

8. TINOSPORA Miers, Ann. Mag. Nat. Hist., ser. 2, 7: 35, 38. 1851, nom. cons.

青牛胆属 qing niu dan shu

Campylus Loureiro.

Vines, often with conspicuous aerial roots. Leaf blade not peltate, base cordate, sometimes sagittate or hastate, palmately veined. Inflorescences axillary or on old leafless stems, solitary or fascicled, racemose, cymose, or paniculate. Male flowers: sepals usually 6 in 2 whorls, free, imbricate, outer 3 usually conspicuously smaller, membranous; petals (3 or)6, base clawed, often with lateral edges involute; stamens 6, filaments free [or connate], anthers subextrorse, dehiscing longitudinally and obliquely. Female flowers: sepals and petals as in male except petals often smaller; staminodes 6; carpels 3, curved-ellipsoidal, style short, fat and thick, stigma reflexed with short, pointed lobes. Drupes 1–3 borne on a short or columnar carpophore, style scar subterminal; endocarp bony, horseshoe-shaped, abaxially convex and sometimes verrucose or tuberculate, adaxially ± flat; condyle broad, with central aperture leading to a globose cavity. Seed half-moon-shaped; endosperm ruminant; cotyledons foliaceous, ovate, extremely thin, much longer than radicle.

More than 30 species: widely distributed in tropical and subtropical Asia to Australia and the Pacific islands (24 species), Africa (seven species), and Madagascar (two species); six species (three endemic) in China.

Several species are used medicinally for a wide variety of problems. The ability of the deciduous species to grow from detached stems means that they often benefit from forest clearance. These species are the larval hosts of fruit-piercing noctuid moths that cause significant damage to crops of *Citrus* (particularly Mandarins) and *Dimocarpus longan* (Longan) in Thailand.

- 1a. Vines deciduous, often with long pendulous aerial roots; branchlets fleshy with membranous epidermis and raised lenticels; lenticels eventually cross-shaped.
 - 2a. Branches and leaves densely puberulent 1. *T. sinensis*
 - 2b. Branches and leaves glabrous.
 - 3a. Older stems with very prominent blunt tubercles; inflorescences appearing before new leaves; leaf blade with flat glabrous pockets in abaxial axils of basal veins 2. *T. crispa*
 - 3b. Older stems terete; inflorescences appearing with new leaves; leaf blade with dense tufts of brownish glandular hairs in abaxial axils of basal veins 3. *T. hainanensis*
- 1b. Vines evergreen, without aerial roots; stems and branches not fleshy; lenticels small, lens-shaped, longitudinally 2-dehiscent.
 - 4a. Leaf blade orbicular-cordate, 6.5–11 cm wide, ca. as long as wide or only slightly longer, with rounded basal lobes, basal sinus very narrow 4. *T. guangxiensis*
 - 4b. Leaf blade lanceolate-sagittate to hastate, 2–7.5 cm wide, clearly longer than wide, often with angular basal lobes, basal sinus broad.
 - 5a. Leaf blade margin not toothed (mainland) 5. *T. sagittata*
 - 5b. Leaf blade margin irregularly toothed (Taiwan) 6. *T. dentata*

1. ***Tinospora sinensis*** (Loureiro) Merrill, Sunyatsenia 1: 193. 1934.

中华青牛胆 zhong hua qing niu dan

Campylus sinensis Loureiro, Fl. Cochinch. 1: 113. 1790; *Cocculus tomentosus* Colebrooke; *Menispermum malabaricum* Lamarck; *M. tomentosum* (Colebrooke) Roxburgh; *Tinospora malabarica* (Lamarck) J. D. Hooker & Thomson; *T. tomentosa* (Colebrooke) J. D. Hooker & Thomson.

Deciduous vines, to 20 m or longer, puberulent when young, often producing very long aerial roots. Old branches fat and thick, bark brownish, membranous, and often glabrous. Stems slightly fleshy, green when young, striate, pubescent; lenticels raised, (2–)4(–6)-dehiscent. Petiole (4–)6–13 cm, puberulent; leaf blade broadly ovate to subrotund, rarely broadly ovate, 7–14 × 5–13 cm, papery, abaxially tomentulose or slightly tomentulose, adaxially puberulent, base deeply to slightly cordate, margin entire, apex acutely acuminate, palmately 5(–7)-veined at base. Inflorescences appearing when plant is leafless. Male inflorescences solitary or few fascicled,

1–4 cm or longer. Male flowers: sepals 6 in 2 whorls, outer 3 oblong or subelliptic, 1–1.5 mm, inner 3 broadly ovate, to 5 mm, ca. 3 mm wide; petals 6, rhomboidal, with claw ca. 1 mm, lobes ca. 2 mm; stamens 6, filaments ca. 4 mm. Female inflorescences solitary. Female flowers: sepals and petals as in male; staminodes 6, to 1 mm; carpels 3. Fruiting peduncle 8–11(–15) mm; carpophores 2–3 mm. Drupes red, subglobose; endocarp semiovoid to hemispherical, 7–9 × ca. 6 mm, broadly keeled at apex with low median ridge abaxially, surface with irregular low tubercles or longitudinal ridges, adaxial aperture elliptic, ca. 1 mm. Fl. Apr, fr. May–Jun.

Forests, cultivation. S Guangdong, S Guangxi, S Yunnan [Cambodia, India, Nepal, Sri Lanka, Thailand, Vietnam].

Preparations of stems and leaves are used for the treatment of rheumatism and other ailments.

2. ***Tinospora crispa*** (Linnaeus) J. D. Hooker & Thomson, Fl. Ind. 1: 183. 1885.

波叶青牛胆 bo ye qing niu dan

Menispermum crispum Linnaeus, Sp. Pl., ed. 2, 2: 1468.

1763; *Tinospora gibbericaulis* Handel-Mazzetti; *T. mastersii* Diels; *T. rumphii* Boerlage; *T. thorelii* Gagnepain.

Deciduous vines, glabrous, often producing very long aerial roots. Old stems fleshy, with very prominent blunt tubercles. Younger stems slightly fleshy, epidermis thin, membranous, brownish, glabrous; lenticels large and prominently raised. Petiole 5–15(–30) cm, glabrous; leaf blade broadly ovate to orbicular, 6–13 × 6–13 cm, slightly fleshy, very thinly papery when dried, both surfaces glabrous, base deeply to shallowly cordate, lobes rounded, margin entire, apex acuminate, palmately 5(–7)-veined, abaxial basal vein axils with shallow glabrous pockets. Inflorescences racemose, unbranched or occasionally shortly branched, appearing before leaves, flowers 2- or 3-fascicled. Male inflorescences very slender, 5–10 cm or longer. Male flowers: sepals 6 in 2 whorls, green, glabrous, outer 3 ovate, ca. 1 mm, inner 3 obovate, 2.5–3 mm; petals 3–6, yellow, obovate-spatulate, 1.6–2.5 mm; stamens 6, as long as petals. Female inflorescences 2–6 cm, flowers mostly 1 per node. Female flowers: sepals and petals as in male; staminodes 6, to 1 mm; carpels 3, ca. 2 mm, stigma lobes very short. Fruiting peduncle 15–20 mm; carpophores 2–3 mm. Drupes orange, subglobose, to 2 cm when fresh; endocarp semiovoid, 11–13 × 7–9 mm, with conspicuous ridge abaxially, surface finely rugulose to almost smooth, adaxial aperture elliptic, small. Fl. spring, fr. summer.

Open forest or shrublands. S Yunnan (Xishuangbanna) [Cambodia, NE India, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand].

Tinospora crispa is widely used for a variety of internal complaints. Female plants have rarely been collected, suggesting that it has largely been distributed by the vegetative propagation of male plants for medicinal purposes.

3. *Tinospora hainanensis* H. S. Lo & Z. X. Li, *Guihaia* 6: 51. 1986.

海南青牛胆 hai nan qing niu dan

Deciduous vines, 3–10 m or longer, glabrous. Old stems fleshy, 6–10 mm in diam., with epidermis membranous, glabrous; lenticels first lens-shaped, 2-dehiscent, then rounded, 4-dehiscent, conspicuously protruding. Petiole 3–12 cm, base swollen and geniculate; leaf blade cordate or orbicular-cordate, 11–15 × 9–12 cm, membranous papery, light green when dried, both surfaces glabrous except for dense brownish glandular hairs in abaxial basal vein axils, base cordate, with sinus 1–2.5 cm, lobes rotund, margin entire, apex often cuspidate, palmately 5-veined, reticulation raised on both surfaces. Inflorescences coetaneous with leaves. Male inflorescences pseudoracemose, consisting of small cymes on 1–3 mm peduncles. Male flowers unknown. Female flowers in fascicles of 2–4, rarely solitary; bract subulate-lanceolate, 2–3 mm; sepals 6, outer whorl minute, subdeltoïd, 1.2–1.5 × ca. 1 mm, inner whorl broadly ovate-elliptic, 3.5–4 × ca. 2.5 mm, ?slightly extended when blooming; petals 6, narrowly lanceolate, ca. 2 × 0.4 mm, margin not reflexed, apex mucronate; staminodes 6, slightly shorter than petals; carpels 3, ca. 2 mm, stigma large. Drupes red, broadly elliptic, 1.1–1.2 × 7–9 mm; endocarp broadly elliptic,

9–10 mm, convex ridge abaxially conspicuous only at each end, surface sparsely tuberculate, adaxially flattened with an elliptic aperture ca. 3 × 1.5 mm to condyle. Fl. Apr, fr. Jun.

• Open forests. Hainan.

Tinospora hainanensis has been misidentified as *T. glabra* (N. L. Burman) Merrill (e.g., Forman, *Kew Bull.* 36: 417. 1981).

An unpublished IUCN list recorded this species as vulnerable: VU(A1c,2c;B2c).

4. *Tinospora guangxiensis* H. S. Lo, *Guihaia* 6: 52. 1986.

广西青牛胆 guang xi qing niu dan

Vines slightly woody. Stems terete, grayish green, often with purplish green speckles, longitudinally sulcate, glabrous or pubescent. Petiole 3.5–4 cm, base swollen and geniculate; leaf blade orbicular-cordate, 8–14 × 6.5–11 cm, papery, olive green when dried, abaxially densely hirsute-villous, adaxially glabrous or subglabrous, base deeply cordate, basal lobes rounded, slightly divaricate, occasionally folded, apex apiculate, palmately 7-veined, together with lateral veins impressed adaxially and prominent abaxially. Inflorescences and flowers unknown. Inflorescences from axils of previous year's stems, loosely paniculate, up to 24 cm overall; peduncle ca. 15 cm, hirsute. Fruiting pedicels 7–10 mm, stout, apex swollen and globose; drupe milky white, red when dry, oblate; endocarp 6.5–7.5 × 8.5–9 mm, abaxially with midrib protuberant, with tuberculate rugae on both surfaces. Fr. Jun.

• Guangxi (Longzhou).

5. *Tinospora sagittata* (Oliver) Gagnepain, *Bull. Soc. Bot. France* 55: 45. 1908.

青牛胆 qing niu dan

Herbaceous vines. Roots with small and yellow tuberous swelling. Stems slender, striate, often puberulent. Petiole 2.5–6 cm, puberulent or subglabrous, striate; leaf blade lanceolate-sagittate or sometimes lanceolate-hastate, rarely ovate or elliptic-sagittate, 7–15(–22) × 2–7.5 cm, papery to thinly leathery, usually abaxially puberulent on veins, sometimes adaxially or both surfaces glabrous, base often with deep sinus, basal lobes rounded, obtuse or mucronate, often extending backward, sometimes incurved into 2 folded lobes, rarely extending outside, apex acuminate, sometimes caudate, palmately 5-veined, reticulation prominent or not abaxially. Inflorescences axillary, often a few or many flowers fascicled, cymes, sometimes pseudopanicles, 2–10(–15) cm or sometimes longer; peduncles and pedicels filamentous; bracteoles 2, closely annexed with sepals. Male flowers: sepals 6, sometimes more, often unequal, outermost whorl minute, often ovate or lanceolate, 1–2 mm, inner whorl conspicuously larger, elliptic to broadly elliptic, obovate to broadly obovate, or narrowly lanceolate to narrowly oblong-lanceolate, to 5 mm; petals 6, lobe subrounded or broadly obovate, rarely rhomboidal, often with claw, basal margin often reflexed, 1.4–2 mm. Female flowers: sepals similar to male; petals cuneate, ca. 0.4 mm; staminodes 6, ?oblong, ca. 0.4 mm; carpels 3, subglabrous. Drupes semiglobose, 6–8 mm wide; endocarp 5–8 × 5–8 mm, abaxially rounded or obscurely ridged, smooth or sparsely weakly papillose, adaxial aperture

large, broadly elliptic; condyle deeply intrusive. Fl. Apr, fr. autumn.

Forests, grasslands. N Fujian, N and W Guangdong, Guangxi, E and S Guizhou, N Hainan, W Hubei, Hunan, NE Jiangxi, Shaanxi, S Shanxi, Sichuan, SE Xizang, SE Yunnan [N Vietnam].

Forman (Kew Bull. 36: 386. 1981) did not accept the following varieties.

- 1a. Leaf blade inconspicuously reticulate abaxially 5c. var. *yunnanensis*
- 1b. Leaf blade conspicuously reticulate abaxially.
 - 2a. Inner sepals narrowly lanceolate or narrowly oblong-lanceolate 5b. var. *craveniana*
 - 2b. Inner sepals elliptic, broadly elliptic, or elliptic-obovate 5a. var. *sagittata*

5a. *Tinospora sagittata* var. *sagittata*

青牛胆(原变种) qing niu dan (yuan bian zhong)

Limacia sagittata Oliver, Hooker's Icon. Pl. 18: t. 1749. 1888; *Tinospora capillipes* Gagnepain; *T. imbricata* S. Y. Hu; *T. sagittata* var. *leucocarpa* Y. Wan & C. Z. Gao; *T. szechuanensis* S. Y. Hu.

Leaf blade conspicuously reticulate abaxially. Inner sepals elliptic, broadly elliptic, or elliptic-obovate.

Forests, grasslands. N Fujian, N and W Guangdong, Guangxi, E and S Guizhou, N Hainan, W Hubei, Hunan, NE Jiangxi, Shaanxi, S Shanxi, Sichuan, SE Xizang, SE Yunnan [N Vietnam].

5b. *Tinospora sagittata* var. *craveniana* (S. Y. Hu) H. S. Lo, Iconogr. Cormophyt. Sin., Suppl. 1: 490. 1982.

峨眉青牛胆 e mei qing niu dan

Tinospora craveniana S. Y. Hu, J. Arnold Arbor. 35: 194. 1954; *T. intermedia* S. Y. Hu.

Leaf blade conspicuously reticulate abaxially. Inner sepals narrowly lanceolate or narrowly oblong-lanceolate, 3–5 mm.

- Forests. Sichuan (Emei Shan).

This species is used medicinally.

5c. *Tinospora sagittata* var. *yunnanensis* (S. Y. Hu) H. S. Lo, Iconogr. Cormophyt. Sin., Suppl. 1: 490. 1982.

云南青牛胆 yun nan qing niu dan

Tinospora yunnanensis S. Y. Hu, J. Arnold Arbor. 35: 197. 1954.

Leaf blade inconspicuously reticulate abaxially. Inner sepals obovate or broadly obovate, ca. 2 mm. Fl. spring.

- Guangxi (Napo), SE Yunnan (Jianshui).

6. *Tinospora dentata* Diels in Engler, Pflanzenr. 46(IV.94): 139. 1910.

台湾青牛胆 tai wan qing niu dan

Vines slightly woody. Stems and branches slender, longitudinally striate, young parts puberulent. Petiole 4–5 cm, puberulent; leaf blade subhastate or sagittate, 6–12.5 × 5–7 cm, papery, both surfaces glabrous or abaxially puberulent, very densely so along veins, base cordate, with basal lobes angular-rounded or bearing a few large triangular teeth, margin repand dentate, apex mucronate, palmately 5–7-veined, with 3–5 pairs of lateral veins, reticulation conspicuous adaxially. Male inflorescences axillary or ramiflorous, pseudopaniculate, laxly flowered, solitary or 2- or 3-fascicled, (5–)10–20 cm, sparsely pubescent. Male flowers: pedicels 5–10 mm; sepals 6, ± equal, elliptic to oblanceolate, 6–7 mm; petals 6, cuneate, fleshy, 1.5–2.5 mm; stamens 6, 4–5 mm. Female panicles 8–10 cm. Female flowers and fruits unknown. Drupe not seen. Fl. Mar.

- Taiwan (Hengchun).

