorescences to 40 cm, pendent; rachis pilose to villous with medium to long spreading trichomes, occasionally glabrescent. Flowers 4–5 mm, sweetly aromatic. Pedicel (0.3–)0.7–1.3 mm, pilose to villous. Calyx 1–1.5 mm, outside pilose to glabrescent, lobes imbricate; sepals usually shallowly triangular especially in bud, 0.6–1 × 0.8–1.5 mm, outside villous to glabrescent, margins ciliate, apex usually acute. Petals white, creamy white, or pale pink, 3.5–5 × 1.6–3.2 mm, outside villous to glabrescent but in bud usually with conspicuous ciliate bands of long appressed trichomes on margins. Androgynophore 2.5–4.7 mm; filaments 1.2–2.5 mm (male flowers), 1–1.3 mm (female flowers), pilose to villous with scattered to dense long trichomes; anthers of male flowers 0.7–1.3 × 0.3–0.8 mm, apex usually apiculate; antherodes of female flowers sagittate, 0.5–0.9 × 0.2–0.6 mm. Disk orange to red, 1.2–2.5 mm in diam., densely pilose. Ovary 1.6–2.8 mm in diam., moderately to densely pilose, with 6 ovules per locule; style 1.2–3 × 0.2–0.5 mm (male), 0.5–1 × ca. 0.3 mm (female), pilose with scattered usually appressed trichomes especially on basal half; stylehead 0.7–1.3 mm in diam. Capsule 1.4–2(–2.4) cm; columella 1.4–2(–2.4) × 0.5–0.8(–1) cm, concave with apical scarring; valves dark brown to blackish brown, rough, verrucose, with conspicuous and often ovoid 0.3–2 × 0.4–1.3 mm rusty lenticels. Seeds 1.1–2(–2.2) cm × (3–)4–4.8 mm, winged at both ends, wings unequal with broadly obtuse apices; seed body 5–8 × 1.5–2 mm. Fl. Apr, fr. Apr–May.

Open hillsides, occasional in ravines, forests, and woods; 700–1600 m. Guizhou, Hainan, Sichuan, Yunnan [Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Thailand].

This species also yields excellent timber. Its bark is used as a powerful astringent and a purgative throughout its range. In Indo-China it is considered to be a tonic, an antiperiodic, and an antirheumatic, while in Indonesia it is used as an astringent and a tonic for treating diarrhea, dysentery, and other intestinal infections. The leaf extracts apparently have an antibiotic activity against *Staphylococcus*, with leaf tip concoctions being applied to swellings. Because of the difficulty of separating this species from *Toona ciliata* in the herbarium, it is probable that *T. sureni* is more widespread in China than the above localities indicate.

**4. *Toona ciliata*** M. Roemer, Fam. Nat. Syn. Monogr. 1: 139. 1846.

红椿 *hong chun*

*Cedrela toona* Roxburgh ex Rottler, Ges. Naturf. Freunde Berlin Neue Schriften 4: 198. 1803; *C. australis* R. Mudie, nom. superfl. (included type of *C. toona*); *C. australis* F. Mueller (1858), not R. Mudie (1829); *C. kingii* C. Candolle; *C. kingii* var. *birmanica* C. Candolle; *C. microcarpa* C. Candolle; *C. mollis* Handel-Mazzetti; *C. toona* var. *gamblei* C. Candolle; *C. toona* var. *haslettii* Haines; *C. toona* var. *latifolia* Miquel ex C. Candolle; *C. toona* var. *multijuga* Haines; *C. toona* var. *nepalensis*

*C. Candolle*; *C. toona* var. *parviflora* Benth; *C. toona* var. *puberula* C. Candolle; *C. toona* var. *pubescens* Franchet; *C. toona* var. *pubinervis* C. Candolle; *C. toona* var. *stracheyi* C. Candolle; *C. toona* var. *sublaxiflora* C. Candolle; *C. toona* var. *talbotii* C. Candolle; *C. toona* var. *vestita* C. T. White; *C. toona* var. *yunnanensis* C. Candolle; *Surenus australis* Kuntze; *S. microcarpa* (C. Candolle) Kuntze; *S. toona* (Roxburgh ex Rottler) Kuntze; *Toona australis* (Kuntze) Harms; *T. ciliata* var. *pubescens* (Franchet) Handel-Mazzetti; *T. ciliata* var. *sublaxiflora* (C. Candolle) C. Y. Wu; *T. ciliata* var. *vestita* (C. T. White) Harms; *T. ciliata* var. *yunnanensis* (C. Candolle) Harms; *T. febrifuga* (Blume) M. Roemer var. *cochinchinensis* Pierre; *T. febrifuga* var. *griffithiana* Pierre; *T. febrifuga* var. *ternatensis* Pierre; *T. kingii* (C. Candolle) Harms; *T. microcarpa* (C. Candolle) Harms; *T. mollis* (Handel-Mazzetti) A. Chevalier; *T. sureni* (Blume) Merrill var. *cochinchinensis* (Pierre) Bahadur; *T. sureni* var. *pubescens* (Franchet) Chun.

Trees, medium sized to 30 m tall; trunk to 22 m tall, to 1.5 m d.b.h., with or without buttresses (to 3.5 m); crown usually rounded and spreading, occasionally dense. Bark grayish white to brown, usually fissured and flaking; inner bark brown to reddish, fibrous; sap-wood white, pink, or red, smelling strongly of cedar when cut. Twigs pilose to glabrescent, inconspicuously lenticellate with small lenticels. Leaves (15–)26–69 cm; petiole 6–11 cm, glabrous or pilose; rachis often reddish, glabrous or sparsely pilose, occasionally velutinous; leaflets usually (5–)9–15 pairs; petiolules 2–10(–14) mm, glabrescent, rarely pilose to velutinous; leaflet blades lanceolate to ovate-lanceolate, (7–)9–12.8(–16) × (2.2–)3.2–5(–6) cm, glabrescent with trichomes on apical midvein or absent or sparse, occasionally moderately pilose, base usually asymmetric, margin entire, apex acute to acuminate. Inflorescences to 55 cm, pendent; rachis pilose to pilose-villous with short to long spreading or appressed trichomes. Flowers 3.5–5(–6) mm, sweetly scented. Pedicel 0.5–1 mm, usually pilose to occasionally villous. Calyx 0.7–1.3 mm, outside usually glabrescent, lobes imbricate; sepals spatulate, (0.4–)0.7–1 × (0.5–)0.7–1.3 mm, margins shortly ciliate. Petals white to creamy white, 3.5–5.8 × 1.3–3.1 mm, usually glabrescent, occasionally outside pilose, margin shortly ciliate. Androgynophore (1.7–)3–4.9(–5.5) mm; filaments 1.2–2.5 mm (male flowers), 0.7–1.8 mm (female flowers), glabrous to pilose/villous; anthers of male flowers 0.6–1.1 × 0.4–0.9 mm,

apex usually apiculate, often with long appendage; antherodes of female flowers usually sagittate, 0.5–0.9 × 0.3–0.6 mm, often with a long apiculate appendage. Disk reddish orange, 1.2–2.5 mm in diam., densely pilose. Ovary 1.2–1.8 mm in diam., moderately pilose, with to 8 ovules per locule; style 1.2–3 × 0.2–0.4 mm (male), 0.3–1.5 × 0.3–0.5 mm (female), glabrous; stylehead 0.7–1.3 mm in diam. Capsule 1.5–2(–2.5) cm; columella 1.5–2(–2.4) × 0.5–0.7(–1) cm, concave with apical scarring; valves red to reddish brown, smooth to lenticellate with 0.1–0.5 mm in diam. scattered lenticels. Seeds 1.1–1.9 cm × 2.5–4(–5.8) mm, winged at both ends; wings unequal, apex narrowly obtuse; seed body 5–7 × 1.2–3 mm. Fl. Jan–Jun, fr. Feb–Nov.

Common to abundant in shade or open habitats: valleys, ravines, woods, thickets, forests, hillsides, mountaintops, slopes, near rivers and streams especially throughout Yunnan; 400–2800 m. Guangdong, Hainan, Sichuan, Yunnan [Bangladesh, Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; E Australia, W Pacific islands].

This species is the most widely distributed *Toona*. It is commonly cultivated as an avenue tree in India. The timber is highly valued, especially in India and Australia, and is frequently used by carpenters in Yunnan. Worldwide, the wood of this species is used in house and boat construction, for high-grade furniture and carvings, and to make tea-chests, oil casks, pencils, and musical instruments. The flowers are used as a source of red and yellow dyes for silk and as an emmenagogue. The leaves and young shoots are lopped for cattle fodder in India. Various parts are used medicinally throughout its geographical range; for example, the bark is a powerful astringent, a tonic, and an antiperiodic, and it is used to treat dysentery and wounds.

*Toona ciliata* exhibits considerable variation in both vegetative and filament pubescence. It was first described from India, where it is the dominant *Toona* and is characterized by glabrous filaments. This variant extends eastward to Hainan. Showing a more restricted distribution within this range are plants with glabrescent or sparsely pilose/villous filaments, while extending as far as E Australia are plants with conspicuously villous filaments. Whether the eastern variants should be recognized infraspecifically has yet to be determined. Typical *T. ciliata* is characterized throughout its range by glabrescent leaflets, but many plants, while exhibiting the distinguishing floral characters given in the key, often display leaf pubescence varying from glabrescent to velutinous, sometimes on the same plant. Flowering and fruiting material are vital for the correct identification of species in this genus.

## 2. CEDRELA P. Browne, Civ. Nat. Hist. Jamaica, 158. 1756.

洋椿属 yang chun shu

Peng Hua (彭华); David J. Mabberley

Trees, tall, deciduous. Leaves in spirals, usually odd-pinnate; leaflets opposite to subopposite; leaflet blades with margin entire or ± serrate. Inflorescences subterminal thyrses. Flowers usually appearing bisexual, small. Calyx short, 4- or 5-lobed. Petals 5, distinct, adnate to disk. Stamens 5, distinct, inserted on apex of disk and alternate with petals; filaments conic; anthers versatile, base cordate; staminodes absent. Disk thick, lobed. Ovary 5-locular, usually with 8–14 seeds per locule; stigma discoid. Fruit a septifragal capsule with 5 valves. Seeds numerous, flat, apical end winged.

About eight species: tropical America; one species (introduced) in China.

1. *Cedrela odorata* Linnaeus, Syst. Nat., ed. 10, 2: 949. 1759.

*Cedrela glaziovii* C. Candolle.

洋椿 yang chun

Trees to 10 m tall. Branchlets glabrous, with sparse lenti-

cels. Leaves 30 cm or more; leaflets 17 or 19; petiolules 1–1.5 cm; leaflet blades ovate, oblong, or elliptic, 8–12 × 3.5–4 cm, membranous, both surfaces glabrous, secondary veins 10–12 on each side of midvein and prominent on both surfaces, base rounded and oblique, margin entire or serrate, apex acuminate to acute. Thyrses shorter than leaves, glabrous, branches and branchlets slender. Flowers oblong to ellipsoid, small. Calyx

5-lobed, sparsely pubescent. Petals white, distinct, oblong to elliptic, ca. 8 mm, both surfaces pubescent, apex mucronate. Disk glabrous. Ovary glabrous, with 12 ovules per locule; style glabrous. Capsule oblong to ellipsoid, ca. 4 cm, glabrous, with pale lenticels. Fl. summer.

Cultivated. Guangdong (Guangzhou) [native to tropical America].

### 3. SWIETENIA Jacquin, Enum. Syst. Pl. 4. 1760.

桃花心木属 tao hua xin mu shu

Peng Hua (彭华); David J. Mabberley

Trees, deciduous. Wood red. Leaves in spirals, even-pinnate, glabrous; leaflets opposite to subopposite. Inflorescences axillary or subterminal thyrses. Flowers small. Calyx small, 5-parted to middle, imbricate. Petals (4 or)5, distinct, broad, imbricate. Staminal tube cup-shaped, apically (8 or)10-lobed; anthers (8 or)10, inserted on inside of tube throat, alternate with lobes. Disk annular. Ovary ovoid, (4 or)5(or 6)-locular, with 9–16 pendulous ovules per locule; style cylindrical; stigma disciform with (4 or)5 lobes. Capsule oblong or ovoid, 5-locular, woody. Seeds 9–16 per locule, winged, hanging by wing-end from distal part of columella; endosperm ± fleshy; cotyledons thin; radicle very short.

Three species: tropical W Africa, tropical and subtropical America; one species (introduced) in China.

**1. Swietenia mahagoni** (Linnaeus) Jacquin, Enum. Syst. Pl. 20. 1760.

桃花心木 tao hua xin mu

*Cedrela mahagoni* Linnaeus, Syst. Nat., ed. 10, 2: 940. 1759.

Trees to 25 m tall, to 4 m d.b.h., base buttressed. Bark slightly red, scalelike. Branches gray, expanding, smooth. Leaves alternate, ca. 35 cm; petiole 3–6 mm, thin, glabrous, base slightly swelling; leaflets 8–12; leaflet blades ovate to lanceolate, 10–16 × 4–6 cm, leathery, glabrous to sparsely pubescent, abaxially light green, adaxially dark green, secondary veins 10 on each side of midvein, base oblique, margin entire or with 1 or 2 serrations, apex long acuminate. Thyrses axillary, 6–15 cm, glabrous, with short and lax branchlets. Flowers small. Pedicel

ca. 3 mm. Calyx cup-shaped, 5-lobed; lobes short and truncate, apex rounded. Petals greenish white, obovate, 3–4 mm, glabrous. Staminal tube subcylindric, glabrous; anthers 10. Disk annular. Ovary conic to ovoid, longer than disk, with 12 ovules per locule; style longer than ovary, glabrous; stigma disciform. Capsule brown, ovoid, ca. 8 cm in diam., many seeded. Seeds apically winged, ca. 7 cm including wing. Fl. May–Jun, fr. Oct–Nov.

Cultivated. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan [native to tropical America].

The identity of the trees cultivated in China needs to be confirmed as some of them may be *Swietenia macrophylla* King.

The wood, the original mahogany, is used for fine quality cabinet-work.

### 4. KHAYA A. Jussieu, Bull. Sci. Nat. Géol. 23: 238. 1830.

非洲楝属 fei zhou lian shu

Peng Hua (彭华); David J. Mabberley

Trees, monoecious. Leaves in spirals, even-pinnate; leaflet blades glabrous, margin entire. Thyrses axillary or subterminal. Flowers appearing bisexual. Calyx 4- or 5-parted almost to base, imbricate. Petals 4 or 5, distinct, contorted, much longer than calyx when in bud. Staminal tube urceolate, kettlelike, or cup-shaped; anthers 8–10, inserted on inside apical part of tube. Disk cushion-shaped. Ovary 4- or 5-locular, with 12–16(–18) amphitropous ovules per locule; stigma disciform, with 4 grooves on apex. Capsule globose or suborbicular, woody, apically 4- or 5-valvate when mature. Seeds with vestigial endosperm; cotyledons flat, collateral; radicle lateral.

About six species: tropical Africa, Madagascar; one species (introduced) in China.

**1. Khaya senegalensis** (Desrousseaux) A. Jussieu, Mém. Mus. Hist. Nat. 19: 250. 1832.

非洲楝 fei zhou lian

*Swietenia senegalensis* Desrousseaux in Lamarck, Encycl. 3: 679. 1791.

Trees to 25 m tall or more. Bark exfoliating. Young

branches with dark grayish brown lenticels. Leaves 15–60 cm or more; petiole and rachis cylindrical, glabrous; leaflets 8–32, subopposite to alternate, apical 2 pairs opposite; petiolules 5–10 mm; leaflet blades basally on rachis ovate but apically on rachis oblong to elliptic, 7–17 × 3–6 cm, abaxially greenish white, adaxially dark green, secondary veins 9–14 on each side of midvein and prominent on both surfaces when dry, base broadly cuneate to ± rounded, margin entire, apex mucronate to acumi-

nate. Thyrses shorter than leaves, glabrous. Sepals 4, distinct, oblong, ca. 1 mm. Petals 4, oblong to obovate, ca. 3 mm, glabrous. Staminal tube urceolate. Ovary ovoid, usually 4-locular, with amphitropous ovules. Capsule globose, woody, septifragal from apex when mature; pericarp thick. Seeds ellipsoid to suborbicular, broad, margin with a round membranous wing.

Cultivated. Fujian, Guangdong, Guangxi, Hainan, Taiwan [native to tropical Africa].

This species is usually grown as an ornamental. The wood is used as construction material, the leaves as animal feed, and the roots as medicine.

## 5. CHUKRASIA A. Jussieu, Bull. Sci. Nat. Géol. 23: 239. 1830.

麻楝属 ma lian shu

Peng Hua (彭华); David J. Mabberley

Trees, deciduous. Leaves in spirals, usually even-pinnate or sometimes odd-pinnate; leaflets usually alternate; leaflet blades with margin entire. Thyrses axillary to subterminal. Flowers bisexual, oblong. Calyx short, 4- or 5-lobed. Petals 4 or 5, distinct, contorted. Staminal tube cylindrical, slightly shorter than petals, apical margin entire or 10-crenate, lobes each bearing one anther; anthers exerted. Disk absent to narrowly cushion-shaped. Ovary 3–5-locular, with numerous ovules per locule; style thick; stigma capitate. Fruit a septicial capsule, 3–5-locular, with 60–100 seeds per locule. Seeds flat, terminally winged; endosperm present; cotyledons leaflike, round; radicle exerted.

One species: tropical and subtropical Asia.

**1. *Chukrasia tabularis*** A. Jussieu, Bull. Sci. Nat. Géol. 23: 241. 1830.

麻楝 ma lian

*Chickrassia nimmonii* J. Graham ex Wight; *C. tabularis* Wight & Arnott; *C. tabularis* var. *velutina* (M. Roemer) King; *C. velutina* M. Roemer; *Chukrasia tabularis* var. *velutina* (M. Roemer) Pellegrin; *C. velutina* (M. Roemer) C. Candolle; *Dysoxylum esquirolii* H. Léveillé.

Trees to 25 m tall. Bark of old branches exfoliating. Young branches reddish brown, glabrous, with pale lenticels. Leaves usually 30–50 cm; petiole cylindrical, 4.5–7 cm; leaflets 10–16; petiolules 4–8 mm; leaflet blades ovate to oblong-lanceolate, 7–12 × 3–5 cm, papery, both surfaces glabrous or abaxially pubescent, secondary veins 10–15 on each side of midvein and abaxially prominent, base oblique, margin entire, apex acute to acuminate. Thyrses lax, ca. 1/2 as long as leaves, branches glabrous or subglabrous; peduncle short; bracts linear, caducous.

Flowers 1.2–1.5 cm, fragrant. Pedicel short, jointed. Calyx ca. 2 mm, puberulent. Petals cream-colored to ± lavender, linear-oblong to spatulate, 12–15 × 5–6 mm. Staminal tube cylindrical, glabrous, apex truncate; anthers 10, oblong, inserted near apex of tube. Ovary on a short disk, elongate, covered with trichomes; style cylindrical, short, thick, covered with trichomes; stigma as high as anthers, capitate, apically 3-lobed. Capsule yellowish gray to brown, subglobose to oblong, ca. 4.5 × 3.5–4 cm, usually 3-valved, woody, surface coarse and verrucose, many seeded. Seeds flat, oblong, ca. 3 × 0.5 mm, broadly winged. Fl. Apr–May, fr. Jul–Jan.

Mixed evergreen broad-leaved and deciduous forests, sparse forests in hilly regions; 300–1600 m. Fujian, Guangdong, Guangxi, S Guizhou, Hainan, Xizang, Yunnan, Zhejiang [Bhutan, India, Indonesia, Laos, Malaysia, Nepal, Sri Lanka, Thailand, Vietnam].

The timber is valuable for making furniture, plywood, carving planks, and woodwork in railway carriages. A yellow transparent gum is obtained from the sap; the astringent bark is medicinal.

## 6. TURRAEA Linnaeus, Mant. Pl. 2: 150. 1771.

杜楝属 du lian shu

Peng Hua (彭华); David J. Mabberley

Trees or shrubs. Leaves alternate, usually simple, petiolate; leaf blade margin entire or sometimes crenate. Flowers bisexual, axillary, solitary or sometimes forming racemes or corymbs. Calyx cup-shaped or campanulate, short, 4- or 5-lobed. Petals 4 or 5, distinct, linear to spatulate, much longer than sepals, imbricate or contorted in bud. Staminal tube cylindrical, long, thin, apex inflated and lobed; anthers 8–10(–20), inserted between lobes, included or ± exerted. Disk annular or absent. Ovary subglobose to elliptic, small, glabrous, 4-locular or more, with 2 anatropous ovules per locule; style filiform, exerted from tube; stigma disciform, capitate, or ampuliform. Fruit a loculicidal capsule, 4-locular or more, with 1 or 2 seeds per locule; pericarp leathery or woody. Seeds oblong to ellipsoid, ± curved, smooth, with one broad and compound hilum; endosperm fleshy; cotyledons leaflike; radicle cylindrical.

About 60 species: tropical Africa, Asia, Australia, and Madagascar; one species in China.

**1. *Turraea pubescens*** Hellenius, Kongl. Vetensk. Acad. Nya Handl. 9: 308. 1788.

杜楝 du lian

Shrubs 2–3 m tall. Young branches brown, with longitu-

dinal stripes, covered with yellow trichomes, glabrescent. Petiole usually 5–10 mm, yellow pubescent; leaf blade elliptic, ovate, or sometimes obovate, 5–10 × 2–4.5 cm, both surfaces pubescent especially when young, secondary veins 8–10 on each side of midvein and abaxially ± prominent, base cuneate to

sometimes nearly rounded, margin entire or sometimes crenate to sinuous, apex acuminate to acute. Racemes axillary, corymbiform, 4- or 5-flowered; peduncle very short, pubescent; bractlets lanceolate, pubescent. Pedicel ca. 1.2 cm. Calyx campanulate, 2–3 mm, outside pubescent, 5-lobed, lobes triangular. Petals 5, white, distinct, linear to spatulate, 3–4.5 cm, apex acute. Staminal tube cylindrical, long, thin, apex inflated and 4- or 5-lobed, lobes 1–2 × as long as anthers, glabrous, and tips usually 2-cleft; anthers 10, inserted below lobes of tube. Disk ca.

1 mm high, glabrous. Ovary short, 5-locular, with 2 anatropous ovules per locule; style long, exerted from filament tube; stigma ampuliform. Capsule globose, 1–1.5 cm in diam., 5-locular, with 1 seed per locule. Seeds oblong to ellipsoid, ca. 7 × 3 mm, ± curved and lunate. Fl. Apr–Jul, fr. Aug–Nov.

Sparse forests near ocean, thickets in low-altitude hilly regions. SW Guangdong (Leizhou Bandao), S Guangxi, W Hainan [India, Indonesia, Laos, Papua New Guinea, Philippines, Thailand, Vietnam; E Australia].

## 7. MUNRONIA Wight, Icon. Pl. Ind. Orient. 1(5): [1]. 1838.

地黄连属 di huang lian shu

Peng Hua (彭华); Bruce Bartholomew

Shrublets or small shrubs. Stem usually not branched. Leaves in spirals, odd-pinnate, trifoliolate, or simple, when compound lateral leaflets opposite; leaf blade or leaflet blades with margin entire or sparsely crenate. Flowers bisexual, few in axillary thyrses or solitary. Sepals 5, basally connate or distinct, imbricate in bud. Petals 5, much longer than sepals, basal half connate into a tube, apically distinct. Staminal tube cylindrical, base adnate with corolla tube, apex distinct, margin 10-lobed; anthers 10, oblong, basifixed, alternate with tube teeth, introrse. Disk tubular, ± as high as ovary, membranous. Ovary 5-locular, ovoid, with 2 superposed ovules per locule; style elongated, slender; stigma capitate, apex 5-lobed. Capsule 5-ridged, 5-loculicidal, with 1 or 2 seeds per locule, puberulent; pericarp thinly leathery, detached from 5-winged axis. Seeds with bony tegument; endosperm thin; cotyledons oblate, rounded; radicle short.

Three species: tropical and subtropical Asia; two species in China.

The third species, *Munronia humilis* (Blanco) Harms, is a simple leafed species that occurs in Indonesia, Malaysia, and Thailand.

- 1a. Leaves simple or extremely rarely those on apical part of branches trifoliolate ..... 1. *M. unifoliolata*  
1b. Leaves odd-pinnate with (3 or)5–9(or more) leaflets ..... 2. *M. pinnata*

**1. *Munronia unifoliolata*** Oliver, Hooker's Icon. Pl. 18: t. 1709. 1887.

单叶地黄连 dan ye di huang lian

*Munronia hunanensis* H. S. Lo; *M. petelotii* Merrill; *M. simplicifolia* Merrill; *M. unifoliolata* var. *trifoliolata* C. Y. Wu ex F. C. How & T. C. Chen.

Shrublets 10–20 cm tall. Stem unbranched or few branched, puberulent, ± glabrescent. Leaves, clustered near stem apex, simple or extremely rarely apical ones trifoliolate; petiole 0.8–2(–3) cm, puberulent; leaf blade elliptic, oblong-elliptic, or ovate, 2.5–6(–12) × 1–2 cm, membranous to thickly papery, abaxially puberulent along midvein and secondary veins, adaxially glabrous or sometimes sparsely puberulent along midvein, secondary veins 3–7 on each side of midvein, base attenuate, cuneate, or rounded, margin entire or 1–3 crenate, apex obtuse, acute, or acuminate. Thyrses subterminal or axillary on apical part of stem, 3–5 cm, with 1–3 flowers. Pedicel (3–)5–10 mm, puberulent. Calyx puberulent; lobes linear to lanceolate, 2–4 mm, distinct, apex obtuse to slightly acuminate. Corolla white, 1.5–2.5 cm; tube slender, as long or longer than corolla lobes, outside sparsely puberulent; lobes oblanceolate, oblong-elliptic, or elliptic, 10–14 × 5–7 mm, apex shortly cuspidate to obtuse. Staminal tube exerted, glabrous; lobes linear to lanceolate, 1–1.5 mm, sometimes apically 2-cleft; anthers 1.6–2 mm, lanulose, apex ± mucronate. Ovary puberulent; style slightly exerted from filament tube. Capsule globose, puberulent. Seeds black, hemispheric, adaxially concave. Fl. Jun–Dec.

Forests in mountainous regions, shady places near cliffs and in rock crevices; 200–600 m. SW Guangzhou (Leizhou Bandao), Guizhou, Hainan (Wanning), W Hubei, Hunan, Sichuan, Yunnan [Vietnam].

**2. *Munronia pinnata*** (Wallich) W. Theobald in Mason, Burmah, ed. 4, 2: 581. 1883.

羽状地黄连 yu zhuang di huang lian

*Turraea pinnata* Wallich, Pl. Asiat. Rar. 2: 21. 1830; *Munronia delavayi* Franchet; *M. hainanensis* F. C. How & T. C. Chen; *M. hainanensis* var. *microphylla* X. M. Chen; *M. henryi* Harms; *M. heterophylla* Merrill; *M. heterotricha* H. S. Lo; *M. javanica* Bennett; *M. neilgherrica* Wight; *M. pumila* Wight; *M. sinica* Diels; *M. timoriensis* Baillon.

Shrublets (5–)10–50 cm, erect. Stems usually not branched, glabrous or apical part covered with appressed puberulence, glabrescent. Leaves odd-pinnate, usually aggregated apically on stem; rachis puberulent; petiole 1.5–4 cm, puberulent; leaflets (3 or)5–9(or more), 8–12 cm; leaflet blades oblong, ovate, elliptic, obovate, or suborbicular, 0.5–7.5 × 0.3–3 cm, basal ones smallest and increasing in size along rachis to apex with apical leaflet distinctly larger, membranous to thickly papery, abaxially sparsely puberulent but more densely so along veins, adaxially glabrous or very sparsely hispid between veins and puberulent along veins, secondary veins ca. 5 on each side of midvein and slender, base oblique and cuneate to rounded, margin entire or with sparse obtuse teeth or shallowly pinnately lobed; lateral leaflets subsessile, smaller than terminal leaflet, apex rounded,



obtuse, or acuminate; terminal leaflet petiolulate, usually basally and apically more attenuate than lateral leaflets. Inflorescence axillary, 1- or few flowered in a raceme; peduncle 5–10 mm, puberulent. Pedicel to 5–12 mm, bracteolate, puberulent. Calyx 5-lobed to near base; lobes linear to lanceolate, 1.5–3 mm, apex acuminate. Corolla white; tube 1.3–4 cm, sparsely puberulent or glabrous; lobes alternate with anthers, oblong, oblanceolate, or lanceolate, 1–2 cm, apex acute. Staminal tube to 4 cm, slightly exserted, base adnate to corolla tube, apical margin with linearly lacerate teeth; anthers ellipsoid, ca. 1 mm, lanulose, apex acuminate. Ovary puberulent; style  $\pm$  as long as filament tube, glabrous or basally puberulent. Capsule oblate, 6–7 mm in diam., sparsely stellate puberulent. Seeds yellowish gray. Fl. Apr–Nov.

Moist places in forests, thickets near roads, shady rock crevices,

grassland on slopes; 200–1800 m. Chongqing (Jinfu Shan, Nanchuan), S Guangdong, NW Guangxi, S Guizhou, Hainan (Qiongzong, Wanning), Yunnan [Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

*Munronia pinnata* is a widespread species that varies greatly in character states, such as plant size, number and size of leaflets, leaflet margin, and inflorescence length. The broad interpretation used here largely follows D. J. Mabberley et al. (Fl. Males., Ser. 1, Spermat. 12(1): 30–34. 1995) and D. J. Mabberley (Rev. Handb. Fl. Ceylon 9: 236–239. 1995).

*Munronia hainanensis* var. *microphylla* is described on the herbarium label of the type specimen (*G. Q. Ding & L. Yu 6795*) as having red flowers. This is most likely either a mistake or a misinterpretation of the color once the flowers were dried.

## 8. CIPADESSA Blume, Bijdr. 162. 1825.

浆果楝属 *jiang guo lian shu*

Peng Hua (彭华); David J. Mabberley

Shrubs or trees. Branchlets covered with grayish white lenticels. Leaves in spirals or subopposite, odd-pinnate; leaflet blades with margin usually entire. Thyrses axillary, polygamous. Flowers small, spherical. Calyx cup-shaped, 5-lobed in apical half. Petals 5, distinct, valvate. Stamens 10; filaments linear, base or basal part forming a cup-shaped tube, tip distinct and 2-lobed, inside usually covered with trichomes; anthers inserted between 2 lobes of filament tube apical margin. Disk short, adnate to base of filament tube. Ovary globose, 1–5-locular, with 2 collateral ovules per locule; style short; stigma capitate. Fruit a drupelike berry,  $\pm$  fleshy, with 5 pyrenes, each pyrene with 1 (or 2) seeds. Seeds with fleshy endosperm; embryo leaflike; radicle superior, exserted.

One species: tropical and subtropical Asia.

**1. *Cipadessa baccifera*** (Roth) Miquel, Ann. Mus. Bot. Lugduno-Batavi 4: 6. 1868.

浆果楝 *jiang guo lian*

*Melia baccifera* Roth, Nov. Pl. Sp. 215. 1821; *Cipadessa baccifera* var. *sinensis* Rehder & E. H. Wilson; *C. cinerascens* (Pellegrin) Handel-Mazzetti; *C. fruticosa* Blume; *C. fruticosa* var. *cinerascens* Pellegrin; *C. sinensis* (Rehder & E. H. Wilson) E. Salisbury; *Rhus blinii* H. Léveillé.

Shrubs or trees, usually 1–4(–10) m tall. Bark coarse. Young branches grayish brown, ribbed, covered with yellow pubescence and sparse grayish white lenticels. Leaves 8–30 cm; petiole and rachis cylindrical, glabrous or covered with yellow trichomes; leaflets usually 9–13, opposite; leaflet blades ovate to ovoid-oblong, 3.5–10  $\times$  1.5–5 cm, smaller basally than apically on rachis, papery, both surfaces covered with appressed yellowish gray pubescence or abaxially only pubescent along veins and adaxially glabrous, secondary veins 8–10 on each side of

midvein, base oblique and rounded, cuneate, or broadly cuneate, margin entire or apical half serrate, apex acute, acuminate, or mucronate. Thyrses 8–15 cm, branches corymbose; peduncle and branches covered with yellow pubescence. Flowers 3–4 mm in diam. Pedicel 1–1.5 mm. Calyx short, outside covered with sparse yellow pubescence; lobes broadly triangular. Petals white or yellow, linear to oblong-elliptic, 2–3.5 mm, outside covered with sparse appressed pubescence. Outside of staminal tube and filaments glabrous, inside covered with trichomes; anthers inserted between 2 lobes of filament tip, ovoid, glabrous. Fruit purple to black when mature, globose, 4–5 mm in diam. Fl. Apr–Oct, fr. Aug–Feb.

Sparse forests and thickets in hilly regions; 200–2100 m. Guangxi, Guizhou, Sichuan, Yunnan [Bhutan, India, Indonesia, Laos, Malaysia, Nepal, Philippines, Sri Lanka, Thailand, Vietnam].

The leaves and roots are used medicinally; oil from the seeds is used for soap-making.

## 9. WALSURA Roxburgh, Fl. Ind., ed. 1832, 2: 386. 1832.

割舌树属 *ge she shu shu*

Peng Hua (彭华); David J. Mabberley

Trees, sometimes small. Leaves in spirals, odd-pinnate or occasionally a single leaflet (sometimes in *Walsura pinnata*); leaflets opposite; petiolule bases inflated and jointlike; leaflet blades abaxially pale, margin entire. Thyrses axillary or subterminal. Flowers bisexual or occasionally only male, small. Calyx short, 5-lobed or with 5 distinct sepals, imbricate in bud. Petals 5, much longer than calyx, distinct, broad and expanding, valvate or imbricate in bud. Stamens 10; filaments flat, broad, usually basally connate into a tube

or sometimes distinct, shorter than petals; anthers introrse, inserted on apex or between 2 lobes of filament. Disk annular, fleshy. Ovary short, apical part covered with short hard trichomes, 2- or 3-locular, with 2 ovules per locule, all or only base surrounded by disk; style almost as long as ovary; stigma disciform or conic, tip 2- or 3-cleft. Fruit a berry [rarely a capsule], pubescent, usually 1(or 2)-locular. Seeds 1 or 2 per locule, arillate; endosperm absent; cotyledons connate.

About 16 species: tropical Asia; two species in China.

- 1a. Leaflets adaxially white-dotted with glaucous patches; filaments distinct or only basally connate ..... 1. *W. robusta*  
 1b. Leaflets adaxially with a continuous glaucous surface; filaments connate for ± half their length into a tube ..... 2. *W. pinnata*

**1. *Walsura robusta*** Roxburgh, Fl. Ind., ed. 1832, 2: 386. 1832.

割舌树 ge she shu

Trees 10–25 m tall. Branches brown, with lenticels, glabrous. Leaves 15–30 cm; petioles 2.5–8 cm; leaflets 3 or 5, opposite; petiolules 0.5–2 cm, both ends inflated, with joints; leaflet blades oblong, elliptic, or lanceolate, lateral ones 5–14 × 1.5–5 cm, terminal ones 7–16 × 3–7 cm, papery to thinly leathery, both surfaces glabrous, adaxially lustrous, secondary veins 5–8 on each side of midvein and ± prominent on both surfaces, base cuneate, apex acuminate. Thyrses 8–17 cm, sparsely pubescent. Flowers 4–6 mm, pedicellate. Calyx short, outside pubescent; lobes ovate, apex acute. Petals white, oblong to elliptic, 3–4 mm, broad, slightly imbricate in bud, outside pubescent, apex acuminate to obtuse. Stamen filament base or basal to middle part connate into a tube, inside apically covered with short hard trichomes, apex acuminate and not lobed; anthers yellow, ovoid, inserted on tips of filaments. Disk red, cup-shaped, outside glabrous, inside pubescent. Ovary oblate, 2-locular, apically covered with trichomes; style cylindrical; stigma disciform, tip not divergent. Berry globose to ovoid, 1–2 cm in diam., densely covered with yellowish gray trichomes. Seeds 1 or 2. Fl. Feb–Mar, fr. Apr–Jun.

Sparse or dense forests in hilly regions. W Guangxi, Hainan, S Yunnan [Bangladesh, Bhutan, India, Laos, Malaysia, Myanmar, Thailand, Vietnam].

**2. *Walsura pinnata*** Hasskarl, Retzia 1: 147. 1855.

越南割舌树 yue nan ge she shu

*Heynea cochinchinensis* Baillon; *Walsura cochinchinensis* (Baillon) Harms; *W. yunnanensis* C. Y. Wu.

Shrubs to small trees, 1–4(–8) m tall. Bark grayish brown, with pale lenticels. Stem stout; branches many. Leaves odd-pinnate or reduced to a single leaflet, 15–20(–30) cm; petiole 1–7(–9) cm, ribbed; leaflets 1 or 3(or 5), opposite; petiolules of lateral leaflet blades 0.5–1.5 cm but terminal one 2–3.5 cm, with joints; leaflet blades ovate, ovate-lanceolate, or elliptic, (10–)14–18 × (3–)5–7 cm but terminal one largest, thickly papery to leathery, both surfaces glabrous, abaxially greenish white, adaxially green and lustrous, secondary veins 8–11 on each side of midvein and abaxially prominent, base attenuate to broadly cuneate, apex acuminate to acute. Panicles 1–6 cm, pubescent. Flowers 4–5 mm. Pedicel thin and slightly shorter than flowers. Calyx lobes triangular, outside pubescent, apex acuminate. Petals white, oblong to narrowly oblong, ca. 5 mm, abaxially pubescent, apex acute to acuminate. Stamen filaments broad, basal to middle part connate into a tube, ± pubescent, tip 2-lobed; anthers ovoid, inserted between 2 lobes of filament apex, apex acute. Disk red, cup-shaped to annular, glabrous. Ovary globose to oblate, flat, 2-locular, covered with thick trichomes; style cylindrical; stigma disciform, tip 2-cleft. Berry globose to ovoid, ca. 1.5 cm in diam., densely covered with yellowish gray trichomes, with 1 or 2 seeds; exocarp thin; endocarp hard and leathery. Fl. Feb–Jul, fr. Jun–Dec.

Sparse or dense forests in hilly regions; 900–1000 m. S Guangxi, S Hainan, S Yunnan (Xishuangbanna) [Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Vietnam].

**10. HEYNEA** Roxburgh, Bot. Mag. 41: t. 1738. 1815.

鹧鸪花属 zhe gu hua shu

Peng Hua (彭华); David J. Mabberley

Trees or shrubs. Branches glabrous or sometimes young branches yellow pubescent or glabrescent. Leaves in spirals, odd-pinnate; leaflets opposite; leaflet blades with margins entire. Thyrses axillary or subterminal, consisting of several cymes; peduncle long. Flowers bisexual, small. Calyx short, 4- or 5-lobed, lobes imbricate. Petals 4 or 5, elongated elliptic, much longer than sepals, distinct, imbricate in bud. Filament tube 8–10-parted; segments linear, tips 2-cleft; anthers 8–10, inserted between 2 lobes of filament tips. Disk annular, fleshy. Ovary glabrous or pubescent, 2- or 3-locular, with 2 collateral ovules per locule; style as long or slightly longer than ovary; stigma disciform or conic, tip 2- or 3-cleft. Fruit a capsule, 1-locular, glabrous or pubescent, dehiscing into 2 valves, with 1 or 2 seeds. Seeds with a white thin aril; endosperm absent; cotyledons thick, hemispheric.

Two species: tropical and subtropical Asia; two species in China.

Although *Heynea* has previously been included in *Trichilia* P. Browne, *Trichilia* is now considered to be genus of tropical Africa and America.

- 1a. Trees 5–10 m tall; ovary and capsule glabrous, with 1 seed; leaflet blades glabrous on both surfaces or sometimes only abaxially covered with yellow pubescence ..... 1. *H. trijuga*  
 1b. Shrubs 3–4 m tall; ovary and capsule yellow pubescent, with 1(or 2) seed(s); leaflet blades adaxially glabrous or only along midvein pubescent, abaxially yellow villous, densely so on midvein ..... 2. *H. velutina*

**1. *Heynea trijuga*** Roxburgh, Bot. Mag. 41: t. 1738. 1815.

鸚鵡花 zhe gu hua

*Heynea trijuga* var. *microcarpa* Pierre; *H. trijuga* var. *pilosula* C. Candolle; *Trichilia connaroides* (Wight & Arnott) Bentvelzen; *T. connaroides* var. *microcarpa* (Pierre) Bentvelzen; *Walsura trijuga* (Roxburgh) Kurz; *W. trijuga* var. *microcarpa* (Pierre) S. Y. Hu; *Zanthoxylum connaroides* Wight & Arnott.

Trees 5–10 m tall. Old branches glabrous, young parts yellow pubescent, black or dark brown when dry, with sparse lenticels. Leaves alternate, usually 20–36 cm; rachis cylindric or ridged, glabrous; leaflets 7 or 9, opposite; leaflet blades lanceolate, ovate, or oblong-elliptic, (5–)8–16 × (2.5–)3.5–5(–7) cm, membranous, abaxially pale and glabrous or yellow pubescent, adaxially glabrous, secondary veins 8–12 on each side of midvein, base oblique, margin entire, apex acuminate. Thyrses axillary, slightly shorter than leaves; peduncle pubescent. Flowers 3–4 mm. Pedicel ± as long as flowers, thin, pubescent or glabrous. Calyx 4- or 5-lobed; lobes orbicular to obtusely triangular, outside pubescent or glabrous. Petals 4 or 5, white or creamy white, oblong-elliptic, outside pubescent or glabrous. Filament tube 10-parted to below middle, pubescent or glabrous, segments inside covered with hard trichomes, tips 2-cleft; anthers 8–10, inserted between 2 lobes of filament tips. Ovary spherical, glabrous; style ± as long as filament tube; stigma spherical, tip 2-cleft. Capsule ellipsoid and with a carpodium, (1.5–)2.5–3 × 1–2.5 cm, glabrous, 1-seeded. Seed black when dry, with a white aril. Fl. Apr–Jun, fr. May–Jun and Nov–Dec.

Forests in hilly regions; 200–1300 m. Guangdong, Guangxi, Gui-

zhou, Hainan, Yunnan [Bhutan, India, Indonesia, Laos, Nepal, Philippines, Thailand, Vietnam].

**2. *Heynea velutina*** F. C. How & T. C. Chen, Acta Phytotax. Sin. 4: 37. 1955.

茸果鸚鵡花 rong guo zhe gu hua

*Trichilia sinensis* Bentvelzen.

Shrubs 1–3 m tall. Young branches yellow pubescent or glabrescent. Leaves 13–30 cm; petiole and rachis yellow pubescent; petiole 5–7 cm; leaflets 7 or 9; petiolules 3–5 mm but for terminal leaflet to 3 cm, densely yellow villous; leaflet blades lanceolate to oblong-elliptic, 7–15 × 2–5 cm, membranous, abaxially yellow villous and denser on veins, adaxially glabrous or only along midvein pubescent, secondary veins 8 or 9 on each side of midvein, thin and scattered, base cuneate and oblique, apex acuminate. Thyrses axillary, slightly shorter than leaves, yellow pubescent. Flowers 4–5 mm. Pedicel 2–4 mm, with joint, yellow pubescent. Calyx cup-shaped, 1–1.5 mm, 5-lobed; lobes ovoid-triangular, apex obtuse. Petals 5, white, oblong, 3.5–4 mm, both surfaces glabrous or only abaxially pubescent, apex ± acute. Filament tube slightly shorter than petals, outside glabrous, inside near throat covered with tough trichomes, apically 10-parted, segment apically 2-cleft. Ovary pubescent; style apically thickened; stigma conic, apically 2-cleft. Capsule spherical, 0.8–1.2 cm in diam., with very thin transverse stripes, yellow pubescent, 1(or 2)-seeded. Seeds dark purple or black, spherical, lustrous. Fl. Apr–Sep, fr. Aug–Dec.

Sparse forests and thickets in hilly regions; low elevations. Guangxi, Guizhou (Jiangkou), Hainan, Yunnan [Vietnam].

**11. *AGLAIA*** Loureiro, Fl. Cochinch. 1: 98, 173. 1790, nom. cons., not F. Allamand (1770).

米仔兰属 mi zi lan shu

Peng Hua (彭华); Caroline M. Pannell

Trees or shrubs, dioecious, young parts usually lepidote or stellately pubescent. Leaves alternate to subopposite, odd-pinnate, 3-foliolate, or rarely simple; leaflet blade margins entire. Flowers in axillary thyrses, small, usually globose. Calyx slightly or deeply 3–5-lobed. Petals 3–5, short, concave, quincuncial or imbricate in bud, distinct or rarely basally connate and adnate to staminal tube. Stamens as many as or more than petals; staminal tube usually subglobose, obovoid, or cup-shaped with apex incurved, apical margin entire, crenate, or shallowly lobed; anthers 5 or 6(–12), included, slightly exerted, or rarely semiexserted. Disk absent. Ovary 1–3(or 4)-locular, with 1 or 2 ovules per locule; style short or absent; stigma ovoid or shortly cylindrical. Fruit with fibrous pericarp, indehiscent with 1 or 2 locules or loculicidally dehiscent with 3 locules; locules without seeds or each containing 1 seed; pericarp often containing latex. Seeds usually surrounded by a colloidal and fleshy aril; endosperm absent.

About 120 species: tropical and subtropical Asia, tropical Australia, Pacific islands; eight species in China.

*Aglaia* is the only source of the group of about 50 known representatives of compounds that bear a unique cyclopenta[b]tetrahydrobenzofuran skeleton. These compounds are more commonly called rocaglate or rocaglamide derivatives, or flavaglines, and have been found to have anticancer and pesticidal properties. Since the first representative in this group was only discovered in 1982, this is one of the few recent examples of a completely new class of plant secondary metabolites of biological promise (see B. G. Wang et al., Biochem. Syst. Ecol. 32: 1223–1226. 2004; L. W. Chaidir et al., J. Nat. Prod. 64: 1216–1220. 2001).

1a. Fruit dehiscent; petals 3 or 4 (*A. sect. Amoor* (Roxburgh) Pannell and *A. sect. Neoaglaia* Harms).2a. Leaflets 11 ..... 1. *A. spectabilis*

2b. Leaflets 3–9.

3a. Indumentum lepidote ..... 2. *A. lawii*3b. Indumentum stellate ..... 3. *A. teysmanniana*1b. Fruit indehiscent; petals 5 (*A. sect. Aglaia*).

4a. Leaflet blades densely lepidote on both surfaces or only abaxially densely lepidote.

- 5a. Leaflets (1 or)3–7; leaflet blades obovate to elliptic, 4–8 cm, abaxially densely yellow squamate, adaxially densely silvery squamate; anthers 5 ..... 4. *A. elaeagnoidea*
- 5b. Leaflets 7; leaflet blades elliptic to oblong, 8–13 cm, abaxially densely brown squamate, adaxially glabrous; anthers 6 ..... 5. *A. rimosa*
- 4b. Leaflet blades glabrous on both surfaces or only abaxially sparsely lepidote along midvein.
- 6a. Leaflet blades abaxially sparsely lepidote along midvein.
- 7a. Leaflets (1 or)3–7, opposite to subopposite; leaflet blade midveins adaxially prominent; petiole and rachis brown squamate ..... 4. *A. elaeagnoidea*
- 7b. Leaflets 7–9(–11), alternate to subopposite; leaflet blade midveins adaxially conspicuously depressed; petiole and rachis brown squamate when young but glabrescent ..... 7. *A. edulis*
- 6b. Leaflet blades glabrous on both surfaces.
- 8a. Petiole and rachis narrowly winged; leaflets opposite; panicles glabrous ..... 8. *A. odorata*
- 8b. Petiole and rachis not winged; leaflets alternate to subopposite; panicles lepidote.
- 9a. Leaflets (1 or)3–7, opposite to subopposite; leaflet blades 8–12 cm, secondary veins 5–10 on each side of midvein; panicles covered with scalelike stellate rust-colored trichomes ..... 4. *A. elaeagnoidea*
- 9b. Leaflets 9–13, alternate to subopposite; leaflet blades 5–15 cm, secondary veins 12–16 on each side of midvein; panicles grayish lepidote ..... 6. *A. perviridis*

**1. *Aglaia spectabilis*** (Miquel) S. S. Jain & Bennet, Indian J. Forest. 9: 271. 1987.

曲梗崖摩 qu geng ya mo

*Amoora spectabilis* Miquel, Ann. Mus. Bot. Lugduno-Batavi 4: 37. 1868; *Aglaia dasyclada* F. C. How & T. C. Chen; *Amoora dasyclada* (F. C. How & T. C. Chen) C. Y. Wu.

Trees to 18 m tall. Leaves alternate; petiole and rachis ca. 35 cm; petiole glabrous, abaxially rounded, adaxially with a shallow groove; leaflets 11, opposite; petiolules 1–1.5 cm, thick, adaxially sulcate and stellately lepidote; leaflet blades oblong-elliptic, both surfaces ± glabrous, secondary veins 14–16 on each side of midvein, abaxially conspicuously prominent, and adaxially depressed, reticulate veins abaxially subprominent, base truncate to rounded, margin reflexed, apex acuminate. Thyrses axillary, 20–25 cm, stellately lepidote, branches thick and often pendulous. Flower buds ovoid, ca. 6 mm. Pedicel 2–4 mm, apex nodiferous. Calyx 3-lobed; lobes broadly triangular, outside stellately lepidote. Petals 3, ovate, 5–6 mm, outside densely stellately lepidote, inside concave and glabrous. Staminal tube urceolate, ca. 3 mm, glabrous, apical margin 10-lobed; anthers 10, linear to oblong, included. Ovary ovoid, 3-locular, densely covered with yellowish pubescence; stigma triquetrous to conical, base sulcate, apex 3-dentate. Fruit dehiscent, obovoid to pyriform, 3-locular, with 1 seed per locule, pubescent and sparsely stellately lepidote; stipe to 4 mm in diam. Fl. Sep–Nov, fr. Oct.

Dense forests; 900–1800 m. S and SE Yunnan (Xichou, Xishuangbanna) [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Vietnam; NE Australia, Pacific islands].

“*Amoora stellatosquamosa*” (C. Y. Wu & H. Li in C. Y. Wu, Fl. Yunnan. 1: 233. 1977) belongs here but was not validly published because two gatherings were indicated as types (*Vienna Code*, Art. 37.2).

*Aglaia dasyclada* is based on a mixture of *A. spectabilis* and *Dysoxylum hongkongense*. It is treated here as a synonym of *A. spectabilis* because the holotype (in IBSC) belongs to *A. spectabilis*.

**2. *Aglaia lawii*** (Wight) C. J. Saldanha ex Ramamoorthy in C. J. Saldanha & Nicolson, Fl. Hassan Dist. 392. 1976.

望谟崖摩 wang mo ya mo

*Nimmonia lawii* Wight, Calcutta J. Nat. Hist. 7: 13. 1847; *Aglaia attenuata* H. L. Li; *A. lawii* subsp. *oligocarpa* (Miquel) Pannell; *A. oligocarpa* Miquel; *A. stipitata* T. P. Li & X. M. Chen; *A. tenuifolia* H. L. Li; *A. tetrapetala* Pierre; *A. tsangii* Merrill; *A. wangii* H. L. Li; *A. wangii* var. *macrophylla* H. L. Li; *A. yunnanensis* H. L. Li; *Amoora calcicola* C. Y. Wu & H. Li; *A. duodecimantha* H. Zhu & H. Wang; *A. ouangliensis* (H. Léveillé) C. Y. Wu; *A. tetrapetala* (Pierre) Pellegrin; *A. tetrapetala* var. *macrophylla* (H. L. Li) C. Y. Wu; *A. tsangii* (Merrill) X. M. Chen; *A. yunnanensis* (H. L. Li) C. Y. Wu; *A. yunnanensis* var. *macrophylla* (H. L. Li) C. Y. Wu; *Ficus ouangliensis* H. Léveillé; *F. vaniottii* H. Léveillé.

Trees or shrubs, 2–20 m tall. Branches grayish, pale to yellowish lepidote, sometimes glabrescent. Leaves alternate, to 50 cm; petiole and rachis lepidote or glabrous; petiolules 1–15 mm, sometimes slightly inflated, sparsely to densely lepidote, sometimes glabrescent; leaflets 3–9, alternate to subopposite; leaflet blades elliptic, oblong, ovate-lanceolate, or lanceolate, 5–20(–30) × 2–7.5(–11.5) cm, papery to leathery, both surfaces glabrous or adaxially lepidote only on midvein and abaxially lepidote on veins only or on entire surface, midvein abaxially prominent and adaxially depressed, secondary veins (8–)12–15(–16) on each side of midvein, abaxially prominent or depressed, and adaxially flat, prominent, or depressed, base rounded or ± oblique by being cuneate and conspicuously decurrent on one side and rounded on other, apex acuminate to obtuse. Thyrses axillary, botryose, usually shorter than leaves, 2–15 cm in male plants but shorter and with fewer flowers in female plants, densely lepidote or stellately lepidote, few flowered or sometimes with just 1 flower. Flowers unisexual, 3–5 mm in diam. Pedicel 2–3 mm, as long or slightly longer than flower buds, nodiferous, lepidote. Calyx cup-shaped, 1–2 mm, densely lepidote, 3–5-lobed, lobes rounded or sometimes nearly truncate. Petals 3 or 4, suborbicular, ovate, obovate, or oblong, 2–6 mm, concave, outside sometimes sparsely lepidote near base, otherwise glabrous, free from staminal tube. Staminal tube turbinate to campanulate, 2–5 mm, both surfaces glabrous or outside sparsely lepidote, apical margin entire or crenate/serrulate; anthers (5 or)6(–12), linear, oblong, or ovoid,

ca. 0.5 mm, inserted just above inside middle of tube, included or very slightly exerted, both ends acute. Ovary shortly conical, stellately lepidote, 2- or 3-locular, with 2 ovules per locule; style absent; stigma conical, glabrous, 3-lobed. Infructescences 6–10 cm, lepidote. Fruit dehiscent, ellipsoid, globose, or pyriform with base gradually constricted into a 3–16 mm stipe, 1–3 cm in diam., 3-locular, rugose, lepidote, apex rounded, concave, or acute; pericarp woody, hard when dry; calyx persistent, spreading and ± reflexed, lepidote, margin 3(or 4)-dentate. Seeds 1–3 per fruit, completely surrounded by a fleshy usually red aril. Fl. May–Dec, fr. almost year-round.

Forests in hilly regions, dense or sparse forests in limestone regions, ravine rain forests in mountainous regions, evergreen broad-leaved forests, thickets; near sea level to 1600 m. Guangdong, Guangxi, Guizhou, Hainan, Taiwan (Lan Yu), SE Xizang, Yunnan [Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Vietnam; Indian Ocean islands, Pacific islands].

*Aglaiia lawii* is the most widespread and variable species in the genus. Although treated here as a single species, in China it could be treated as two subspecies, *Aglaiia lawii* subsp. *lawii* and *A. lawii* subsp. *oligocarpa*. *Aglaiia lawii* subsp. *lawii* is lepidote on the abaxial surface of the leaflets and has a pear-shaped fruit. It occurs in Guangdong, Guangxi, Guizhou, Hainan, Taiwan (Lan Yu), and SE Xizang (as well as Bhutan, India, Indonesia, Laos, Myanmar, Papua New Guinea, Philippines, Thailand, Vietnam, and Indian Ocean and Pacific islands). *Aglaiia lawii* subsp. *oligocarpa* has subglobose fruit without a stipe and leaflets almost completely without hairs or scales. It occurs in Yunnan (as well as Indonesia, Laos, Malaysia, Thailand, and Vietnam).

**3. *Aglaiia teysmanniana*** (Miquel) Miquel, Ann. Mus. Bot. Lugduno-Batavi 4: 48. 1868.

星毛崖摩 xing mao ya mo

*Amoora teysmanniana* Miquel, Fl. Ned. Ind., Eerste Bijv. 3: 503. 1861.

Trees 7–10 m tall, to 10 cm d.b.h. Bark glaucous. Young branches with dense stellate trichomes, glabrescent. Petiole and rachis 13–20 cm, with dense stellate trichomes, abaxially rounded, adaxially with a groove; leaflets 5–9; petiolules 5–7 mm, with stellate trichomes; leaflet blades elliptic, 10–22 × 4–6 cm, papery, abaxially with dense stellate trichomes especially along midvein and secondary veins, adaxially with stellate trichomes to nearly glabrous, base cuneate and ± oblique, apex acuminate and caudate. Thyrses axillary, 9–15 cm, with sparse flowers. Flowers subglobose, ca. 2 mm in diam. Pedicel ca. 1 mm, straight or flexed, with yellow stellate trichomes. Calyx cup-shaped, 5-lobed; lobes obtuse-triangular, outside with dense yellow stellate trichomes, inside glabrous. Petals 3, rotund to ovate, both surfaces glabrous. Staminal tube cup-shaped with apical margin incurved, glabrous; anthers (6 or)7(–9), ellipsoid, just protruding beyond aperture. Fruit dehiscent, obovoid-globose, lepidote, base with persistent calyx, apex concave; pericarp leathery. Seeds (2 or)3 per fruit, enveloped by a red aril. Fl. Apr, fr. in following year.

Dense or sparse forests; 300–500 m. SE Yunnan (Hekou, Jinping) [Indonesia, Malaysia, Papua New Guinea, Philippines, Thailand].

“*Amoora stellata*” (C. Y. Wu, Fl. Yunnan. 1: 234. 1977) belongs here but was not validly published because two gatherings were indicated as types (*Vienna Code*, Art. 37.2).

**4. *Aglaiia elaeagnoidea*** (A. Jussieu) Benth., Fl. Austral. 1: 383. 1863.

山楞 shan luo

*Nemedra elaeagnoidea* A. Jussieu, Bull. Sci. Nat. Géol. 23: 239. 1832; *Aglaiia abbreviata* C. Y. Wu; *A. elaeagnoidea* var. *formosana* Hayata; *A. elaeagnoidea* var. *pallens* Merrill; *A. formosana* (Hayata) Hayata; *A. roxburghiana* (Wight & Arnott) Miquel; *Milnea roxburghiana* Wight & Arnott.

Trees 1.5–15 m tall, to 30 cm d.b.h., evergreen. Bark greenish white or russet, thin, exfoliating. Young branches, petioles, rachises, and inflorescences covered with scalelike stellate rust-colored trichomes, densely brown squamate and glabrescent, or densely silvery to yellowish stellate squamate. Leaves alternate to subopposite, 10–20 cm; petiole and rachis 3–10 cm, brown squamate, covered with scalelike stellate rust-colored trichomes when young but glabrescent; leaflets (1 or)3–7, opposite to subopposite; petiolules 2–13 mm, brown squamate; leaflet blades obovate, elliptic, or oblong-elliptic, (3–)6–12(–16) × (1.5–)2.5–5.5 cm, thinly papery to leathery, both surfaces glabrous or abaxially densely yellowish squamate and adaxially densely silvery squamate but abaxially sparsely lepidote along midvein, abaxially greenish yellow when dry, adaxially lustrous, midvein abaxially prominent and adaxially slightly prominent, secondary veins 5–10 on each side of midvein, slender, and abaxially ± prominent, base cuneate to broadly cuneate and ± oblique, margin entire, apex acuminate, obtuse, or rounded. Thyrses axillary, as long as or slightly shorter than leaves, lax, covered with rust-colored or yellowish scalelike stellate trichomes or densely russet squamate. Flowers ca. 2.5 mm in diam. Pedicel ± as long as flower, covered with scalelike stellate rust-colored trichomes. Calyx ca. 0.6 mm, 5-lobed; lobes rounded, outside rust-colored or yellowish lepidote. Petals 5, oblong, 1–1.5 mm, glabrous or outside yellowish lepidote, apex rounded. Staminal tube subglobose, slightly shorter than petals, apical margin entire, undulate, or 5-lobed; anthers 5, included. Ovary ovoid, densely covered with scalelike stellate trichomes; stigma sessile. Infructescences axillary, 1–3 cm, usually with 1(–3) fruit, brown squamate; bractlets conical. Fruit indehiscent, yellowish brown when mature, subglobose, ellipsoid, or obovoid, 1–1.4 cm in diam.; persistent calyx 5-crenate, crenations triangular, brown squamate. Seeds 1(or 2) per fruit. Fl. Jun–Oct, fr. Jul–Dec.

Dense and moist forests in valleys and mountainous regions, ravine rain forests, evergreen broad-leaved forests; near sea level to 1500 m. Guangdong, Guangxi, Guizhou, Hainan, S Taiwan (Hengchun peninsula), Yunnan [Cambodia, India, Indonesia, Laos, Malaysia, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Australia, Pacific islands].

**5. *Aglaiia rimosa*** (Blanco) Merrill, Sp. Blancoan. 212. 1918.

椭圆叶米仔兰 tuo yuan ye mi zi lan

*Portesia rimosa* Blanco, Fl. Filip. 297. 1837; *Aglaiia elliptifolia* Merrill.

Shrubs or small trees. Branchlets densely ferruginous lepidote. Leaves odd-pinnate, 15–25 cm; petiole and rachis lepidote; leaflets 7, opposite to subopposite; petiolules 5–7 mm; leaflet

blades obovate-elliptic to oblong, 8–14(–20) × 4–6.5(–8) cm, thinly leathery, abaxially brown lepidote especially along veins, adaxially glabrous, midvein prominent on both surfaces, secondary veins 6–10 on each side of midvein, veinlets rather loose, base obtuse, apex shortly cuspidate. Thyrses axillary, ca. 15 cm, densely lepidote. Flowers ca. 2.5 mm in diam. Pedicel 1–3 mm. Calyx short, 5-lobed; lobes ca. 1 mm, lepidote. Petals 5, yellow, ovate, ca. 2.5 mm, quincuncial, free from staminal tube, glabrous. Staminal tube ca. 1.8 mm, rather thick, apical margin inconspicuously toothed; anthers 6, sessile, ca. 0.8 mm, slightly exerted. Ovary 2-locular. Fruit indehiscent, ellipsoid, ca. 2 × 1.8 cm, densely ferruginous lepidote. Seed 1 per fruit, with a fleshy yellow aril.

Forests; low elevations. S and SE Taiwan and nearby islands [Indonesia, Papua New Guinea, Philippines; Pacific islands].

**6. *Aglaia perviridis*** Hiern in J. D. Hooker, Fl. Brit. India 1: 556. 1875.

碧绿米仔兰 *bi lü mi zi lan*

Trees to 15 m tall. Branchlets dark gray, with scattered small yellowish lenticels. Leaves ca. 30 cm; leaflets 9–13, alternate to subopposite; petiolules 5–10 mm; leaflet blades oblong-elliptic or ovate, 5–15(–18) × (2–)3–4.5 cm, thickly papery to subleathery, both surfaces glabrous, secondary veins 12–16 on each side of midvein and slender, base ± oblique and cuneate to subrotund, apex acuminate. Thyrses axillary, 20–24 cm, slightly shorter than leaves, dark gray squamate. Flowers ca. 2 mm in diam., glabrous. Pedicel short. Calyx 5-parted; lobes rounded, margin ciliate. Petals 5, white, orbicular to ovate, ca. 1.5 mm. Staminal tube subglobose, glabrous; anthers 5, ovoid. Ovary with 2 ovules per locule. Fruit indehiscent, oblong and curved, 3–3.8 × ca. 2 cm, rust-colored squamate. Seed 1 per fruit, with a yellowish fleshy aril. Fl. Mar–May, fr. Sep–Dec.

Seasonal rain forests, ravine rain forests, evergreen broad-leaved forests; 100–1400 m. S and SE Yunnan [Bangladesh, Bhutan, India, Laos, Malaysia, Thailand; Indian Ocean islands].

**7. *Aglaia edulis*** (Roxburgh) Wallich, Calc. Garden Rep. 26. 1840.

马肾果 *ma shen guo*

*Milnea edulis* Roxburgh, Fl. Ind. 2: 430. 1824; *Aglaia testicularis* C. Y. Wu.

Trees 5–9 m tall, to 30 cm d.b.h. Bark rufous. Young branches pale brown, glabrous, with inconspicuous lenticels. Leaves 25–30 cm; petiole and rachis 10–15 cm, glabrous but sparsely brown squamate when young; leaflets 7(–11), alternate to subopposite; petiolules 3–11 mm, slightly inflated; leaflet blades ovate-oblong to elliptic, 5–10(–22) × 1.5–4(–11) cm,

papery, both surfaces glabrous but abaxially sparsely lepidote along midvein, midvein abaxially prominent and adaxially conspicuously depressed, secondary veins 9–12 on each side of midvein and abaxially prominent, base rounded to cuneate, apex acute to acuminate. Thyrses axillary, 5–15 cm, sparsely branching, brown squamate. Flowers subsessile, globose, ca. 2 mm in diam. Calyx 5-lobed; lobes rounded, sparsely brown squamate, margin ciliate. Petals 5, broadly ovate, glabrous. Staminal tube globose, free from petals, glabrous, apical margin entire or undulate; anthers 5, ovoid, inserted on or near throat of tube, included or ± exerted. Style very short; stigma conical, truncate, glabrous. Fruit indehiscent, brown, elliptic, ca. 5.5 × 3–3.5 cm, yellowish lenticellate, densely brown squamate, basally contracted into a 1–1.5 cm stipe, apex plump and turbinate; persistent calyx inconspicuous. Seeds 1–3 per fruit, ellipsoid, ca. 4 cm; hilum to 3 cm. Fl. Nov–Jan, fr. Nov–Jan.

Evergreen broad-leaved forests on limestone hills; 1200–1800 m. SE Yunnan (Malipo) [Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam].

The timber of this species is red, hard, and usually used for making carts, boats, furniture, etc.

**8. *Aglaia odorata*** Loureiro, Fl. Cochinch. 1: 173. 1790.

米仔兰 *mi zi lan*

*Aglaia odorata* var. *microphyllina* C. Candolle.

Shrubs or small trees, much branching. Young branches apically with stellate or lepidote trichomes. Leaves 5–12(–16) cm; petiole and rachis narrowly winged; leaflets 3–7(or 9), opposite; leaflet blades usually obovate, sometimes elliptic, 1–7(–11) × 0.5–3.5(–5) cm with apical one biggest, both surfaces glabrous, secondary veins 8 on each side of midvein, very slender, and ± prominent on both surfaces, base cuneate, apex obtuse. Thyrses axillary, 5–10 cm, lax, glabrous. Flowers fragrant, ca. 2 mm in diam. Pedicel of male flowers 1.5–3 mm, slender. Pedicel of female flowers short and thick. Calyx 5-lobed, lobes round. Petals 5, yellow, oblong to suborbicular, 1.5–2 mm, apex rounded to truncate. Staminal tube slightly shorter than petals, obovoid to subcampanulate, outside glabrous, apical margin entire or lobed; anthers 5, ovoid, included. Ovary ovoid, densely covered with yellow trichomes. Fruit indehiscent, ovoid to subglobose, 1–1.2 cm, scattered stellate lepidote but glabrescent. Seeds with a fleshy aril. Fl. May–Dec, fr. Jul–Mar.

Sparse forests or thickets in mountainous regions; low elevations. Guangdong, Guangxi, Hainan [Cambodia, Laos, Thailand, Vietnam].

This species is also cultivated in Anhui, Fujian, Guizhou, Henan, Sichuan, Taiwan, Yunnan, and Zhejiang.

## 12. REINWARDTIODENDRON Koorders, Meded. Lands Plantentuin 19: 389. 1898.

雷棘属 *lei lian shu*

Peng Hua (彭华); David J. Mabberley

Shrubs or trees, dioecious. Leaves odd-pinnate; leaflets few; leaflet blades leathery, margin entire. Inflorescences axillary. Flowers subglobose, small. Male flowers in lax panicles. Female flowers in racemes or spikes. Sepals 5. Petals 5, orbicular, imbricate.

Staminal tube globose or ovoid; anthers 10, in 2 whorls, included. Disk inconspicuous. Ovary globose, 5-locular, with 1 ovule per locule; style extremely short or almost absent; stigma 3–5-lobed. Berry fleshy. Seeds 1–5, surrounded by a sarcotesta.

Seven species: tropical Asia; one species in China.

**1. Reinwardtiodendron humile** (Hasskarl) Mabberley, Malaysian Forester 45: 452. 1982.

雷棟 lei lian

*Lansium humile* Hasskarl, Hort. Bogor. Descr. 1: 121. 1858; *L. dubium* Merrill; *Reinwardtiodendron dubium* (Merrill) X. M. Chen.

Shrubs to trees, 3–6(–27) m tall. Branches grayish white to brownish gray. Leaves odd-pinnate, 12–20 cm; petiole and rachis adaxially flat, abaxially rounded; leaflets usually 3 or 5, subopposite to opposite; petiolules 3–5 mm; leaflet blades thinly elliptic to oblong-lanceolate, 6–10 × 2.5–4 cm, leathery, both

surfaces glabrous and lustrous, secondary veins numerous, thin, almost parallel, ± prominent on both surfaces, and connected at margin as an intramarginal vein, base cuneate, margin entire, apex obtuse to acuminate. Male flowers not seen in Chinese material. Female flowers sessile, globose, 2–3 mm in diam., axillary on apical part of branches, forming spikes, 7–12 cm; rachis slender, finely ribbed, with scattered flowers. Sepals less than 2 mm; lobes ca. 3 mm, glabrous. Berry ovoid, 1.7–2 × 1.2–1.3 cm, outside brown pubescent, with 1 or 2 seeds. Fr. Feb–Mar.

Thickets in mountainous regions. Hainan (Baisha) [Cambodia, Indonesia, Laos, Malaysia, Philippines, Thailand, ?Vietnam].

### 13. APHANAMIXIS Blume, Bijdr. 165. 1825.

山棟属 shan lian shu

Peng Hua (彭华); David J. Mabberley

Trees or shrubs, polygamo-dioecious. Leaves odd-pinnate; leaflets opposite; leaflet blades with base frequently oblique, margin entire. Flowers, globose, sessile. Male flowers forming panicles. Female or bisexual flowers forming racemes. Sepals 5, distinct or connate at base, imbricate. Petals 3, concave, imbricate in bud. Staminal tube nearly globose, slightly shorter than petals; anthers 3–6, included. Disk extremely small or absent. Ovary 3-locular, with (1 or)2 ovules per locule; style absent; stigma large, pointed or conic. Capsule septicidal with 3 valves; segments leathery. Seeds arillate.

Three species: tropical Asia, Pacific islands; one species in China.

**1. Aphanamixis polystachya** (Wallich) R. Parker, Indian Forester 57: 486. 1931.

山棟 shan lian

*Aglaia polystachya* Wallich in Roxburgh, Fl. Ind. 2: 429. 1824; *A. aphanamixis* Pellegrin; *Amoora elmeri* Merrill; *A. grandifolia* (Blume) Walpers; *A. rohituka* (Roxburgh) Wight & Arnott; *Andersonia rohituka* Roxburgh; *Aphanamixis elmeri* (Merrill) Merrill; *A. grandifolia* Blume; *A. rohituka* (Roxburgh) Pierre; *A. sinensis* F. C. How & T. C. Chen; *A. tripetala* (Blanco) Merrill; *Chunioidendron spicatum* Hu; *C. yunnanense* Hu; *Trichilia tripetala* Blanco.

Trees or shrubs, (2–)20–30 m tall. Leaves odd- or even-pinnate, 30–60(–90) cm; leaflets (5–)9–21, opposite; petiolules (2–)6–12 mm; leaflet blades oblong-elliptic, elliptic, or ovate, (7–)17–26 × 4–10 cm with basal pair smallest, membranous when young, subleathery to leathery when mature, with visible transparent tiny spots under sunlight, both surfaces glabrous,

secondary veins (8–)11–20 on each side of midvein and slender, base oblique and cuneate to broadly cuneate or sometimes one side rounded, margin entire, apex caudate-acuminate to obtuse. Inflorescences axillary, less than 30 cm. Flowers 6–7 mm in diam., with 3 bracteoles. Sepals 5, suborbicular, 1–1.5 mm in diam., margin sometimes ciliate. Petals 3–7 mm in diam., concave. Staminal tube globose, glabrous; anthers 5 or 6, oblong. Ovary 3-locular, with thick trichomes. Capsule spherical-pyriform to nearly ovoid, 2–2.5 × 2.5–3 cm, orangish when mature. Seeds grayish brown, oblate, 1.3–1.5 × 1–1.2 cm. Fl. May–Sep, fr. Oct–Apr.

Dense or sparse mixed evergreen broad-leaved and deciduous forests in mountainous regions; low to middle elevations. Fujian, Guangdong, Guangxi, Hainan, Taiwan (Lan Yu), Yunnan [Bhutan, India, Indonesia, Laos, Malaysia, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Pacific islands (Solomon Islands)].

The seed oil is used for making soap and lubricating oil. The very fine wood is used for construction and ship-making.

### 14. DYSOXYLUM Blume, Bijdr. 172. 1825.

欐木属 jian mu shu

Peng Hua (彭华); David J. Mabberley

Trees or very rarely shrubs, usually dioecious. Leaves in spirals or rarely opposite, pinnate; leaflets alternate, subopposite, or alternate, petiolulate, not always an equal number on each side of rachis; leaflet blade base usually oblique, margin usually entire, very rarely serrulate. Flowers appearing bisexual, 4- or 5-merous, in axillary thyrses, rarely spikes, sometimes borne on older branches or bole. Calyx cup-shaped, 4- or 5-lobed or of 4 or 5 free sepals. Petals 4 or 5, oblong, valvate or apex ± imbricate in bud, free or

sometimes basally adnate to staminal tube. Staminal tube cylindrical, slightly shorter than petals, apex often lacinate or crenate; anthers 8–10, included in apex of filament tube. Disk tubular, as high or higher than ovary (rarely shorter), margin entire or crenate. Ovary (3 or)4- or 5-locular, with 1 or 2 ovules per locule; style  $\pm$  as long as filament tube; stigma usually disciform. Capsule globose or pyriform, splitting into (3 or)4 or 5 segments, with 1 or 2 seeds per valve. Seeds arillate or not; hilum often large; cotyledons fleshy.

About 80 species: tropical Asia, tropical and subtropical Australia, Pacific islands; 11 species (one endemic) in China, with two insufficiently known species (not included in the key).

- 1a. Terminal leaflet absent, small “spike” or scar almost always present.
  - 2a. Apical bud with young leaves like clenched fists.
    - 3a. Leaflets not markedly shiny above; petals 4 ..... 1. *D. excelsum*
    - 3b. Leaflets shiny above; petals (4 or)5 ..... 2. *D. hongkongense*
  - 2b. Apical bud with young leaves spikelike or stiletto-shaped.
    - 4a. Leaflets with 25–30 veins either side of midvein ..... 6. *D. grande*
    - 4b. Leaflets with 8–12 veins either side of midvein.
      - 5a. Leaflets 5–11; petals 6–8 mm; staminal tube pubescent on both surfaces ..... 3. *D. gotadhora*
      - 5b. Leaflets 5 or 6; petals 5–6 mm; staminal tube glabrous within ..... 5. *D. pallens*
- 1b. Terminal leaflet present.
  - 6a. Inflorescences only axillary.
    - 7a. Leaves with up to 23 leaflets; petals 4; fruit usually 4-valved ..... 7. *D. mollissimum*
    - 7b. Leaves with up to 9 leaflets; petals 5; fruit usually 5-valved ..... 8. *D. arborescens*
  - 6b. Inflorescences on branches or bole (sometimes axillary too).
    - 8a. Calyx ca. 1 cm ..... 11. *D. parasiticum*
    - 8b. Calyx less than 5 mm.
      - 9a. Petals 5 ..... 4. *D. lenticellatum*
      - 9b. Petals 4.
        - 10a. Innovations merely pubescent; fruit with dense trichomes ..... 9. *D. densiflorum*
        - 10b. Innovations with dense trichomes; fruit subglabrous ..... 10. *D. cumingianum*

### 1. *Dysoxylum excelsum* Blume, Bijdr. 176. 1825.

檉木 jian mu

*Dysoxylum gobara* (Buchanan-Hamilton) Merrill; *D. procerum* Hiern; *Epicharis procera* (Hiern) Pierre; *Guarea gobara* Buchanan-Hamilton.

Trees to 13 m tall. Branchlets brown to reddish brown, glabrous; apical buds with leaves like clenched fists. Leaves 40–60 cm, even-pinnate; leaflets usually 7 or 9, alternate; petiolules ca. 1 cm; leaflet blades elliptic to oblong, (9–)25–35  $\times$  (5–)8–15 cm, thickly papery to thinly leathery, both surfaces glabrous, not markedly shiny above, secondary veins 11–16 on each side of midvein, abaxially protruding, and adaxially slightly impressed, base  $\pm$  oblique and cuneate to slightly rounded, apex acute. Thyrses axillary,  $\pm$  as long as leaves, glabrous or sparsely pubescent; branches spreading, basal ones 20–35 cm. Flowers 7–10 mm. Calyx 4-lobed at first but subsequently 4-parted, outside puberulent. Petals 4, white, linear to narrowly elliptic, 6–10  $\times$  2–3 mm, outside puberulent, inside glabrous. Staminal tube glabrous on both surfaces, apical margin entire or shortly crenate; anthers 8, oblong. Disk cylindrical, ca. 2  $\times$  as high as ovary, ciliate, outside smooth, inside with inverted trichomes, apex 8-lobed. Ovary conic, 4-locular, with long thick trichomes, with 2 ovules per locule; style several times longer than ovary, basal part with long thick trichomes. Capsule globose to pyriform, ca. 3.5  $\times$  3.5–4 cm, glabrous, apex concave. Seeds with bright red testa. Fl. Sep–Nov, fr. Apr–Jun.

Rain forests in mountainous ravines, evergreen broad-leaved forests, sparse forests; 100–1000 m. SW Guangxi, SE Xizang (Médog), S and SE Yunnan [Bhutan, NE India, Indonesia, Laos, Nepal, Papua New

Guinea, Philippines, Sri Lanka, Thailand, Vietnam; Pacific islands (Solomon Islands)].

### 2. *Dysoxylum hongkongense* (Tutcher) Merrill, Lingnan Sci. J. 13: 33. 1934.

香港檉木 xiang gang jian mu

*Chisocheton hongkongensis* Tutcher, J. Linn. Soc., Bot. 37: 64. 1905; *C. erythrocarpus* Hayata & Kanehira (1938), not Hiern (1875); *C. kanehirae* Sasaki; *C. kusukusensis* Hayata; *Dysoxylum kanehirae* (Sasaki) Kanehira & Hatusima; *D. kusukusense* (Hayata) Kanehira & Hatusima.

Trees 8–25 m tall. Young branches yellow pubescent to nearly glabrous; apical buds with leaves like clenched fists. Leaves 20–30(–50) cm or more, even-pinnate; leaflets 7–18, opposite, subopposite, or alternate, shiny above; petiolules 1–10 mm; leaflet blades narrowly elliptic to ovate, 7–15(–18)  $\times$  3–6.5 cm, usually subleathery, both surfaces glabrous, midvein abaxially protruding and adaxially slightly impressed, secondary veins 8–15 on each side of midvein, abaxially protruding and adaxially flat, base oblique and cuneate to rounded, apex obtuse, acute, shortly acuminate. Thyrses in upper leaf axils, 12–25 cm, appressed yellowish gray pubescent. Pedicel 2–4(–10) mm, stout, brownish pubescent. Calyx cup-shaped, (4 or)5-lobed, outside pubescent. Petals (4 or)5, white, narrowly elliptic, 5–6(–8)  $\times$  ca. 2 mm, outside usually appressed rufous pubescent. Staminal tube 4–6.5 mm, outside sometimes covered with trichomes, apically margin truncate to undulate-crenulate; anthers 8, linear-oblong, included. Disk tubular, ca. 3 mm high, with crenations, apex brilliantly yellow ciliate. Ovary 3- or 4-locular, covered with dense yellow filiform trichomes, at least at base;



style glabrous. Capsule pyriform to ellipsoid or globose, ca. 4 cm in diam. Seeds brown, narrowly ellipsoid, to 2.5 cm. Fl. May–Dec, fr. Nov–Jun.

• Forests on mountains; low to middle elevations. Guangdong, Guangxi, Hainan, Taiwan, S Yunnan.

This species is very closely allied to *Dysoxylum alliaceum* (Blume) Blume, a widespread and variable species of Malesia.

The timber is light and soft and usually used as construction and furniture material.

**3. *Dysoxylum gotadhora*** (Buchanan-Hamilton) Mabblerley, **comb. nov.**

红果榿木 hong guo jian mu

Basionym: *Guarea gotadhora* Buchanan-Hamilton, Mem. Wern. Nat. Hist. Soc. 6: 307. 1 Jan 1832; *Dysoxylum binectariferum* (Roxburgh) J. D. Hooker ex Hiern; *D. cupuliforme* H. L. Li; *D. grandifolium* H. L. Li (1944), not Merrill (1905); *G. binectarifera* Roxburgh (not before 14 Jan 1832).

Trees 8–20 m tall. Young branches pubescent or glabrescent; apical bud spikelike or stiletto-shaped. Leaves 20–30(–40) cm, even-pinnate; petiole and rachis ± 4-sided; leaflets 5–11, alternate; petiolules 3–8 mm; leaflet blades oblong, oblong-elliptic, or lanceolate, 8–16(–23) × 4–7(–15) cm, papery to thickly papery, both surfaces glabrous, secondary veins 9–14 on each side of midvein, base oblique and cuneate to ± rounded, apex acuminate (sometimes shortly). Thyrses axillary, much shorter than leaves; short branches pulverulent pubescent. Pedicel 2–4 mm, pulverulent pubescent. Calyx cup-shaped, leathery, pulverulent pubescent, 4-lobed, lobes triangular. Petals 4, yellow, oblong, 6–8 × 2–4 mm, both surfaces pulverulent pubescent. Staminal tube cylindrical, free from petals, outside and inside pubescent, mouth 8-lobed; anthers 8, alternate with lobes, oblong, included in staminal tube with only apical tip slightly protruding. Disk cylindrical, ± as high as ovary, apex 8–10-crenate. Ovary densely grayish white pubescent; style cylindrical, basally grayish white pubescent, apically glabrous; stigma globose to oblate, glabrous. Capsule obovoid, pyriform, or subglobose, 4.5–5 × 3–4 cm, glabrous. Seeds 4, red when mature. Fl. Mar–Jul, fr. May–Nov.

Dense forests in mountainous ravines; 500–1700 m. Hainan, S Yunnan [Bhutan, India, Laos, Nepal, Thailand, Vietnam].

*Dysoxylum ficiforme* (Wight) Gamble of S India and Sri Lanka may belong here.

The hard, compact timber is used for making furniture and carts.

**4. *Dysoxylum lenticellatum*** C. Y. Wu in H. Li, Fl. Yunnan. 1: 251. 1977.

皮孔榿木 pi kong jian mu

Trees 10–30 m tall, sometimes deciduous. Young branches brownish gray when dry, puberulent, with small lenticels, leaf scars obvious. Leaves alternate, odd-pinnate; petiole and rachis 25–30 cm, puberulent, with lenticels; leaflets 9 or 11, opposite; petiolules 5–8 mm; leaflet blades ovate, elliptic, or oblanceolate, 6–7 × 2.8–4.2 cm for basal leaflets and 15–20(–25) × 4–7 cm for apical leaflets, membranous to papery, both surfaces glabrous,

base ± oblique and rounded to cuneate, apex shortly acuminate. Thyrses arising from old and second-year branches, 3–5-fascicled, rarely solitary, 5–7 cm, brown pubescent, sessile; branches 4–5 cm, with bractlets. Flowers ca. 1 cm in diam. Pedicel ca. 5 mm, slender, gray pubescent. Calyx cup-shaped, less than 5 mm, ca. 3 mm in diam., 5-parted, outside densely tomentose. Petals 5(or 6), white, 6–7 × 1.5–2 mm, outside puberulent. Staminal tube urceolate, 4–5 mm, glabrous, basal part ca. 3 mm wide, mouth ca. 5 mm wide, apical margin undulate; anthers 10(–12), ovoid, inserted on inner side of tube mouth, alternating with and as long as tube lobes. Disk annular, ca. 1 mm high, fleshy, most of it adnate with ovary. Ovary puberulent; style puberulent; stigma as long as staminal tube, puberulent. Fl. Feb–Apr.

Ravine rain forests, mixed evergreen broad-leaved and deciduous forests near streams in limestone regions; 900–1400 m. S and SE Yunnan (Funing, Jingdong, Xishuangbanna) [Myanmar, Thailand].

**5. *Dysoxylum pallens*** Hiern in J. D. Hooker, Fl. Brit. India 1: 548. 1875.

少花榿木 shao hua jian mu

*Dysoxylum spicatum* H. L. Li.

Trees to 7 m tall. Branchlets brown, with longitudinal stripes, densely pubescent; apical buds spikelike or stiletto-shaped. Leaves in spirals, even-pinnate; petiole and rachis 15–30 cm, ribbed, pubescent; leaflets 5 or 6, alternate; petiolules 2–8 mm, densely puberulent; leaflet blades ovate to elliptic, 10–13 × 4–5 cm for basal ones and 14–20 × 6–7 cm for apical ones, membranous, both surfaces glabrous, abaxially with fine mamillate tubercles, secondary veins 8–12 each side of midvein and abaxially ± prominent, base nearly rounded to broadly cuneate, apex acuminate. Thyrses axillary, racemose, 1–3 cm, pulverulent yellow pubescent, few flowered. Pedicel 2–3 mm, pulverulent pubescent; bracteoles small, pulverulent pubescent. Calyx cup-shaped, almost truncate, outside pulverulent pubescent. Petals 4, 5–6 mm, both surfaces pulverulent pubescent. Staminal tube ca. 4 × 3 mm, outside pulverulent pubescent, inside glabrous, apical margin 8-lobed; anthers 8, alternate with tube lobes, oblong. Disk annular, ca. 1 mm high, glabrous, margin undulate. Ovary and style covered with long thick trichomes; stigma subcapitate, pulverulent pubescent. Fruit often solitary, young fruit yellowish green, globular-pyriform, carpodium stout, base of fruit with persistent calyx. Fl. Mar–Jul.

Dense and moist forests; 1200–1400 m. Hainan, Yunnan [Bhutan, Cambodia, India, Myanmar, Thailand].

This species is perhaps conspecific with *Dysoxylum cyrtobotryum* Miquel, a widespread species of Malesia to the Solomon Islands.

"*Dysoxylum oliganthum*" (C. Y. Wu, Fl. Yunnan. 1: 247. 1977) belongs here but was not validly published because two gatherings were indicated as types (*Vienna Code*, Art. 37.2).

**6. *Dysoxylum grande*** Hiern in J. D. Hooker, Fl. Brit. India 1: 547. 1875.

多脉榿木 duo mai jian mu

*Dysoxylum lukii* Merrill; *D. lukii* var. *paucinervium* F. C. How & T. C. Chen.

Trees 4–12(–15) m tall. Branchlets densely yellowish pubescent; older branches gray pubescent; apical buds spikelike or stiletto-shaped. Leaves in spirals, scattered, ca. 60 cm, even-pinnate; petiole and rachis densely pubescent; leaflets 9–15, usually alternate; leaflet blades lanceolate or oblong, 10–30 × 3–9 cm, papery, abaxially yellowish villous, adaxially densely pubescent on midvein and otherwise sparsely pubescent, secondary veins 25–30 on each side of midvein, spreading but anastomosing near margin, abaxially conspicuously prominent and adaxially concave, base usually oblique with one side rounded and other side cuneate, apex acuminate. Thyrses axillary, ca. 20 cm, many branched, yellowish pubescent. Flowers 4-merous. Pedicel 4 mm or more. Calyx nearly disciform, ca. 2.5 mm in diam., outside pubescent, apex inconspicuously lobed. Petals linear-oblong, 6–7 × 2(or less) mm, outside pubescent. Staminal tube cylindrical, ca. 5 mm, glabrous, margin serrulate; anthers 8, oblong, ca. 1 mm, included. Disk annular, ca. 1 mm high, glabrous, apex crenate. Ovary densely yellow pubescent; style 3–4 mm, slender, basally villous. Capsule obovoid-globose to pyriform, ca. 4 × 3 cm or wider, wrinkled when dry, glabrous. Seeds obovoid, with thick sarcotesta. Fl. May–Jul and Sep–Nov, fr. Oct–Nov and Mar–Apr.

Forests in mountainous regions; middle elevations. Guangdong, Guangxi, Hainan, S Yunnan [Bhutan, NE India, Indonesia, Malaysia, Thailand, Vietnam].

**7. *Dysoxylum mollissimum*** Blume, Bijdr. 175. 1825.

海南欒木 hai nan jian mu

*Dysoxylum filicifolium* H. L. Li; *D. hainanense* Merrill; *D. hainanense* var. *glaberrimum* F. C. How & T. C. Chen; *D. mollissimum* var. *glaberrimum* (F. C. How & T. C. Chen) P. Y. Chen.

Trees 7–10(–20) m tall. Branchlets puberulent; apical buds with leaves like clenched fists. Leaves alternate, 25–30(–45) cm, odd-pinnate; petiole and rachis glabrous or villous; leaflets 20–23, opposite to subopposite; petiolules 3–5 mm, glabrous or pubescent; leaflet blades oblong to oblong-lanceolate, 5–11(–13) × 2–3.5(–4.5) cm, membranous, abaxially glabrous or sparsely villous but densely villous on midvein and secondary veins, adaxially glabrous or densely pubescent only on midvein, secondary veins 12–15 on each side of midvein and outspreading, base oblique, apex acuminate. Thyrses axillary, ca. 18 cm or more, lax and with a few scattered flowers, nearly glabrous to sparsely pubescent; branches few, sparse, ca. 5 cm at base of thyrses. Flowers 4-merous, ca. 9 mm. Pedicel 1–2 mm, pubescent. Calyx disciform, ca. 2 mm in diam., pubescent, lobes round. Petals yellow, linear to spatulate, ca. 8.5 mm, glabrous, apex obtuse. Staminal tube cylindrical, ca. 7 mm, both surfaces white villous, apical margin crenate; anthers 8. Disk cylindrical, ca. 3 mm high, margin ciliate and crenate. Ovary densely villous; style 7–8 mm. Capsule yellow when dry, globose, 1.6–2 cm in diam.; pericarp thin and flexible. Fl. May–Sep and Jan–Feb, fr. Oct–Nov and Mar–Apr.

Forests and ravines in mountainous regions; low to middle elevations. Guangdong, Guangxi, Hainan (Qiongzong), S Yunnan [Bhutan, India (Assam), Indonesia, Malaysia, Myanmar, Philippines].

The plants in China are *Dysoxylum mollissimum* subsp. *mollissimum*. *Dysoxylum mollissimum* subsp. *molle* (Miquel) Mabblerley occurs in E Australia, Indonesia, Pacific islands, and Papua New Guinea.

**8. *Dysoxylum arborescens*** (Blume) Miquel, Ann. Mus. Bot. Lugduno-Batavi 4: 24. 1868.

兰屿欒木 lan yu jian mu

*Goniocheton arborescens* Blume, Bijdr. 177. 1825.

Trees to 20(–30) m tall. Bark smooth to finely cracked, lenticellate. Twigs slender, prominently lenticellate; apical buds with leaves like clenched fists. Leaves in spirals, to 45 cm, odd-pinnate; petiole glabrous, drying blackish, base swollen; leaflets 5–9; petiolules to 6 mm; leaflet blades elliptic to obovate, 8.5–18 × 3–7 cm, papery to somewhat leathery, glabrous, base cuneate, sometimes ± asymmetric, apex conspicuously acuminate with acumen to 1.2 cm, secondary veins 7 or 9(or 10) on each side of midvein. Thyrses ± axillary, 2–8(–25) cm, tawny puberulent, branches to 5(–12) cm. Calyx shallowly cupular, 3–6 mm, fawn-colored pubescent, margin irregularly 5-lobed. Petals (4 or)5(or 6), whitish, 7–10 × 1.8–2.2 mm, usually glabrous. Staminal tube truncate to weakly crenulate, sparsely pubescent outside; anthers 10, ca. 1 mm, inserted near margin. Disk 1–1.5 mm high, inside pubescent, margin crenulate. Ovary (3 or)4- or 5-locular, with 2 collateral ovules per locule; style pubescent in proximal 2/3. Capsule to 3 cm in diam., flattened globose, (3–)5-valved, bright pinkish red, glabrous. Seeds 1–6, ca. 1.8 × 1.5 cm, planoconvex with bright orange sarcotesta.

Taiwan (Lan Yu) [Indonesia, Malaysia, Papua New Guinea, Philippines; Australia, Indian Ocean islands, Pacific islands].

**9. *Dysoxylum densiflorum*** (Blume) Miquel, Ann. Mus. Bot. Lugduno-Batavi 4: 9. 1868.

密花欒木 mi hua jian mu

*Epicharis densiflora* Blume, Bijdr. 167. 1825.

Trees to 25 m tall, evergreen. Bark exfoliating, endodermis yellowish. Young shoots pubescent. Leaves alternate, 35–46 cm, odd-pinnate; rachis densely yellow pubescent; leaflets 7–15, opposite to subopposite; petiolules 4–6 mm, densely pubescent; leaflet blades oblong but apical one obovate-oblong, 9–16 × 3–6 cm, papery, abaxially densely pubescent along veins, adaxially only on midvein, secondary veins 10–14 on each side of midvein, base oblique, apex acuminate to shortly acuminate. Thyrses on older branches and sometimes axillary, solitary or 2- or 3(–10)-conglomerate, 5–9 cm, rachis densely pubescent. Flowers yellowish, 8–10 mm. Pedicel 2–4 mm, densely pubescent. Calyx cup-shaped, 3–4 mm, 4-lobed; lobes triangular, outside sparsely pubescent, inside glabrous. Petals 4. Staminal tube 6–8 × ca. 2 mm, both surfaces sparsely pubescent, margin 8-lobed, each lobe tip 2-cleft as 2 teeth; anthers 8, slightly included within tube. Disk tubular to urceolate, ca. 2 mm high, glabrous, apex undulate. Ovary included in disk, densely covered with thick trichomes, 4-locular; style ca. 8 mm, sparsely villous; stigma peltate. Capsule yellowish green, ellipsoid to obovoid, 4–6 × 2.5–4 cm; pericarp densely covered with pulverulent yellow trichomes. Seeds bright red, with a salmon-colored aril. Fl. Apr and Sep, fr. Apr–May and Oct–Nov.

Seasonal rain forests in ravines; 500–800 m. S Yunnan (Jinghong, Mengla) [Indonesia, Malaysia, S Myanmar, Thailand].

**10. *Dysoxylum cumingianum*** C. Candolle, Monogr. Phan. 1: 497. 1878.

肯氏欐木 *ken shi jian mu*

Trees, medium sized. Young branches densely covered with thick trichomes, glabrescent. Leaves in spirals, ca. 30 cm, odd-pinnate; leaflets 7–9, opposite or alternate; leaflet blades elliptic to ovate-elliptic, (5–)12–16 × (3–)5–6 cm, membranous, yellowish gray when dry, abaxially densely puberulent along midvein and secondary veins, adaxially glabrous, secondary veins 12–14 on each side of midvein and abaxially ± prominent, base oblique and cuneate to sometimes rounded, apex obtuse to acute. Thyrses linear, ± as long as petioles, ca. 8 cm, densely covered with yellow thick trichomes, borne on older branches and sometimes also axillary. Calyx kettlelike, ca. 2.5 mm, membranous, outside with dense thick trichomes, 4-lobed. Petals 4, linear to elongate-elliptic, ca. 1.5 cm, membranous, apex covered with yellow small trichomes. Staminal tube glabrous; anthers 8, narrowly ellipsoid. Disk cylindrical, outside glabrous, inside covered with trichomes. Ovary 4-locular, densely yellow villous, with 1 ovule per locule; style ± as long as filament tube, middle part pilose. Capsule globose, 2–2.5 cm in diam., subglabrous, valvate with 4 or 5 segments.

Near sea level to 400 m. Taiwan (Lan Yu) [Indonesia, Malaysia, Philippines].

**11. *Dysoxylum parasiticum*** (Osbeck) Kostermans, Reinwardtia 7: 247. 1966.

大花欐木 *da hua jian mu*

*Melia parasitica* Osbeck, Dagb. Ostind. Resa 278. 1757;  
*Dysoxylum leytense* Merrill.

Trees to 27(–32) m tall. Branchlets pubescent, glabrescent. Leaves 15–150 cm; rachis glabrous; leaflets 6 or 7 pairs, opposite to subopposite; petiolules 1–3 mm; leaflet blades oblong-elliptic, 11–15 × 3–5 cm, papery, abaxially densely puberulent along midvein and secondary veins, adaxially glabrous, secondary veins 14 on each side of midvein, base ± oblique, apex shortly acuminate. Inflorescences caespitose, arising from old branches or trunk, extremely short, sometimes racemelike; peduncle often less than 1 cm. Pedicel 7–8 mm. Calyx goblet-shaped, ca. 1 cm, densely covered with very small spots, glabrous, 4-lobed; lobes broadly ovate, 2–5 mm, irregular, apex obtuse. Petals 4, oblong, ca. 2.5 cm × 3–4 mm, apex thickened and densely pubescent. Staminal tube free from petals, ca. 2 cm × 3.5–4 mm, outside glabrous, inside ± villous, apical margin 8-lobed; anthers 8, sessile, alternating with lobes. Disk ca. 3 mm high, truncate, glabrous. Ovary villous; style base villous. Fruit nearly globose when mature, 4–6 cm in diam.

Taiwan (Lan Yu) [Indonesia, Malaysia, Papua New Guinea, Philippines; NE Australia, Pacific islands (Solomon Islands)].

#### Insufficiently known species

The following two species are known only from inadequate material and need re-collecting to ascertain their identity.

***Dysoxylum laxiracemosum*** C. Y. Wu & H. Li in H. Li, Fl. Yunnan. 1: 246. 1977.

总序欐木 *zong xu jian mu*

Trees 10–12 m tall, to 35 cm d.b.h. Young branches brown when dry, with many longitudinal stripes, glabrous. Petiole and rachis 17–44 cm, glabrous; leaflets 9–13, alternate; petiolules 1–1.5 cm, glabrous; leaflet blades elliptic to oblong, (9–)18–22 × 5–8.5 cm, thickly papery, both surfaces glabrous, secondary veins 13 or 14 on each side of midvein, abaxially prominent and adaxially flat, base rounded to broadly cuneate, apex acuminate. Inflorescences axillary, racemose, ca. 30 cm, glabrous, branches sparse and 1–2 cm from base to apex, basal branches with 6 or 7 flowers but fewer on apical branches, only flowers on apical part of panicle developing into fruits. Flowers with 1 conical bracteole. Pedicel 2–3 mm, pubescent. Calyx shallowly cup-shaped, pubescent, 5-lobed, lobes broadly triangular. Corolla not seen. Mature infructescences ca. 34 cm. Fruit reddish yellow, oblate, ca. 3.5 × 4 cm, with sparse long appressed filamentous yellow trichomes when young but glabrescent at maturity. Seeds 2–4, with a red aril. Fl. Feb–Mar, fr. May.

• Dense ravine rain forests; 600–900 m. S Yunnan (Xishuangbanna).

***Dysoxylum medogense*** C. Y. Wu & H. Li, Acta Phytotax. Sin. 18: 111. 1980.

墨脱欐木 *mo tuo jian mu*

Trees to 30 m tall. Young branchlets brown; old branches ± shiny, with fawn-colored lenticels. Petiole and rachis 10–20 cm, puberulent; leaflets 5–9, opposite to subopposite; leaflet blades elliptic, ca. 5 × 2.5 cm for basal ones and ca. 15 × 5 cm for apical ones, papery, abaxially sparsely pubescent but midvein densely yellow pubescent, adaxially densely yellowish pubescent on midvein, secondary veins 8–15 on each side of midvein, base rounded to broadly cuneate, apex acute to caudate-acuminate. Flowers not seen. Infructescences axillary, racemose, 4–30 cm. Young fruit with hazel pubescence; fruit nearly globose, 2–2.5 × 3–3.5 cm, glabrous, 5-locular, with channels between locules, loculicidal, carpodium 1–2 cm, calyx persistent, crenate. Seeds 1 per locule, with red aril.

• Broad-leaved forests, forest margins; 800–900 m. SE Xizang (Médog).

#### 15. CHISOCHETON Blume, Bijdr. 168. 1825.

溪杪属 *xi suo shu*

Peng Hua (彭华); David J. Mabberley

Trees, dioecious or polygamo-dioecious. Leaves in spirals, large, pinnate, usually pseudogemmate; leaflets opposite to sub-

opposite; leaflet blades with margin entire. Inflorescences generally axillary thyrses or spikes. Flowers 4–6-merous, narrow and extended. Calyx cup-shaped or tubular, margin entire or ± dentate. Petals 4–6, distinct, linear-oblong, imbricate to valvate in bud. Staminal tube slightly shorter than petals, margin lobed or entire; anthers alternating with filament tube lobes, oblong, usually locellate. Disk usually absent, sometimes annular or shallowly cup-shaped, surrounding ovary. Ovary 2–4-locular, outside covered with thick trichomes, with 1 ovule per locule; style linear, much longer than ovary; stigma capitate. Capsule 2–4-locular, leathery, with 2–4 irregular valves. Seeds 1 or 2 per valve, thick, scutelliform to orange-segment-shaped.

About 53 species: tropical Asia and W Pacific; one species in China.

**1. *Chisocheton cumingianus*** (C. Candolle) Harms subsp. ***balansae*** (C. Candolle) Mabberley, *Taxon* 26: 528. 1977.

溪桫 xi suo

*Chisocheton balansae* C. Candolle, *Bull. Herb. Boissier* 2: 578. 1894; *C. paniculatus* Hiern, nom. illeg. superfl.; *Dysoxylum multijugum* Arnott (1834), not *C. multijugis* C. Candolle (1910); *Guarea paniculata* Roxburgh (not before 14 Jan 1832), not Buchanan-Hamilton (1 Jan 1832).

Trees to 16 m tall. Young branches and inflorescences covered with brown trichomes. Leaves 30–100 cm or more, even-pinnate; leaflets 10–12 pairs; petiole and rachis covered with appressed trichomes; leaflet blades oblong to oblong-lanceolate, 13–30 × 4–6 cm, papery to leathery, both surfaces glabrous or abaxially appressed pubescent along veins, secondary veins 9–12(–15) on each side of midvein, abaxially conspicuously prominent and adaxially flat, base broadly oblique with one side cuneate and other side cuneate to rounded, apex acuminate. Thyrses axillary, usually as long as or longer than leaves, basally to 20 cm, sparsely branching, spreading, covered with short thick trichomes. Pedicel 3–5 mm, covered with brown tri-

chomes, with nodes below calyx. Calyx tubular, ca. 1.5 mm, outside puberulent or glabrous, truncate or inconspicuously 4-dentate. Petals 4, linear to spatulate, 1.4–1.8 cm × ca. 1.5 mm, narrowing toward base, glabrous except puberulent on apex, apex rounded or mucronate. Staminal tube long cylindrical, outside apically densely puberulent, inside basally sparsely pilose, apical margin 7- or 8-lobed, lobes oblong and glabrous; anthers opposite to filament tube lobes, abaxially puberulent. Disk annular to shallowly cup-shaped, glabrous. Ovary 4-locular, hispid; style slender, basal part densely villous, apically ± sparsely villous; stigma capitate. Capsule salmon-colored when mature, pyriform-globose, brown pubescent when young but glabrescent. Fl. Jun–Jul, fr. Oct.

Dense forests in ravines and on hills. Guangdong, S Guangxi, S Yunnan [Bhutan, India, Laos, Myanmar, Thailand, Vietnam].

*Chisocheton cumingianus* includes three subspecies, with subsp. *balansae* restricted to continental Asia and the other two, subsp. *cumingianus* and subsp. *kinabaluensis* (Merrill) Mabberley, occurring in Indonesia, Malaysia, Papua New Guinea, and Philippines. See D. J. Mabberley (*Taxon* 26: 528. 1977) for a detailed explanation of why the name *C. cumingianus* must be used for this species.

## 16. MELIA Linnaeus, Sp. Pl. 1: 384. 1753.

楝属 lian shu

Peng Hua (彭华); David J. Mabberley

Trees or shrubs, usually deciduous. Young parts usually covered with stellate trichomes. Branchlets with obvious leaf scars and lenticels. Leaves in spirals, 2- or 3-pinnate; leaflets with petiolules; leaflet blades with margin usually dentate or sometimes entire. Thyrses axillary, much branched, consisting of several dichasia. Flowers bisexual. Calyx 5- or 6-parted, imbricate. Petals 5 or 6, white or purple, distinct, linear-spatulate, expanding. Staminal tube cylindrical, with 10–12 ribs, mouth expanding, margin 10–12-lobed; anthers 10–12, inserted between filament tube lobes, included or partly exerted. Disk annular. Ovary subglobose, 3–6-locular, with 2 superposed ovules per locule; stigma capitate, 3–6-lobed. Fruit a drupe, subfleshy; stone bony. Seeds pendulous; exotesta hard chitinous; endosperm fleshy, thin, or absent; cotyledons leaflike, thin; radicle cylindrical.

Three species: S tropical Africa, tropical to temperate Asia; one species in China.

**1. *Melia azedarach*** Linnaeus, Sp. Pl. 1: 384. 1753.

楝 lian

*Melia azedarach* subvar. *intermedia* Makino; *M. azedarach* var. *intermedia* (Makino) Makino; *M. azedarach* var. *subtripinnata* Miquel; *M. azedarach* var. *toosendan* (Siebold & Zuccarini) Makino; *M. japonica* G. Don var. *semperflorens* Makino; *M. toosendan* Siebold & Zuccarini.

Trees to 10 m tall, deciduous. Bark brownish gray, longitudinally exfoliating. Branches spreading; branchlets with leaf scars. Leaves odd-pinnate, 2-pinnate or 3-pinnate, 20–40 cm; leaflets opposite; leaflet blades ovate, elliptic, or lanceolate, 3–7 × 2–3 cm but terminal one usually slightly larger, both surfaces

with stellate trichomes when young but glabrescent, secondary veins 12–16 on each side of midvein, outspread and ascending, base ± oblique and cuneate to broadly cuneate, margin crenate or sometimes entire, apex shortly acuminate. Thyrses ± ca. 1/2 as long as leaves, glabrous or covered with short lepidote pubescence. Flowers fragrant. Calyx 5-parted; sepals ovate to oblong-ovate, outside puberulent, apex acute. Petals lilac-colored, obovate-spatulate, 0.9–1.3 cm, both surfaces puberulent but usually outside more densely so. Staminal tube purple, 7–8 mm, with longitudinal stripes, glabrous or subglabrous, apical margin with 10 narrow lobes; lobes conic, further 2- or 3-lobed; anthers 10, inserted on inner side of lobes and alternate to lobes, narrowly elliptic, apex slightly mucronulate. Ovary spherical, glabrous, 5–8-locular, with 2 ovules per locule; style acerose; stigma

capitate, not included within filament tube, apex 5-dentate. Drupe globose to ellipsoid, 1–3 × 0.8–1.5 cm; endocarp ligneous. Seed ellipsoid. Fl. Mar–May, fr. Oct–Dec.

Mixed evergreen broad-leaved and deciduous forests, sparse forests, field margins, roadsides; 500–2100 m. Anhui, Fujian, S Gansu, Guangdong, Guangxi, Guizhou, Hainan, S Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, Shandong, S Shanxi, Sichuan, Taiwan, Yunnan, SE Xizang, Zhejiang [Bhutan, India, Indonesia, Laos, Nepal,

Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; tropical Australia, Pacific islands (Solomon Islands)].

This species is cultivated and sometimes naturalized in many warm-temperate and tropical parts of the world. Because of its extensive cultivation and tendency to become naturalized in disturbed habitats, its original wild distribution is uncertain.

It is used medicinally, for industrial oil material, and for timber.

## 17. XYLOCARPUS J. Koenig, Naturforscher (Halle) 20: 2. 1784.

木果楝属 mu guo lian shu

Peng Hua (彭华); David J. Mabberley

Trees or shrubs, semievergreen. Leaves in spirals, even-pinnate; leaflets [2–]4[–8] pairs; leaflet blades with margin entire. Thyrses axillary, consisting of sparse cymes. Flowers appearing bisexual. Calyx short, 4-lobed; lobes oblong, contorted in bud. Staminal tube kettlelike, apically narrowed, apex 8-lobed; anthers 8, sessile, inserted between and alternating with lobes, oblong, included. Disk thick, hemispheric, fleshy, adnate with ovary base. Ovary small, globose, 4-locular, with 3 or 4 superposed ovules per locule; style cylindrical; stigma disciform. Capsule globose; pericarp fleshy, dehiscent into 4 segments. Seeds 5–20, large and thick, irregularly tetrahedral to pyramidal; sarcotesta spongy; endosperm absent; cotyledons thick.

Three species: tropical E Africa, tropical Asia, W Pacific islands; one species in China.

1. *Xylocarpus granatum* J. Koenig, Naturforscher (Halle) 20: 2. 1784.

木果楝 mu guo lian

*Carapa obovata* Blume.

Trees or shrubs, to 5 m tall. Branches gray, smooth, glabrous. Leaves ca. 15 cm; petiole and rachis cylindrical, glabrous; petiole 3–5 cm; leaflets usually 4, opposite; petiolules ca. 4 mm, base inflated; leaflet blades elliptic to obovate-oblong, 4–9 × 2.5–5 cm, subleathery, both surfaces glabrous and usually pale, secondary veins 8–10 on each side of midvein, ascending, anastomosing near margin, reticulate veins sparse and ± obvious, base cuneate to broadly cuneate, margin entire, apex

rounded. Cymes consisting of 1–3 flowers, many cymes forming thyrses, glabrous. Pedicel 1 cm or more. Calyx lobes rounded. Petals white, obovate-oblong, ca. 6 mm, leathery. Staminal tube lobes suborbicular and weakly 2-cleft; anthers ellipsoid, glabrous, base cordate. Disk ± as high as ovary, base contracting, apex fleshy, striate. Style subquadrilateral, glabrous; stigma ± as long as staminal tube. Capsule 10–12 cm in diam., stipitate, with 8–12 seeds. Fl. and fr. Apr–Nov.

Mangrove forests. Hainan [India, Indonesia, Malaysia, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam; E Africa, W Pacific islands].

The bark contains ca. 30% tannin. The red, hard wood is used as timber.