

3. FIRMIANA Marsili in Saggi Sci. Lett. Accad. Padova 1: 114, 116. 1786.

梧桐属 wu tong shu

*Erythropsis* Lindley ex Schott & Endlicher; *Karaka* Rafinesque.

Trees or shrubs, deciduous. Leaves simple, palmately 3–5-lobed or entire. Inflorescence paniculate or rarely racemose, axillary or terminal. Flowers unisexual or polygamous, sometimes appearing before leaves. Calyx orange-red or golden, funnel-shaped or cylindrical, (4 or)5-lobed or -partite, lobes short or divided nearly to base, reflexed. Petals absent. Male flowers: stamens 10–20, in capitate cluster at apex of androgynophore; anther 2-celled, anther cells curved; undeveloped pistil present. Female flowers: ovary 5-locular, ovoid or globose, basally enclosed by undeveloped anthers; styles basally connate; stigmas as many as carpels; ovules 2 to many per locule. Follicles stipitate, endocarp membranous, dehiscent long before maturity, foliaceous. Seeds 1 to many per follicle, on inner margin of foliaceous endocarp, globose, endosperm flat or plicate; cotyledons flat, very thin.

About 16 species: tropical, subtropical, and temperate Asia; seven species (five endemic) in China.

The relationship between *Firmiana* and *Hildegardia* Schott & Endlicher is unresolved. Kostermans (Reinwardtia 4: 281–310. 1957) used a follicle character, dehiscence vs. indehiscence, to separate the two genera. Molecular data, based on limited sampling, support a division based on floral characters, especially relating to calyx morphology, but there are unpublished molecular data that suggest that *Firmiana* and *Hildegardia* may not be distinct. *Firmiana* is the older of the two names.

- 1a. Flowering when leafless; calyx lobes much shorter than tube.
  - 2a. Base of leaf blade deeply cordate, apex obtuse; calyx funnel-shaped, base nearly cuneate ..... 5. *F. colorata*
  - 2b. Base of leaf blade truncate or shallowly cordate, apex acuminate; calyx subcampanulate or cylindrical, base ± rounded.
    - 3a. Lobes of leaf blade 9–14 cm, apex long acuminate; calyx subcampanulate, ca. 16 mm, densely stellate pubescent with rust-colored hairs ..... 6. *F. pulcherrima*
    - 3b. Lobes of leaf blade 2–3 cm, apex acute to shortly acuminate; calyx cylindrical, ca. 32 mm, densely stellate tomentose with golden and reddish brown hairs ..... 7. *F. kwangsiensis*
- 1b. Flowering with leaves present; calyx divided almost to base, lobes much longer than tube, reflexed.
  - 4a. Leaf blade abaxially glabrous or slightly pilose; inflorescence terminal.
    - 5a. Leaf blade cordate, 3–5-lobed, 15–30 cm wide; bark greenish; flowers yellowish green or yellow-white ..... 1. *F. simplex*
    - 5b. Leaf blade suborbicular, entire, 8–10 cm wide; bark blackish brown; flowers purple ..... 4. *F. danxiaensis*
  - 4b. Leaf blade abaxially densely hairy; inflorescence terminal or axillary.
    - 6a. Leaf blade 3-lobed, 17–30 × 19–40 cm, base cordate, petiole 15–45 cm ..... 3. *F. major*
    - 6b. Leaf blade entire, 7–14 × 5–12 cm, base truncate or slightly cordate, petiole 4–16 cm ..... 2. *F. hainanensis*

1. *Firmiana simplex* (Linnaeus) W. Wight, U. S. D. A. Bur. Pl. Industr. Bull. 142: 67. 1909.

梧桐 wu tong

*Hibiscus simplex* Linnaeus, Sp. Pl., ed. 2, 2: 977. 1763; *Firmiana platanifolia* (Linnaeus f.) Schott & Endlicher; *F. simplex* var. *glabra* Hatusima; *Sterculia firmiana* J. F. Gmelin; *S. platanifolia* Linnaeus f.; *S. pyriformis* Bunge; *S. simplex* (Linnaeus) Druce.

Deciduous trees, up to 16 m tall; bark greenish, smooth. Petiole 15–30 cm; leaf blade cordate, palmately 3–5-lobed, 15–30 cm in diam., lobes triangular, both surfaces glabrous or minutely puberulent, basal veins 7, base cordate, apex acuminate. Inflorescence paniculate, terminal, 20–50 cm. Calyx yellowish green, 7–9 mm, divided nearly to base, lobes linear, twisted outward, abaxially puberulent and yellowish, adaxially villous only basally; pedicel nearly as long as calyx. Male flower: androgynophore as long as calyx, thicker in lower part, glabrous. Anthers 15, irregularly fascicled, pistillode pear-shaped and very small. Female flower: ovary globose, hairy. Follicle membranous, stalked, foliaceous, 6–11 × 1.5–2.5 cm, 2–4-seeded, abaxially puberulent or nearly glabrous. Seeds globose, ca. 7 mm in diam., wrinkled. Fl. Jun.  $2n = 40^*$ .

Widely cultivated. Anhui, Fujian, Guangdong, Guangxi, Guizhou,

Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan; cultivated in Europe and North America (United States)].

2. *Firmiana hainanensis* Kostermans, Pengum. Balai Besar Penjel. Kehut. Indonesia 54: 30. 1956.

海南梧桐 hai nan wu tong

Trees, up to 16 m tall, 45 cm d.b.h.; bark gray. Branches smooth. Petiole 4–16 cm, yellowish stellate pilose; leaf blade ovate, 7–14 × 5–12 cm, abaxially gray-white, densely stellate pubescent, adaxially glabrous, basal veins 5, lateral veins 4–5 on each side of midrib, base truncate or subcordate, apex obtuse or acute. Inflorescence paniculate, terminal or axillary, to 20 cm, densely yellowish brown stellate pubescent. Calyx yellow-white, ca. 9 mm, divided nearly to base, abaxially densely yellow-brown stellate pubescent, adaxially basally woolly, lobes linear-lanceolate, ca. 1.5 mm wide. Male flower: androgynophore as long as calyx, apex 5-lobed. Anthers 15, in capitate fascicle. Female flower: ovary ovoid, ca. 2.5 mm, longitudinally 5-grooved, densely stellate hairy. Follicle ovoid, ca. 7 × 3 cm, 3–5-seeded, abaxially minutely hairy with simple hairs and stellate pubescence, apex acute or emarginate. Seeds yellow-brown when mature, ellipsoid, ca. 6 mm. Fl. Apr.

• Sandy soils. C and W Hainan.

**3. *Firmiana major*** (W. W. Smith) Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 60: 96. 1924 [*"Firmiania maior"*].

云南梧桐 yun nan wu tong

*Sterculia platanifolia* Linnaeus f. var. *major* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 9: 130. 1916; *Hildegardia major* (W. W. Smith) Kostermans.

Deciduous trees, up to 15 m tall; trunk erect; bark greenish gray-black, rough. Branchlets robust, puberulent. Petiole robust, 15–45 cm, puberulent at first, glabrescent; leaf blade palmately 3-lobed, 17–30 × 19–40 cm, usually wider than long, abaxially densely yellow-brown puberulent, glabrescent, adaxially glabrous, basal veins 5–7, base cordate, apex acute or acuminate. Inflorescence paniculate, terminal or axillary. Calyx purple-red, ca. 12 mm, hairy, divided nearly to base, lobes linear or oblong-linear. Male flowers: androgynophore long, tube-shaped. Female flowers: ovary long stalked, abaxially velutinous; ovules many; staminodes present. Follicle membranous, ca. 7 × 4.5 cm, nearly glabrous. Seeds yellow-brown, globose, ca. 8 mm, wrinkled. Fl. Jun–Jul, fr. Oct.

- Slopes; 1600–3000 m. SW Sichuan, C, S, and W Yunnan.

The synonym *Hildegardia major* was the source of the report in Bayer and Kubitzki (Fam. Gen. Vasc. Pl. 5: 265. 2003) that the genus *Hildegardia* Schott & Endlicher occurs in China.

**4. *Firmiana danxiaensis*** H. H. Hsue & H. S. Kiu, J. S. China Agric. Univ. 8(3): 2. 1987.

丹霞梧桐 dan xia wu tong

Trees, 3–8 m tall; bark black-brown. Branchlets terete, greenish, glabrous. Petiole 4.5–8.5 cm, glabrous; leaf blade suborbicular, 8–10 × 8–10 cm, thinly leathery, glabrous, basal veins 7, prominently raised abaxially and apparent adaxially, base cordate, margin entire or 3-lobed at apex, apex shortly acute. Inflorescence paniculate, up to 20 cm, many-flowered, densely yellow stellate tomentose. Calyx purple, divided nearly to base, abaxially densely yellowish pilose, adaxially white villous at base, lobes linear, ca. 10 × 1–1.2 mm. Stamens 15. Ovary subglobose, 5-celled, ca. 4 mm, 5-grooved, densely stellate tomentose. Follicle oblanceolate, 8–10 × 2.5–3 cm, 2- or 3-seeded, subglabrous. Seeds yellowish brown, globose, ca. 6 mm in diam.

- Limestone forests; 200–300 m. Guangdong.

**5. *Firmiana colorata*** (Roxburgh) R. Brown, *Pterocymbium*, 235. Jun 1844.

火桐 huo tong

*Sterculia colorata* Roxburgh, Pl. Coromandel 1: 26. 1795; *Erythropsis colorata* (Roxburgh) Burkill; *E. roxburghiana* Schott & Endlicher, nom. illeg. superfl.; *Karaka colorata* (Roxburgh) Rafinesque.

Deciduous trees, up to 15 m tall. Branchlets gray-black when desiccate, minutely gray puberulent. Petiole 10–15 cm; leaf blade broadly cordate, 17.5–25 × 18–20 cm, thinly leathery, both surfaces sparsely yellowish stellate puberulent, basal veins

5–7, veinlets prominently raised on both surfaces, nearly parallel, base deeply cordate, apex 3–5-lobed, middle lobe ca. 5 cm, apex obtuse, lateral lobes ca. 3 cm. Inflorescence cymose-paniculate, up to 7 cm, densely orange-red stellate puberulent. Pedicels 4–5 mm, puberulent. Calyx funnel-shaped, base nearly cuneate, ca. 20 × 7–8 mm, apex 5-lobed, abaxially densely stellate puberulent with orange hairs, adaxially densely puberulent, lobes ovate-triangular, ca. 4 mm, apex acute. Male flower: androgynophore 10–12 mm, stellate puberulent. Female flower: ovary 5-locular, nearly separated, glabrous. Style short; stigma curved outward. Follicle stalked, red or purple when mature, foliaceous, tongue-shaped, 5–7 cm, 2–4-seeded, with apparent venation. Seeds black, globose, ca. 6 mm in diam. Fl. Mar–Apr.

- Forested slopes; 700–1000 m. S Yunnan [Bhutan, India (including

Andaman Islands), Indonesia (Sumatra), Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

The place of publication of *Firmiana colorata* is often given as R. Brown in Bennett, Pl. Jav. Rar. 235. 1844, which was published in November 1844 and was thus predated by Brown's preprint published in June of the same year.

**6. *Firmiana pulcherrima*** H. H. Hsue, Acta Phytotax. Sin. 8: 271. 1963.

美丽火桐 mei li huo tong

*Erythropsis pulcherrima* (H. H. Hsue) H. H. Hsue.

Deciduous trees, up to 18 m tall; bark gray-white or brown-black. Branchlets purple when desiccate, glabrate. Leaves heteromorphic; petiole 6–17 cm, glabrate; leaf blade 3–5-palmate or entire, 7–23 × 7–9 cm, middle lobe up to 14 cm, lateral lobes to 9 cm, papery, stellate puberulent at base of midrib only, basal veins 5, prominent on both surfaces, base truncate or subcordate, apex caudate. Inflorescence cymose, paniculate, 8–14 cm, densely brown-red stellate hairy. Pedicel 3–4 mm. Calyx nearly campanulate, ca. 16 × 8 mm, apically 5-lobed, abaxially densely brownish red stellate hairy, adaxially villous around base, lobes triangular, ca. 3 mm. Male flower: androgynophore ca. 24 mm, stellate hairy. Anthers 15–25, in capitate cluster, enclosing 5 sterile, nearly free, carpels. Female flower and fruit unknown. Fl. Apr–May.

• Forests, stream valleys. E Hainan.

**7. *Firmiana kwangsiensis*** H. H. Hsue, Acta Phytotax. Sin. 15(1): 81. 1977.

广西火桐 guang xi huo tong

*Erythropsis kwangsiensis* (H. H. Hsue) H. H. Hsue.

Deciduous trees, up to 10 m tall; bark gray, not flaking. Branchlets gray-brown, nearly glabrous; young buds densely yellow-brown stellate puberulent. Petiole to 20 cm, minutely yellowish brown stellate hairy; leaf blade broadly ovate or nearly round, 10–17 × 9–17 cm, entire or apically 3-lobed, papery, both surfaces sparsely puberulent, densely hairy in axils of veins, basal veins 5–7, veinlets prominent on both sides, nearly parallel, base truncate or nearly cordate, lobes acuminate or acute, 2–3 cm. Inflorescence cymose-racemose, 5–7 cm. Pedicels 4–8 mm, golden to red-brown stellate hairy. Calyx cylindric, ca. 32 × 11 mm, apically 5-lobed, abaxially golden to red-brown stellate hairy, adaxially bright red stellate pilose, lobes triangular-ovate, ca. 4 mm. Male flowers: androgynophore ca. 28 mm. Anthers 15, in capitate cluster. Fruit unknown. Fl. Jun.

• Scrub-covered slopes; 900–1000 m. Guangxi (Jinxi).

