

## 8. GARCINIA Linnaeus, Sp. Pl. 1: 443. 1753.

藤黄属 teng huang shu

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*Brindonia* Thouars; *Cambogia* Linnaeus; *Discostigma* Hasskarl; *Hebradendron* Graham; *Mangostana* Gaertner; *Oxycarpus* Loureiro; *Rhinostigma* Miquel; *Xanthochymus* Roxburgh.

Trees or shrubs, usually with yellow latex. Terminal bud functional; buds usually lacking scales. Leaves opposite [or rarely whorled], very rarely stipulate, petiolate, entire, leathery to papery, usually glabrous; secondary veins usually prominent, numerous to few, oblique to perpendicular to midvein; tertiary veins reticulate, with adaxial brownish transvenous resin canals [or much branched] and abaxial linear [to punctiform or much branched] or intervenous translucent glands; petiole often with basal liguliform appendage. Plant functionally dioecious (sometimes apparently flowers bisexual or plant monoecious), flowers in terminal and/or axillary cymes (often thyrsoform), triads or fascicles, or paired or solitary. Sepals [2 or 3 or]4 or 5, decussate or imbricate (quincuncial), free [or very rarely completely connate in bud]. Petals [3 or]4 or 5[–8], fascicles each with many to few stamens with filaments almost free to completely united, or ± completely connate [or adnate to petals], with anthers 1, 2, 4 or many-celled, basifixed or variously united; fascicloides (sterile stamen fascicles) 4 or 5, antisealous and free or ± united or absent; pistillode present or absent. Female flowers: staminode fascicles as for staminate flowers but smaller or staminodes apparently free; fascicloides free as in male flower but smaller or united in a ring at base of ovary or absent; stigmas free or ± united, peltate, 2–5-lobed or entire. Berry smooth or sulcate [or verrucose or rarely secondarily dehiscent], with leathery to thin exocarp and 1–5 or sometimes more seeds embedded in endocarpic pulp. Seeds large; hypocotyl massive.

About 450 species: tropical and S Africa, Madagascar, tropical Asia, NE Australia, W Polynesia, tropical America; 20 species (13 endemic, one introduced) in China.

The present authors were unable to place *Garcinia qinzhouensis* Y. X. Liang & Z. M. Wu (J. S. China Agric. Univ. 17(3): 56. 1996), described from Guangxi (Qinzhou), because of insufficient information.

The fruit of most species in this genus are edible, among them, those of *Garcinia mangostana* are famous. The seeds yield more than 15% oil. The yellow resin of some species is used as a medicine. Species like *G. hanburyi* J. D. Hooker provide medicinal resin and yellow dyes of the best quality. The timber of many species is used for building houses or making furniture.

- 1a. Sepals and petals 5; stamen fascicles and fascicloides 5, free.
  - 2a. Flowers [female only known] in corymbiform cymes or fascicles in axils of fallen leaves; sepals 3 large, 2 small; berry (obliquely) globose or ovoid, apex apiculate ..... 1. *G. xanthochymus*
  - 2b. Flowers solitary or fascicled in axils of fallen leaves, or male pseudospicate; sepals 2 large, 3 small; berry broadly cylindric, apex rounded ..... 2. *G. subelliptica*
- 1b. Sepals and petals 4; stamen fascicles and fascicloides 4, free or ± united, or absent.
  - 3a. Stigma in female flower and fruit (if persistent) smooth.
    - 4a. Inflorescence of male flowers a thyrsoform cyme or, if flowers solitary, then terminal.
      - 5a. Flowers 2–3 cm in diam.; sepals 2 large, 2 small; ovary 2-loculed; female flowers 1–5 ..... 3. *G. multiflora*
      - 5b. Flowers 0.8–1 cm in diam.; sepals equal; ovary 4-loculed; female flowers in thyrsoform cyme ..... 4. *G. yunnanensis*
    - 4b. Inflorescence of male flowers a simple cyme or flowers fascicled or, if solitary, then axillary.
      - 6a. Stamen fascicles united in a ring or unlobed mass; ovary 1-loculed.
        - 7a. Peduncle with 2 foliar bracts at apex; stigma irregularly lobed; stipules absent ..... 8. *G. bracteata*
        - 7b. Peduncle without foliar bracts at apex; stigma entire; stipules present ..... 9. *G. paucinervis*
      - 6b. Stamen fascicles 4 or forming a 4-lobed mass; ovary (where known) 1–10-loculed.
        - 8a. Inflorescence terminal; flowers 1.2–1.5 cm in diam.; mature fruit 3–8 cm ..... 7. *G. mangostana*
        - 8b. Inflorescence axillary; flowers 2–4 mm in diam. or, if larger (ca. 2.3 cm), then mature fruit 2–3 cm.
          - 9a. Flowers in 6–8 or more-flowered cymes; stipules present ..... 11. *G. nujiangensis*
          - 9b. Flowers solitary or paired; stipules absent.
            - 10a. Flowers ca. 4 mm in diam.; mature fruit 1–1.5 cm; branchlets slender, pendulous ..... 19. *G. lancilimba*
            - 10b. Flowers 2.2–2.4 cm in diam.; mature fruit 2–3 cm; branchlets robust ..... 20. *G. linii*
    - 3b. Stigma in female flower and fruit (if persistent) papillose or tuberculate.
      - 11a. Sepal pairs equal.
        - 12a. Sepals and pedicel purple-red ..... 14. *G. erythrosepala*
        - 12b. Sepals and pedicel greenish.
          - 13a. Fruit oblate, both ends concave, 10–18 × 11–20 cm; fruiting pedicel 5–6 cm ..... 5. *G. pedunculata*
          - 13b. Fruit globose or ovoid, less than 5 cm in diam.; fruiting pedicel shorter.

- 14a. Fruit ovoid, oblique, 4–5 cm in diam., 4–8-sulcate, usually apiculate; fruiting pedicel short ..... 12. *G. cowa*
- 14b. Fruit globose or ovoid, less than 3.5 cm in diam., not sulcate, not apiculate; fruiting pedicel short or subsessile.
  - 15a. Fruit globose, 2–2.5 cm in diam.; stigma 4-lobed; fruiting pedicel nearly sessile ..... 18. *G. tetralata*
  - 15b. Fruit ovoid or globose, 2–3.5 cm in diam.; stigma peltate, convex radiately 8–10-lobed; fruiting pedicel 3–7 mm ..... 13. *G. oblongifolia*
- 11b. Sepal pairs unequal.
  - 16a. Fruit orange, 6–8 × 5–9 cm, 6–8(–11)-sulcate; stigma persistent, entire, papillate; petals of male flowers 3 large and equal, inner one smallest ..... 17. *G. esculenta*
  - 16b. Fruit small, exsulcate.
    - 17a. Secondary veins of leaf 30–45 pairs, tertiary veins inconspicuous; twigs reddish brown ..... 10. *G. kwangsiensis*
    - 17b. Secondary veins of leaf less than 16 pairs, tertiary veins ± conspicuous; twigs greenish.
      - 18a. Secondary veins of leaf obscure but ± visible, to 5 pairs; fruit fusiform or narrowly ellipsoid, 1.5–1.8 cm ..... 15. *G. oligantha*
      - 18b. Secondary veins of leaf conspicuous, 7–13 pairs; fruit globose, 2–5 cm in diam.
        - 19a. Leaf blade apically long acuminate, usually falcate; stigma radiately lobed, papillate; fruit globose, ca. 3 cm in diam.; pedicel not articulate ..... 16. *G. subfalcata*
        - 19b. Leaf blade apically acute or acuminate, not falcate; stigma thick, subpapillate; fruit globose, 4–5 cm in diam.; pedicel distinctly articulate ..... 6. *G. xishuanbannaensis*

**1. *Garcinia xanthochymus*** J. D. Hooker ex T. Anderson in J. D. Hooker, Fl. Brit. India 1: 269. 1874.

大叶藤黄 da ye teng huang

*Garcinia pictoria* (Roxburgh) Engler (1925), not Buchanan-Hamilton (1826); *G. tinctoria* W. Wight (1909); *G. tinctoria* (Candolle) Dunn (1915); *Xanthochymus pictorius* Roxburgh; *X. tinctorius* Candolle.

Trees 8–10 m tall, 15–45 cm in diam. Bark gray-brown. Branches numerous, slender, decussate, horizontal but usually ± distally pendulous, twigs distinctly angled. Petiole robust, V-shaped and somewhat clasping at base, 1.5–2.5 cm, angled and transversely wrinkled when dry, those of terminal 1 or 2 pairs on branchlet usually rose-colored; leaf blade shiny, elliptic or oblong to oblong-lanceolate, (14–)20–34 × (4–)6–12 cm, thickly leathery, midvein robust, raised on both surfaces; veins dense, to 35–40 pairs, near margin arching and anastomosing; tertiary veins and veinlets conspicuous, base ± broadly cuneate, margin involute, apex acute to obtuse, rarely acuminate. Corymbose cyme (2–)5–10(–14)-flowered, arising from leafless axils; peduncle 6–12 mm. Pedicels 1.8–3 cm. Flowers 5-merous, only female observed. Sepals and petals 3 large and 2 small, apparently ciliate. Staminode fascicles 5, ca. 3 mm, complanate, united below, upper parts free, each fascicle with 2–5 staminodes; fascicloides 5, square, ca. 1 mm, strongly rugose. Ovary globose, usually 5-loculed; style short, ca. 1 mm; stigma peltate, apex concave, (3–)5-cleft. Mature berry yellow, globose or ovoid, sometimes oblique, 3–5 cm in diam., smooth or sometimes with orbicular lenticels, apiculate, sepals and staminal bundles usually persistent. Seeds 1–4, oblong or ovoid; testa brown, smooth. Fl. Mar–May, fr. Aug–Nov.  $2n = 72, 80, 96$ .

Dense humid forests of valleys or on hills; (100–)600–1000(–1400) m. Guangdong (cultivated), SW Guangxi, S, SW, and W Yunnan [Bangladesh, Bhutan, Cambodia, India, Japan (introduced and cultivated), Laos, Myanmar, Nepal, Thailand, Vietnam].

The fruit is edible but is rather sour. The seeds yield up to 17% oil.

Some scholars have reduced *Garcinia pictoria* Buchanan-Hamilton (Mem. Wern. Nat. Hist. Soc. 5: 346. 1826) to this species; however, *G. pictoria* Buchanan-Hamilton has 4-merous, solitary, sessile flowers, 4-cleft stigmas, and 4-angled fruit, so it is regarded as distinct.

**2. *Garcinia subelliptica*** Merrill, Philipp. J. Sci. 3: 361. 1909.

菲岛福木 fei dao fu mu

Trees to 2 m tall or more. Twigs rigid, robust, 4–6-angled. Petiole 0.6–1.5 cm, robust; leaf blade abaxially yellow-green, adaxially dark green and shiny, ovate, ovate-oblong, or elliptic, rarely orbicular or lanceolate, 7–14(–20) × 3–6(–7) cm, thickly leathery, midvein raised abaxially; secondary veins 12–18 pairs, slender, slightly arching, raised on both surfaces, joining at leaf margin, tertiary veins and veinlets conspicuous, base broadly cuneate or subrounded, margin involute, apex obtuse, rounded, or emarginate. Plant monoecious; flowers 5-merous, male and female flowers usually mixed together, clustered or solitary in leafless axil, sometimes female flowers in cluster but male ones arranged in a pseudospike ca. 1 cm. Male flowers: sepals sub-orbicular, leathery, densely ciliate at margin, inner 2 large, outer 3 small; petals yellow, obovate, ca. 2 × as long as sepals or more; stamens 5 fascicle bundles, each with 6–10 stamens; stalk ca. 2 mm; anthers 2-celled; fascicloides 5, glandlike, rugose; pistillode absent. Female flowers: pedicels usually long; staminode fascicles 5; fascicloides 5, free, irregularly erose on upper half; ovary globose, 3–5-loculed; stigma peltate, 5-cleft, smooth. Mature berry yellow, broadly oblong, smooth; seeds 1–3(or 4).

Coastal broad-leaved forests. Taiwan (Gaoxiong, Huoshao Dao, cultivated in Taibei) [Indonesia (Java), Japan (Ryukyu Islands), Philippines, Sri Lanka].

This species is characteristically a coastal tree.

**3. *Garcinia multiflora*** Champion ex Benth, Hooker's J. Bot. Kew Gard. Misc. 3: 310. 1851.

木竹子 mu zhu zi

*Garcinia hainanensis* Merrill.

Trees, rarely shrubs, (3–)5–15 m tall, 20–40 cm in diam. Bark gray, scabrid. Twigs gray, angled. Petiole 0.6–1.2 cm; leaf blade abaxially glaucous-green or brown when dry, ovate, oblong-ovate, or oblong-obovate, 7–16(–20) × 3–6 cm, thinly leathery, midvein raised abaxially, impressed adaxially; secondary veins 10–15 pairs, slender, joining near leaf margin; tertiary veins and veinlets inconspicuous adaxially, base cuneate or broadly cuneate, margin somewhat recurved, apex acute, acuminate, or obtuse. Plant monoecious. Male flowers sometimes solitary, sometimes in a thyrse 5–7 cm, 2–3 cm in diam.; pedicels 0.8–1.5 cm; sepals 2 large, 2 small; petals orange, obovate, 1–5 × as long as sepals; stamen fascicles stalk 2–3 mm, each fascicle with 50 anthers; anthers aggregated into a head, 2-celled, cells longitudinally dehiscent; pistillode columnar; stigma distinctly peltate, 4-lobed. Female flowers 1–5; staminode fascicles short, stalk ca. 1.5 mm, shorter than pistil; ovary oblong, wider in upper half, 2-loculed; stigma sessile, peltate, large, thick. Mature fruit yellow, ovoid to obovoid, 3–5 × 2.5–3 cm, smooth. Seeds 1 or 2, oblong, 2–2.5 cm. Fl. Jun–Aug, fr. Nov–Dec, flowers and fruit appear occasionally at same time.

Open or dense forests on mountain slopes, valley margins, secondary forests, thickets; (100–)400–1200(–1900) m. Fujian, Guangdong, Guangxi, S Guizhou, Hainan, SW Hunan, Jiangxi, Taiwan, Yunnan [N Vietnam].

This is a widely adaptable species growing in various habitats and at various elevations.

The seeds yield up to 50% oil (seed pulp up to 55% oil). The oil is used for manufacturing soap or as a lubricant for machines. The bark is used as an external medicine to reduce inflammation. The timber is hard, and is used for making furniture, boats, and woodcuts.

**4. *Garcinia yunnanensis*** H. H. Hu, Bull. Fan Mem. Inst. Biol., Bot. 10: 131. 1940.

云南藤黄 yun nan teng huang

Trees to 20 m tall, to 30 cm in diam. Branches robust, with small, hollow pith; twigs sometimes robust, lenticellate, gray-brown, irregularly striate, with short internodes. Petiole 1–2 cm; leaf blade oblanceolate, obovate, or oblong, (5–)9–16 × 2–5 cm, papery, midvein raised abaxially, impressed adaxially; secondary veins many, dense, 30–36 pairs, oblique, joining at leaf margin; tertiary veins and veinlets slender, conspicuous on both surfaces, base cuneate-decurrent, margin somewhat recurved, apex obtusely acuminate, apiculate, or rounded, sometimes strongly emarginate. Plant dioecious. Male flowers 0.8–1 cm in diam., in a terminal or axillary thyrse; thyrse 8–10 cm, pedunculate; peduncle conspicuously articulate, sometimes 2-foliolate at base; pedicels robust, 3–5 mm, 2-bracteolate at base; bracteoles opposite, subulate; sepal ca. 2.5 mm; petals yellow, ca. as long as or slightly longer than sepal; stamens united into 4 bundles; bundle stalk robust, somewhat complanate, broader on lower part, ca. 3 mm, each with 60–70 anthers aggregated into a head, 2-celled, cells longitudinally dehiscent;

pistillode semiglobose, slightly angular. Female flowers in a paniculiform thyrse; thyrse axillary, ca. 10 cm; staminode bundles 4, each with 15–20 antherodes, sometimes among them a few fertile, shorter than pistil; bundle stalk 1.5–2 mm; ovary turbinate, 4-loculed; stigma sessile, peltate, 4-lobed, 2.5–3 mm. Young fruit ellipsoid, smooth. Fl. Apr–May, fr. Jun–Aug.

• Mixed forests on mountain slopes or hills; 1300–1600 m. SW Yunnan.

The fruit is slightly sour. The yellowish timber is used for house construction.

This species is close to *Garcinia multiflora* Champion ex Benth but easily distinguished from it by its oblanceolate leaves, smaller flowers, non-columnar pistillode, and 4-loculed ovary. A few stamens in the carpellate flower may be fertile. The mature fruit is unknown.

The specimens cited by Hu in the protologue of *Garcinia yunnanensis*, except for the type and one other (*C. W. Wang* 73277, male, and *C. W. Wang* 73278, female), all are *G. cova* Roxburgh.

**5. *Garcinia pedunculata*** Roxburgh ex Buchanan-Hamilton, Edinburgh J. Sci. 7: 45. 1827.

大果藤黄 da guo teng huang

Trees ca. 20 m tall. Bark thick, corky; branchlets obtusely 4-angled or subterete, striate, lenticellate, glabrous. Petiole 2–2.5 cm; leaf blade oblong, obovate, or oblong-lanceolate, (12–)15–25(–28) × 7–12 cm, papery, midvein robust, raised abaxially, somewhat impressed adaxially; secondary veins regular, oblique, 9–14 pairs, near margin arching and joining together; tertiary veins nearly parallel, almost inconspicuous, base cuneate, margin conspicuously narrowly involute, apex usually rounded, rarely obtusely acuminate. Plant dioecious, flowers 4-merous. Male flowers 8–12 in an erect 8–15 cm paniculiform cyme; peduncle 3–6 cm; pedicels robust, 3–7 cm; sepals broadly ovate or suborbicular, thick, fleshy, margin membranous; petals yellow, oblong-lanceolate, 7–8 mm; stamen fascicles connate in capitate ring ca. 3 mm high, anthers sessile, or a few near pistillode with short filaments, anthers 2-celled, cells longitudinally dehiscent; pistillode columnar-cuneate, slightly angular; stigma peltate, inconspicuously tuberculate. Female flowers usually in pairs or solitary at apex of branchlet; pedicels robust, slightly tetragonal, with 2 suborbicular bracts at base; staminodes basally united, surrounding ovary, 80–100, upper parts free; ovary subglobose, 8–10-loculed; stigma radiate, 8–10-lobed, papillate. Fruit yellow, large, oblate, concave on both ends when mature, 10–18 × 11–20 cm, smooth; fruiting pedicel 5–6 cm. Seeds 8–10, reniform. Fl. Aug–Dec, fr. Dec–Jan.

Humid dense forests on hills; 200–400(–1500) m. SE Xizang (Médog), W Yunnan (Ruili, Yingjiang) [N Bangladesh (sometimes cultivated), NE India (Assam)].

The fruit is edible.

This species is characterized by its long, robust peduncle and pedicel, large fruit, and by the plant exuding barely any yellow resin wherever cut. The Chinese plant (*G. D. Tao* 17879, *Expedition for Drugs* 6862) has 90–100 staminodes in the female flower. It is somewhat different from the descriptions of Anderson (in Hooker, Fl. Brit. India 1: 264. 1874) and Pierre (Fl. Forest. Cochinch. 1: xxiv, t. 79,

M. 1883). We think it may be a local variant.

**6. *Garcinia xishuanbannaensis*** Y. H. Li, Res. Bull. Trop. Pl. 15: 16. 1980 [*“xipshuanbannaensis”*].

版纳藤黄 ban na teng huang

Trees 6–15 m tall. Branches brown, striate, with hollow pith; branchlets initially green, subterete, striate, glabrous. Petiole 1.2–2.2 cm; leaf blade abaxially greenish, elliptic, elliptic-lanceolate, or ovate-lanceolate, 13–18 × 4–8 cm, papery, midvein raised on both surfaces; secondary veins 8–12 pairs, near margin arching and anastomosing; tertiary veins and veinlets many, inconspicuous, base cuneate and slightly decurrent, margin slightly involute, apex acuminate or acute. Plant monoecious, flowers arranged in a lax paniculiform cyme; cyme to 8 cm, usually terminal, rarely axillary, sometimes with a 2-flowered ca. 2.5 cm long cymule at base. Pedicel 0.8–1.2 cm, like peduncle distinctly articulate. Flowers orange-yellow, ca. 1 cm in diam. when open; sepals: outer 2 shorter, triangular-ovate, inner 2 longer, suborbicular; petals nearly equal, fleshy, broadly ovate, longer than sepals. Male flowers: stamens many, not fascicled; filaments united in basal cup enveloping ovary, robust, ca. as long as or longer than anthers; anthers oblate, 2-celled, cells longitudinally dehiscent; pistillode not inflated, stigma depressed, 2–3 mm high, smooth. Female flowers: ovary 10–12-loculed; stigma thick, subpapillate. Infructescence 5–7 cm, usually with 1 or 2 fruit. Mature fruit yellow, globose, 4–5 cm in diam., smooth. Seeds 2–4, nearly ovoid, 2–2.5 cm, smooth. Fl. Jan–Feb, fr. Apr–May.

- Dense valley forests; ca. 600 m. S Yunnan (Mengla).

This species is similar in habit to *Garcinia gummi-gutta* (Linnaeus) N. Robson (*G. cambogia* Desrousseaux) but differs in having many stamens, a pistillode with a subentire, smooth stigma, and a smooth fruit.

**7. *Garcinia mangostana*** Linnaeus, Sp. Pl. 1: 443. 1753.

莽吉柿 mang ji shi

*Mangostana garcinia* Gaertner.

Trees small, 12–20 m tall. Branches many, dense, decussate; twigs distinctly angled. Petiole robust, ca. 2 cm, densely and transversely wrinkled when dry; leaf blade shiny, elliptic or elliptic-oblong, 14–25 × 5–10 cm, thickly leathery, midvein raised on both surfaces; secondary veins dense, to 40–50 pairs, joining just within leaf margin, base broadly cuneate or subrounded, margin involute, apex shortly acuminate. Plant dioecious. Male flowers rare, 2–9, clustered at apex of branchlet; pedicels short; stamen fascicles 4, anthers 2-celled, cells longitudinally dehiscent; pistillode conic. Female flowers solitary or paired at apex of branchlet, slightly larger than male ones, 4.5–5 cm in diam.; pedicels ca. 1.2 cm; ovary 5–8-loculed; style nearly absent; stigma 5- or 6-lobed. Mature fruit purple-red, sometimes yellow-brown spotted, globose, 5–8 cm in diam., smooth. Seeds 4 or 5 or more, pulp white, juicy, fleshy. Fl. Sep–Oct, fr. Nov–Dec.  $2n = 96$ .

Cultivated. Fujian, Guangdong, Hainan, Taiwan, Yunnan [native to Indonesia (Maluku)]; widely cultivated in tropical regions of Africa and Asia].

This is a well-known fruit tree (mangosteen).

**8. *Garcinia bracteata*** C. Y. Wu ex Y. H. Li, Acta Phytotax. Sin. 19: 490. 1981.

大苞藤黄 da bao teng huang

Trees ca. 8 m tall. Branchlets greenish, robust, striate, glabrous. Petiole robust, 1–1.5 cm; leaf blade abaxially greenish, ovate, ovate-elliptic, or oblong, 8–14(–18) × 4–8 cm, leathery, midvein raised abaxially, impressed adaxially; secondary veins conspicuous, dense, 20–30 pairs, near margin anastomosing; tertiary veins few and inconspicuous, base broadly cuneate or subrounded, margin cartilaginous, involute, apex acuminate or shortly acuminate, rarely obtuse. Plant dioecious, flowers in 2–7-flowered umbels; umbels usually axillary but male ones occasionally terminal; peduncles (1–)2–3 cm, with a distal pair of foliar bracts; foliar bracts ovate, large or small, leathery; pedicels 0.6–1.3 cm, 4-bracteolate at base; bracteoles broadly ovate or ovate, ca. 1.5 mm; sepals and petals gradually deflexed after anthesis. Male flowers with staminodes; fertile stamens ca. 40; filaments fleshy, connate into a cup and enveloping pistillode; anthers free, 4-celled, cells longitudinally dehiscent. Female flowers: staminodes ca. 20; filaments membranous, connate into a disk, enveloping ovary base; ovary cylindrical but dilated at middle, 1-loculed; stigma peltate, smooth, irregularly lobed. Infructescence usually 1-fruited. Fruit ovoid, usually oblique at apex, 2.2–4 cm, to 3 cm in diam. when mature, ± smooth, finely striate, stipitate, wilted tepals persistent. Seed 1. Fl. Apr–May, fr. Nov–Dec.

- Mixed forests on limestone hills; 400–1300(–1800) m. S Guangxi, S and SE Yunnan.

**9. *Garcinia paucinervis*** Chun & F. C. How, Acta Phytotax. Sin. 5: 12. 1956.

金丝李 jin si li

Trees 3–15(–25) m tall. Bark gray-black, white spotted. Young branchlets dark purple, depressed tetragonal, longitudinally sulcate when dry. Stipules 2, ca. 1 mm; petiole 0.8–1.5 cm; leaf blade purple-red when young, abaxially greenish or glaucous when dry, adaxially dark green, elliptic, elliptic-oblong, or ovate-oblong, 8–14 × 2.5–6.5 cm, membranous when young, becoming subleathery, midvein raised abaxially; secondary veins 5–8 pairs, raised on both surfaces, curved and connected at leaf margin; tertiary veins sinuous, parallel, joined by veinlets, slightly raised on both surfaces, base broadly cuneate, rarely rounded, margin cartilaginous, involute, apex acute or shortly acuminate, with obtuse or rounded acumen. Plant monoecious. Male flowers 4–10, in terminal and axillary short pedunculate cymes; pedicels robust, slightly tetragonal, 3–5 mm, 2-bracteolate at base; sepals 4, nearly equal, suborbicular, ca. 3 mm; petals ovate, ca. 5 mm, margin membranous and subtransparent, apex obtuse; stamen fascicles connate forming a 4-lobed ring of 300–400 stamens; free part of filaments very short; anthers narrowly elliptic, 2-celled, cells longitudinally dehiscent; pistillode subtetragonal; stigma peltate, convex. Female flowers usually solitary and axillary, slightly larger than male ones; staminodes of fascicles 4; fascicle stalks complanate, lamellate, shorter than ovary, each fascicle with 6–

8 rudimentary anthers; ovary globose, ca. 2.5 mm, not angular, 1-loculed; stigma peltate, convex, smooth, entire. Mature fruit ellipsoid or ovoid-ellipsoid, 3.2–3.5 × 2.2–2.5 cm, smooth; sepals persistent. Seeds 2. Fl. Jun–Jul, fr. Nov–Dec.

• Rather dry sparse or dense forests on limestone mountains; 300–800 m. SW and W Guangxi, SE Yunnan (Malipo).

This is a valuable timber species but is vulnerable to extirpation because of its restricted and scattered distribution, overcutting, and poor seed germination and natural reproduction. The wood is hard, heavy, and extremely water-tolerant. It is used for shipbuilding, construction, quality furniture, and in the military industry.

The species is similar to *Garcinia stipulata* T. Anderson but differs in having fewer secondary leaf veins, smaller male flowers, shorter pedicels, and a usually 1-seeded fruit.

**10. *Garcinia kwangsiensis*** Merrill ex F. N. Wei, Acta Phytotax. Sin. 19: 355. 1981.

广西藤黄 *guang xi teng huang*

Trees small, ca. 6 m tall. Twigs reddish brown, slightly angular when dry. Petiole 1–1.5 cm; leaf blade brown when dry, elliptic to elliptic-lanceolate, 8–14 × 2–4 cm, thinly leathery, midvein raised abaxially, impressed adaxially; secondary veins 30–45 pairs, slender, joined at leaf margin, tertiary veins inconspicuous, base cuneate and decurrent, margin involute, apex acuminate or acute. Plant dioecious. Male flowers (1 or) 2–4 clustered in leaf axil, ca. 5 mm in diam.; pedicels 1–2 mm; petals subequal, ovate or obovate, ca. 3 mm; stamen fascicles 4, shorter than pistillode; fascicle stalk short, adnate to petal base and spreading as petal when flower is open, each fascicle with 60–70 anthers, 2-celled, cells longitudinally dehiscent; pistillode with dilated stigma; stigma fungiform, somewhat papillate on top. Female flowers and fruit unknown. Fl. Jun–Jul.

• Mixed forests on mountain slopes; ca. 600 m. S Guangxi.

**11. *Garcinia nujiangensis*** C. Y. Wu & Y. H. Li in Y. H. Li, Acta Phytotax. Sin. 19: 494. 1981.

怒江藤黄 *nu jiang teng huang*

Trees 10–15 m tall, 20–30 cm in diam. Bark gray-brown. Twigs gray-brown or dark brown, longitudinally sulcate, not lenticellate. Stipules 2; petiole 6–12 mm; leaf blade lanceolate, ovate-lanceolate, or oblong-lanceolate, 10–13(–18) × 3–5 cm, papery, midvein raised on both surfaces; secondary veins 12–15 pairs, conspicuously raised abaxially, curved, joined at leaf margin; tertiary veins subparallel, not reticulate, base cuneate, margin narrowly cartilaginous, slightly involute, apex acuminate. Plant dioecious. Male flowers in 6–8- or more flowered cymes; cymes 2 or 3, axillary, very short; peduncles ca. 2 mm, robust; pedicels 1–2 mm; sepals 4, suborbicular, subequal, membranous on margin; outer 2: thicker, fleshy; inner 2: thinner; petals yellowish, obovate, subequal, slightly smaller than sepals; stamen fascicles 4, filaments in each completely united, forming annular mass around pistillode, each fascicle with 50–60 anthers, 2-celled, cells longitudinally dehiscent; pistillode obovoid; stigma peltate, irregularly lobed on margin. Female flowers di- or trichotomous cymes, axillary; peduncle very short, 3–4 mm, with persistent basal bracts; pedicels 1.5–2 cm,

sulcate; filaments of staminodes united into 1 whorl and enveloping pistil; anthers 20–25; ovary 6–8 mm, 1-loculed, dilated at middle; stigma peltate, 4-lobed, not papillate. Mature fruit yellowish, globose, ellipsoid or ovoid, 2.5–3.5 × 1.5–2(–2.5) cm, smooth, 1- or 2-seeded; stigma sometimes oblique. Seeds 1 or 2. Fl. Dec–Feb, fr. Aug–Sep.

• Dense forests on mountain slopes and valleys; (800–)1100–1700 m. SE Xizang (Médog), NW and W Yunnan (Gongshan, Longchuan, Yingjiang).

This species is similar to *Garcinia stipulata* T. Anderson but the latter differs in having fewer, indistinct, incurved reticulate, secondary, and tertiary leaf veins, male flowers in 4–6-flowered cymes, and female flowers solitary or geminate.

**12. *Garcinia cowa*** Roxburgh, Fl. Ind. 2: 622. 1832.

云树 *yun shu*

*Garcinia roxburghii* Wight; *G. wallichii* Choisy; *Oxycarpus gangetica* Buchanan-Hamilton.

Trees 8–12 m tall, 15–20 cm in diam. Bark dark brown. Branches many, borne toward top of trunk, horizontal but usually distally pendulous, slender; twigs dark brown, striate. Petiole 0.8–1.5(–2) cm; leaf blade lanceolate or oblong-lanceolate, 6–14 × 2–5 cm, papery, midvein raised abaxially, impressed adaxially; secondary veins 12–18 pairs, near margin joining together; tertiary veins conspicuous on both surfaces, base cuneate, sometimes slightly decurrent, margin cartilaginous, involute, apex acuminate or long acuminate, rarely acute or obtuse. Plant dioecious. Male flowers 3–8, terminal or axillary, in an umbel; umbel shortly pedunculate or rarely sessile, 4-bracteate at base; bracts subulate; pedicels 4–8 mm, slender; petals yellow, ca. 2 × as long as sepals; stamen fascicles 4, connate, forming a central capitate 4-sided mass of 40–50 anthers; filaments ± absent, at most short, anthers 4-celled, cells longitudinally dehiscent; pistillode absent. Female flowers usually solitary, axillary, larger than male; pedicels robust, 2–3 mm; staminodes united in lower half and enveloping ovary base; filaments long or short, usually shorter than ovary; ovary ovoid, 4–8-loculed; stigma radiately 4–8-lobed, papillate, 6–7 mm high. Mature fruit opaquely yellow-brown, ovoid-globose, oblique, 5–6 × 4–5 cm in diam., 4–8-sulcate, usually apiculate. Seeds 2–4, narrow, fusiform, slightly curved, ca. 2.5 cm, rough. Fl. May, fr. Jul–Oct.  $2n = 52$ .

Humid mixed forests on hills or in valleys; (100–)400–900(–1300) m. S and W Yunnan [E Bangladesh, Cambodia, India, Laos, Malaysia, Vietnam].

The mature fruit is edible. The seeds yield ca. 9% oil.

**13. *Garcinia oblongifolia*** Champion ex Bentham, Hooker's J. Bot. Kew Gard. Misc. 3: 311. 1851.

岭南山竹子 *ling nan shan zhu zi*

Trees or shrubs, 5–15 m tall, to 30 cm in diam. Bark dark gray. Branchlets usually with interrupted rings. Petiole ca. 1 cm; leaf blade oblong, obovate-oblong to oblanceolate, 5–10 × 2–3.5 cm, subleathery, midvein slightly raised adaxially, sec-

ondary veins 10–18 pairs, tertiary veins reticulate, base cuneate, margin reflexed, apex acute or obtuse. Plant dioecious; flowers solitary or in an umbel-like cyme; pedicels 3–7 mm. Male flowers: sepals suborbicular, equal, 3–5 mm; petals orange or yellowish, obovate-oblong, 7–9 mm; stamen fascicles not evident; anthers aggregated into a head, 2-celled, cells longitudinally dehiscent; pistillode absent. Female flowers: sepals and petals similar to those of males; staminode fascicles free, shorter than pistil; ovary ovoid, 8–10-loculed; style absent; stigma peltate, convex, radiately 8–10-lobed, papillate. Fruit ovoid or globose, 2–4 × 2–3.5 cm, subtended by persistent sepals at base and crowned by convex stigma. Seeds 1. Fl. Apr–May, fr. Oct–Dec.

• Dense or sparse forests on plains, hills, or in valleys; 200–400 (–1200) m. Guangdong, Guangxi, Hainan.

The fruit is edible. The seeds yield ca. 60% oil (seed pulp up to 70% oil). The oil is used as a lubricant and for manufacturing soap. The timber is used for making furniture and woodcuts. The bark contains 3%–8% tannin.

**14. *Garcinia erythrosepala*** Y. H. Li, Res. Bull. Trop. Pl. 15: 14. 1980.

红萼藤黄 hong e teng huang

*Garcinia rubrisepala* Y. H. Li, nom. illeg. superfl.

Trees ca. 4 m tall. Branches dark purple, finely striate with hollow pith; twigs purple-red, subterete, slender, finely striate. Petiole 5–8 mm; leaf blade abaxially gray-green, elliptic, oblanceolate, or elliptic-lanceolate, 4–7(–9) × 2–3.5 cm, membranous, both surfaces glabrous, midvein slender, raised abaxially, slightly impressed adaxially; secondary veins inconspicuous, 5–8 pairs, irregularly arranged; tertiary veins few, lax, inconspicuous, base cuneate or broadly cuneate, margin involute, apex acuminate or acute. Plant dioecious. Male flowers large, ca. 1 cm in diam., usually 2–5 in cluster, rarely solitary, usually inserted at apex of current year's branchlet, rarely axillary; pedicels purple-red, 4–6 mm, slender; sepals purple-red, elliptic, nearly equal; stamen fascicles connate, forming a central mass of ca. 40 stamens; filaments ca. 1/2 as long as anthers; anthers 4-celled, cells longitudinally dehiscent; pistillode absent. Female flowers and fruit unknown. Fl. Dec–Jan.

• Humid mixed forests; 300–400 m. W Yunnan (Yingjiang).

**15. *Garcinia oligantha*** Merrill, Philipp. J. Sci. 22: 254. 1923.

单花山竹子 dan hua shan zhu zi

Shrubs 1–3 m tall. Twigs slender, conspicuously striate. Petiole 4–10 mm; leaf blade gray-green on both surfaces when dry, oblong-elliptic to lanceolate, rarely ovate, 5–8 × 1.5–3.5 cm, papery; secondary veins slender, obscure but ± visible, to 5 pairs, base abruptly or broadly cuneate, margin cartilaginous, involute, apex caudate-acuminate. Plant dioecious. Male flowers unknown. Female flowers solitary and axillary, purplish; pedicels absent or nearly so; sepals: outer 2 subovate, 2–3 mm; inner 2 elliptic, 4–5 mm; petals equal, suborbicular, 4–5 mm,

apex obtuse; staminodes 12, usually shorter than pistil; filaments united forming a shallow cup, enveloping ovary base; ovary ovoid-oblong, 4-loculed; style very short; stigma peltate, papillate. Fruit fusiform or narrowly ellipsoid, 1.5–1.8 cm, to 1 cm in diam., smooth, with persistent sepals and remnants of staminodes at base. Seeds 2. Fl. Jun–Jul, fr. Oct–Dec.

Dense forests; 200–1200 m. Guangdong, Hainan [N Vietnam].

**16. *Garcinia subfalcata*** Y. H. Li & F. N. Wei, Bull. Bot. Res., Harbin 1(4): 139. 1981.

尖叶藤黄 jian ye teng huang

Trees ca. 7 m tall, ca. 15 cm in diam. Bark dark brown. Branches striate, twigs with broken rings. Petiole 0.4–1.2 cm; leaf blade narrowly elliptic or elliptic-lanceolate, 3.5–8 × 0.8–2.5 cm, papery, midvein raised abaxially, flat adaxially; secondary veins 7–13 pairs, near margin arching and anastomosing, tertiary veins sparse, inconspicuous, base attenuate, slightly decurrent, apex long acuminate, usually falcate, rarely obtuse. Plant dioecious. Male flowers unknown. Female flowers solitary or in pairs, usually at apex of branchlet, sometimes axillary; pedicels ca. 2 mm; sepals 4; outer 2: suborbicular, short; inner 2: narrowly elliptic, thicker; petals 4, nearly equal, oblong, slightly longer than sepals, ca. 5 mm; staminodes 4; anthers 4-celled; cells longitudinally dehiscent; connectives thickened; filaments robust, ca. 1 mm; ovary ovoid, sulcate outside; style nearly absent; stigma radiately lobed, papillate. Fruit globose, ca. 3 cm in diam., smooth, nearly sessile. Fl. Apr–May, fr. Sep–Oct.

• Valleys, mixed forests near water; 500–600 m. S Guangxi.

This species is similar to *Garcinia fusca* Pierre, from N Vietnam, but the latter differs in having more numerous secondary leaf veins (in 28–32 pairs), staminodes united into 4 bundles, and the stigma with papillae arranged in pairs.

**17. *Garcinia esculenta*** Y. H. Li, Acta Phytotax. Sin. 19: 495. 1981.

山木瓜 shan mu gua

Trees 15–20 m tall. Twigs gray-brown, finely striate, sometimes lenticellate. Petiole 1–1.5 cm; leaf blade abaxially brownish, elliptic, ovate-elliptic, or oblong-elliptic, 12–18(–20) × 4–7 cm, papery, midvein raised on both surfaces; secondary veins regular, 8–10 pairs; tertiary veins rather dense, inconspicuous, base cuneate, slightly decurrent, margin cartilaginous, involute, apex acute or obtusely acuminate. Plants dioecious. Male flowers 2 or 3 in cymule; cymules ca. 2 cm, 1–3 together at apex of young branchlet; peduncles robust, distinctly articulate, 0.8–1 cm; pedicels robust, shorter than 5 mm; sepals 2 large, 2 small, obovate; petals yellowish, 3 large and equal, inner 1 smallest, elliptic or oblong; anthers sessile, complanate, varying in form, 2-celled, cells longitudinally dehiscent; pistillode absent. Female flowers usually solitary at apex of branchlet, larger than males, ca. 1 cm in diam.; filaments of staminodes united and enveloping ovary base; ovary globose, 8–12-loculed, 1–1.2 cm; stigma entire, papillate. Fruit orange-green or orange, ovoid or oblate, 6–8 × 5–9 cm, 6–8(–11)-sulcate outside. Mature seeds 2–4, subrhomboid or obliquely ovoid, 2.5–3

cm. Fl. Aug–Oct, fr. Jun–Aug.

- Mixed forests in valleys; (900–)1300–1700 m. W Yunnan.

This species is related to *Garcinia gummi-gutta* (Linnaeus) N. Robson (*G. cambogia* Desrousseaux) but the latter differs in having male flowers with a pistillode, stamens 10–20 or more, with filaments, rudimentary stigmas 3 or 4, very short or absent, and female flowers with stigmatic rays 8–10-tuberculate, free nearly to the base.

The fruit is edible, juicy, and slightly sour.

**18. *Garcinia tetralata*** C. Y. Wu ex Y. H. Li, Res. Bull. Trop. Pl. 15: 14. 1980.

双籽藤黄 shuang zi teng huang

Trees 5–8(–15) m tall, ca. 15 cm in diam. Branches usually pendulous; twigs greenish, angular. Petiole 0.8–1.2 cm; leaf blade elliptic or narrowly elliptic, 8–13(–15) × 3–6 cm, papery, midvein raised abaxially, impressed adaxially; secondary veins 13–16 pairs, raised on both surfaces, slender, oblique and connected at leaf margin; tertiary veins reticulate, base cuneate, slightly decurrent, margin cartilaginous, involute, apex acute or shortly acuminate. Flowers unknown. Fruit solitary, axillary in foliar or leafless axils, globose, 2–2.5 cm in diam., smooth, nearly sessile; stigma persistent, 4-lobed, each lobe 4- or 5-papillate. Seeds 2. Fr. May.

- Mixed forests on hills or in basins; 800–1000 m. S and SW Yunnan (Cangyuan, Gengma, Jinghong).

This species is related to *Garcinia anomala* Planchon & Triana but the latter differs in having 2 bracts under each flower, the stigma broad, discoid, with the margin revolute, slightly lobed, and the fruit 1- or 2-seeded.

**19. *Garcinia lancilimba*** C. Y. Wu ex Y. H. Li, Acta Phytotax. Sin. 19: 493. 1981.

长裂藤黄 chang lie teng huang

Trees small, 3–6 m tall. Twigs pendulous, 4-angled, gray-yellow when young. Petiole 2–4(–6) mm; leaf blade abaxially greenish, ovate-lanceolate, oblong-lanceolate, or lanceolate, 6–10 × (1.5–)2–3.5 cm, papery, midvein raised on both surfaces; secondary veins many, 20–30 pairs, obliquely ascending, joined at leaf margin; tertiary veins obscure, base cuneate or attenuate, apex obtusely long acuminate or caudate. Plant monoecious; flowers usually solitary, sometimes in pairs, axillary, yellowish, ca. 4 mm in diam. when open; pedicels ca. 6 mm; sepals and petals nearly equal. Male flowers: stamens 4-fascicled, fascicle stalk short, anthers 2-celled, cells longitudinally dehiscent. Female flowers: ovary subglobose, 2-loculed; stigma peltate, concave, smooth, entire. Mature fruit globose; 1–1.5 cm in diam., smooth. Seeds 1 or 2. Fl. Apr–May, fr. Feb–Apr.

- Humid dense forests on shady slopes or hills and in valley forests; 600–1000(–1800) m. S Yunnan.

This species is related to *Garcinia bonii* Pitard, from N Vietnam, but the latter differs in having the pedicel only 2–4 mm, the stigma lobed and tuberculate, and the ovary 4-loculed.

**20. *Garcinia linii*** C. E. Chang, Bull. Taiwan Prov. Pingtung Inst. Agric. 6: 1. 1964.

兰屿福木 lan yu fu mu

Trees small, 10–15 m tall. Twigs yellowish brown, robust;

young ones tetragonous. Petiole 5–12 mm; leaf blade adaxially dark green, ovate to elliptic, 7.5–12 × 4–6.3 cm, subleathery, secondary veins slightly raised abaxially, base broadly cuneate, margin involute, apex obtuse to acute or rounded. Plant dioecious; flowers solitary, axillary; pedicels 6–10 mm. Male flowers: sepals 4, 2 large, 2 small; outer 2: orbicular or elliptic-spatulate; petals obovate, 9–10 mm; stamens 4-fascicled, each fascicle with robust stalk and many anthers; anther cells oblong, longitudinally dehiscent; pistillode cylindric, slender. Female flowers unknown. Fruit ellipsoid or globose, 2–3 × ca. 2 cm, smooth.

- Mountain slopes. E Taiwan.

This species is related to *Garcinia dives* Pierre, from the Philippines, but differs in having broader leaves and solitary, axillary flowers.



