

## 16. CINCHONA Linnaeus, Sp. Pl. 1: 172. 1753.

金鸡纳属 jin ji na shu

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*Kinkina* Adanson; *Quinquina* Boehmer.

Shrubs or usually trees, unarmed; buds flattened with stipules erect and pressed together; bark usually notably bitter. Raphides absent. Leaves opposite, decussate, usually with well-developed domatia; stipules caducous, interpetiolar or shortly united around stem, ligulate to obovate, entire. Inflorescences terminal and often also in axils of uppermost leaves, cymose to paniculiform, many flowered, pedunculate, bracteate. Flowers pedicellate, bisexual, fragrant, usually distylous. Calyx limb 5-lobed. Corolla yellow, pink, purple, red, or occasionally white, salverform or funnellform, inside glabrous or pubescent in throat, with tube often weakly 5-ridged outside; lobes 5, valvate in bud, with margins densely ciliate to villous. Stamens 5, inserted in corolla tube, included to partially exerted; filaments short to developed, glabrous; anthers dorsifixed. Ovary 2-celled, ovules many in each cell on axile placentas; stigma 2-lobed, lobes capitate to linear. Fruit capsular, ovoid to cylindrical or ellipsoid, septicidally dehiscent into 2 valves from base or sometimes from apex with valves then loculicidal through septum, stiffly papery to woody, often lenticellate, with calyx limb persistent; seeds numerous, medium-sized, ellipsoid to fusiform and somewhat flattened with membranous marginal wing and elliptic central seed portion; endosperm fleshy; cotyledons ovate.

Twenty-three species: Central America (Costa Rica, Panama) and South America (Bolivia, Colombia, Ecuador, Peru, Venezuela) and cultivated as species and hybrids in tropical regions worldwide; two species (both introduced) in China.

Several species of *Cinchona* are the natural source of quinine, which has long been used worldwide as a treatment for malaria. Quinine is found along with several other alkaloids in high concentrations in some species of *Cinchona*, particularly the bark; these alkaloids give the plants their bitter taste. *Cinchona* is native to South America, where its species are not all well differentiated, are morphologically variable, and hybridize freely especially in cultivation, where numerous artificial hybrids have been created. *Cinchona* was recently monographed by Andersson (Mem. New York Bot. Gard. 80: 1–75. 1998), followed here, who clarified the identities of the commonly cultivated species.

*Cinchona officinalis* (Linnaeus, Sp. Pl. 1: 172. 1753; 正鸡纳树 zheng ji na shu) is native to South America (Ecuador) and perhaps occasionally cultivated in tropical regions worldwide. No confirmed documentation of this species has been seen from China. The name has long been incorrectly used in cultivation for plants treated here as *Cinchona calisaya* (Andersson, loc. cit.: 55–57). It is included for reference in the key to species.

- 1a. Leaf blade usually relatively broad, ovate, ovate-elliptic, or elliptic-oblong, 5.5–17 cm wide, abaxially moderately to densely hirtellous at least when young and with pilosulous domatia but without crypt domatia in axils of veins ..... 2. *C. pubescens*
- 1b. Leaf blade usually of average or relatively narrow width, lanceolate, oblong-lanceolate, elliptic, obovate-lanceolate, or elliptic-oblong, 2–11 cm wide, abaxially glabrous or puberulent to hirtellous and with or without crypt domatia.
  - 2a. Leaf blade without crypt domatia ..... *C. officinalis* (see comment above)
  - 2b. Leaf blade with crypt domatia.
    - 3a. Leaves with domatia best developed in proximal part of blade; calyx lobes comprising more than 1/2 length of calyx limb; capsules stiffly papery to woody ..... 1. *C. calisaya*
    - 3b. Leaves with domatia best developed in distal part of blade; calyx lobes comprising less than or up to ca. 1/2 length of calyx limb; capsules stiffly papery ..... *C. officinalis* (see comment above)

1. *Cinchona calisaya* Weddell, Ann. Sci. Nat., Bot., sér. 3, 10: 6. 1848.

金鸡纳树 jin ji na shu

*Cinchona calisaya* var. *ledgeriana* Howard; *C. ledgeriana* (Howard) Bernelot Moens ex Trimen; *Quinquina calisaya* (Weddell) Kuntze; *Q. ledgeriana* (Howard) Kuntze.

Trees or shrubs, to 15(–25) m tall; bark grayish brown, thin, with many shallow fissures; branches flattened to sub-quadrangular, puberulent to hirtellous or glabrescent. Petiole 3–20(–30) mm, glabrous or hirtellous or puberulent; leaf blade drying papery or thinly leathery, oblong-lanceolate, elliptic-oblong, or lanceolate, 7–16(–21.5) × 2.5–6(–11) cm, both surfaces glabrous or sparsely puberulent to hirtellous abaxially, base acute to cuneate, apex obtuse to rounded or rarely acute; secondary veins 7–11 pairs, usually with crypt domatia, these best developed in proximal part of blade; stipules 10–20 mm,

glabrous to puberulent or hirtellous, obtuse to rounded. Inflorescences 5–23 × 5–18 cm, densely hirtellous to puberulent; bracts triangular, 0.5–3 mm; pedicels 1–8 mm. Calyx densely sericeous; ovary portion ellipsoid, 1.5–2 mm; limb 1–2 mm, sparsely puberulent, partially lobed; lobes ovate-triangular, 0.5–1 mm. Corolla white, pale yellow, or pale pink, glabrous to puberulent outside; tube cylindrical, 5–9 mm, glabrous inside; lobes lanceolate, 3–4(–6) mm, acute. Capsules 8–30 × 3–8 mm, stiffly papery to woody, puberulent or pilosulous to glabrescent; seeds 3–10 × 1.6–3.7 mm (including wing). Fl. Jun–Feb.

Cultivated. Hainan, Taiwan, S Yunnan [native to South America (Bolivia, Peru); cultivated in tropical regions worldwide].

Plants cultivated under the trade name *Cinchona ledgeriana* were considered to belong to *C. calisaya* by Andersson (Mem. New York Bot. Gard. 80: 55–57. 1998). The description of the plants treated as *C. ledgeriana* by W. C. Chen (in FRPS 71(1): 224–225. 1999) agrees with Andersson's classification of *C. lancifolia* Mutis and also generally

Fl. China 19: 88–89. 2011.

matches the cultivated hybrid *C. lucumifolia* Pavon ex Lindley × *C. pubescens* (Andersson, loc. cit.: 60).

**2. *Cinchona pubescens*** Vahl, Skr. Naturhist.-Selsk. 1: 19. 1790.

鸡纳树 ji na shu

*Cinchona succirubra* Pavon ex Klotzsch.

Trees and shrubs, to 12 m tall; bark grayish brown, sometimes striped with white and/or longitudinally fissured; branches somewhat flattened to subterete or angled, densely pilosulous or hirtellous to puberulent or glabrescent. Petiole 1.5–4 cm, glabrous or puberulent to hirtellous; leaf blade drying papery, ovate, ovate-elliptic, or elliptic-oblong, 10–24.5 × 5.5–17 cm, adaxially glabrous to pilosulous or puberulent, abaxially hirtellous to pilosulous or puberulent and often reddened at least when young, base obtuse to rounded or truncate, apex obtuse to rounded; secondary veins 6–11 pairs, with pilosulous domatia; stipules 10–25 mm, sparsely pilosulous, obtuse to rounded. Inflorescences 6–23 × 6–23 cm, pilosulous or hirtellous to puberulent; bracts triangular, 0.5–3 mm; pedicels 1–3 mm. Calyx with ovary portion ellipsoid, 2–3 mm, densely pilosulous; limb 1.5–3 mm, sparsely to densely pilosulous or hirtellous, shallowly lobed; lobes triangular, 0.5–1 mm. Corolla white or pink, outside glabrescent to pilosulous or puberulent; tube cylindrical, 8.5–14 mm; lobes ovate-lanceolate, 4–6 mm, acute. Capsules 10–18(–41) × 5–7 mm, pilosulous to glabrescent; seeds 7–12 × 2–3 mm (including wing). Fl. and fr. Jun–Feb.

Cultivated. Guangxi (Nanning), Hainan, Taiwan, S Yunnan [native to Central America (Costa Rica) and South America (Bolivia, Colombia, Ecuador, Peru, Venezuela); often cultivated in tropical regions worldwide].

This is the most frequently cultivated species and hybrid parent of *Cinchona*. It is variable morphologically in cultivation and also in its native range.

Fl. China 19: 88–89. 2011.