

4. TORREYA Arnott, Ann. Nat. Hist. 1: 130. 1838, nom. cons.

榧树属 fei shu shu

Trees evergreen, dioecious (occasionally monoecious); branches whorled; branchlets subopposite or subwhorled, base with bud scales not persistent; winter buds with several pairs of decussate bud scales. Leaves decussate or subopposite, 2-ranked, linear or linear-lanceolate, basally twisted, leathery, adaxial surface slightly convex with midvein ± indistinct, abaxial surface with 2 stomatal bands, resin canal present on abaxial side of vascular bundle, base decurrent, apex sharply acuminate. Pollen cones axillary, solitary, shortly pedunculate, ellipsoid or shortly columnar; microsporophylls in 4–8 whorls each of 4 microsporophylls; pollen sacs (3 or)4, marginal, pendulous. Seed-bearing structures borne in pairs in leaf axils, sessile, each with 2 pairs of decussate bracts and 1 lateral bract; ovule 1, erect. Aril succulent, base of aril with persistent bracts. Seed ripening in autumn of 2nd year, drupelike, completely enclosed within aril; female gametophyte tissue ruminant or not. Cotyledons 2. Germination hypogeal. 2n = 22.

Six species: China, Japan; SE and W United States; four species (three endemic, one introduced) in China.

- 1a. Leaves borne at 20–60° to branchlet axis, 3.5–9 cm, stomatal bands silvery gray initially, later turning brown 4. *T. jackii*
- 1b. Leaves usually borne at 60–90° to branchlet axis, (0.7–)1.1–3.6(–4) cm, stomatal bands brown even when young.
 - 2a. Leaves with 2 longitudinal grooves adaxially, midvein distinctly narrower than marginal bands 3. *T. fargesii*
 - 2b. Leaves without 2 longitudinal grooves adaxially, midvein about as wide as marginal bands.
 - 3a. Leaves (0.7–)1.1–2.5(–4.5) cm, base obtuse or broadly rounded, apex cuspidate; axis of 2nd- or 3rd-year branchlets yellowish green, light brownish yellow or pale brown 2. *T. grandis*
 - 3b. Leaves 2–3 cm, base slightly rounded or cuneate, apex very long acuminate; axis of 2nd- or 3rd-year branchlets green or reddish brown 1. *T. nucifera*

1. *Torreya nucifera* (Linnaeus) Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4(3): 234. 1846.

日本榧树 ri ben fei shu

Taxus nucifera Linnaeus, Sp. Pl. 2: 1040. 1753.

Trees to 25 m tall; trunk to 90 cm d.b.h.; bark grayish brown or light brownish red, smooth when young, fissured and peeling off in thin strips. Axis of leafy branchlets green and glabrous in 1st year, green or reddish brown and lustrous in 2nd or 3rd year. Leaves 2-ranked, linear, straight or slightly curved, 2–3 cm × 2.2–3 mm, rigid, pale green adaxially, stomatal bands 2, pale yellow, narrow, impressed, base slightly rounded or cuneate, abruptly narrowed into a short petiole, apex very long acuminate, spinose. Seed dark green when young, purplish brown at maturity, ellipsoid-obovoid or obovoid, 2.5–3.2 × 1.3–1.7 cm. Pollination Apr–May, seed maturity Oct.

Cultivated as a slow-growing, ornamental tree. Jiangsu, Jiangxi, Shandong, Shanghai, Zhejiang [native to Japan].

2. *Torreya grandis* Fortune ex Lindley, Gard. Chron. 1857: 788. 1857.

榧树 fei shu

Trees to 25 m tall; trunk to 0.5(–2) m d.b.h.; bark light yellowish gray, dark gray, or grayish brown, with irregular vertical fissures. Leafy branchlets oblong-obovate in outline, 4–7 × 2.5–4 cm, axis green and glabrous in 1st year, thereafter yellowish green, light brownish yellow or pale brown. Leaves borne at (50–

60–90° to branchlet axis; petiole 0.5–1 mm; blade bright green and glossy adaxially, linear-lanceolate, usually straight, (0.7–)1.1–2.5(–4.5) cm × 2–3.5 mm, with no conspicuous grooves, midvein indistinct adaxially, (0.2–)0.5–0.7 mm wide abaxially, stomatal bands (0.2–)0.3–0.4 mm wide, marginal bands 0.5–0.7 mm wide, base obtuse or broadly rounded, ± symmetric, margin flat or very narrowly revolute, apex symmetrically or slightly asymmetrically tapered, cuspidate, cusp 0.3–1 mm. Pollen cones columnar, ca. 8 mm; bracts conspicuously ridged. Aril pale purplish brown and white powdery when ripe, apex obtuse-rounded or rounded and cuspidate. Seed ellipsoid to ovoid, elongate-ellipsoid, obovoid, or obovoid-conical, 2–4.5 × 1.2–2.5 cm; female gametophyte tissue slightly wrinkled, not ruminant. Pollination Apr, seed maturity Sep–Nov of 2nd year.

• Mountains, open valleys, often by streams, on yellow, red, and dark soils; 200–1400 m. S Anhui, N Fujian, NE Guizhou, W Hunan, S Jiangsu, N Jiangxi, Zhejiang.

The wood is used in constructing buildings, bridges, and furniture. The seed, known as “xiangfei,” is edible and also yields an edible oil; the essential oil “torreya oil” is extracted from the aril. Numerous variants have been recognized at the rank of variety, form, or cultivar (cf. S. Y. Hu, *Taiwania* 10: 23–25. 1964). *Torreya grandis* var. *sargentii* Hu appears very distinct, leaf blade: midvein very narrow, ca. 0.2 mm wide, with green belt on either side ca. 0.3 mm wide, stomatal bands very narrow, 0.2–0.25 mm wide; seed strongly obovoid, 40–45 × 18–20 mm); however, very few specimens have been seen, so the distinctions are probably not genuine; it is included here in the synonymy of var. *grandis*.

- 1a. Leaf blade (0.7–)1.1–2.5 cm; aril of seed ellipsoid to ovoid or elongate-ellipsoid, apex obtuse-rounded 2a. var. *grandis*
 1b. Leaf blade 2.5–4.5 cm; aril of seed obovoid-conical, apex rounded, cuspidate 2b. var. *jiulongshanensis*

2a. *Torreya grandis* var. *grandis*

榿树(原变种) fei shu (yuan bian zhong)

Caryotaxus grandis (Fortune ex Lindley) Henkel & W. Hochstetter; *Torreya grandis* var. *chingii* Hu; *T. grandis* var. *dielsii* Hu; *T. grandis* f. *major* Hu; *T. grandis* var. *merrillii* Hu; *T. grandis* f. *non-apiculata* Hu; *T. grandis* var. *sargentii* Hu; *T. nucifera* (Linnaeus) Siebold & Zuccarini var. *grandis* (Fortune ex Lindley) Pilger; *Tumion grande* (Fortune ex Lindley) Greene.

Leaf blade (0.7–)1.1–2.5 cm. Aril of seed ellipsoid to ovoid or elongate-ellipsoid, apex obtuse-rounded.

- Mountains, open valleys; 200–1400 m. S Anhui, N Fujian, NE Guizhou (Songtao), W Hunan, S Jiangsu, N Jiangxi, Zhejiang.

2b. *Torreya grandis* var. *jiulongshanensis* Z. Y. Li & al., Bull. Bot. Res., Harbin 15: 356. 1995.

九龙山榿树 jiu long shan fei shu

Leaf blade 2.5–4.5 cm. Aril of seed obovoid-conical, apex rounded, cuspidate.

- Mountains; ca. 800 m. S Zhejiang (Suichang Xian).

3. *Torreya fargesii* Franchet, J. Bot. (Morot) 13: 264. 1899.

巴山榿树 ba shan fei shu

Trees or shrubs to 20 m tall; trunk to 1 m d.b.h.; bark dark gray, pale brown, or grayish brown, irregularly vertically fissured, sometimes flaking. Leafy branchlets oblong to elliptic-oblong in outline, 5–13 × 3–7.5 cm, axis green in 1st year, thereafter yellowish. Leaves borne at 55–80° to branchlet axis; petiole 0.5–1 mm; blade shining green adaxially, linear to linear-lanceolate, straight or distally falcate, 1.2–3.6(–4) cm × 2–4 mm, with 2 longitudinal grooves, midvein indistinct adaxially, 0.3–0.6 mm wide abaxially, stomatal bands light brown, (0.15–)0.2–0.3 mm wide, marginal bands 0.5–1.2 mm wide, base broadly cuneate, ± asymmetric, margin flat or very narrowly revolute, apex usually shortly and symmetrically tapered, cuspidate, cusp 0.3–1 mm. Pollen cones pale yellow, ovoid, ca. 5–6 × 4.5–5 mm; bracts in 4–12 pairs in 4 rows, longitudinally ridged. Aril pale green or slightly white powdery, with small apical mucro. Seed ovoid to globose or broadly ellipsoid, 1.5–2.5 cm in diam.; inner wall of seed coat smooth or with 2 opposite longitudinal ridges; female gametophyte tissue conspicuously and deeply ruminant internally. Pollination Apr–May, seed maturity Sep–Oct of 2nd year.

- Coniferous, mixed, and broad-leaved forests; 1000–3400 m. ?S Anhui, W Hubei, NW Hunan, Jiangxi, S Shaanxi, Sichuan, NW Yunnan.

Suitable for afforestation and reforestation. The high quality timber is used in constructing houses, bridges, and furniture, and making implements and utensils; an oil is extracted from the seed.

- 1a. Leaves ± straight, usually shortly and symmetrically tapered at apex, grooves on adaxial surface usually not extending beyond middle of blade, marginal bands 0.5–0.9(–1.1) mm wide 3a. var. *fargesii*
 1b. Leaves often strongly falcate, gradually tapered toward apex from about middle, grooves on adaxial surface extending beyond middle of blade, marginal bands (0.7–)0.9–1.2 mm wide 3b. var. *yunnanensis*

3a. *Torreya fargesii* var. *fargesii*

巴山榿树(原变种) ba shan fei shu (yuan bian zhong) *Torreya grandis* Fortune ex Lindley var. *fargesii* (Franchet) Silba; *Tumion fargesii* (Franchet) Skeels.

Leaves ± straight, usually shortly and symmetrically tapered at apex, grooves on adaxial surface usually not extending beyond middle of blade, marginal bands 0.5–0.9(–1.1) mm wide.

- Scattered in coniferous and broad-leaved forests; 1000–1800 m. ?S Anhui, W Hubei, NW Hunan, Jiangxi, S Shaanxi, Sichuan. The record from S Anhui is based on *R. C. Ching 3036* (E, K) from Huang Shan, a locality outside the main distribution area of *Torreya fargesii*. This specimen was cited under *T. grandis* by S. Y. Hu (Taiwania 10: 24. 1964), but is provisionally and tentatively placed under *T. fargesii* here. However, it differs strikingly from the latter species in several features, and clearly deserves further investigation; the specimens seen are sterile and more material from the area would be required before a decision could be made as to their taxonomic status.

3b. *Torreya fargesii* var. *yunnanensis* (W. C. Cheng & L. K. Fu) N. Kang, Bull. Bot. Res., Harbin 15: 353. 1995.

云南榿 yun nan fei

Torreya yunnanensis W. C. Cheng & L. K. Fu in W. C. Cheng & al., Acta Phytotax. Sin. 13(4): 87. 1975; *T. grandis* var. *yunnanensis* (W. C. Cheng & L. K. Fu) Silba.

Leaves often strongly falcate, gradually tapered toward apex from about middle, grooves on adaxial surface extending beyond middle of blade, marginal bands (0.7–)0.9–1.2 mm wide.

- Coniferous and mixed forests in warm temperate zones, locally a common forest tree; 1500–3400 m. NW Yunnan (Gongshan Drungzu Nuzu Zizhixian, Lijiang Naxizu Zizhixian, Weixi Xian, Zhongdian Xian).

A vulnerable plant.

4. *Torreya jackii* Chun, J. Arnold Arbor. 6: 144. 1925.

长叶榧树 chang ye fei shu

Trees to 12 m tall; trunk to 20 cm d.b.h.; bark gray or dark gray, falling off in thick flakes exposing pale brown cortex. Leafy branchlets horizontal or pendulous, rhombic-elliptic, \pm flabellate or broadly obovate in outline, 7–9 \times 5–10 cm, axis green turning greenish brown in 1st year, thereafter reddish brown and glossy. Leaves borne at 20–60° to branchlet axis, adjacent leaves (especially distal ones), with blades twisted through ca. 90° so that their surfaces nest within each other; petiole 1–2 mm, twisted; blade deep shining green adaxially, linear to linear-lanceolate, very gradually tapered from proximal 1/3 into apex, distally \pm falcate, (2.5–)3–7(–9) cm \times (2.5–)3–3.8(–4) mm, leathery, with 2 raised ridges extending from base to near apex, midvein extremely indistinct adaxially, strongly raised abaxially with a flat band on either side, whole midvein band ca. 1.2 mm wide, stomatal bands with silver-gray powder initially but finally brown, 0.1–0.2 mm wide, ca. 12 rows, marginal bands 0.5–0.7 mm wide, base cuneate, slightly asymmetric, strongly twisted, margin thickened abaxially and slightly downcurved but not revolute, apex cuspidate, cusp slender, tapered, 1–1.5 mm, often breaking off. Aril white powdery, with small mucro. Seed obovoid, 2–3 \times ca. 1.2 cm; female gametophyte tissue deeply ruminant within. Seed maturity autumn.

- Woods; 400–1000 m. N Fujian, NE Jiangxi, S Zhejiang.

A vulnerable species. *Torreya jackii* is unlike the other Chinese members of the genus and is remarkably similar to *Cephalotaxus fortunei*, from which it can be distinguished by its sessile seed-bearing structures and by the peculiar, strongly twisted leaf arrangement.

The wood is very fragrant, and is used to make agricultural implements, utensils, and handicrafts. The leaves are also very aromatic when bruised or burned, giving off a fragrance like sandalwood oil.

