

1. TAXUS Linnaeus, Sp. Pl. 2: 1040. 1753.

红豆杉属 hong dou shan shu

Trees or shrubs evergreen, dioecious; branchlets irregularly alternate, basal part with few or several persistent or early deciduous bud scales; winter bud scales overlapping, with prominent or indistinct, longitudinal adaxial ridges. Leaves 2-ranked, spirally arranged, sessile, or shortly petiolate in *Taxus cuspidata*, linear, straight or falcate, decurrent, adaxial surface with raised midvein, abaxial surface with 2 pale gray, grayish blue, or pale yellow stomatal bands, resin canal absent. Reproductive structures axillary, solitary. Pollen cones pedicellate, globose, with overlapping bracts at base; microsporophylls 6–14, shield-shaped, each with 4–9 radially arranged pollen sacs. Seed-bearing structures sessile, with several overlapping bracts, 2 or 3 distal pairs of which are decussate. Aril red or orange when ripe, succulent. Seed nutlike, ripening in 1st year, enclosed within cupular aril but with apex exposed; hilum prominent. Cotyledons 2. Germination epigeal. $2n = 24$.

About nine species: mainly N hemisphere; three species in China.

Taxus sumatrana (Miquel) de Laubenfels (*T. celebica* (Warburg) H. L. Li), from Indonesia (Sulawesi and Sumatra) and the Philippines, has been recorded from China (e.g., Fl. Taiwan, ed. 2). Such records are based on a broad concept of that species, including the taxa treated in this account as *T. wallichiana* var. *chinensis* and *T. wallichiana* var. *mairei* (but excluding the type of *T. wallichiana*). The total number of distinct species of *Taxus* occurring in Asia is quite controversial and in need of further study.

The papillae and other characters of the abaxial leaf surface are best observed in fresh, young leaves. The papillae are minute and are best seen using a microscope or a lens of $\times 25$ magnification or greater.

- 1a. Leafy branchlets \pm flat in living state; leaves linear to lanceolate, gradually tapered distally, usually falcate, apex gradually acuminate or abruptly tapered and indistinctly mucronate; winter bud scales early deciduous or some persistent at base of branchlets 2. *T. wallichiana*
- 1b. Leafy branchlets “V”-shaped in cross section in living state; leaves linear, almost equally wide throughout length, straight or slightly falcate, apex shortly mucronate to cuspidate; winter bud scales persistent at base of branchlets.
- 2a. Leaves usually straight, midvein densely and evenly papillate abaxially, base usually symmetric; seed columnar-oblong, \pm equally wide throughout length, obtusely ridged on 2 sides distally; hilum elliptic 1. *T. fuana*
- 2b. Leaves slightly falcate, midvein not papillate abaxially, base \pm asymmetric; seed ovoid or trigonous-ovoid, distal part with 3 or 4 or more obtuse ridges; hilum usually triangular or quadrangular 3. *T. cuspidata*

1. Taxus fuana Nan Li & R. R. Mill, Novon 7: 263. 1997.

密叶红豆杉 mi ye hong dou shan

Trees or large shrubs to 12 m tall; trunk to 3.5 m d.b.h.; winter buds ovoid, scales persistent at base of branchlets, ridged adaxially, abruptly acute at apex. Leafy branchlets “V”-shaped in cross section in living state, $3\text{--}6 \times 3.5\text{--}6$ cm in outline. Leaves borne at $60\text{--}90^\circ$ to branchlet axis; petiole 1–1.5 mm; blade bright green adaxially, linear, almost equally wide throughout length, usually straight, $1.2\text{--}3\text{--}(3.5)$ cm \times $1.5\text{--}2.5$ mm, \pm thick, midvein and stomatal bands both densely and evenly papillate abaxially, midvein ca. 0.2 mm wide abaxially, stomatal bands pale yellow, 0.6–0.7 mm wide, marginal bands 0.1–0.2 mm wide, base cuneate or shortly attenuate, usually symmetric, margin revolute (especially when dry), apex cuspidate, cusp 0.5–1 mm. Pollen cones ovoid, 6–8 mm; cone axis extended above apical bracts as a short stalk ca. 1 mm; bracts 2-ranked, proximal ones imbricate, small, distal ones pale green and semitransparent, much larger; microsporophylls pinkish brown. Seed-bearing structures axillary, sessile. Aril red when ripe. Seed columnar-oblong, \pm equally wide throughout length, slightly bilaterally flattened, ca. $6.5\text{--}7 \times 4.5\text{--}5$ mm, obtusely ridged on 2 sides distally, apex sharply

mucronate; hilum elliptic. Pollination Apr, seed maturity Sep–Nov.

Mixed forests and *Pinus* forests, usually in shade; 2500–3100 (–3400) m (descending to 1800 m in other parts of range of species). SW Xizang (Jilong Xian) [N India, Kashmir, Nepal, Pakistan].

An endangered species in China. In FRPS, two species of *Taxus* were recognized from SW China: the plants restricted to SW Xizang were identified as *T. wallichiana*, while those from SW Sichuan, SE Xizang, and W Yunnan were recognized as *T. yunnanensis*. However, Nan Li & L. K. Fu (Novon 7: 263–264. 1997) noted that critical study of types and authentic material revealed *T. yunnanensis* to be a synonym of *T. wallichiana*, and the plants identified in FRPS as *T. wallichiana* to be a new species, *T. fuana*.

2. Taxus wallichiana Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 3: 803. 1843.

须弥红豆杉 xu mi hong dou shan

Trees or shrubs to 30 m tall; trunk to 1.3 m d.b.h.; bark variably colored, grayish brownish, reddish, or purplish, peeling off in strips or cracking and falling off as thin scales; winter bud scales early deciduous or some persistent at base of branchlets, triangular-ovate, with or without longitudinal ridges abaxially. Leafy branchlets \pm flat in living state, $3\text{--}9 \times 1.5\text{--}6$ cm in outline. Leaves borne at $(50\text{--})60\text{--}90^\circ$ to branchlet axis, sessile or with petiole to 1 mm; blade dark green and glossy adaxially, paler abaxially, linear to

lanceolate, gradually tapered distally, usually falcate, (0.9–)1.5–3.5(–4.7) cm × (1.5–)2–4(–5) mm, midvein slightly elevated adaxially, 0.1–0.2 mm wide, densely and evenly papillate abaxially, or with papillae scattered on midvein or in 1–several lateral rows adjacent to stomatal band, or midvein not papillate, stomatal bands pale yellowish, 0.6–0.9 mm wide, densely and evenly papillate, marginal bands 0.1–0.4 mm wide, base cuneate or attenuate, asymmetric, margin flat to revolute, apex gradually acuminate or abruptly tapered and indistinctly mucronate, mucro 0.1–0.5 mm. Pollen cones scattered along 2nd year branchlet axis, ± sessile or shortly pedunculate (peduncle ca. 0.5 mm), pale yellowish, ovoid, 5–6 × ca. 3 mm; bracts usually 6, broadly ovate, pale green; microsporophylls 8–14, each with (4 or)5 or 6(–8) pollen sacs. Seed-bearing structures borne toward distal end of branchlet axis. Aril red or orange when ripe, often ± translucent. Seed ovoid or obovoid, occasionally columnar-oblong, sometimes slightly flattened, 5–8 × 3.5–5 mm, usually with obtuse ridges (sometimes trigonous and 3-ridged); apex with small mucro; hilum elliptic to suborbicular or rounded-trigonous. Pollination Sep–Apr, seed maturity Aug–Dec. Broad-leaved, coniferous, and mixed forests, thickets, deforested rocks, open slopes; 100–3500 m. S Anhui, Fujian, S Gansu, N Guangdong, N Guangxi, Guizhou, W Henan, W Hubei, Hunan, Jiangxi, S Shaanxi, Sichuan, Taiwan, SE Xizang, Yunnan, Zhejiang [Bhutan, N India, ?Laos, Myanmar, Sikkim, Vietnam].

Can be used within its native range for afforestation. The wood is an excellent building material, and is also used in making vehicles, agricultural implements, furniture, and stationery. A compound recently isolated from the leaves may prove promising as an antitumor agent.

- 1a. Leaves linear to lanceolate, thin and soft 2a. var. *wallichiana*
- 1b. Leaves linear, thick textured.
 - 2a. Leaves straight to distally falcate, usually 1.5–2.2 cm × ca. 3 mm, midvein of same color as stomatal band, densely and evenly papillate, margin flat in living state 2b. var. *chinensis*
 - 2b. Leaves usually falcate, 2–3.5 cm × 2.5–4 mm, midvein of different color to stomatal band, not papillate, or with papillae scattered on midvein or in 1–several lateral rows adjacent to stomatal band, margin revolute 2c. var. *mairei*

2a. *Taxus wallichiana* var. *wallichiana*

须弥红豆杉(原变种) xu mi hong dou shan (yuan bian zhong)

Taxus baccata Linnaeus subsp. *wallichiana* (Zuccarini) Pilger; *T. wallichiana* var. *yunnanensis* (W. C. Cheng & L. K. Fu) C. T. Kuan; *T. yunnanensis* W. C. Cheng & L. K. Fu.

Leaves linear to lanceolate, thin and soft.

Broad-leaved and mixed forests, often among bamboos, frequently by streams; 2000–3500 m. SW Sichuan, SE Xizang, W Yunnan [Bhutan, N India, N Myanmar, Sikkim, S Vietnam].

2b. *Taxus wallichiana* var. *chinensis* (Pilger) Florin, Acta Hort. Berg. 14(8): 355. 1948.

红豆杉 hong dou shan

Taxus baccata subsp. *cuspidata* (Siebold & Zuccarini) Pilger var. *chinensis* Pilger in Engler, Pflanzenr. IV. 5 (Heft 18): 112. 1903; *T. baccata* var. *sinensis* A. Henry; *T. chinensis* (Pilger) Rehder; *T. cuspidata* Siebold & Zuccarini var. *chinensis* (Pilger) C. K. Schneider.

Leaves linear, straight to distally falcate, usually 1.5–2.2 cm × ca. 3 mm, thick textured, midvein of same color as stomatal band, densely and evenly papillate, margin flat in living state.

Forests, often among bamboos, frequently by streams; 1100–2500(–2700) m. S Anhui (Huang Shan), Fujian, S Gansu, N Guangxi, SE and W Guizhou, W Hubei, NE Hunan, S Shaanxi, Sichuan, E Yunnan, Zhejiang; cultivated in Jiangxi (Lu Shan) [N Vietnam].

2c. *Taxus wallichiana* var. *mairei* (Lemée & H. Léveillé) L. K. Fu & Nan Li, Novon 7: 263. 1997.

南方红豆杉 nan fang hong dou shan

Tsuga mairei Lemée & H. Léveillé, Monde Pl. 2(16): 20. 1914; *Taxus chinensis* (Pilger) Rehder var. *mairei* (Lemée & H. Léveillé) W. C. Cheng & L. K. Fu; *T. mairei* (Lemée & H. Léveillé) S. Y. Hu ex T. S. Liu; *T. speciosa* Florin.

Leaves linear, usually falcate and 2–3.5 cm × 2.5–4 mm, thick, midvein of different color to stomatal band, not papillate, or with papillae scattered on midvein or in 1–several lateral rows adjacent to stomatal band, margin revolute.

Coniferous and mixed forests, thickets, deforested rocks, open slopes; 100–3500 m (but usually at lower elevations than var. *chinensis*, especially in the E, typically below 1200 m, ascending to over 3000 m in Sichuan and Yunnan). S Anhui, Fujian, S Gansu, N Guangdong, N Guangxi, Guizhou, W Henan, W Hubei, Hunan, Jiangxi, S Shaanxi, Sichuan, Taiwan, E Yunnan, Zhejiang [N India, ?Laos, Myanmar, Vietnam].

3. *Taxus cuspidata* Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4(3): 232. 1846.

东北红豆杉 dong bei hong dou shan

Taxus baccata Linnaeus subsp. *cuspidata* (Siebold & Zuccarini) Pilger; *T. baccata* subsp. *cuspidata* var. *latifolia* Pilger; *T. baccata* var. *microcarpa* Trautvetter; *T. caespitosa* Nakai; *T. cuspidata* var. *latifolia* (Pilger) Nakai; *T. cuspidata* var. *microcarpa* (Trautvetter) Kolesnikov.

Trees to 20 m tall; trunk to 1–1.5 m d.b.h.; bark reddish brown, with shallow fissures; winter bud scales persistent at base of branchlets, overlapping, ridged dorsally, tapered apically. Leafy branchlets “V”-shaped in cross section in living state. Leaves borne at 75–95° to branchlet axis, subsessile; blade dark green and glossy adaxially, linear, almost equally wide throughout length, slightly falcate, 1–2.5(–4) cm × 2.5–

3 mm, midvein not papillate abaxially, stomatal bands tawny yellow, 0.6–0.7 mm wide, at least 2 × as wide as marginal bands, marginal bands ca. 0.2 mm wide, base cuneate, ± asymmetric, margin revolute, apex usually shortly mucronate, mucro 0.1–0.3 mm. Pollen cones ovoid or subglobose, ca. 3.5 mm; peduncle 0.5–1 mm; microsporophylls 9–14, each with 5–8 pollen sacs. Aril purplish red when ripe, lustrous. Seed ovoid or trigonous-ovoid, ca. 6 × 4–4.5 mm, distally with 3 or 4 or more obtuse ridges, apex with small, obtuse mucro; hilum usually triangular or quadrangular. Pollination spring, seed maturity autumn.

Acid soils in cold, humid places; 500–1000 m. Heilongjiang, E Jilin, Liaoning, Shaanxi [Japan, Korea, E Russia (Kurile Islands, Primorye, Sakhalin)].

Only var. *cuspidata*, described here, occurs in China; var. *nana*

Rehder occurs in Japan.

The wood used in building construction, furniture manufacture, and as a carving material. The heartwood yields a red dye, oil is extracted from the seeds, and a compound used to treat diabetes is extracted from the wood, bark, leaves, and roots.

