

## NYSSACEAE

蓝果树科 lan guo shu ke

Qin Haining (覃海宁)<sup>1</sup>; Chamlong Phengkhai<sup>2</sup>

Trees or shrubs, dioecious or polygamo-monoecious. Leaves alternate, simple, estipulate. Flowers 5-merous, ± regular, subtended by 1–5 bracts; male ones in heads, racemes, or umbels; female and hermaphroditic ones solitary or in 2–12-flowered heads. Calyx tube adnate to ovary in bisexual or female flowers; lobes small or obsolete. Petals usually 5–10 (or absent). Stamens in male flowers usually 10 or more in 2 ± distinct whorls around a nectariferous disk. Ovary inferior, 1–8-loculed, with 1 pendulous, apotropous ovule per locule. Fruit a drupe; each locule of stone opening at apical part by a ± triangular abaxial valve at germination. Seeds 1–5; embryo straight; endosperm copious.

Five genera and about 30 species: mostly in temperate regions of E Asia and E North America; three genera (two endemic) and ten species (eight endemic) in China.

Recent studies suggest that this family can alternatively be treated as part of the Cornaceae (Xiang et al., Amer. J. Bot. 85: 285–297. 1998).

Fang Wen-pei. 1983. Nyssaceae. In: Fang Wen-pei & Chang Che-yung, eds., Fl. Reipubl. Popularis Sin. 52(2): 144–159.

- 1a. Fruit samaralike, clustered in globose heads ..... 1. *Camptotheca*  
1b. Fruit a drupe, solitary or several in a cluster.  
2a. Drupe 3–4 cm, 1.5–2 cm in diam., usually solitary; ovary 6–10-loculed; bracts white, 7–16 × 3–5 cm, larger one pendulous ..... 2. *Davidia*  
2b. Drupe to 2 cm, to 1 cm in diam., usually several in a cluster; ovary 1- or 2-loculed; bracts yellowish or greenish, smaller than above ..... 3. *Nyssa*

### 1. CAMPTOTHECA Decaisne, Bull. Soc. Bot. France 20: 157. 1873.

喜树属 xi shu shu

Trees deciduous, polygamo-monoecious. Young branchlets puberulous. Leaves petiolate; leaf blade oblong-ovate to oblong-elliptic, papery, slightly puberulous. Heads terminal or axillary. Bracts 3, triangular-ovate, both surfaces puberulous. Calyx cyathiform, 5-lobed; lobes tooth-shaped, margin ciliate. Petals 5, caducous, imbricate, pale green, oblong to oblong-ovate, outside densely puberulous. Stamens 10, unequal in length, inserted on disk, in 2 whorls; filaments slender, glabrous; anthers 4-celled. Ovary inferior, 1-loculed; ovules 1 per locule; style glabrous, 2-lobed. Fruit samaralike, clustered in globose heads, oblong, sessile, disk persistent. Seed 1; radicle terete, cotyledons thin.

- Two species: China.

*Camptotheca* is a primary source of anticancer camptothecin (Li et al., Pl. Med. (Stuttgart) 68: 1010–1016. 2002).

- 1a. Leaf blade oblong-ovate or oblong-elliptic, with 11–15 pairs of lateral veins ..... 1. *C. acuminata*  
1b. Leaf blade cordate or ovate, with 6–8 pairs of lateral veins ..... 2. *C. lowreyana*

**1. *Camptotheca acuminata*** Decaisne, Bull. Soc. Bot. France 20: 157. 1873.

喜树 xi shu

*Camptotheca acuminata* var. *rotundifolia* B. M. Yang & L. D. Duan; *C. acuminata* var. *tenuifolia* W. P. Fang & Soong; *C. yunnanensis* Dode.

Trees deciduous, to 20 m high; bark light gray, deeply furrowed; young branchlets purplish, villous, old branchlets glabrous. Petiole 1.5–3 cm; leaf blade abaxially greenish and lucid, oblong-ovate, oblong-elliptic, or orbicular, 12–28 × 6–12 cm, papery, slightly pubescent, lateral veins (4–)8–11(–15) pairs, base subrounded, margin entire, apex acute. Head terminal or axillary, often 2–9-flowered, 1.5–2 in diam.; bracts 3, triangular, 2.5–3 mm, both surfaces pubescent. Calyx cup-shaped, shallowly 5-lobed. Petals 5, light green, ca. 2 mm. Disk conspic-

uous. Stamens 10, outer 5 longer than petals, glabrous. Style ca. 4 mm, glabrous; stigmas 2. Fruit thinly winged, gray-brown, 2.5–3.5 cm × 5–7 mm, smooth and lucid when dry. Seed 1; cotyledons lanceolate, 2–4 × ca. 1 cm, pinniveined, with 6–8 lateral veins on each side. Fl. May–Jul, fr. Sep.  $2n = 44^*$ .

- Forest margins, by streams; below 1000 m. Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Yunnan, Zhejiang.

This species is commonly cultivated mainly along roadsides.

**2. *Camptotheca lowreyana*** S. Y. Li, Bull. Bot. Res., Harbin 17: 348. 1997.

洛氏喜树 luo shi xi shu

Trees deciduous, to 20 m high, ca. 1.2 m in diam. Bark light gray, smooth when young, deeply furrowed when mature. Leaf blade abaxially greenish and lucid, cordate or ovate, 12–19

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× 7–10 cm, slightly pubescent, lateral veins 14–18 pairs, margin entire. Bracts 1.5–2 mm. Petals 1.2–1.5 mm. Fruit 2 or 3, thinly winged, gray-brown, 2.5–3.5 cm × 5–7 mm, smooth and lucid when dry. Seed 1, cotyledons lanceolate, 2–4 × ca. 1 cm, pinni-

veined, with 6–8 lateral veins on each side. Fl. Jun–Aug, fr. Sep–Dec.

- Fujian, Guangdong, Guangxi, Hunan, Jiangxi, Sichuan.

**2. DAVIDIA** Baillon, *Adansonia* 10: 114. 1871.

珙桐属 gong tong shu

Trees deciduous, polygamous. Leaf blade ovate, membranous, base cordate, margin serrate. Heads terminal, globose, pedunculate; bracts 2(or 3), white, 7–16 × 3–5 cm, larger one pendulous. Staminate flowers without perianth; stamens 1–7, inserted on receptacle; filaments slender, glabrous; anthers introrse, purple. Pistillate or bisexual flower 1, inserted at top of head; perianth segments small, unequal in size; ovary inferior, connected to receptacle, 6–10-loculed, ovule 1 per locule; style short, stout, 6–10-lobed; stigmas inflated. Drupe purple-green or pale brown, with yellowish dots, oblong-ovoid to ellipsoidal; mesocarp fleshy; endocarp bony, sulcate. Seeds 3–5; embryo erect, radicle terete, cotyledons oblong.

- One species: China.

**1. Davidia involucrata** Baillon, *Adansonia* 10: 115. 1871.

珙桐 gong tong

Trees to 20 m high, with ascending bark. Petiole red, 3.6–7 cm; leaf blade adaxially bright green, broadly ovate, 8–15 × 7–12 cm, abaxially densely silky pubescent, strongly veined, adaxially finally glabrous, base cordate, margin dentate-serrate with acuminate teeth, apex acuminate. Flower heads terminal, ca. 2 cm in diam. on slender peduncles ca. 7 cm, on short lateral spurs; bracts 2(or 3), opposite, ovate to oblong-obovate, margin entire or serrate, larger one to 16 cm, smaller one ca. 1/2 as long. Fruit usually solitary, green with purple bloom, pear-shaped, 3–4 × 1.5–2 cm. Fl. Apr, fr. Oct.  $2n = 40^*$ ,  $42^*$ .

- Montane mixed forests; 1100–2600 m. Guizhou, W Hubei, W Hunan, Sichuan, N Yunnan.

This species was listed as rare in China by Fang and Song (in Fu & Jin, *China Pl. Red Data Book* 1: 474–476. 1992).

- 1a. Leaves abaxially densely pubescent .... 1a. var. *involucrata*
- 1b. Leaves abaxially glabrous or scarcely

pubescent when young, sometimes abaxially glaucous ..... 1b. var. *vilmoriniana*

**1a. Davidia involucrata** var. *involucrata*

珙桐(原变种) gong tong (yuan bian zhong)

*Davidia laeta* Dode.

Leaves abaxially densely pubescent.

- Mixed forests; 1500–2200 m. N Guizhou, W Hubei, W Hunan, Sichuan, N Yunnan.

**1b. Davidia involucrata** var. *vilmoriniana* (Dode) Wangerin in Engler, *Pflanzenr.* 41(IV. 220a): 19. 1910.

光叶珙桐 guang ye gong tong

*Davidia vilmoriniana* Dode, *Rev. Hort. (Paris)* 80: 406. 1908; *D. involucrata* subsp. *vilmoriniana* (Dode) J. Holub.

Leaves abaxially glabrous or scarcely pubescent when young, sometimes abaxially glaucous.

- Forests; 1500–2000 m. Guizhou, W Hubei, Sichuan.

**3. NYSSA** Linnaeus, *Sp. Pl.* 2: 1058. 1753.

蓝果树属 lan guo shu shu

Trees dioecious. Leaves often crowded near ends of branches, stipulate. Flowers unisexual, usually in heads or short racemes, in axil of a bract with 2 bracteoles. Male flowers 5-merous. Stamens 10, arranged in two alternate whorls; filaments linear; anthers 2-celled, dorsifixed, with lateral lengthwise slits; disk pulvinate. Female flowers (4 or)5-merous; staminodes usually present. Ovary inferior, 1(or 2)-loculed, 1-ovuled; style bifid, with stigmatic tissue at inside of stylar arms. Fruit drupaceous, ± laterally flattened, with persistent calyx and disk.  $n = 22$  [in *Nyssa javanica* (Blume) Wangerin (Mehra & Bawainin, *Evolution* 23: 466–481. 1969)].

About 12 species: four in North America, one in Costa Rica, one from India to Malaysia, and seven (five endemic) in China.

According to C. Q. Zhang (pers. comm.), most Chinese species of *Nyssa* are endangered and some of them may already have become extinct.

- 1a. Flowers pedicellate, in umbels or racemes.
  - 2a. Branchlets, petioles, and pedicels pilose when young, subglabrous when old ..... 5. *N. sinensis*
  - 2b. Branchlets, petioles, and pedicels persistently pilose ..... 4. *N. shweliensis*
- 1b. Flowers in heads, sessile or male ones shortly pedicellate.
  - 3a. Leaves thin, papery.
    - 4a. Leaf blade subelliptic, to 5 × 3.5 cm, petiole to 1 cm ..... 2. *N. leptophylla*
    - 4b. Leaf blade suboblong, not less than 8 × 4 cm, petiole not less than 1.5 cm ..... 6. *N. wenshanensis*
  - 3b. Leaves thick, leathery.
    - 5a. Drupes usually less than 1.2 cm; branchlets, pedicels, and leaves glabrous ..... 3. *N. shangszeensis*
    - 5b. Drupes not less than 1.4 cm; branchlets, pedicels, and leaves pilose at least when young.

- 6a. Branchlets, pedicels, and leaves abaxially tomentose when young, subglabrous when mature ..... 1. *N. javanica*  
 6b. Branchlets, pedicels, and leaves abaxially persistently pilose ..... 7. *N. yunnanensis*

**1. *Nyssa javanica*** (Blume) Wangerin in Engler, Pflanzenr. 41(IV. 220a): 15. 1910.

华南蓝果树 hua nan lan guo shu

*Agathisanthes javanica* Blume, Bijdr. 645. 1826; *Cerato-stachys arborea* Blume; *Daphniphylopsis capitata* Kurz; *Ilex daphniphyloides* Kurz; *Nyssa arborea* (Blume) Koorders; *N. bifida* Craib; *N. sessiliflora* J. D. Hooker & Thomson.

Trees deciduous, to 30 m high. Current year twigs densely tomentose, glabrescent. Leaves often crowded near ends of branches; petioles 1.5–3.5 cm, flattened; leaf blade oblanceolate or oblong-obovate, 10–15(–23) × 3–5 cm, leathery, tomentose when young, late glabrescent except at veins abaxially, midvein and secondary veins 8–15 pairs conspicuous adaxially, base slightly cuneate or acute, margin entire, apex acute. Flowers in ± globose axillary heads; peduncle 1–3.5 cm. Calyx campanulate, outside densely hairy; lobes triangular, 4–5 × 1–1.5 mm. Petals 4 or 5, yellowish or greenish, ovate to obovate, 3–5 × 1.5–3 mm, both surfaces tomentose. Male heads 20–40-flowered; pedicels 1–4 mm, slender, pubescent. Stamens 8–10, in 2 series, outer ones ca. 4 mm, inner ones ca. 2 cm. Female heads with 3–8(–15) sessile flowers; peduncle similar to male ones; staminodes 8–10. Styles 1.5–2 mm, 2-lobed at top. Drupe purple, ellipsoid, 1.4–2.6 cm, 1.2–1.5 mm in diam. Seeds flattened, on one side with 5 lengthwise grooves, other side with few tubercles on upper half. Fl. Apr–May, fr. Oct.

Evergreen forests; 100–2500 m. Guangdong, Guangxi, Hainan, Yunnan [Bhutan, India, Indonesia, Laos, Malaysia, Myanmar, Vietnam].

**2. *Nyssa leptophylla*** W. P. Fang & T. P. Chen, Acta Phytotax. Sin. 13(2): 84. 1975.

薄叶蓝果树 bao ye lan guo shu

Trees small. Bark brown, smooth; young branches pubescent, becoming glabrous. Petiole 7–10 mm, pubescent; leaf blade abaxially light green, adaxially dark green, subelliptic, 4–5 × 3–3.5 cm, thinly papery, glabrous except midvein sparsely pubescent at base, lateral veins 9 or 10 pairs conspicuous abaxially, base broadly cuneate or obtuse, margin entire, revolute when dried, apex acute. Flowers unknown. Drupes sessile, 2 or 3 in head, subovoid or obovate, slightly flattened, 7–8 mm, ca. 5 mm in diam., ca. 3 mm thick, pubescent when young, late glabrescent; peduncle 2.5–2.8 cm, slender. Seeds slightly laterally flattened, with 5–7 lengthwise grooves. Fl. unknown, fr. Sep.

- Sparse forests; ca. 1000 m. Hunan.

*Nyssa leptophylla* is known to us only from the protologue.

**3. *Nyssa shangszeensis*** W. P. Fang & Soong, Acta Phytotax. Sin. 13(2): 84. 1975.

上思蓝果树 shang si lan guo shu

Trees evergreen, small, 3–5 m high; branches thick, ca. 5 mm in diam., current year twigs glabrous. Petiole 1.5–2.5 cm, glabrous; leaf blade abaxially light green, adaxially green, narrowly elliptic, sometimes oblong-obovate, 7–11 × 3.8–4.8 cm,

thickly leathery, glabrous, lateral veins 9 or 10 pairs, base broadly cuneate or obtuse, margin slightly sinuate or subentire, revolute when dried, apex acute. Flowers unknown. Drupes sessile, 3 or 4 in head, narrowly ellipsoid, laterally flattened, ca. 1.2 cm, ca. 7 mm in diam., ca. 4 mm thick, outside pubescent, with persistent calyx at top and 3 oval bractlets at base; peduncles 1.5–2.5 cm, thick. Seeds laterally flattened, with 5–7 lengthwise grooves. Fl. unknown, fr. Sep.

- Evergreen forests; ca. 300 m. SW Guangxi (Shangsi).

*Nyssa shangszeensis* is known to us only from the protologue.

**4. *Nyssa shweliensis*** (W. W. Smith) Airy-Shaw, Kew Bull. 23: 311. 1969.

瑞丽蓝果树 rui li lan guo shu

*Alangium shweliense* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 13: 152. 1921.

Trees to 15 m high. Young twigs light purple, densely pilose, becoming dark brown and glabrous when old. Petiole 2.5–4 cm, pilose; leaf blade ovate to ovate-oblong, 9–14 × 5.5–8 cm, papery, abaxially densely pilose at veins, adaxially sparsely stiffly hairy, midvein and 7–9 pairs of lateral veins more conspicuous abaxially, base subrounded, margin slightly sinuate, apex acuminate. Staminate flowers in dense racemes or small umbels; peduncle 2.5–3 cm, densely pilose; bract solitary, ovate, ca. 1 cm; disk platform, pilose. Pedicel 7–8 mm, slender, pilose. Calyx lobes 5, ovate or triangular, outside pilose. Petals 5, suboblanceolate, ca. 3 × 1 mm. Stamens 10, in 2 series, unequal, 2–4 mm, sparsely pilose at base. Female flowers not seen. Drupe ovoid or oblong, ca. 1.3 cm, 6–7 mm in diam.; calyx lobes and disk persistent; petiole 3–6 mm; exocarp mealy, endocarp woody, 1-seeded. Fl. Apr–May, fr. Sep.

- Sparse forests; 1700–2700 m. W Yunnan [?Vietnam].

*Nyssa shweliensis* is possibly only a small-fruited variant of *N. wenshanensis*.

**5. *Nyssa sinensis*** Oliver, Hooker's Icon. Pl. 20: t. 1964. 1891.

蓝果树 lan guo shu

*Daphniphyllum cavaleriei* H. Léveillé; *Microrhammus bodinieri* H. Léveillé; *Nyssa sinensis* var. *oblongifolia* W. P. Fang & Soong.

Trees to 20 m tall. Bark dark gray, shallowly fissured, lenticellate. Petiole 1.5–2 cm, flattened; leaf blade abaxially light green, adaxially dark green, oblong to narrowly oblong, 10–15 × 4–6(–8) cm, papery to subleathery, abaxially sparsely pubescent, adaxially glabrous, midvein and 6–10 pairs of lateral veins distinct abaxially, inconspicuous adaxially, base subrounded, margin slightly sinuate, apex acute. Inflorescences umbels or racemes; peduncle 3–5 cm, sparsely pilose when young, glabrescent. Staminate flowers on old branches. Pedicels ca. 5 mm. Calyx lobes small. Petals shortly oblong, shorter than filaments. Stamens 5–10. Female flowers axillary on young branches. Pedicels 1–2 mm. Calyx lobes entire. Petals ca. 1.5 mm. Staminodes 8–10. Drupe bluish, oblong or obovoid, 1–1.2 cm, ca. 6

mm in diam., 4–5 mm thick, ± laterally flattened. Seeds slightly flattened, with 5–7 lengthwise grooves. Fl. Apr, fr. Sep.  $2n = 44^*$ .

Wet mixed forests along streams and valleys; 300–1700 m. S Anhui, S Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, SE Sichuan, Yunnan, Zhejiang [Vietnam].

**6. *Nyssa wenshanensis*** W. P. Fang & Soong, *Acta Phytotax. Sin.* 13(2): 85. 1975.

文山蓝果树 *wen shan lan guo shu*

*Nyssa wenshanensis* var. *longipedunculata* W. P. Fang & Soong.

Trees to 20 m tall. Bark dark gray; lenticels light white; branches glabrous. Petiole 1.5–2 cm, slender, glabrous; leaf blade abaxially light green, adaxially dark green, oblong to narrowly elliptic, 8–10 × 4–5 cm, thinly papery, glabrous, lateral veins 10–12 pairs, base subrounded or obtuse, margin entire, apex acute. Staminate flowers sessile, ca. 30 in head; disk plate-form, shortly pilose; peduncle 0.8–1.2 mm, sparsely tomentose. Calyx lobes 4 or 5, light green, subglobose, ca. 0.5 × 0.8 mm, margin usually revolute. Petals suboblong, ca. 3 × 1.8 mm, margin usually revolute. Stamens 8–10, in 2 series, 1.5–3 mm, glabrous. Female flowers and fruit not seen. Fl. May, fr. unknown.

- Evergreen forests; ca. 1900 m. SE Yunnan.

**7. *Nyssa yunnanensis*** W. Q. Yin ex H. N. Qin & Phengkai, **sp. nov.**

云南蓝果树 *yun nan lan guo shu*

Type: China. Yunnan: Jinghong Shi, Puwen, 27 Mar 1957 (fl.), *Yunnan Expedition 9102* (holotype, KUN).

Validating Latin diagnosis: that of “*Nyssa yunnanensis* W. C. [sic] Yin” (C. Y. Wu & J. R. Fan in C. Y. Wu, *Fl. Yunnan*. 1: 292. 1977).

Trees dioecious, 25–30 m tall, ca. 1 m d.b.h. Bark dark brown, shallowly fissured, lenticels conspicuous. Branches densely yellowish tomentose. Petiole 2–3 cm, thick; leaf blade abaxially gray-green, adaxially dark green, elliptic or obovate, 15–22 × 8–12 cm, thickly leathery, abaxially densely tomentose, midvein and secondary veins 14–18 pairs, more densely tomentose, base obtuse or subrounded, margin entire to slightly sinuate; apex acute. Staminate flowers many, in axillary umbels; peduncle 2–2.5 cm, thick; pedicels ca. 3 mm, tomentose. Calyx lobes ovate-triangular, ca. 0.5 mm. Petals 5, oblong, ca. 2 × 1 mm. Stamens 2–3 mm; filaments linear. Female flowers not seen. Drupes 4 or 5 in head, purplish brown, ellipsoid, ca. 2 cm, ca. 1 mm in diam.; peduncles ca. 2 cm. Seeds slightly flattened, with 7 lengthwise grooves. Fl. Mar, fr. Sep.

- Dense forests in valleys; 500–1100 m. S Yunnan.

When *Nyssa yunnanensis* was originally described by Wu and Fan (loc. cit.), two gatherings were indicated as types, one flowering and one fruiting, with the result that the name was not validly published (see Art. 37.2 of the *Vienna Code*).

*Nyssa yunnanensis* was listed as endangered in China by Xu (in Fu & Jin, *China Pl. Red Data Book* 1: 477. 1992).