

6. BETULA Linnaeus, Sp. Pl. 2: 982. 1753.

桦木属 hua mu shu

Trees or shrubs deciduous. Buds sessile, with several overlapping scales. Leaves often glandular punctate abaxially, usually serrate or dentate, rarely lobulate. Male inflorescence pendulous, elongate, cylindrical, with numerous overlapping bracts, each bract subtending 2 bracteoles and 3 flowers; calyx 4-lobed; stamens 2; anthers 2-loculed; thecae connate, apex pubescent or glabrous. Female inflorescence 1, or 2–several in a raceme, spicate, ellipsoid, or cylindrical; bracts numerous, overlapping, leathery, deciduous, apex deeply 3-lobed, each bract subtending 3 flowers. Nutlet compressed, usually with membranous wings.

Between 50 and 60 species: Afghanistan, China, Japan, Kazakstan, Korea, Kyrgyzstan, Mongolia, Nepal, Russia, Sikkim; Europe, North and South America; 32 species (14 endemic) in China.

- 1a. Female inflorescence narrowly cylindrical; lateral lobes of bracts reduced; wings of nutlet partly exerted, much wider than nutlet; leaves irregularly and doubly setiform serrate.
- 2a. Female inflorescences 2–5 in a raceme; bracts densely pubescent abaxially; leaves lanceolate or ovate-lanceolate, apex acuminate or caudate-acuminate 1. *B. alnoides*
- 2b. Female inflorescences 1 or 2.
- 3a. Female inflorescence 1(or 2) 4. *B. luminifera*
- 3b. Female inflorescences 2.
- 4a. Scales of buds glabrous; petiole glabrous except villous in furrow; bracts rhombic, 4–5 × ca. 3 mm, glabrous; nutlet 3–5 × 1.5–3 mm 2. *B. rhombibracteata*
- 4b. Scales of buds villous; petiole densely yellow villous; bracts oblong-lanceolate, 2–3 × 1.5–1.7 mm, pubescent at base; nutlet ca. 2 × 1–1.5 mm 3. *B. cylindrostachya*
- 1b. Female inflorescence oblong-cylindric, oblong, or subglobose; lateral lobes of bracts distinct; wings of nutlet included; leaves irregularly or regularly doubly serrate.
- 5a. Nutlet narrowly bordered, not distinctly winged.
- 6a. Leaves leathery, midvein and lateral veins deeply impressed adaxially, distinctly raised abaxially.
- 7a. Trees to 12 m tall; bracts of male inflorescence yellow-brown tomentose 8. *B. jiulongensis*
- 7b. Shrubs or small trees to 5 m tall; bracts of male inflorescence yellow or white villous.
- 8a. Leaves orbicular or broadly ovate, apex rounded or obtuse; petiole 1–2 mm; bracts of female inflorescence densely yellow villous 7. *B. calcicola*
- 8b. Leaves ovate-lanceolate or elliptic, apex acuminate or acute; petiole 3–5 mm; bracts of female inflorescence glabrous or pubescent.
- 9a. Scales of buds glabrous; leaves densely yellow or white villous along veins except on reticulate veins abaxially, margin with 2 acute teeth between lateral veins 5. *B. potaninii*
- 9b. Scales of buds densely white tomentose; leaves densely yellow-brown tomentose along veins abaxially, margin with 1(or 2) obtuse teeth between lateral veins 6. *B. trichogemma*
- 6b. Leaves papery, midvein and lateral veins sometimes slightly impressed adaxially, raised abaxially.
- 10a. Female inflorescences 4 in a raceme, cylindrical; leaves 12–13 × 7–8 cm, densely yellow tomentose abaxially 9. *B. gynoterminalis*
- 10b. Female inflorescence 1, subglobose, ovoid, ovoid-oblong, or oblong-cylindric; leaves less than 10 × 5 cm, villous or glabrescent abaxially.
- 11a. Trees to 35 m tall.
- 12a. Trees to 35 m tall; bark black or black-brown; female inflorescence oblong-cylindric; peduncle 3–6 mm; bracts 4–5 mm, with lateral lobes ca. 1/2 as long as middle lobe 10. *B. schmidtii*
- 12b. Trees to 15 m tall; bark dark gray; female inflorescence ovoid or ovoid-oblong; peduncle 1–2 mm; bracts 5–10 mm, with lateral lobes subequal to middle lobe 11. *B. fargesii*
- 11b. Shrubs usually to 5 m tall.
- 13a. Female inflorescence oblong-cylindric or oblong; lobes of bracts with apex not reflexed; leaves with 9–21 lateral veins on each side of midvein 12. *B. delavayi*
- 13b. Female inflorescence subglobose, rarely oblong; lobes of bracts with apex usually reflexed; leaves with 8 or 9 lateral veins on each side of midvein 13. *B. chinensis*
- 5b. Nutlet with distinct, membranous wings.

- 14a. Leaves with 8–15 lateral veins on each side of midvein.
- 15a. Bud scales densely silky villous; leaves triangular-ovate, broadly ovate, or ovate; bark grayish white 20. *B. ermanii*
- 15b. Bud scales glabrous; leaves ovate, elliptic, oblong, or lanceolate; bark grayish black, dark brown, red-brown, or dark red-brown.
- 16a. Wings of nutlet 1/4–1/2 as wide as nutlet; female inflorescence sessile 14. *B. insignis*
- 16b. Wings of nutlet ca. 1/2 as wide as nutlet or more; female inflorescence pedunculate.
- 17a. Wings of nutlet ca. 1/2 as wide as nutlet; female inflorescence 1–2.5 cm in diam.; peduncle only
2–3 mm or obscure; branchlets without resinous glands.
- 18a. Female inflorescence 1, or 2 or 3 in a cluster, 4–5 × ca. 1 cm; bracts with a tuft of yellow hairs
at base 15. *B. jipingensis*
- 18b. Female inflorescence 1, 2.5–6 × 1.2–2.5 cm; bracts densely pubescent 16. *B. austrosinensis*
- 17b. Wings of nutlet ca. as wide as nutlet; female inflorescence less than 1 cm in diam.; peduncle 8–15 mm; branchlets densely resinous glandular.
- 19a. Female inflorescence 1; bracts ciliate; bark grayish 19. *B. costata*
- 19b. Female inflorescence 1, or 2–4 in a raceme; bracts sparsely pubescent; bark red-brown or dark red-brown.
- 20a. Leaves densely bearded in axils of lateral veins abaxially; bark dark red-brown 17. *B. utilis*
- 20b. Leaves usually not bearded in axils of lateral veins abaxially; bark orange-red or orange 18. *B. albosinensis*
- 14b. Leaves with 3–8 lateral veins on each side of midvein.
- 21a. Trees.
- 22a. Bark black-brown, fissured; wings of nutlet ca. 1/2 as wide as nutlet 26. *B. dahurica*
- 22b. Bark gray-white, yellow-white, light yellow-brown, or grayish brown, exfoliating; wings of nutlet
ca. as wide as or wider than nutlet.
- 23a. Leaves triangular, triangular-ovate, or triangular-rhombic, apex acuminate or caudate-acuminate.
- 24a. Branches usually pendulous in mature trees; wings of nutlet ca. 2 × as wide as nutlet 22. *B. pendula*
- 24b. Branches not pendulous; wings of nutlet about as wide as nutlet 21. *B. platyphylla*
- 23b. Leaves ovate, rhombic, ovate-rhombic, or broadly ovate-rhombic, apex acute or acuminate.
- 25a. Bark grayish brown; leaves ovate; wings of nutlet 1.5–2 × as wide as nutlet 23. *B. halophila*
- 25b. Bark grayish white, yellow-white, or yellow-brown; leaves rhombic, ovate-rhombic, or broadly
ovate-rhombic; wings of nutlet ca. as wide as nutlet.
- 26a. Bark grayish white; leaves rhombic or obovate-rhombic, base cuneate 24. *B. microphylla*
- 26b. Bark yellow-white or light yellow-brown; leaves broadly ovate-rhombic, base broadly
cuneate 25. *B. tianschanica*
- 21b. Shrubs or dwarf shrubs.
- 27a. Leaves suborbicular or broadly obovate.
- 28a. Leaves suborbicular; peduncle 3–4 mm; wings of nutlet ca. as wide as or slightly narrower
than
nutlet 31. *B. rotundifolia*
- 28b. Leaves broadly obovate; peduncle 8–10 mm; wings of nutlet slightly wider than nutlet 32. *B. middendorffii*
- 27b. Leaves ovate, broadly ovate, ovate-rhombic, elliptic-rhombic, obovate-elliptic, or broadly
elliptic.
- 29a. Wings of nutlet 1–2 × as wide as nutlet 30. *B. gmelinii*
- 29b. Wings of nutlet ca. 1/2 as wide as nutlet.
- 30a. Branchlets densely villous and pubescent; leaves obovate-elliptic, ovate-rhombic, elliptic-
rhombic,
or broadly elliptic, densely white villous on both surfaces when young; lateral lobes of
bracts
suberect or slightly spreading 27. *B. ovalifolia*
- 30b. Branchlets scabrous; leaves ovate, broadly ovate, or ovate-elliptic, glabrous; lateral lobes of
bracts spreading or horizontal.
- 31a. Bark grayish white; leaves densely glandular punctate on both surfaces, margin minutely
serrate; peduncle (2–)3–10 mm 28. *B. fruticosa*

31b. Bark dark brown; leaves not glandular punctate, margin roughly serrate; peduncle 1–3 mm 29. *B. humilis*

1. *Betula alnoides* Buchanan-Hamilton ex D. Don, Prodr. Fl. Nepal. 58. 1825.

西桦 xi hua

Betula acuminata Wallich; *B. alnoides* var. *acuminata* (Wallich) H. Winkler; *Betulaster acuminata* (Wallich) Spach.

Trees to 30 m tall; bark gray, exfoliating. Branchlets densely white villous and resinous glandular. Petiole 1.5–3(–4) cm, densely villous and glandular punctate; leaf blade lanceolate, ovate-lanceolate, or ovate-elliptic, 4–12 × 2.5–5.5 cm, papery, abaxially densely glandular punctate, sparsely villous along veins, bearded in axils of lateral veins, adaxially glabrous, base cuneate, broadly cuneate, or subrounded, rarely subcordate, margin irregularly incurved setiform serrate, apex acuminate or caudate-acuminate; lateral veins 10–13 on each side of midvein. Female inflorescences 3–5 in a raceme, pendulous, narrowly cylindrical, 5–10 cm × 4–6 mm when mature; peduncle 2–3 mm, densely yellow villous; bracts ca. 3 mm, densely pubescent and ciliolate, becoming spongy at base, 3-lobed, middle lobe oblong or obtuse, lateral lobes reduced, auriculate. Nutlet obovate, 1.5–2 mm, sparsely pubescent at apex, with membranous wings ca. 2 × as wide as nutlet. Fl. Oct–Jan, fr. Mar–May. $2n = 28$.

Subtropical forests; 700–2100 m. Fujian, Guangxi, Hainan, Hubei, Sichuan, S Yunnan [Bhutan, India, Myanmar, Nepal, Thailand, Vietnam].

2. *Betula rhombibracteata* P. C. Li, Acta Phytotax. Sin. 17(1): 88. 1979.

菱苞桦 ling bao hua

Trees to 7 m tall; bark dark yellow-brown. Branchlets purplish brown, densely white villous and resinous glandular. Petiole 1–1.5 cm, sparsely villous and resinous punctate; leaf blade oblong or ovate-lanceolate, 8–13 × 5–7.5 cm, abaxially densely resinous punctate and villous along veins, bearded in axils of lateral veins, adaxially sparsely villous when young, becoming villous and resinous punctate along midvein, base rounded, rarely subcordate or broadly cuneate, margin irregularly mucronate serrate or setiform serrate, apex acuminate; lateral veins 11–15 on each side of midvein. Female inflorescences 2, sometimes 3 in a raceme, narrowly cylindrical, ca. 10 cm × 8 mm when mature; peduncle 0.5–1.5 cm, densely pubescent; bracts rhombic, 4–5 × ca. 3 mm, glabrous, ciliolate along margin, 3-lobed, middle lobe rhombic, lateral lobes triangular, small, ca. 1/2 as long as middle lobe. Nutlet oblong, 3–5 × 1.5–3 mm, sparsely pubescent, with membranous wings ca. 2 × as wide as nutlet. Fl. May–Jun, fr. Jul–Aug.

• Broad-leaved forests; 2500–2800 m. NW Yunnan (Dêqên Xian, Weixi Xian).

An endangered species. A. K. Skvortsov indicates that *Betula rhombibracteata* is very similar to *B. cylindrostachya*, and further studies may show that they are conspecific.

3. *Betula cylindrostachya* Lindley in Wallich, Pl. Asiat. Rar. 2: 7. 1831.

长穗桦 chang sui hua

Betula acuminata Wallich var. *cylindrostachya* (Lindley) Regel; *B. alnoides* Buchanan-Hamilton var. *cylindrostachya* (Lindley) H. Winkler; *Betulaster cylindrostachya* (Lindley) Spach.

Trees to 30 m tall; bark brown or grayish black. Branchlets yellow-brown, densely yellow villous. Petiole 0.8–1.5 cm, densely yellow pubescent; leaf blade ovate-elliptic, oblong, or ovate-lanceolate, 5–14 × 2–8 cm, both surfaces densely villous when young, abaxially densely resinous punctate and bearded in axils of lateral veins, base rounded or subcordate, margin irregularly and doubly subincurved setiform serrate; apex acuminate; lateral veins 13 or 14 on each side of midvein. Female inflorescences 2, narrowly cylindrical, 2.5–10 cm × 5–7(–10) mm; peduncle 7–10 mm, densely yellow pubescent; bracts oblong-lanceolate, 2–3 × 1.5–1.7 mm, sparsely pubescent at base, ciliolate, spongy at base when mature, 3-lobed, middle lobe ovate-lanceolate, lateral lobes ± reduced, ca. 1/3 as long as middle lobe. Nutlet ovate or oblong, ca. 2 × 1–1.5 mm, densely pubescent at apex, with membranous wings ca. 2 × as wide as nutlet. Fl. Apr–Jun, fr. Jul–Aug. $2n = 28$.

Subtropical and warm temperate broad-leaved forests; 1400–2800 m. ?Sichuan, SE Xizang, NW Yunnan [Bhutan, India].

4. *Betula luminifera* H. Winkler in Engler, Pflanzenr. IV. 61 (Heft 19): 91. 1904.

亮叶桦 liang ye hua

Betula acuminata Wallich var. *pyrifolia* Franchet; *B. alnoides* Buchanan-Hamilton var. *pyrifolia* (Franchet) Burkill; *B. baeumkeri* H. Winkler; *B. cylindrostachya* Lindley var. *resinosa* Diels; *B. hupehensis* C. K. Schneider; *B. luminifera* var. *baeumderi* (H. Winkler) P. C. Kuo.

Trees to 25 m tall; bark dark brown, smooth. Branchlets yellow-brown, densely yellow pubescent, sparsely resinous glandular, glabrescent. Petiole 1–2 cm, densely villous and resinous punctate; leaf blade oblong, broadly oblong, or oblong-lanceolate, rarely elliptic or ovate, 4.5–10 × 2.5–6 cm, abaxially densely resinous punctate, bearded in axils of lateral veins, adaxially densely pubescent when young, base rounded, subcordate, or broadly cuneate, margin irregularly and

doubly setiform serrate, apex mucronate or caudate; lateral veins 12–14 on each side of midvein. Female inflorescence 1(–2), pendulous, narrowly cylindrical, 3–9 cm × 6–10 mm; peduncle 1–2 mm, densely pubescent and resinous punctate; bracts 2–3 mm, sparsely pubescent and ciliolate, spongy at base, 3-lobed, middle lobe oblong or lanceolate, lateral lobes ± reduced, 1/4–1/3 as long as middle lobe. Nutlet obovate, ca. 2 mm, sparsely pubescent, with membranous wings 1–2 × as wide as nutlet. Fl. May–Jun, fr. Jun–Aug.

• Broad-leaved forests on sunny mountain slopes; 200–2900 m. Anhui, Fujian, Gansu, N Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Yunnan, Zhejiang.

The wood is hard, close grained, and fine textured, and is used for construction and making agricultural tools and furniture.

5. *Betula potaninii* Batalin, Trudy Imp. S.-Peterburgsk. Bot. Sada 13: 101. 1893.

矮桦 ai hua

Betula wilsonii Bean.

Shrubs or trees to 5 m tall; bark grayish brown. Branches decumbent and prostrate or slender and pendulous; branchlets brown, very slender, densely yellow or white pubescent. Bud scales glabrous. Petiole 3–5 mm, densely yellow villous; leaf blade ovate-lanceolate or oblong-lanceolate, 2–2.5 × 1–2.5 cm, leathery, abaxially densely yellow-brown or white sericeous-villous along veins, adaxially densely villous when young, base rounded, margin acutely doubly serrate, apex acuminate or acute; lateral veins 9–21 on each side of midvein, distinctly raised abaxially, deeply impressed adaxially. Female inflorescence oblong-cylindrical, 1–2 cm × 5–6 mm; peduncle ca. 2 mm, densely yellow villous; bracts 4–5 mm, densely pubescent and ciliolate, 3-lobed, middle lobe ovate-oblong, with a tuft of long hairs at apex, lateral lobes ovate, slightly shorter than middle lobe. Nutlet obovate, ca. 1.5 × 1 mm, pubescent, with very narrow wings. Fl. May–Jun, fr. Jul–Aug.

• Thickets on moist cliffs; 1900–3100 m. SE Gansu, Shaanxi, N and W Sichuan.

6. *Betula trichogemma* (Hu ex P. C. Li) T. Hong in W. C. Cheng, Silva Sin. 2: 2133. 1985.

峨眉矮桦 e mei ai hua

Betula potaninii Batalin var. *trichogemma* Hu ex P. C. Li, Acta Phytotax. Sin. 17(1): 91. 1979.

Shrubs or trees to 4 m tall; bark gray-brown. Branchlets brown, densely grayish tomentose. Bud scales densely grayish tomentose. Petiole ca. 2 mm, densely villous; leaf blade ovate-elliptic or elliptic, 1.5–3 × 0.8–1.5 cm, abaxially yellow-brown tomentose along veins, adaxially pubescent along midvein, base rounded or broadly cuneate, margin obtusely simply serrate, rarely mucronate serrate, apex acute or obtuse; lateral veins 11–14 on each side of midvein, raised abaxially, deeply impressed adaxially. Female inflorescence oblong-cylindrical, 1.2–1.6 cm × 3–4 mm; bracts ca. 4 mm, densely pubescent and ciliolate, 3-lobed, middle lobe

ovate-oblong, lateral lobes obovate, ca. 2/3 as long as middle lobe. Nutlet suborbicular, 2–2.5 × 1.8–2.2 mm, sparsely pubescent, with very narrow wings. Fl. Jun, fr. Jul–Aug.

• Thickets on cliffs; 2400–3100 m. Sichuan (Emei Shan).

A. K. Skvortsov indicates that this species is very similar to *Betula calcicola* and *B. jiulongensis*, and further studies may show that it is conspecific with one of them.

7. *Betula calcicola* (W. W. Smith) P. C. Li in P. C. Li & S. H. Cheng, Fl. Reipubl. Popularis Sin. 21: 137. 1979.
岩桦 yan hua

Betula delavayi Franchet var. *calcicola* W. W. Smith, Notes Roy. Bot. Gard. Edinburgh 8: 333. 1915; *B. forrestii* (W. W. Smith) Handel-Mazzetti var. *calcicola* (W. W. Smith) Handel-Mazzetti.

Shrubs to 4 m tall; bark gray-black. Branches erect or prostrate; branchlets grayish brown, densely white or yellow villous. Petiole 1–2 mm, densely yellow sericeous-villous; leaf blade suborbicular or broadly ovate, rarely oblong, 2–3.2 × 1.5–2.5 cm, leathery, abaxially densely yellow sericeous-villous along veins, sparsely resinous punctate, adaxially densely white or yellow sericeous-villous, base rounded or broadly cuneate, margin obtusely doubly serrate, apex rounded or obtuse; lateral veins 9–16 on each side of midvein, distinctly raised abaxially, deeply impressed adaxially. Female inflorescence oblong-cylindrical, 1.5–2 cm × 7–10 mm; peduncle ca. 2 mm; bracts ca. 5 mm, densely sericeous-villous, base hispidulous, margin densely and long ciliate, middle lobe oblong, lateral lobes ovate, 1/3–1/2 as long as middle lobe. Nutlet suborbicular, ca. 2.5 × 2 mm, with very narrow wings. Fl. Jun–Jul, fr. Jul–Aug.

• Thickets on cliffs; 2800–3800 m. SW Sichuan, NW Yunnan.

8. *Betula jiulongensis* Hu ex P. C. Li, Acta Phytotax. Sin. 17(1): 90. 1979.

九龙桦 jiu long hua

Trees to 12 m tall. Branches gray-brown, glabrous; branchlets brown, densely yellow villous. Petiole 3–5 mm, yellow sericeous-villous; leaf blade ovate, ovate-elliptic, ovate-oblong, or ovate-lanceolate, 2–5 × 1–2.7 cm, subleathery, abaxially sparsely yellow sericeous-villous, adaxially sparsely white villous, base subrounded, margin doubly serrate, apex acuminate; lateral veins 16–19(–21) on each side of midvein, distinctly raised abaxially, deeply impressed adaxially. Male inflorescence 1, or 2 or 3 in a cluster, to 4.7 cm; bracts densely yellow tomentose. Female inflorescence oblong-cylindrical, 1–2 cm × 5–8 mm; peduncle ca. 2 mm; bracts ca. 5 mm, ciliolate, 3-lobed, middle lobe oblong, lateral lobes spreading, ovate, ca. 1/2 as long as middle lobe. Nutlet ovate, ca. 2 × 1.5 mm, with very narrow wings. Fl. Jun, fr. Jul–Aug.

• Broad-leaved forests; ca. 2400 m. SW Sichuan (Jiulong Xian).

9. *Betula gynoterminalis* Y. C. Hsu & C. J. Wang, *Acta Bot. Yunnan.* 5: 381. 1983.

贡山桦 gong shan hua

Trees to 7 m tall. Branches dark purplish, glabrous. Petiole ca. 5 mm, densely villous; leaf blade broadly ovate or broadly oblong, 12–13 × 7–8 cm, leathery or papery, abaxially densely yellow tomentose, villous along veins, adaxially glabrous, base broadly cuneate, margin irregularly and simply serrate, apex acuminate; lateral veins 16–18 on each side of midvein, raised abaxially, slightly impressed adaxially. Female inflorescences 4 in a raceme, terminal, pendulous, cylindrical, 5–7 × ca. 1 cm; peduncle obscure; bracts ca. 8 × 4 mm, long ciliate at apex, 3-lobed, middle lobe oblanceolate, lateral lobes spreading, narrowly oblong, ca. 1/2 as long as middle lobe. Nutlet ca. 2 × 1.5 mm, with very narrow wings. Fl. Jun–Jul, fr. Jul–Aug.

• Broad-leaved forests; ca. 2600 m. NW Yunnan (Gongshan Drungzu Nuzu Zizhixian).

10. *Betula schmidtii* Regel, *Bull. Soc. Imp. Naturalistes Moscou* 38(2): 412. 1865.

赛黑桦 sai hei hua

Trees to 35 m tall; bark black or black-brown, fissured. Branchlets purplish brown, densely villous, sparsely resinous glandular. Petiole 5–10 mm, villous; leaf blade ovate, ovate-elliptic, or elliptic, 4–8 × 2.5–4.5 cm, subleathery, shiny, abaxially densely resinous punctate and sparsely villous along veins, adaxially glabrous, base rounded, margin irregularly and doubly or simply minutely serrate; lateral veins 8–10 on each side of midvein. Female inflorescence erect, oblong-cylindrical, 2–3 cm × 7–8 mm; peduncle robust, 3–6 mm, sparsely pubescent; bracts 4–5 mm, glabrous, 3-lobed, middle lobe lanceolate, lateral lobes spreading, ovate-lanceolate, ca. 1/2 as long as middle lobe. Nutlet ovate, ca. 2 × 1.5 mm, sparsely pubescent, with very narrow wings. Fl. Jun, fr. Jul–Aug.

Temperate broad-leaved forests; 700–800 m. E Jilin (Linjiang), NE Liaoning [Japan, N Korea, E Russia (Primorye)].

11. *Betula fargesii* Franchet, *J. Bot. (Morot)* 13: 205. 1899.

狭翅桦 xia chi hua

Betula chinensis Maximowicz var. *fargesii* (Franchet) P. C. Li.

Trees to 15 m tall; bark dark gray. Branchlets brown, sparsely pubescent. Petiole 4–6 mm, pubescent; leaf blade ovate or ovate-lanceolate, 4.5–6 × 2.5–4.5 cm, papery, abaxially villous along veins, adaxially scattered pilose, base rounded, margin irregularly and doubly mucronate serrate, apex acute or acuminate; veins 9–11 on each side of midvein. Female inflorescence ovoid or ovoid-oblong, 1–1.5 × 0.5–1.5 cm; peduncle 1–2 mm; bracts 5–10 mm, ciliate, with 3 subequal lobes. Nutlet obovate, pubescent, with very narrow wings. Fl. May–Jun, fr. Jul–Aug.

• Broad-leaved forests or thickets on hilltops; 1500–2600 m. W Hubei, E Sichuan (Chengkou Xian).

12. *Betula delavayi* Franchet, *J. Bot. (Morot)* 13: 205. 1899.

高山桦 gao shan hua

Shrubs or trees to 8 m tall; bark dark gray. Branches diagonal or prostrate, sometimes erect; branchlets brown, densely yellow villous. Petiole 5–10 mm, sparsely villous; leaf blade elliptic, oblong, ovate, or broadly ovate, (1.5–)2–7 × 1–4 cm, abaxially sparsely resinous punctate and white sericeous-villous along veins, adaxially densely yellow sericeous-villous when young, base rounded, margin doubly minutely serrate, apex acuminate or subrounded; lateral veins (5–)9–21 on each side of midvein. Female inflorescence oblong or oblong-cylindrical, 1–2.5 cm × 5–10 mm; peduncle ca. 5 mm, villous; bracts 5–10 mm, pubescent, ciliate, sometimes densely villous, 3-lobed, middle lobe lanceolate or oblong, lateral lobes spreading, ovate, ca. 1/2 as long as middle lobe. Nutlet obovate or elliptic, 2.5–3 × 1.5–2 mm, pubescent, with very narrow wings. Fl. Jun, fr. Jul–Aug.

• Broad-leaved forests, thickets; 2400–4000 m. ?Gansu, W Hubei, ?Qinghai, W Sichuan, E Xizang, NW Yunnan.

- 1a. Leaves 1.5–2 cm, lateral veins 5–10 on each side of midvein; female inflorescence ca. 10 × 5 mm 12c. var. *microstachya*
- 1b. Leaves 3–7 cm, lateral veins 10–21 on each side of midvein; female inflorescence 15–25 × 7–10 mm.
 - 2a. Leaves with 10–14 lateral veins on each side of midvein; bracts not densely villous, ciliate 12a. var. *delavayi*
 - 2b. Leaves with 19–21 lateral veins on each side of midvein; bracts densely villous and ciliate 12b. var. *polyneura*

12a. *Betula delavayi* var. *delavayi*

高山桦(原变种) gao shan hua (yuan bian zhong)

Betula chinensis Maximowicz var. *delavayi* (Franchet) C. K. Schneider; *B. delavayi* var. *forrestii* W. W. Smith; *B. forrestii* (W. W. Smith) Handel-Mazzetti.

Leaves 3–7 × 2–4 cm; lateral veins 10–14 on each side of midvein. Female inflorescence oblong-cylindrical, 1.5–2.5 cm × 7–10 mm; bracts ciliate.

• Thickets; 2400–4000 m. ?Gansu, W Sichuan, SE Xizang (Zayü Xian), NW Yunnan.

Further studies of material named *Betula forrestii* are required to better understand its placement.

12b. *Betula delavayi* var. *polyneura* Hu ex P. C. Li, *Acta Phytotax. Sin.* 17(1): 90. 1979.

多脉高山桦 duo mai gao shan hua

Leaves 3–7 × 2–4 cm; lateral veins 19–21 on each side of midvein. Female inflorescence oblong-cylindrical, 1.5–2.5 cm × 7–10 mm; bracts densely villous and ciliate.

• Broad-leaved forests; ca. 2600 m. NW Yunnan (Lijiang Naxizu Zizhixian).

12c. *Betula delavayi* var. *microstachya* P. C. Li, Acta Phytotax. Sin. 17(1): 90. 1979.

细穗高山桦 xi sui gao shan hua

Betula bomiensis P. C. Li.

Leaves 2–2.5 × 1–1.5 cm; lateral veins 5–10 on each side of midvein. Female inflorescence oblong, 1–1.5 cm × 5–10 mm.

• W Hubei, Qinghai (?Nangqên Xian), W Sichuan, NE Xizang (?Qamdo Xian).

13. *Betula chinensis* Maximowicz, Bull. Soc. Imp. Naturalistes Moscou 54(1): 47. 1879.

坚桦 jian hua

Betula ceratoptera G. H. Liu & Y. C. Ma; *B. chinensis* var. *angusticarpa* H. Winkler; *B. chinensis* var. *nana* Liou; *B. exalata* S. Moore; *B. jiaodongensis* S. B. Liang; *B. liaotungensis* Baranov.

Shrubs to 5 m tall; bark black-gray. Branchlets brown or yellow-brown, densely villous. Petiole 0.2–2 cm, densely villous; leaf blade ovate, broadly ovate, or ovate-elliptic, 1.5–6 × 1–5 cm, abaxially villous, sometimes resinous punctate, sparsely bearded in axils of lateral veins, adaxially densely villous when young, base rounded or broadly cuneate, margin irregularly and doubly dentate-serrate, apex acute or obtuse; lateral veins 8 or 9 (or 10) on each side of midvein. Female inflorescence subglobose, rarely oblong, 1–2 × 0.6–1.5 cm; peduncle 1–2 mm; bracts 5–9 mm, pubescent, ciliate, 3-lobed, lobes reflexed, middle lobe lanceolate, lateral lobes spreading, ovate, 1/3–1/2 as long as middle lobe. Nutlet obovate or ovate, with very narrow wings, sometimes horn-shaped at apex. Fl. May–Jun, fr. Jul–Aug.

Broad-leaved forests in mountain valleys, shaded, rocky mountain slopes; 700–3000 m. E Gansu, Hebei, Henan, Liaoning, Nei Mongol, Shaanxi, Shandong, Shanxi [Korea].

This species is one of the most valuable timber trees in N China. The wood is extremely hard and dense, close grained, very fine textured, and is used for making pestles and wagon axles.

14. *Betula insignis* Franchet, J. Bot. (Morot) 13: 206. 1899.

香桦 xiang hua

Betula kweichowensis Hu.

Trees to 25 m tall; bark grayish black, fragrant. Branchlets brown, yellow pubescent at first, soon glabrescent, fragrant. Petiole 0.8–2 cm; leaf blade elliptic or ovate-lanceolate, 8–13 × 3–6 cm, abaxially densely resinous punctate, villous along veins, bearded in axils of lateral veins, adaxially sparsely villous, base subrounded or subcordate, margin doubly mucronate serrate, apex acuminate or caudate-acuminate; lateral veins 12–15 on each side of midvein. Female inflorescence erect or recurved, oblong, 2.5–4 × 1.5–2 cm; peduncle obscure; bracts 7–12 mm, densely pubescent and ciliate, 3-lobed, lobes lanceolate, lateral lobes erect, ca. 1/2 as long as middle lobe. Nutlet

narrowly oblong, ca. 4 × 1.5 mm, glabrous, with membranous wings 1/4–1/2 as wide as nutlet. Fl. May–Jun, fr. Jul–Aug.

• Broad-leaved forests; 1400–3400 m. Guizhou, W Hubei, Sichuan.

The bark, timber, leaves, and buds yield fragrant oil.

15. *Betula jinpingsensis* P. C. Li, Acta Phytotax. Sin. 17(1): 89. 1979.

金平桦 jin ping hua

Trees. Branches dark gray; branchlets grayish, glabrous. Petiole robust, ca. 1.5 cm; leaf blade oblong-lanceolate, 7–10 × 3.5–5 cm, papery, abaxially sparsely resinous punctate, villous along veins, adaxially glabrous, base rounded, margin irregularly and doubly minutely serrate, apex acuminate; lateral veins ca. 13 on each side of midvein. Female inflorescence 1, or 2 or 3 in a cluster, oblong or oblong-cylindric, 4–5 × 1–1.2 cm; peduncle 6–7 mm or ± obscure; bracts 6–7 mm, with a tuft of coarse hairs at base, ciliate, 3-lobed, middle lobe ovate-lanceolate, lateral lobes spreading, ovate, ca. 1/3 as long as middle lobe. Nutlet elliptic, ca. 2 mm, with membranous wings ca. 1/2 as wide as nutlet. Fl. Apr–May, fr. Jun–Aug.

• Subtropical forests; ca. 2200 m. SE Yunnan (Jinping Xian). A. K. Skvortsov indicates that this species is similar to *Betula utilis*, and further studies may show that they are conspecific.

16. *Betula austrosinensis* Chun ex P. C. Li, Acta Phytotax. Sin. 17(1): 89. 1979.

华南桦 hua nan hua

Trees to 25 m tall; bark brown or gray-brown, fissured. Branchlets yellow-brown, sparsely pubescent. Petiole 1–2 cm; leaf blade ovate-elliptic, elliptic, or oblong-lanceolate, 5–14 × 2–7 cm, papery, abaxially densely resinous punctate, villous along veins, bearded in axils of lateral veins, adaxially glabrous, base rounded or subcordate, sometimes asymmetric, margin irregularly and doubly minutely serrate, apex acuminate or caudate-acuminate; lateral veins 12–14 on each side of midvein. Female inflorescence 1, erect, oblong or oblong-cylindric, 2.5–6 × 1.2–2.5 cm; peduncle 2–3 mm; bracts 0.8–1.3 cm, densely pubescent and ciliate, 3-lobed, middle lobe oblong-lanceolate, lateral lobes spreading, oblong, ca. 1/2 as long as middle lobe. Nutlet narrowly elliptic or oblong-obovate, 4–5 × ca. 2 mm, with membranous wings ca. 1/2 as wide as nutlet. Fl. May–Jun, fr. Jun–Aug.

• Broad-leaved forests; 700–1900 m. Fujian, Guangdong, Guangxi (Lingui Xian), Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Yunnan.

17. *Betula utilis* D. Don, Prodr. Fl. Nepal. 58. 1825.

糙皮桦 cao pi hua

Betula albosinensis Burkill var. *septentrionalis* C. K. Schneider; *B. bhojpatra* Lindley in Wallich; *B.*

bhojpattra var. *latifolia* Regel; *B. utilis* var. *prattii* Burkill.

Trees to 35 m tall; bark dark red-brown, exfoliating in thin flakes. Branches red-brown, glabrous; branchlets brown, densely resinous glandular and pubescent. Petiole 0.8–2 cm; leaf blade ovate, ovate-elliptic, or oblong, 4–9 × 2.5–6 cm, abaxially densely resinous punctate and pubescent, bearded in axils of lateral veins, adaxially densely villous when young, base rounded or subcordate, margin irregularly and doubly mucronate serrate, apex acuminate or caudate-acuminate; lateral veins 8–14 on each side of midvein. Female inflorescence 1, or 2 or 3 in a raceme, pendulous, oblong-cylindric, 3–5 cm × 7–12 mm; peduncle 0.5–1.5 cm; bracts 5–8 mm, pubescent, ciliate, 3-lobed, middle lobe lanceolate, lateral lobes ovate, ca. 1/3 as long as middle lobe. Nutlet obovate, 2–3 × 1.5–2 mm, with membranous wings ca. as wide as nutlet. Fl. Jun–Jul, fr. Jul–Aug. $2n = 56$.

Temperate broad-leaved forests; 2500–3800 m. Gansu, Hebei, Ningxia, Qinghai, Shaanxi, W Sichuan, E and S Xizang, NW Yunnan [Afghanistan, Bhutan, India, Nepal].

A valuable timber tree of commercial importance. The wood is hard, dense, and rather brittle, with the heartwood pinkish or light reddish brown, with a silky luster.

18. *Betula albosinensis* Burkill in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 497. 1899.

红桦 hong hua

Betula bhojpattra Lindley var. *sinensis* Franchet; *B. utilis* D. Don var. *sinensis* (Franchet) H. Winkler. Trees to 30 m tall; bark orange-red or orange, shiny, exfoliating in papery flakes. Branchlets reddish brown, glabrous, sometimes resinous glandular. Petiole 0.5–1.5 cm; leaf blade ovate, ovate-elliptic, or ovate-oblong, 3–8 × 2–5 cm, abaxially densely resinous punctate, sparsely villous, adaxially glabrous, base rounded or subcordate, rarely broadly cuneate, margin irregularly and doubly mucronate serrate, apex acuminate; lateral veins 10–14 on each side of midvein. Female inflorescence 1, or 2 or 3 in a raceme, oblong-cylindric, 3–4 × 1–1.2 cm; peduncle slender, ca. 1 cm; bracts 4–7 mm, 3-lobed, middle lobe oblong or lanceolate, lateral lobes spreading, suborbicular, ca. 1/3 as long as middle lobe. Nutlet ovate, 2–3 mm, with membranous wings ca. as wide as nutlet. Fl. May–Jun, fr. Jul–Aug.

• Temperate broad-leaved forests; 1000–3400 m. S Gansu, Hebei, Henan, W Hubei, S Ningxia (Liupan Shan), Qinghai, S Shaanxi (Hua Shan, Taibai Shan), Shanxi, E Sichuan.

The wood is hard, dense, and rather brittle, with the heartwood pinkish or light red-brown; it is used for many purposes.

19. *Betula costata* Trautvetter, Mém. Acad. Imp. Sci. St. Pétersbourg Divers Savans 9: 253. 1895.

硕桦 shuo hua

Betula ermanii Chamisso var. *costata* (Trautvetter) Regel; *B. ulmifolia* Siebold & Zuccarini var. *costata* (Trautvetter) Regel.

Trees to 30 m tall; bark grayish brown, exfoliating in papery flakes. Branches red-brown, glabrous; branchlets brown, densely yellow resinous glandular, sparsely pubescent. Petiole 0.8–2 cm; leaf blade ovate or ovate-elliptic, 3.5–7 × 1.5–4.5 cm, abaxially densely resinous punctate, villous, bearded in axils of lateral veins, adaxially glabrous, base rounded or subcordate, margin irregularly and doubly minutely serrate, apex acuminate or caudate-acuminate; lateral veins 9–16 on each side of midvein. Female inflorescence 1, oblong, 1.5–2.5 × ca. 1 cm; peduncle 2–5 mm; bracts 5–8 mm, ciliate, 3-lobed, middle lobe oblong-lanceolate, lateral lobes spreading, oblong, ca. 1/3 as long as middle lobe. Nutlet obovate, ca. 2.5 mm, glabrous, with membranous wings ca. 1/2 as wide as nutlet. Fl. May–Jun, fr. Jul–Sep.

Mixed forests of coniferous and broad-leaved trees; 600–2500 m. Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol [Korea, E Russia (Primorye)].

The wood is straight grained, coarse textured, and cracks easily; it is used for making carrying poles and for fuel and charcoal.

20. *Betula ermanii* Chamisso, Linnaea 6: 537. 1831.

岳桦 yue hua

Trees to 20 m tall; bark grayish white, exfoliating in thin sheets. Branches red-brown, glabrous; branchlets brown-green, densely villous, resinous glandular; bud scales densely silky villous. Petiole 1–2.4 cm; leaf blade ovate, broadly ovate, or triangular-ovate, 2–7 × 1.2–5 cm, abaxially resinous punctate and villous, adaxially sparsely villous, base subrounded, truncate, broadly cuneate, or subcordate, margin irregularly and doubly mucronate serrate, apex acute, acuminate, or caudate-acuminate; lateral veins 8–12 on each side of midvein. Female inflorescence ovoid or oblong, 1.5–2.7 × 0.8–1.5 cm; peduncle 3–6 mm or obscure; bracts 5–8 mm, 3-lobed, lobes oblanceolate, lateral lobes spreading or erect, slightly shorter than middle lobe. Nutlet obovate or ovate-elliptic, 2.5–3 × 1.8–2 mm, with membranous wings ca. 1/2 as wide as nutlet. Fl. Jun–Jul, fr. Jul–Aug. $2n = 56$.

Forming pure forest stands, but also in mixed forests of coniferous and broad-leaved trees; 1000–1700 m. Heilongjiang, Jilin, Liaoning, Nei Mongol [Japan, N Korea, Russia (Kamchatka)].

The wood is hard and dense, and is used for construction and making furniture.

- 1a. Lateral lobes of bracts spreading, apex obtuse, with a lobule at base 20c. var. *yingkiliensis*
- 1b. Lateral lobes of bracts erect, apex acute, without a lobule at base.

- 2a. Female inflorescence oblong; peduncle 3–6 mm 20a. var. *ermanii*
- 2b. Female inflorescence ovoid; peduncle obscure 20b. var. *macrostrobila*

20a. *Betula ermanii* var. *ermanii*

岳桦(原变种) yue hua (yuan bian zhong)
Betula ermanii var. *lanata* Regel; *B. ulmifolia* Siebold & Zuccarini var. *glandulosa* H. Winkler.
 Leaves acute or acuminate at apex. Female inflorescence oblong; peduncle 3–6 mm; lateral lobes of bracts erect, apex acute, without a lobule at base.

Forming pure forest stands, but also in mixed forests of coniferous and broad-leaved trees; 1000–1700 m. Heilongjiang, Jilin, Liaoning, E Nei Mongol [Japan, N Korea, Russia (Kamchatka)].

20b. *Betula ermanii* var. *macrostrobila* Liou, Gen. Chin. Woody Pl. 200. 1955.

帽儿山岳桦 mao er shan yue hua
 Leaves caudate-acuminate at apex. Female inflorescence ovoid; peduncle obscure; lateral lobes of bracts erect, apex acute, without a lobule at base.

• Mixed forests. Heilongjiang (Mao'er shan, Shangzhi Xian).
20c. *Betula ermanii* var. *yingkiliensis* Liou & Z. Wang, Gen. Chin. Woody Pl. 200. 1955.

英吉里岳桦 ying ji li yue hua
 Female inflorescence ovoid; peduncle ca. 6 mm; lateral lobes of bracts spreading, apex obtuse, with a lobule at base.

• Mixed forests. Heilongjiang, Nei Mongol (Daxinganling, Yingjili Shan).
21. *Betula platyphylla* Sukaczew, Trav. Mus. Bot. Acad. Imp. Sci. St.-Petersbourg 8: 220. 1911.

白桦 bai hua
Betula alba Linnaeus subsp. *latifolia* Regel; *B. alba* subsp. *mandshurica* Regel; *B. alba* subsp. *tauschii* Regel; *B. japonica* Siebold ex H. Winkler; *B. japonica* var. *mandshurica* (Regel) H. Winkler; *B. japonica* var. *rockii* Rehder; *B. japonica* var. *szechuanica* C. K. Schneider; *B. latifolia* Komer; *B. mandshurica* (Regel) Nakai; *B. platyphylla* var. *japonica* Hara; *B. platyphylla* var. *mandshurica* (Regel) Hara; *B. platyphylla* var. *szechuanica* (C. K. Schneider) Rehder; *B. szechuanica* (C. K. Schneider) Jansen; *B. verrucosa* Ehrhart var. *platyphylla* (Sukaczew) Lindley ex Jansson.
 Trees to 30 m tall; bark grayish white, exfoliating in sheets. Branches not pendulous, dark gray or dark brown, glabrous; branchlets brown, sparsely resinous glandular. Petiole slender, 1–2.5 cm; leaf blade triangular, ovate-triangular, rhombic-triangular, rhombic-ovate, or broadly ovate, 3–9 × 2–7.5 cm, abaxially densely resinous punctate, glabrous, bearded in axils of lateral veins, adaxially sparsely pubescent and resinous glandular when young, base truncate, broadly cuneate, or cuneate and subcordate, margin doubly or simply serrate, or incised-serrate, apex acute, acuminate, or caudate-acuminate; lateral veins 5–7(–9) on each side of midvein. Female inflorescence

pendulous, oblong or oblong-cylindric, 2–5 × 0.6–1.4 cm; peduncle slender, 1–2.5 cm; bracts 5–7 mm, densely pubescent and ciliate, 3-lobed, middle lobe triangular-ovate, lateral lobes erect or spreading to recurved, ovate or suborbicular, slightly shorter to longer than middle lobe. Nutlet narrowly oblong, oblong, or ovate, 1.5–2 × 1–1.5 mm, sparsely pubescent, with membranous wings slightly longer than and about as wide as nutlet. Fl. Jun–Jul, fr. Jul–Sep. *2n* = 28.
 Temperate broad-leaved forests, shaded, S-facing slopes, ridges, dry, sunny slopes, marshes, forming vast, pure stands or mixed with *Acer*, *Larix*, *Picea*, *Tilia*, and other species of *Betula*; 700–4200 m. Gansu, Hebei, Heilongjiang, Henan, Jiangsu, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shanxi, SW and W Sichuan, SE Xizang, NW Yunnan [Japan, N Korea, E Mongolia, Russia (Far East, Siberia)].

This species has been divided into varieties or separate species (*B. japonica*, *B. mandshurica*, and *B. szechuanica*); however, the morphological characters are not distinct; therefore, the entities are all treated here as *B. platyphylla*. A. K. Skvortsov considers *B. platyphylla* to be synonymous with *B. pendula*.

A very important timber tree. The wood is soft and light, close grained, and fine to coarse textured; it is used for making agricultural tools, wooden ware, and tobacco boxes, and rarely for house construction. The white, papery bark is made into canoes and fancy articles, food baskets, and is also used as a substitute for tiles; the inner bark contains much resin.

22. *Betula pendula* Roth, Tent. Fl. Germ. 1: 405. 1788.

垂枝桦 chui zhi hua
Betula verrucosa Ehrhart.
 Trees to 25 m tall; bark grayish white, exfoliating in sheets. Branches usually pendulous, dark brown, slender, glabrous, shiny; branchlets brown, slender, glabrous, sparsely resinous glandular or not. Petiole slender, 2–3 cm; leaf blade triangular-ovate or rhombic-ovate, 3–7.5 × 1.5–6 cm, abaxially densely resinous punctate, adaxially glabrous, base truncate, broadly cuneate, or cuneate, margin coarsely or incised doubly serrate, apex acuminate or caudate-acuminate; lateral veins 6–8 on each side of midvein. Female inflorescence oblong or oblong-cylindric, 1–3.3 cm × 8–10 mm; peduncle pendulous, 1–2 cm; bracts 5–6 mm, densely pubescent, ciliate, 3-lobed, middle lobe ovate or triangular-ovate, lateral lobes recurved, slightly longer than middle lobe. Nutlet obovate-elliptic, ca. 2 × 1 mm, sparsely pubescent, with membranous wings slightly longer than and ca. 2 × as wide as nutlet. Fl. Jun–Jul, fr. Jul–Aug. *2n* = 28, (42), 56.

Temperate broad-leaved forests; 500–2300 m. N Xinjiang (Altay Shan) [Kazakhstan, Mongolia, Russia (W Siberia); Europe]. May easily be confused with *Betula platyphylla*; however, in that species, the branches are not pendulous and the wings of the nutlet are about as wide as the nutlet. The name *B. alba* Linnaeus, nom. rej. prop., has been widely and persistently misapplied in the sense of *B. pendula*; the lectotype of *B. alba* belongs to the species currently known as *B. pubescens* Ehrhart, which does not occur in China.

23. *Betula halophila* Ching in P. C. Li, Acta Phytotax. Sin. 17(1): 88. 1979.

盐桦 yan hua

Shrubs to 3 m tall; bark grayish brown. Branches brown; branchlets densely pubescent and resinous glandular. Petiole slender, ca. 1 cm, densely pubescent; leaf blade ovate, rarely ovate-rhombic, 2.5–4.5 × 1.2–3 cm, abaxially sparsely resinous punctate and pubescent, adaxially glabrous, base subrounded, broadly cuneate, or cuneate, margin irregularly and doubly mucronate serrate, apex acuminate or acute; lateral veins 6 or 7 on each side of midvein. Female inflorescence pendulous, oblong, 2–3 × 1–1.2 cm; peduncle 5–8 mm, densely pubescent; bracts ca. 7 mm, densely pubescent and ciliate, 3-lobed, middle lobe triangular, lateral lobes horizontal or recurved, oblong-ovate, ca. as long as middle lobe. Nutlet ovate, ca. 2 × 1.5 mm, sparsely pubescent, with membranous wings 1.5–2 × as wide as nutlet. Fl. Jun–Jul, fr. Jul–Aug.

• Saline soils; ca. 1500 m. N Xinjiang (Altay Xian).

An endangered species. A. K. Skvortsov believes it is probably a variety of *Betula microphylla*.

24. *Betula microphylla* Bunge, Mém. Acad. Imp. Sci. St.-Pétersbourg Divers Savans 2: 506. 1835.

小叶桦 xiao ye hua

Betula fruticosa Pallas var. *cuneifolia* Regel.

Trees to 6 m tall; bark grayish white, exfoliating in flakes. Branches grayish or grayish brown, resinous glandular; branchlets yellow-brown, densely pubescent and resinous glandular. Petiole slender, ca. 1 cm, densely pubescent; leaf blade rhombic or rhombic-obovate, 1.5–5 × 1–3.5 cm, both surfaces sparsely pubescent and resinous punctate when young, base cuneate, rarely broadly cuneate, margin irregularly and doubly or simply roughly serrate, apex acute or obtuse; lateral veins 4–6 on each side of midvein. Female inflorescence oblong-cylindric, 1–2.5 cm × 7–8 mm; peduncle erect, 5–10 mm; bracts 5–6 mm, sparsely pubescent and ciliate, 3-lobed, middle lobe oblong, lateral lobes erect or slightly spreading, ovate or oblong, ca. 1/2 as long as middle lobe. Nutlet ovate, ca. 2.5 × 1.5 mm, densely pubescent, with membranous wings ca. as wide as nutlet. Fl. Jun–Jul, fr. Jul–Aug.

Temperate broad-leaved forests; 1200–1600 m. Xinjiang (Altay Shan, Hami Xian) [Kazakhstan, Mongolia].

25. *Betula tianschanica* Ruprecht, Mém. Acad. Imp. Sci. Saint Pétersbourg, sér. 7, 4: 72. 1867.

天山桦 tian shan hua

Betula alba Linnaeus subsp. *soongarica* var. *microphylla* Regel; *B. jarmolenkoana* Goloskokov.

Trees to 12 m tall; bark yellow-white or yellow-brown, exfoliating in flakes. Branches gray-brown or dark brown, glabrous; branchlets densely pubescent and villous, sparsely resinous glandular. Petiole 5–7 mm; leaf blade broadly ovate-rhombic or ovate-rhombic, rarely ovate or rhombic, 2–7 × 1–6 cm, both surfaces sparsely resinous punctate and villous when young,

base broadly cuneate or cuneate, margin doubly and coarsely mucronate serrate, apex acute or acuminate; lateral veins 4–7 on each side of midvein. Female inflorescence oblong-cylindric, 1–4 cm × 5–10 mm; peduncle pendulous, 0.5–1.7 cm, densely pubescent; bracts 5–8 mm, pubescent, ciliate, 3-lobed, middle lobe triangular or oblong, lateral lobes slightly spreading to horizontal or recurved, ovate, oblong, or subrhombic, slightly wider and shorter than middle lobe. Nutlet obovate, ca. 2.5 mm, with membranous wings ca. as wide as or slightly wider and longer than nutlet. Fl. Jun–Jul, fr. Jul–Aug.

Temperate broad-leaved forests, streambanks, valleys, shaded or rocky slopes; 1300–2500 m. Xinjiang (Tian Shan) [Kyrgyzstan, Tajikistan].

26. *Betula dahurica* Pallas, Reise Russ. Reich. 3: 224. 1776.

黑桦 hei hua

Betula dahurica var. *oblongifolia* Liou; *B. dahurica* var. *ovalifolia* Liou; *B. dahurica* var. *tiliifolia* Liou; *B. maackii* Ruprecht; *B. maximowiczii* Ruprecht.

Trees to 20 m tall; bark black-brown, fissured. Branches red-brown or dark brown, shiny, glabrous; branchlets red-brown, villous, with dense, resinous glands. Petiole 0.5–1.5 cm; leaf blade ovate, broadly ovate, rhombic-ovate, or elliptic, 4–8 × 3.5–5 cm, abaxially densely resinous glandular along veins, bearded in axils of lateral veins, adaxially glabrous, base subrounded, broadly cuneate, or cuneate, margin irregularly and acutely doubly serrate, apex acute or acuminate; lateral veins 6–8 on each side of midvein. Female inflorescence erect or pendulous, oblong-cylindric, 2–2.5 × ca. 1 cm; peduncle 5–12 mm; bracts 5–6 mm, ciliate, 3-lobed, middle lobe oblong-lanceolate, lateral lobes spreading or recurved, ovate or broadly ovate, ca. as long as middle lobe. Nutlet broadly elliptic, glabrous, with membranous wings ca. 1/2 as wide as nutlet. Fl. Jun–Jul, fr. Jul–Aug. $2n = 56$.

Mixed or coniferous forests, dry or moist, sunny slopes, rocks on mountain summits; 400–1300 m. Hebei, Heilongjiang, E Jilin, N Liaoning, Nei Mongol, Shaanxi, Shanxi [Japan, Korea, E Mongolia, Russia (Far East)].

The wood is hard and dense, and is used in house construction and for making agricultural tools and furniture.

27. *Betula ovalifolia* Ruprecht, Bull. Acad. Imp. Sci. Saint-Pétersbourg 15: 378. 1857.

油桦 you hua

Betula fruticosa Pallas var. *ruprechtiana* Trautvetter; *B. humilis* Schrank var. *ovalifolia* Regel; *B. humilis* var. *reticulata* Regel; *B. humilis* var. *ruprechtii* Regel; *B. reticulata* Ruprecht.

Shrubs to 2 m tall; bark gray-brown. Branches dark brown, sparsely pubescent and resinous glandular; branchlets brown, densely yellow villous and pubescent,

± resinous glandular. Petiole 3–7 mm; leaf blade elliptic, ovate-elliptic, rhombic-elliptic, rhombic-ovate, or obovate, 3–3.5 × 2–4 cm, both surfaces densely resinous glandular and white villous when young, abaxially glabrous, base broadly cuneate, cuneate, or subrounded, margin simply minutely serrate, apex acute or obtuse; lateral veins 5–7 on each side of midvein. Female inflorescence erect, oblong, rarely globose, 1.5–3 cm × 7–12 mm; peduncle 2–6 mm, sparsely pubescent; bracts 5–6 mm, ciliate, 3-lobed, middle lobe oblong, lateral lobes erect or subspreading, oblong or ovate, slightly shorter than middle lobe. Nutlet elliptic, ca. 3 × 1.5 mm, with membranous wings 1/3–1/2 as wide as nutlet. Fl. Jun–Jul, fr. Jul–Aug.

Peat bogs, marshes, moist places; 500–1200 m. S Heilongjiang, Jilin (Changbai Shan), Nei Mongol [Japan, Korea, Russia (Far East)].

28. *Betula fruticosa* Pallas, Reise Russ. Reich. 3: 758. 1776.

柴桦 *chai hua*

Shrubs to 3 m tall; bark grayish white. Branches dark purplish brown or gray-black, glabrous; branchlets brown, scabrous, with dense, resinous glands. Petiole 2–10 mm, glabrous; leaf blade ovate or ovate-elliptic, rarely broadly ovate, 1.5–3 (–4.5) × 1–2 (–3.5) cm, abaxially densely resinous glandular, adaxially sparsely pubescent along veins, base subrounded or broadly cuneate, margin irregularly and simply minutely serrate, apex acute, rarely subrounded or obtuse; lateral veins 5–8 on each side of midvein. Female inflorescence erect or spreading, oblong or oblong-cylindric, 1–2 cm × 5–8 mm; peduncle 2–5 (–10) mm, densely pubescent; bracts 4–7 mm, ciliate, 3-lobed, middle lobe oblong, lateral lobes spreading or suberect, oblong, ca. 1/2 as long as middle lobe. Nutlet elliptic, ca. 1.5 × 1 mm, with membranous wings 1/3–1/2 as wide as nutlet. Fl. Jun–Jul, fr. Jul–Aug.

Swamps in forests, streambanks; 600–1100 m. N Heilongjiang, Nei Mongol [Korea, Mongolia, Russia (E Siberia)].

29. *Betula humilis* Schrank, Bayer. Fl. 1: 420. 1789.

甸生桦 *dian sheng hua*

Betula humilis var. *vulgaris* Perfiljev; *B. sibirica* Watson.

Shrubs to 2 m tall; bark dark brown. Branches black-brown, glabrous, densely resinous glandular; branchlets brown, densely pubescent and yellow resinous glandular. Petiole ca. 5 mm, pubescent; leaf blade ovate, broadly ovate, or ovate-elliptic, 1–2.5 (–4) × 0.6–1.5 (–2) cm, both surfaces glabrous, base broadly cuneate or cuneate, rarely subrounded, margin irregularly and doubly coarsely serrate, apex acute; lateral veins 4 or 5 on each side of midvein. Female inflorescence erect, oblong, 1–1.5 cm × 4–6 mm; peduncle 1–3 mm, sparsely pubescent and resinous glandular; bracts 3–4 mm, ciliate, 3-lobed, middle lobe oblong, lateral lobes spreading, ovate or oblong, ca. 1/2 as long as or subequal to middle lobe. Nutlet oblong, ca. 2 × 1.5 mm,

with membranous wings ca. 1/2 as wide as nutlet. Fl. Jun–Jul, fr. Jul–Aug. $2n = 28$.

Swamps and meadows in forests, 1400–1800 m. Xinjiang (Altay Shan) [Kazakstan, N Mongolia, Russia (Siberia); Europe].

A. K. Skvortsov believes that this species is a synonym of *Betula fruticosa*.

30. *Betula gmelinii* Bunge, Mém. Acad. Imp. St.-Pétersbourg Divers Savans 2: 607. 1835.

砂生桦 *sha sheng hua*

Betula fruticosa Pallas var. *gmelinii* Regel.

Shrubs to 3 m tall; bark gray-black. Branches dark brown or gray-brown, glabrous; branchlets densely pubescent and villous, sometimes slightly scabrous, with dense, resinous glands. Petiole slender, 2–7 mm; leaf blade elliptic, ovate, or broadly ovate, 1.5–4 × 1–2.5 cm, glabrous, abaxially resinous punctate when young, base cuneate or broadly cuneate, margin irregularly acutely minutely serrate, apex acute or rounded-obtuse; lateral veins 4–6 on each side of midvein. Female inflorescence erect, oblong, 1–2.2 cm × 8–9 mm; peduncle 3–6 mm or ± obscure; bracts 5–6 mm, 3-lobed, middle lobe oblong, lateral lobes spreading, ovate, slightly shorter than and ca. 2 × as wide as middle lobe. Nutlet obovate-elliptic, ca. 3 × 1.5 mm, with membranous wings 1–2 × as wide as nutlet. Fl. Jun–Jul, fr. Jul–Aug.

Sandy hills, deserts; 500–1000 m. N Heilongjiang, N Liaoning, Nei Mongol [N Mongolia, Russia (E Siberia)].

31. *Betula rotundifolia* Spach, Ann. Sci. Nat., Bot., sér. 2, 15: 194. 1841.

圆叶桦 *yuan ye hua*

Betula glandulosa Michaux var. *rotundifolia* (Spach) Regel.

Shrubs to 2 m tall; bark gray-black. Branches dark gray, glabrous, densely yellow resinous glandular; branchlets red-brown, densely white pubescent and resinous glandular. Petiole 5–7 mm, slender, densely pubescent; leaf blade suborbicular, rarely broadly obovate, 1–2.5 × 0.8–2 cm, both surfaces glabrous and densely resinous punctate, base rounded or broadly cuneate, margin obtusely serrate, apex subrounded; lateral veins 3 or 4 on each side of midvein. Female inflorescence erect, oblong-cylindric, 1.5–2.4 cm × 6–8 mm; peduncle 3–4 mm, densely pubescent; bracts ca. 6 mm, ciliate, 3-lobed, middle lobe oblong, lateral lobes slightly spreading, elliptic, slightly shorter than middle lobe. Nutlet oblong, ca. 2.5 × 1.8 mm, with membranous wings slightly narrower than nutlet. Fl. Jun–Jul, fr. Jul–Aug. $2n = 28$.

Thickets on mountain slopes; ca. 2300 m. Xinjiang (Altay Shan) [Kazakstan, N Mongolia, Russia (Siberia)].

A. K. Skvortsov believes that this species should be treated as a variety of the circumboreal *Betula nana* Linnaeus.

32. *Betula middendorffii* Trautvetter & C. A. Meyer in Middendorff, Reise Sibir. 1(2), Fl. Ochot. Phaenog. 2: 84. t. 21. 1856.

扇叶桦 shan ye hua

Shrubs to 2 m tall; bark red-brown, shiny. Branches spreading, dark red-brown, glabrous, shiny, becoming glaucous; branchlets black-brown, densely pubescent and resinous glandular. Petiole ca. 3 mm, densely pubescent; leaf blade broadly obovate, $1.5\text{--}2.7 \times 1.2\text{--}2.1$ cm, abaxially light green, sparsely resinous punctate, glabrous, adaxially dark green and shiny, base broadly cuneate or rounded-cuneate, margin irregularly and obtusely doubly serrate, apex obtuse or subrounded; lateral veins 3–5 on each side of midvein. Female inflorescence spreading or pendulous, oblong, $1.2\text{--}1.5$ cm \times 8–9 mm; peduncle 8–10 mm, slender, densely pubescent and resinous glandular, bracts ca. 6 mm, ciliate, 3-lobed, middle lobe ovate, lateral lobes erect, obovate, ca. as long as middle lobe. Nutlet ovate, ca. 2×1.5 mm, glabrous, with membranous wings slightly wider than nutlet. Fl. Jun–Jul, fr. Aug–Sep. $2n = 42, 48, 56$.

Thickets; 1000–1200 m. Heilongjiang (Daxinganling), Nei Mongol [Russia (E Siberia)].

