

## 1. ULMUS Linnaeus, Sp. Pl. 1: 225. 1753.

榆属 yu shu

Trees or shrubs, deciduous or evergreen. Branchlets never spinose, sometimes with a thick and irregularly longitudinally fissured corky layer or with 2 flat opposite corky wings. Bud scales imbricate, glabrous or pubescent. Stipules 2, lanceolate-ovate to linear, membranous, caducous, leaving a short transverse scar on each side of leaf base. Leaves distichous, blade base  $\pm$  oblique, margin doubly or simply serrate; venation pinnate; secondary veins extending to margin, each ending in a tooth. Bracteoles at base of pedicels, membranous. Pedicel shorter than to almost as long as perianth, pubescent or rarely glabrous. Flowers bisexual or polygamous, appearing in spring before leaves, rarely in autumn or winter. Perianth 4–9-lobed, usually campanulate; tepals membranous, usually persistent, apex usually laciniate. Stamens equal in number to tepals; filaments flat; anthers extrorse. Ovary flat; ovule pendulous, amphitropous. Style very short or rarely slightly elongate and bifid; stigmas 2, linear, pubescent. Samara flat, orbicular, obovate, oblong, elliptic, or rarely shuttle-shaped, wings membranous, apex with notch and persistent stigmas. Seed at center or toward apex of samara, compressed or  $\pm$  convex, without endosperm; embryo erect; cotyledon flat or  $\pm$  convex.

About 40 species: Asia, Europe, North America; 21 species (14 endemic) in China.

Many species yield fine woods, edible fruit, and medicinal products.

Many Chinese *Ulmus* species are cultivated in areas beyond their native range. In addition, the non-native species *Ulmus americana* Linnaeus, *U. densa* Litvinov, and *U. laevis* Pallas are grown as cultivated plants in China.

- 1a. Evergreen trees; samaras strongly asymmetric, orange-brown ..... 20. *U. lanceifolia*
- 1b. Deciduous trees; samaras symmetric or weakly asymmetric, tan, light brown, pale green, or whitish (rarely slightly orange- or red-brown in *U. macrocarpa* and *U. parvifolia*).
  - 2a. Flowers and fruit appearing late summer to early autumn ..... 21. *U. parvifolia*
  - 2b. Flowers and fruit appearing in spring.
    - 3a. Inflorescences racemose cymes or short cymes; peduncle slightly elongated to very noticeably elongated, pendulous; pedicel 2–4  $\times$  as long as perianth ..... 1. *U. elongata*
    - 3b. Inflorescences fascicled cymes or fasciculate; peduncle extremely short, not pendulous; pedicel almost as long as or rarely longer than perianth.
      - 4a. Seed at center or toward apex of samara; seed apex reaching notch (apex sometimes only nearly to notch in *U. glaucescens*).
        - 5a. Flowers developed from mixed buds thus samaras usually on short shoots with one or a few leaves; leaves 1–3 cm wide, both surfaces pubescent or subglabrous, often with tufts of hairs abaxially in forkings of secondary veins (never in vein axils); samara wings relatively thick; seed broader than wings ..... 12. *U. glaucescens*
        - 5b. Flowers developed from floral buds thus no leaves attached within each cluster of samaras; leaves 1.5–10 cm wide, variously pubescent or glabrous but often with tufts of hairs abaxially in vein axils (never in forkings of secondary veins); samara wings thin; seed narrower than wings.
          - 6a. Samara  $\pm$  pubescent ..... 13. *U. chenmoui*
          - 6b. Samara glabrous except for notch or pubescent only on seed.
            - 7a. Leaf blade abaxially densely pubescent ..... 19. *U. castaneifolia*
            - 7b. Leaf blade abaxially glabrous or sparsely pubescent.
              - 8a. Branchlets densely pubescent ..... 18. *U. androssowii*
              - 8b. Branchlets glabrous or sparsely pubescent.
                - 9a. Samara obovate to  $\pm$  obovate or oblong-elliptic to oblong-obovate.
                  - 10a. Samara obovate to  $\pm$  obovate; branchlets sometimes with a corky layer ..... 14. *U. davidiana*
                  - 10b. Samara oblong-elliptic to oblong-obovate; branchlets without a corky layer ..... 15. *U. prunifolia*
                - 9b. Samara  $\pm$  orbicular to ovate-orbicular.
                  - 11a. Samara 7–8  $\times$  7–8 mm; leaf blade 8.5–17 cm; petiole ca. 5 mm ..... 16. *U. microcarpa*
                  - 11b. Samara 11–16  $\times$  9–13 mm; leaf blade 2–9 cm; petiole 5–12 mm ..... 17. *U. szechuanica*
    - 4b. Seed at center or slightly toward base of samara; seed apex not reaching notch (apex sometimes near to notch in *U. pumila*).
      - 12a. Samara pubescent.
        - 13a. Leaf blade abaxially glabrous and  $\pm$  scabrous, adaxially sparsely pubescent when young but glabrescent, margin serrate with acute teeth; bud scales glabrous ..... 5. *U. changii*
        - 13b. Leaf blade abaxially  $\pm$  pubescent and scabrous or not, adaxially scabrous and densely hirsute, margin rounded serrate; bud scales  $\pm$  pubescent.
          - 14a. Flowers developed from mixed buds; bark irregularly exfoliating, gray to grayish

ULMACEAE

- white ..... 4. *U. lamellosa*
- 14b. Flowers developed from floral buds or mixed buds; bark longitudinally fissured, gray to blackish gray.
- 15a. Branchlets pubescent; leaf blade apex obtuse-acuminate to acute; samara 1.8–2.8 × 1.7–2.7 cm ..... 2. *U. gausсенii*
- 15b. Branchlets glabrous or sparsely pubescent; leaf blade apex acuminate or shortly caudate; samara 1.5–4.7 × 1–3.9 cm ..... 3. *U. macrocarpa*
- 12b. Samara glabrous or pubescent only on stigmatic surface.
- 16a. Leaf blade apically 3–7-lobed; pedicel glabrous ..... 6. *U. laciniata*
- 16b. Leaf blade apically not lobed; pedicel pubescent.
- 17a. Leaf blade 5–18 × 3–8.5 cm, apically narrowly acuminate to caudate; winter buds glabrous or variously pubescent.
- 18a. Winter buds ± pubescent, margin of bud scales prominently long ciliate; twigs sometimes conspicuously winged; samaras 1.5–4.7 × 1–3.9 cm ..... 3. *U. macrocarpa*
- 18b. Winter buds finely and inconspicuously puberulent, margin of bud scales entire or inconspicuously short-ciliate; twigs never winged; samaras 1–1.8 × 0.8–1.6 cm.
- 19a. Leaf blade 5–11 × 3–4.5 cm, abaxially pubescent, base ± oblique to ± symmetric; secondary veins 11–20 on each side of midvein; samara 8–10 mm wide ..... 8. *U. uyematsui*
- 19b. Leaf blade 6–18 × 3–8.5 cm, abaxially glabrous or pubescent, base distinctly oblique; secondary veins 17–26 on each side of midvein; samara 10–16 mm wide ..... 7. *U. bergmanniana*
- 17b. Leaf blade 2–8 × 1.2–3.5 cm, apically acuminate to cuspidate; winter bud scale margin usually white-ciliate.
- 20a. Leaf blade pubescent; petiole pubescent; samara wings relatively thick ..... 11. *U. pseudopropinqua*
- 20b. Leaf blade smooth and glabrous or with tufts of hair in vein axils; petiole glabrous or pubescent; samara wings relatively thin.
- 21a. Leaf blade margin simply serrate or sparsely doubly serrate; base symmetric to ± oblique ..... 9. *U. pumila*
- 21b. Leaf blade margin doubly serrate; base oblique ..... 10. *U. harbinensis*

**1. *Ulmus elongata*** L. K. Fu & C. S. Ding, Acta Phytotax. Sin. 17(1): 46. 1979.

长序榆 chang xu yu

Trees, to 30 m tall, d.b.h. to 80 cm, deciduous. Bark brownish gray, exfoliating. Branchlets chestnut brown, sometimes with a corky layer, with scattered lenticels. Winter buds narrowly ovoid; inner bud scale margin apically pubescent. Stipules lanceolate to narrowly lanceolate, 0.7–1.8 cm. Petiole 3–11 mm, pubescent; leaf blade elliptic to lanceolate-elliptic, 7–19 × 3–8 cm, abaxially densely pubescent, adaxially glabrous or glabrescent, base cuneate and ± oblique, margin doubly serrate with teeth incurved and cuspidate, apex acuminate; secondary veins 16–30 on each side of midvein. Inflorescences racemose cymes; rachis elongated, pendulous, sparsely pubescent. Flowers from floral buds on second year branchlets. Pedicel 2–4 × as long as perianth. Perianth funnellform; tepals 6. Samaras yellowish green, shuttle-shaped, 2–2.5 cm × ca. 3 mm, basally with a long gynophore, margin densely white ciliate; stalk slender, unequally long, 0.5–2.2 cm. Seed at center or slightly toward apex of samara. Fl. Feb, fr. Mar.

• Scattered in evergreen broad-leaved forests; 200–900 m. Anhui, N Fujian, Jiangxi, Zhejiang.

**2. *Ulmus gausсенii*** W. C. Cheng, Trav. Lab. Forest. Toulouse 3(3): 110. 1939.

醉翁榆 zui weng yu

Trees, to 25 m tall, d.b.h. to 80 cm, deciduous. Bark dark gray to blackish, longitudinally fissured, scabrous. Branchlets densely pubescent in first or second year, sometimes with opposite flat corky wings, with scattered yellowish brown lenticels. Winter buds ± globose to ovoid; bud scale margin ciliate. Petiole 4–8 mm, pubescent; leaf blade oblong-obovate, elliptic-obovate, or rhombic-elliptic, 3–11 × 1.8–5.5 cm, abaxially scabridulous and densely pubescent when young but only on veins with age, adaxially scabrous and densely hirsute, base oblique, margin simply or doubly serrate, apex obtuse-acuminate to acute; secondary veins 8–10 on each side of midvein. Flowers from floral buds, rarely from mixed buds. Perianth campanulate, 4- or 5-lobed, pubescent, margin ciliate. Samaras orbicular to obovate-orbicular, 1.8–2.8 × 1.7–2.7 cm, pubescent, base broadly rounded to rounded; stalk 1–2 mm, densely pubescent; perianth persistent. Seed at center of samara. Fl. and fr. Mar–Apr.

• River banks, limestone mountains. Anhui (Langya Shan).

This species is cultivated in Jiangsu (Nanjing).

**3. *Ulmus macrocarpa*** Hance, J. Bot. 6: 332. 1868.

大果榆 da guo yu

Shrubs or trees, to 20 m tall, d.b.h. to 40 cm, deciduous.

Bark gray to blackish gray, longitudinally fissured. Branchlets tan to red-brown, sometimes with corky wings, glabrous or sparsely pubescent when young, with scattered lenticels. Winter buds dark brown, sometimes hoary from pubescence, ovoid-orbicular to ± globose; bud scales ± pubescent, margin prominently long ciliate. Petiole 2–14 mm, pubescent; leaf blade broadly obovate, obovate-orbicular, obovate-rhombic, or obovate, 4–11 × 3.5–6 cm, leathery, margin obtusely doubly or simply serrate; secondary veins 6–16 on each side of midvein. Inflorescences fascicled cymes on second year branchlets or scattered at base of new branchlets. Flowers from floral buds or mixed buds. Perianth campanulate, 5-lobed, pubescent or not, margin ciliate. Samaras tan to light brown, rarely slightly orange-brown, broadly obovate-orbicular, ± orbicular, or broadly elliptic, 1.5–4.7 × 1–3.9 cm; perianth persistent. Seed at center of samara. Fl. Mar–May, fr. Apr–Jun.

Mixed forests, slopes, valleys; 700–1800 m. Anhui, Gansu, Hebei, Heilongjiang, Henan, Hubei, N Jiangsu, Jilin, Liaoning, Nei Mongol, E Qinghai, Shaanxi, Shandong, Shanxi [Korea, Mongolia, Russia (Far East, E Siberia)].

- 1a. Samara pubescent; leaf blade abaxially sparsely pubescent, adaxially hirsute or with convex trichome scars, base attenuated to rounded, apex shortly caudate ..... 3a. var. *macrocarpa*
- 1b. Samara glabrous; leaf blade surfaces smooth and glabrous with tufted hairs on veins, base oblique, apex acuminate to narrowly acuminate ..... 3b. var. *glabra*

**3a. *Ulmus macrocarpa* var. *macrocarpa***

大果榆(原变种) da guo yu (yuan bian zhong)

*Ulmus macrocarpa* var. *mandshurica* Skvortsov; *U. macrocarpa* var. *mongolica* Liou & Li; *U. macrocarpa* var. *nana* Liou & Li; *U. macrophylla* Nakai; *U. taihangshanensis* S. Y. Wang.

Leaf blade abaxially sparsely pubescent with hairs tufted in axils and forks of secondary veins, adaxially hirsute or with convex trichome scars, base attenuated to rounded, apex shortly caudate. Samaras pubescent, apically concave or rounded, wings thick, stigmas pubescent. Fl. Mar, fr. Apr.

Slopes, valleys; 700–1800 m. Anhui, Gansu, Hebei, Heilongjiang, Henan, Hubei, N Jiangsu, Jilin, Liaoning, Nei Mongol, E Qinghai, Shaanxi, Shandong, Shanxi [Korea, Mongolia, Russia (Far East, E Siberia)].

*Ulmus taihangshanensis*, described from Henan, differs in having more pubescent twigs that never develop corky wings, and thinner leaves (papery rather than leathery).

**3b. *Ulmus macrocarpa* var. *glabra* S. Q. Nie & K. Q. Huang, Bull. Bot. Res., Harbin 7(1): 153. 1987.**

光秃大果榆 guang tu da guo yu

Leaf blade ± elliptic, smooth, with tufted hairs in vein axils, base oblique, apex acuminate to narrowly acuminate. Samaras smooth, glabrous, wings thin. Fl. Apr–May, fr. May–Jun.

- Mixed forests. Heilongjiang (Harbin).

**4. *Ulmus lamellosa* C. Wang & S. L. Chang, Acta Phytotax. Sin. 17(1): 47. 1979.**

脱皮榆 tuo pi yu

Trees, 8–12 m tall, d.b.h. 15–20 cm, deciduous. Bark gray to grayish white, exfoliating in irregular flakes. Branchlets brown to grayish brown, glabrous, unwinged, sometimes with a corky layer. Winter buds ovoid-orbicular to ± orbicular; bud scales ± pubescent, margin ciliate. Stipules linear to lanceolate, pubescent, caducous. Petiole 3–8 mm; leaf blade obovate, 5–10 × 2.5–5.5 cm, abaxially ± scabrous and densely pubescent when young, adaxially scabrous and densely hirsute or with trichome scars, base ± oblique, margin simply or doubly serrate with blunt teeth, apex caudate to cuspidate. Flowers from mixed buds, appearing at same time as leaves. Perianth campanulate, 6-lobed, pubescent. Samara usually scattered near base of branchlets, orbicular to ± orbicular, 2.5–3.5 × 2–2.7 cm, densely pubescent, apically concave; stigmas beak-shaped, densely pubescent; stalk 3–4 mm, densely pubescent or with elongate glandular hairs; perianth persistent. Seed at center of samara. Fl. Mar–Apr, fr. Apr–May.

- Mountain ravines; ca. 1200 m. Hebei, Henan, Nei Mongol, Shanxi.

This species is cultivated in Beijing and Liaoning (Xiongyuecheng).

**5. *Ulmus changii* W. C. Cheng, Contr. Biol. Lab. Chin. Assoc. Advancem. Sci., Sect. Bot. 10: 94. 1936.**

杭州榆 hang zhou yu

Trees, to 20 m tall, d.b.h. to 90 cm, deciduous. Bark dark gray, grayish brown, or grayish black. Branchlets reddish brown, pubescent when young, unwinged. Winter buds dark reddish brown, ovoid-orbicular to ± globose, glabrous. Petiole 2–8 mm, pubescent; leaf blade ovate to ovate-elliptic, 3–11 × 1.7–4.5 cm, abaxially often scabrous and with hairs tufted in forks of secondary veins and sometimes also scattered along major veins, adaxially sparsely appressed villous or scattered hispidulous when young but glabrescent and smooth or ± scabrous with age, base obliquely rounded to obtuse, margin sharply simply serrate or rarely doubly serrate, apex slenderly acuminate to mucronate; secondary veins 9–20(–24) on each side of midvein. Flowers from floral buds or mixed buds. Perianth campanulate, 4- or 5-lobed, margin ciliate. Samaras tan, ± orbicular to narrowly elliptic-orbicular, 1.5–3.5 × 1.3–2.2 cm, pubescent; stalk as long as or slightly shorter than perianth, densely pubescent; perianth persistent. Seed at center or slightly toward base of samara. Fl. Mar–Apr, fr. Mar–Apr.

- Montane forests; 200–1800 m. Anhui, Fujian, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Yunnan, Zhejiang.

- 1a. Flowers in fascicled cymes from floral buds; leaf blade abaxially glabrous or pubescent on veins ..... 5a. var. *changii*
- 1b. Flowers from mixed buds, scattered in basal or subbasal bract axil of young branches; leaf blade abaxially with tufted hairs in

axils of veins ..... 5b. var. *kunmingensis*

**5a. *Ulmus changii* var. *changii***

杭州榆(原变种) hang zhou yu (yuan bian zhong)

Leaf blade abaxially glabrous or pubescent on veins. Flowers from floral buds, fascicled cymes. Fl. Mar–Apr, fr. Mar–Apr.

• 200–800 m. Anhui, Fujian, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Zhejiang.

**5b. *Ulmus changii* var. *kunmingensis*** (W. C. Cheng) W. C. Cheng & L. K. Fu, Acta Phytotax. Sin. 17(1): 49. 1979.

昆明榆 kun ming yu

*Ulmus kunmingensis* W. C. Cheng, Sci. Silv. Sin. 8(1): 12. 1963; *U. kunmingensis* var. *qingchengshanensis* T. P. Yi.

Branches of sprout sometimes with swelling and irregularly longitudinally fissured corky layer. Leaf blade abaxially with tufted hairs in axil of veins. Flowers from mixed buds, scattered in basal or subbasal bract axil of young branches. Fl. and fr. same as for autonym variety but slightly earlier in season.

• Montane forests; 600–1800 m. Guangxi, Guizhou, Sichuan, Yunnan.

**6. *Ulmus laciniata*** (Trautvetter) Mayr, Fremdländ Wald-Park-bäume, 523. 1906.

裂叶榆 lie ye yu

*Ulmus montana* Withering var. *laciniata* Trautvetter, Mém. Acad. Imp. Sci. St.-Petersbourg Divers Savans 9: 246. 1859; *U. major* Hohenacker var. *heterophylla* Maximowicz.

Trees, to 27 m tall, d.b.h. to 50 cm, deciduous. Bark dark grayish brown to gray, longitudinally fissured, slightly longitudinally exfoliating in flakes. Branchlets pale brownish gray, grayish brown, or reddish brown, pubescent when young, glabrate or glabrescent, unwinged. Winter buds brown, ovoid-orbicular to elliptic; inner bud scales pubescent. Petiole 2–5 mm, glabrous or pubescent; leaf blade obovate, obtriangular-elliptic, or long obovate-orbicular, 7–18 × 4–14 cm, abaxially pubescent, adaxially hirsute but sparsely so late in season, base oblique, margin ciliate and deeply doubly serrate, apex ± truncate, abruptly caudate-acuminate, and often with 1–3 caudate lobes on each side, or sometimes apex rounded; secondary veins 10–17 on each side of midvein. Inflorescences fascicled cymes on second year branchlets. Perianth campanulate, 5-lobed, glabrous or tips of lobes ciliate. Samaras tan or pale green, elliptic to orbicular-elliptic, 1.5–2 × 1–1.4 cm, glabrous except for pubescence on stigmatic surface; stalk shorter than perianth, glabrous; perianth persistent. Seed at center or slightly toward base of samara. Fl. and fr. Apr–May. 2n = 28.

700–2200 m. Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Shaanxi, Shandong [Japan, Korea, Russia (Far East, E Siberia)].

**7. *Ulmus bergmanniana*** C. K. Schneider, Illustr. Handb. Laubholz. 2: 902. 1912.

兴山榆 xing shan yu

Trees, to 26 m tall, d.b.h. to 90 cm, deciduous. Bark grayish white, dark gray, or grayish brown, longitudinally fissured. Branchlets purplish brown to tan, glabrous or pubescent, unwinged. Winter buds brown, ovoid-orbicular to oblong-ovoid; bud scales glabrous or finely and inconspicuously puberulent, margin entire or inconspicuously short-ciliate. Petiole 1–13 mm, glabrous or pubescent; leaf blade elliptic, long orbicular-elliptic, narrowly elliptic, obovate-oblong, or ovate, 6–18 × 3–8.5 cm, abaxially pubescent in vein axils or over whole blade, adaxially glabrous and often scabrous, base ± oblique, margin doubly serrate, apex caudate, acuminate-caudate, or cuspidate-caudate; secondary veins (15–)17–26 on each side of midvein. Inflorescences fascicled cymes on second year branchlets. Flowers from floral buds. Perianth campanulate, 4–6-lobed, margin ciliate. Samaras tan to light brown, broadly obovate, obovate-orbicular, orbicular, or long orbicular, 1.2–1.8 × 1–1.6 cm, glabrous except for pubescence on stigmatic surface in notch; stalk shorter than perianth, ± pubescent; perianth persistent. Seed at center or slightly toward base of samara. Fl. and fr. Feb–Apr.

• Forests; 1500–2900 m. Anhui, Gansu, Henan, Hubei, Hunan, Jiangxi, Shaanxi, Shanxi, Sichuan, SE Xizang, Yunnan, Zhejiang.

- 1a. Leaf blade abaxially densely hirsute when young, glabrescent with tufted hairs remaining only in axil of veins ..... 7a. var. *bergmanniana*
- 1b. Leaf blade abaxially with dense pubescence of curved or crisped hairs ..... 7b. var. *lasiophylla*

**7a. *Ulmus bergmanniana* var. *bergmanniana***

兴山榆(原变种) xing shan yu (yuan bian zhong)

Leaf blade abaxially densely hirsute when young, glabrescent with tufted hairs only remaining in axil of veins. Fl. and fr. Feb–Apr.

• 1500–2600 m. Anhui, Gansu, Henan, Hubei, Hunan, Jiangxi, Shaanxi, Shanxi, Sichuan, Yunnan, Zhejiang.

**7b. *Ulmus bergmanniana* var. *lasiophylla*** C. K. Schneider in Sargent, Pl. Wilson. 3: 241. 1916.

蜀榆 shu yu

*Ulmus lasiophylla* (C. K. Schneider) W. C. Cheng.

Leaf blade abaxially with dense pubescence of curved or crisped hairs. Fl. and fr. Feb–Apr.

• Forests; 2100–2900 m. Gansu, Shaanxi, NW Sichuan, SE Xizang, NW Yunnan.

**8. *Ulmus uyematsui*** Hayata, Icon. Pl. Formosan. 3. 174. 1913.

阿里山榆 a li shan yu

Trees, to 25 m tall, d.b.h. to 80 cm, deciduous. Bark dark gray, longitudinally fissured, scabrous, exfoliating in irregular flakes. Branchlets brown to dark brown, glabrous or pubescent when young, soon glabrescent, unwinged and without a corky

layer, with scattered lenticels. Winter buds dark purplish brown, ovoid; bud scales finely and inconspicuously puberulent, margin entire or inconspicuously short-ciliate. Petiole 2–6 mm, pubescent; leaf blade elliptic to oblong-elliptic, 5–11 × 3–4.5 cm, abaxially densely pubescent with conspicuous tufts in vein axils, adaxially smooth and glabrous or with scattered hairs, base obtuse to obliquely truncate, margin doubly serrate, apex caudate; secondary veins 11–20 on each side of midvein, tufted pubescent in axils. Inflorescences fascicled cymes on second year branchlets. Perianth campanulate, 5- or 6-lobed. Samaras tan, obovate to obovate-orbicular, 1–1.5 × 0.8–1 cm, glabrous except for pubescence on stigmatic surface in notch; stalk almost as long as or slightly shorter than perianth, pubescent; perianth persistent. Seed at center of samara. Fl. and fr. Feb–Mar.

- Forests in mountains; 800–2500 m. C Taiwan.

**9. *Ulmus pumila*** Linnaeus, Sp. Pl. 1: 326. 1753.

榆树 yu shu

*Ulmus campestris* Linnaeus var. *pumila* (Linnaeus) Maximowicz; *U. pumila* var. *microphylla* Persoon; *U. manshurica* Nakai.

Trees, to 25 m tall, d.b.h. to 1 m, deciduous. Bark dark gray, irregularly longitudinally fissured. Branchlets yellowish gray, glabrous or pubescent, unwinged and without a corky layer, with scattered lenticels. Winter buds dark brown to red-brown, ± globose to ovoid; inner bud scale margin usually white ciliate. Petiole 4–10 mm, pubescent; leaf blade elliptic-ovate to elliptic-lanceolate, 2–8 × 1.2–3.5 cm, abaxially pubescent when young but glabrescent or with tufts of hairs in vein axils or sometimes a few hairs on midvein and in forks of secondary veins, adaxially glabrous, base obliquely to symmetrically obtuse to rounded, margin simply or sometimes doubly serrate, apex acute to acuminate; secondary veins 9–16 on each side of midvein. Inflorescences fascicled cymes on second year branchlets, appearing before leaves. Perianth 4-lobed, margin ciliate. Samaras whitish tan, ± orbicular to rarely broadly obovate or elliptical, 1–2 × 1–1.5 cm, glabrous except for pubescence on stigmatic surface; stalk 1–2 mm; perianth persistent. Seed at center of samara or occasionally slightly toward apex but not reaching the apical notch. Fl. and fr. Mar–May.  $2n = 28$ .

Slopes, valleys, plains; 1000–2500 m. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, E Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Xinjiang, Xizang [Korea, Mongolia, E Russia; C Asia].

This species is cultivated throughout China.

**10. *Ulmus harbinensis*** S. Q. Nie & K. Q. Huang, Bull Bot. Res., Harbin 7(1): 151. 1987.

哈尔滨榆 ha er bin yu

Trees, to 15 m tall, d.b.h. to 32 cm, deciduous. Bark dark gray, irregularly and finely fissured. Branchlets grayish brown in first year, gray and glabrous in second year. Winter floral buds dark brown, cordate-globose, ca. 5 × 4 mm; bud scales lustrous. Leaf buds dark brown, conic, 3–4 × ca. 2.3 mm; bud

scales pilose. Petiole pubescent; leaf blade obovate, 2–5.5 × 2–3.5 cm, abaxially with white tufted hairs in vein axils, margin doubly serrate; secondary veins 9–15 on each side of midvein. Inflorescences fascicled cymes, 20–30-flowered. Perianth tubular, 4–6-lobed, margin ciliate. Stamens 4 or 5. Stigmas 2-parted, pinnatifid. Samaras orbicular, broadly obovate, or ± orbicular, narrowly winged, glabrous except for stigmatic surface in notch; stalk ca. 2 mm. Seed at center of samara. Fl. Apr, fr. Jun.

- Mixed woods. Heilongjiang (Harbin).

This poorly understood species should be reinvestigated. It may be a hybrid between *Ulmus pumila* and another species.

**11. *Ulmus pseudopropinqua*** Wang & Li, Ill. Fl. Lign. Pl. N.-E. China 561. 1955.

假春榆 jia chun yu

Trees, to 10 m tall, deciduous. Branchlets yellowish gray, unwinged, without a corky layer when young, densely or sparsely black lenticellate. Winter buds ± orbicular to ovoid-orbicular; bud scale margin densely white ciliate. Petiole 5–7 mm, pubescent; leaf blade ovate to ± obovate, 2–5.5 × 1–2.5 cm, abaxially pubescent, adaxially densely hirsute or with trichome scars, base oblique, margin doubly serrate, apex acuminate; secondary veins 12–17 on each side of midvein. Inflorescences fascicled cymes on second year branchlets. Perianth campanulate, glabrous, 4-lobed. Samara elliptic-oblong, obovate-oblong, or obovate-orbicular, 2–2.5 × 1.5–2 cm, glabrous except for pubescence on stigmatic surface in notch; stalk ca. 2 mm, pubescent; wings ± thick; perianth persistent. Seed at center of samara. Fl. and fr. Apr–Jun.

- Heilongjiang (Harbin).

This poorly understood species should be reinvestigated. It may be of hybrid origin.

**12. *Ulmus glaucescens*** Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 7: 77. 1884.

旱榆 han yu

Trees or shrubs, to 18 m, deciduous. Bark ± longitudinally fissured. Branchlets glabrous or pubescent, unwinged and without a corky layer; second year branchlets grayish yellow, yellowish gray, or yellowish brown. Winter buds brown, ovoid-orbicular to ± globose; inner scales pubescent or puberulent. Petiole 3–8 mm, pubescent; leaf blade elliptic, rhombic-ovate, narrowly ovate, or elliptic-lanceolate, 2.5–5 × 1–3 cm, both surfaces pubescent or subglabrous and often with tufts of hairs in forkings of secondary veins but never in vein axils, base asymmetrically acute to obliquely truncate, margin obtusely and regularly simply serrate or ± doubly serrate, apex weakly to strongly acuminate; secondary veins 6–12(–14) on each side of midvein. Inflorescences fascicled cymes on second year branchlets, 3–5-flowered. Flowers from mixed buds or floral buds, scattered at base or near base of branchlets. Perianth campanulate, ca. 4-lobed, glabrous or lobe margins ciliate. Samaras tan, elliptic, broadly elliptic, or obovate, 2–2.5 × 1.5–2 cm, glabrous or pubescent; stalk 2–4 mm, pubescent; wings thick; perianth persistent. Seed at center or toward apex of samara. Fl. and fr. Mar–May.

• Along rivers, mountain slopes; 2000–2600 m. Gansu, Hebei, Henan, Liaoning, Nei Mongol, Ningxia, E Qinghai, Shaanxi, Shandong, Shanxi.

1a. Samara glabrous except stigmatic surface pubescent in notch ..... 12a. var. *glaucescens*

1b. Samara densely pubescent when young, with scattered hairs when mature ..... 12b. var. *lasiocarpa*

**12a. *Ulmus glaucescens* var. *glaucescens***

旱榆(原变种) han yu (yuan bian zhong)

Samaras glabrous except stigmatic surface pubescent in notch. Fl. and fr. Mar–May.

• 2000–2400 m. Gansu, Hebei, Henan, Liaoning, Nei Mongol, Ningxia, E Qinghai, Shaanxi, Shandong, Shanxi.

**12b. *Ulmus glaucescens* var. *lasiocarpa*** Rehder, J. Arnold Arbor. 11: 157. 1930.

毛果旱榆 mao guo han yu

Samaras densely pubescent when young, with scattered hairs when mature. Fl. and fr. Mar–May.

• Along rivers, mountain slopes; 2500–2600 m. Hebei, Henan, Nei Mongol, Ningxia (Helan Shan), E Qinghai, Shanxi.

**13. *Ulmus chenmoui*** W. C. Cheng, Nanjing Forest. Inst. 1(1): 68. 1958.

琅琊榆 lang ya yu

Trees, to 20 m tall, d.b.h. to 50 cm, deciduous. Bark grayish brown, exfoliating in irregular oblong flakes. Branchlets densely pubescent when young, glabrescent, unwinged and without a corky layer. Winter buds ovoid; bud scales partly pubescent. Petiole 1–1.5 cm, densely villous; leaf blade broadly obovate, oblong-obovate, oblong, or oblong-elliptic, 6–18 × 3–10 cm, scabrous, abaxially densely pubescent, adaxially densely hirsute and pubescent along midvein, base oblique, margin doubly serrate, apex shortly caudate to caudate-acuminate; secondary veins 15–21 on each side of midvein. Inflorescences fascicled cymes on second year branchlets. Perianth glabrous, apically 4-lobed. Samara narrowly obovate, oblong-obovate, or broadly obovate, 1.5–2.5 × 1–1.7 cm, pubescent; stalk 1–2 mm; perianth persistent. Seed at center or toward apex of samara. Fl. and fr. Mar–Apr.

• 100–200 m. Anhui (Chuxian), Jiangsu (Jurong).

Species 13 through 19 share many characters in common, and differ in relatively minor characters. There has been much disagreement in the past about species delimitation in this group.

**14. *Ulmus davidiana*** Planchon in Candolle, Prodr. 17: 158. 1873.

黑榆 hei yu

Trees or shrubs, to 15 m tall, d.b.h. to 30 cm, deciduous. Bark longitudinally fissured. Branchlets pubescent when young, glabrescent or ± pubescent, sometimes with irregularly longitudinally fissured corky layer. Winter buds ovoid; bud scales partly pubescent. Petiole 5–10(–17) mm, pubescent; leaf blade obovate to obovate-elliptic, 4–9(–10) × 1.5–4(–5.5) cm, abaxially

ially densely pubescent when young but glabrescent with tufted hairs only in axil of veins, adaxially sparsely hirsute when young but glabrescent, base oblique, margin doubly serrate, apex caudate-acuminate to acuminate; secondary veins 12–22 on each side of midvein. Inflorescences fascicled cymes on second year branchlets. Perianth glabrous, 4-lobed. Samaras tan, obovate to ± obovate, 1–1.9 × 0.7–1.4 cm; stalk pubescent, ca. 2 mm; wings usually glabrous. Seed toward apex and in center of samara.

Slopes, wetlands near streams, valleys; below 2300 m. Anhui, Gansu, Hebei, Heilongjiang, Henan, Hubei, Jilin, Liaoning, Nei Mongol, Ningxia, E Qinghai, Shaanxi, Shandong, Shanxi, Zhejiang [Japan, Korea, Mongolia, Russia (Far East, E Siberia)].

1a. Bark pale gray to gray; samara densely pubescent over seed ..... 14a. var. *davidiana*

1b. Bark blackish; samara glabrous ..... 14b. var. *japonica*

**14a. *Ulmus davidiana* var. *davidiana***

黑榆(原变种) hei yu (yuan bian zhong)

*Ulmus davidiana* var. *mandshurica* Skvortsov; *U. davidiana* var. *pubescens* Skvortsov.

Bark pale gray to gray. Samaras densely pubescent over seed. Fl. and fr. Mar–May.

• Hebei, Henan, Liaoning, Shaanxi, Shanxi.

**14b. *Ulmus davidiana* var. *japonica*** (Rehder) Nakai, Fl. Sylv. Kor. 19: 26. 1932.

春榆 chun yu

*Ulmus campestris* Linnaeus var. *japonica* Rehder in Bailey, Cycl. Amer. Hort. 4: 1882. 1902; *U. davidiana* var. *levigata* (C. K. Schneider) Nakai; *U. japonica* (Rehder) Sargent; *U. japonica* var. *levigata* C. K. Schneider; *U. propinqua* Koidzumi; *U. wilsoniana* C. K. Schneider.

Bark blackish. Samaras glabrous. Fl. and fr. Feb–May.

Slopes, wetlands near streams, valleys; below 2300 m. Anhui, Gansu, Hebei, Heilongjiang, Henan, Hubei, Jilin, Liaoning, Nei Mongol, Ningxia, E Qinghai, Shaanxi, Shandong, Shanxi, Zhejiang [Japan, Korea, Mongolia, Russia (Far East, E Siberia)].

**15. *Ulmus prunifolia*** W. C. Cheng & L. K. Fu, Acta Phytotax. Sin. 17(1): 48. 1979.

李叶榆 li ye yu

Trees, to 30 m tall, d.b.h. to 45 cm, deciduous. Bark dark gray, smooth. Branchlets pilose when young, glabrescent, with scattered lenticels; second branchlets gray to brownish gray. Winter buds ovoid, glabrous. Petiole 0.6–1.6 cm, pubescent when young, glabrescent; leaf blade narrowly elliptic, oblong-elliptic, elliptic-lanceolate, or ovate-lanceolate, 5–11(–14) × 2–4(–5.5) cm, abaxially pilose when young but glabrescent with age or pubescent only in vein axils, adaxially pubescent when young but glabrescent, base ± oblique, margin doubly serrate, apex acuminate; secondary veins 12–22 on each side of midvein. Inflorescences fascicled cymes on second year branchlets. Perianth glabrous, 4-lobed. Samaras oblong-elliptic to oblong-

obovate, 1.2–2 × 0.8–1.3 cm, glabrous except for pubescence on stigmatic surface in notch; stalk 1–2 mm; perianth persistent. Seed at center or slightly toward apex of samara. Fl. and fr. Feb–May.

- 1000–1500 m. Chongqing Zhixiashi, W Hubei.

**16. *Ulmus microcarpa*** L. K. Fu, Acta Phytotax. Sin. 17(1): 48. 1979.

小果榆 xiao guo yu

Trees, to 30 m tall, d.b.h. to 80 cm, deciduous. Branchlets of first year with very short hairs. Winter buds narrowly ovate; bud scales glabrous. Petiole ca. 5 mm, pubescent to subglabrous; leaf blade oblong-elliptic, elliptic, or rarely oblong-obovate, 8.5–17 × 5–8 cm, abaxially sparsely pubescent and with tufted hairs in vein axils, adaxially ± scabrous and hirsute when young but glabrescent with trichome scars, base oblique, margin doubly serrate, apex shortly caudate; secondary veins 18–25 on each side of midvein. Perianth campanulate, 4-lobed, glabrous except for margin of tepals. Filament nearly twice as long as perianth. Samara ± orbicular, 7–8 × 7–8 mm, glabrous except for pubescence on stigmatic surface in notch, tip long beak-shaped; perianth persistent. Seed near center of samara. Fl. and fr. Mar–May.  $2n = 28^*$ .

- Broad-leaved forests; ca. 2800 m. SE Xizang (Zayü).

**17. *Ulmus szechuanica*** W. P. Fang, Commem. Vol. 22. 1947.

红果榆 hong guo yu

*Ulmus erythrocarpa* W. C. Cheng.

Trees, to 18 m tall, d.b.h. to 80 cm, deciduous. Bark dark gray, grayish black, or brownish gray, irregularly longitudinally fissured, scabrous. Branchlets pale gray to gray, pubescent when young, sometimes with an irregularly longitudinally fissured corky layer, with pale yellow lenticels. Winter buds ovoid; inner bud scale margin long ciliate. Petiole 5–12 mm, glabrous or pubescent; leaf blade obovate, elliptic-obovate, ovate-oblong, or elliptic-ovate, 2–9 × 1.7–5.5 cm, abaxially sparsely pubescent and densely hairy along main secondary veins when young but glabrescent, adaxially pubescent and villos along midvein when young but glabrescent, base oblique, margin doubly serrate, apex acute to acuminate; secondary veins 9–19 on each side of midvein. Inflorescences fascicled cymes on second year branchlets. Perianth campanulate, 4-lobed, glabrous. Samaras tan, ± orbicular to obovate-orbicular, 1.1–1.6 × 0.9–1.3 cm, glabrous except for pubescence on stigmatic surface in notch; stalk shorter than perianth, 1–2 mm, pubescent; perianth persistent. Seed at or near center of samara. Fl. and fr. Feb–Mar.

- Anhui, Jiangsu, Jiangxi, C Sichuan, Zhejiang.

**18. *Ulmus androssowii*** Litvinov var. ***subhirsuta*** (C. K. Schneider) P. H. Huang et al., Bull. Bot. Res., Harbin 11(3): 43. 1991.

毛枝榆 mao zhi yu

*Ulmus wilsoniana* C. K. Schneider var. *subhirsuta* C. K. Schneider in Sargent, Pl. Wilson. 3: 257. 1916; *U. androssowii*

var. *virgata* (Wallich ex Planchon) Grudzinskaja; *U. chumlia* Melville & Heybroek; *U. pumila* var. *pilosa* Rehder; *U. virgata* Wallich ex Planchon.

Trees, to 20 m tall, d.b.h. to 50 cm, deciduous. Bark blackish gray, longitudinally fissured. Branchlets densely pubescent when young but second year ± pubescent, sometimes with an irregularly longitudinally fissured corky layer, with scattered lenticels. Winter buds ovoid; bud scales pubescent. Petiole 2–10 mm, pubescent or glabrous; leaf blade ovate to elliptic to rarely rhombic or obovate, 3–8 × 2–2.5 cm, abaxially sparsely pubescent or glabrous and somewhat pubescent or glabrous on veins and with tufted hairs in vein axils, adaxially ± scabrous, hirsute when young, glabrescent with trichome scars, and puberulous along veins or glabrous, base slightly oblique, apex usually acuminate. Inflorescences fascicled cymes on second year branchlets. Perianth campanulate, 5-lobed, margin ciliate. Samaras orbicular to ± orbicular, 8–15 × 6–10 mm, glabrous except for pubescence on stigmatic surface in notch; stalk shorter than perianth, pubescent; perianth persistent. Seed at center of samara. Fl. and fr. Feb–Apr.

- Broad-leaved forests on mountain slopes and in valleys; 1200–2800 m. Sichuan, Xizang, Yunnan.

*Ulmus androssowii* var. *androssowii* occurs in C Asia (not China).

**19. *Ulmus castaneifolia*** Hemsley, J. Linn. Soc., Bot. 26: 466. 1894.

多脉榆 duo mai yu

*Ulmus ferruginea* W. C. Cheng; *U. multinervis* W. C. Cheng.

Trees, to 20 m, d.b.h. to 50 cm, deciduous. Bark pale gray to blackish brown, thick, with a corky layer, longitudinally fissured. Branchlets thick, unwinged and usually without a corky layer, with yellow to brownish yellow lenticels; first year branchlets white to reddish brown, densely villous; second year branchlets grayish brown to dark brownish gray, ± pubescent or glabrescent. Winter buds ovoid, usually slightly compressed; bud scales densely pubescent. Petiole 1–12 mm, densely pubescent; leaf blade oblong-elliptic, narrowly elliptic, oblong-ovate, obovate-oblong, or obovate-elliptic, 8–15 × 3.5–6.5 cm, abaxially densely pubescent and with tufted hairs in vein axils, adaxially smooth or ± scabrous, densely hirsute when young, and glabrescent but ± pubescent on main secondary veins with age, base distinctly oblique, margin doubly serrate, apex long acute to cuspidate; main secondary veins depressed; secondary veins 16–35 on each side of midvein. Inflorescences fascicled cymes on second year branchlets. Perianth 4- or 5-lobed, glabrous or margin ciliate. Samaras tan, oblong-obovate, obtriangular-obovate, or obovate, 1.6–3 × 1–1.6 cm, glabrous except for pubescence on stigmatic surface in notch; stalk shorter than perianth, densely pubescent; perianth persistent. Seed toward apex of samara. Fl. and fr. Feb–Apr.

- Broad-leaved forests; 500–1600 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Yunnan, Zhejiang.

**20. *Ulmus lanceifolia*** Roxburgh ex Wallich, Pl. Asiat. Rar. 2: 86. 1831.

常绿榆 *chang lü yu*

*Ulmus tonkinensis* Gagnepain.

Trees, to 30 m tall, d.b.h. 40–80 cm, evergreen. Bark yellowish gray to chestnut brown, exfoliating in irregular flakes. Branchlets brown to red-brown, pubescent when young, ± pubescent with age, unwinged and without a corky layer, with scattered lenticels. Winter buds dark brown to red-brown, ovoid-orbicular, pubescent or glabrous. Petiole 2–7 mm, pubescent; leaf blade lanceolate, ovate-lanceolate, or narrowly orbicular-lanceolate, 3–10(–11) × 1.5–3.5 cm, thick, abaxially pea green and pubescent only near petiole or occasionally with a few hairs on midvein, adaxially lustrous green and pubescent only on midvein, base rounded or ± oblique and asymmetric, margin obtusely regularly simply serrate, apex acuminate; midvein depressed; secondary veins 6–18 on each side of midvein. Inflorescences fascicled cymes, 3–11-flowered. Flowers from floral buds. Perianth glabrous or margin ciliate. Samaras orange-brown, obovate, orbicular-obovate, or ± orbicular, strongly oblique, 1.2–2.8 × 1.2–2.1 cm, glabrous except for pubescence on stigmatic surface in notch; stalk shorter than perianth, glabrous or pubescent; perianth persistent. Seed at center or toward apex of samara. Fl. and fr. winter or early spring, rarely in autumn.  $2n = 28$ .

300–1500 m. Guangxi, Hainan, Yunnan [Bhutan, India, Laos, Myanmar, Sikkim, Thailand, Vietnam].

*Ulmus lanceifolia* has been reported from Nepal (Hara et al., Enum. Fl. Pl. Nepal 3: 205. 1982), but this identity is uncertain.

**21. *Ulmus parvifolia*** Jacquin, Pl. Hort. Schoenbr. 3: 262. 1798.

榔榆 *lang yu*

*Microptelea parvifolia* (Jacquin) Spach; *Planera parvifolia* (Jacquin) Sweet; *Ulmus campestris* Linnaeus var. *chinensis* Loudon; *U. chinensis* Persoon; *U. coreana* Nakai; *U. japonica* Siebold; *U. sieboldii* Daveau; *Ulmus shirasawana* Daveau.

Trees, to 25 m tall, d.b.h. to 100 cm, deciduous. Crown broadly orbicular. Bark gray to grayish brown, ± smooth, exfoliating into irregular scale-like flakes. Branchlets dark brown, densely pubescent when young, never winged. Winter buds reddish brown, ovoid-orbicular, glabrous. Petiole 2–6 mm, pubescent; leaf blade lanceolate-ovate to narrowly elliptic, lamina on two sides of midvein unequal in length and width, 2.5–5 × 1–2 cm, thick, abaxially pea green and pubescent when young, adaxially dark green, lustrous, and pubescent only on midvein, base oblique, margin obtusely and irregularly simply serrate, apex acute to obtuse; midvein depressed; secondary veins 10–15 on each side of midvein. Inflorescences fascicled cymes, 3–6-flowered. Pedicel very short, pubescent. Perianth funnellform; tepals 4. Samaras tan to brown, occasionally dark red-brown, elliptic to ovate-elliptic, 10–13 × 6–8 mm, glabrous except for pubescence on stigmatic surface in notch; stalk 1–3 mm, shorter than perianth, sparsely pubescent; perianth persistent or tardily deciduous. Seed at center or toward apex of samara. Fl. and fr. Aug–Oct.  $2n = 28$ .

Below 800 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Zhejiang [India, Japan, N Korea, Vietnam].



ULMACEAE