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*Keteleeria* Carrière, Rev. Hort. 37: 449. 1866. Type: *Keteleeria fortunei* (A. Murray bis) Carrière (*Pinaceae*).

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Named after Jean-Baptiste Keteleer, a Belgian horticulturist.

### Description

488

Monoecious evergreen trees with a monopodial trunk. Resin canals in wood (few), leaves and seed cones. Branches in pseudo-whorls, spreading more or less horizontally and ascending (Massart's and/or Rauh's model); capacity to coppice present. Bark scaly and often longitudinally fissured on lower part of trunk. Terminal buds ovoid conical to subglobose, axillary lateral buds subglobose, with numerous, more or less triangular, imbricate and persistent bud scales without resin. Leaves spirally inserted and pectinately arranged, weakly dimorphic; leaves on saplings, young trees and coppicing shoots relatively broad, lanceolate, thin and flat, with acute acuminate apices and usually larger than leaves on mature trees, which are linear, narrower, thicker, with more obtuse apices; all leaves with two primary stomatal bands on abaxial side and a variable but much lesser number or no stomata on adaxial side. Pollen cones in umbellate clusters of approximately 5–10 from a single axillary bud, cylindrical, 1–1.5 cm long; microsporophylls with 2 pollen sacs containing bisaccate pollen. Seed cones on leaved peduncles, erect, oblong to cylindrical. Bracts relatively small, sometimes trilobate and always cuspidate. Seed scales persistent (cone rachis finally breaking up after a few to several seasons), flabellate with a relatively broad, pedicellate base. Seeds large, held in a deep cup, fully covered on one side and for a fourth on other side; membrane continuing in a persistent, oblique wing 1.5–2.5 times length of seed. Germination hypogeal (unique in *Pinaceae*); seedling with 2–4 cotyledons.

3 species.

### Distribution

Central and SE China, Viet Nam, N Lao PDR, Taiwan.

### Taxonomic notes

A total of 14 species and 1 variety have been described in this genus, the majority of which were based on small differences in variable characters observed in few specimens or collections. In the first revision of the genus *Keteleeria* since Flous (1936), Farjon (1989) has reduced the number of species to the three accepted by most authors prior to 1936: *K. davidiana* (Bertr.) Beissner, *K. evelyniana* Masters and *K. fortunei* (Andr. Murray) Carrière. This taxonomy is now generally accepted, although in Flora of China 4: 42–44 (1999) two more species, *K. hainanensis* and *K. pubescens*, were maintained (with some caveats).

### Key to the species of *Keteleeria*

It should be observed, that only the seed scales of the central part of mature cones show these diagnostic characters fully; likewise, only shoots and leaves on branches of mature trees, not of (relatively) young plants or regrowth of coppiced plants, should be compared using this key. Trees in cultivation often tend to retain juvenile characters longer than is observed in natural habitats.

- 1a. Seed scales of mature cones with convex, rounded or truncate upper margin. Leaves short (less than 4 cm long). Shoots usually glabrous *K. fortunei*
- 1b. Seed scales of mature cones with a more or less obtuse-acute, concave or recurved apex. Leaves often longer than 4 cm, but variable. Shoots glabrous or pubescent 2
- 2a. Seed scales equally wide as long or slightly longer, lateral margins straight. Leaves with an obtuse or truncate apex. Shoots brown pubescent *K. davidiana*
- 2b. Seed scales longer than wide, lateral margins usually concave. Leaves with a more or less mucronate apex. Shoots weakly pubescent or glabrous *K. evelyniana*

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*Keteleeria davidiana* (Bertrand) Beissn., Handb. Nadelholzk.: 424, f. 117. 1891.

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### Etymology

This species has been named after Armand David (1826–1900), a French Lazarist missionary to China and an avid naturalist.

### Vernacular names

David's Keteleeria; tijian yushan (Chinese)

### Description

Trees to 40–50 m tall, d.b.h. to 2–2.5 m; trunk monopodial; bark rough and scaly, fissured in lower part of trunk, dark grey brown. Branches of first and second order long, heavy, spreading and ascending; crown broad conical or domed, often open in old trees. Branchlets slender, firm, (light) reddish brown or yellowish brown, becoming grey; surface ridged and grooved; young shoots usually densely brown pubescent, but soon glabrous, leaf scars small, circular. Vegetative buds ovoid globose, 3–5 × 2–4 mm, not resinous; bud scales triangular, obtuse, appressed, persisting several years. Leaves directed forward, (1.5–)2–5(–5.5) cm long, 2.5–4.5 mm wide, slightly twisted and/or narrowed at base, narrowly linear, ligulate linear, or lanceolate in young plants, flattened, with slightly recurved margins, obtuse or truncate (in young plants acute) at apex, with a longitudinal midrib on both surfaces; stomata none or a few near apex above, in two broad bands below; leaf colour (glaucous) green above, greenish white stomatal bands below. Pollen cones pedunculate, 1–1.5 cm long, yellow with brown perular scales. Seed cones lateral or (sub)terminal, solitary or paired; peduncles 1.5–6 cm long, leaved as shoots, at an angle to axis of cone; cones short or long cylindrical, with obtuse apex, (5–)8–21 cm long, 3.5–6 cm wide with opened scales, ripening to light or dark brown; cone rachis deciduous with cone, or slowly disintegrating, narrowly conical. Seed scales subcordate, with often reflexed apical end or margin, 2.6–3.2 × 2.2–2.8 cm at mid-cone; abaxial surface striated, sometimes pubescent in young cones, but soon glabrous; upper margin erose denticulate in young cones, becoming entire. Bracts narrowly spatulate, with cuspidate or tridentate apex, 1.5–2 cm long, straight, slightly

exserted with opened seed scales. Seeds oblong, grooved with resin vesicles, 10–15 × 6–8 mm, dull brown, on one side covered by the seed wing; seed wing semi-trullate, 25–30 × 10–12 mm, lustrous light brown.

### Taxonomic notes

*Keteleeria davidiana* is a highly variable species and this has led several authors to describe new species based on such aberrant specimens as seemed distinct. Most if not all of these have later been reduced to synonymy or, at most, to varieties of this widespread species. In Farjon (1989, 1990) *K. formosana* was reduced to synonymy, but in Flora of China 4: 44 (1999) it has been retained as a variety, based on a single and rather obscure distinction. As a clearly disjunct element within the species, endemic to Taiwan, it may be appropriate to give it the benefit of the doubt as a mere variety of *K. davidiana*, as is done here.

### Distribution

China: NE Yunnan, SE Sichuan, Chongqing, SE Gansu, S Shaanxi, NW Guizhou, SW Hubei, SW Hunan, N Guangxi; Taiwan; Viet Nam.

**TDWG codes:** 36 CHC-CQ CHC-GZ CHC-HU CHC-SC CHC-YN CHN-GS CHN-SA CHS-GX CHS-HN 38 TAI 41 VIE

### Ecology

*Keteleeria davidiana* occurs from hills to low mountains throughout much of E China, at elevations of (300–)600–1000(–1300) m a.s.l. It grows on the red and yellow earth, which are acid, podzolic soils poor in nutrients, or on brown forest soils. The climate is humid, continental warm temperate to subtropical, with annual precipitation between 1000 and 2000 mm. It is a constituent of the mixed mesophytic forest formation (Wang, 1961), together with many genera and species of broad-leaved deciduous trees, and some other gymnosperms, such as *Pinus massoniana*, *P. bungeana*, *Cunninghamia lanceolata*, *Cupressus funebris*, *Torreya grandis*, and *Podocarpus nakaii* (Taiwan). It also occupies the evergreen broad-leaved forest formation (Guizhou, Taiwan), with numerous (sclerophyllous) evergreen tree species and *Pinus* spp. It rarely forms pure stands. It