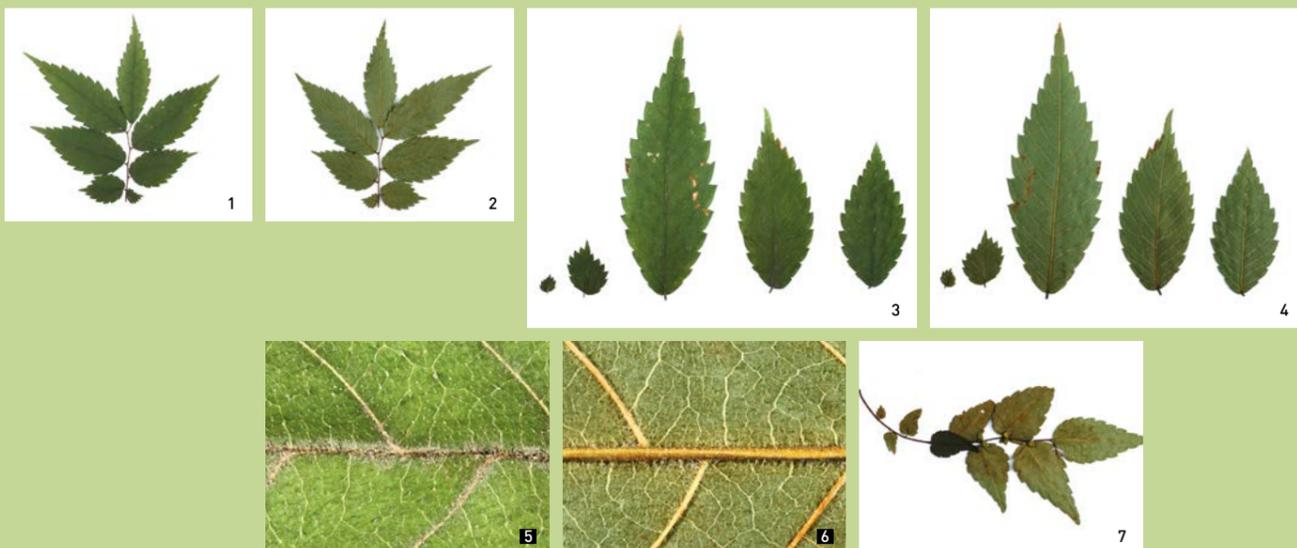


Zelkova serrata (Thun.) Makino

Japanese Zelkova/Keyaki (Japan)/Ju shu (China)/Neutinamu (Korea)
IUCN Red List of Threatened Species: Not Evaluated

Zelkova serrata exhibits the largest geographical range among the members in the genus. Its densely grained and rot-resistant hardwood is widely sought after in construction and shipbuilding, and for the production of tool handles and superior quality furniture. The recent discovery of compounds in twig extracts of this species that are relevant to cancer treatment, may offer new opportunities for *Z. serrata* to become a major medicinal plant in the future.



HABIT

Z. serrata is a large tree that can grow up to 30 m and reach 1 m in diameter, and produces an exfoliating grayish white to grayish brown bark upon ageing. Elliptic to ovate-lanceolate, leaves can measure up to 10 cm in length and 5 cm in width, with a serrate to crenate margin and 9-15 secondary veins. In contrast to the similar *Z. schneideriana*, young branchlets of *Z. serrata* are brownish purple and glabrous (rarely lightly pubescent). The smooth and glabrous leaf blade abaxially is sparsely pubescent but only along the veins. The drupes, 2.5-3.5 mm in diameter with an irregular network of low ridges, mature from September to November.



1-2. Upper surface and underside of a sterile branchlet (hrs)

3-4. Upper surface and underside of leaves (hrs)

5-6. Closer view of the upper surface and underside of a leaf (hrs)

7. Underside of a fertile branchlet (hrs)

8. Fruits (hrs)

9-10. Young branches of *Z. serrata* are brownish purple and glabrous (leg, gk)

11. Seedlings of *Z. serrata* on the forest floor. Chichibu, Honshu Island, Japan (sb)

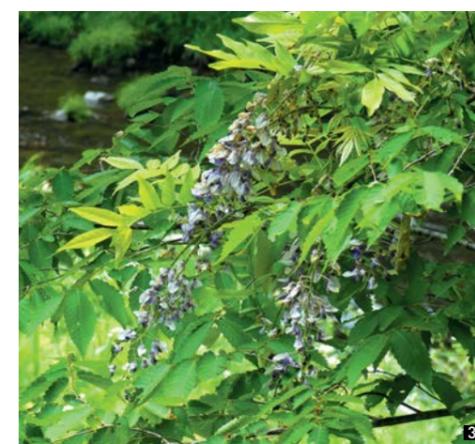
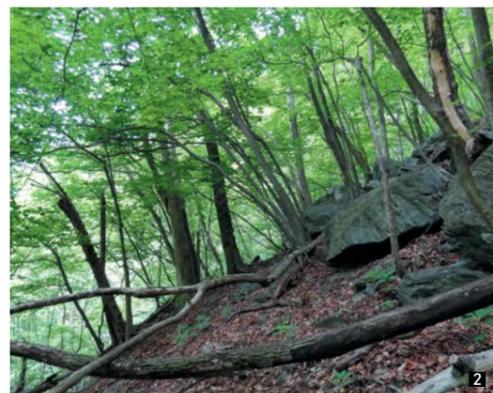
12. Stem of *Z. serrata*. Chichibu, Honshu Island, Japan (sb)

13. Large *Z. serrata*. Hita, Kyushu Island, Japan (sb)



DISTRIBUTION

In Japan, *Z. serrata* naturally occurs from the south of Kyushu Island (Kagoshima) through Shikoku Island to the extreme north of Honshu Island (Aomori). For centuries, this species has been widely planted as an ornamental tree in parks, near homes and along streets and alleys. In China, *Z. serrata* is described from numerous provinces (Anhui, Fujian, Gansu, North Guangdong, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Shaanxi, Shandong, Sichuan and Zhejiang). The species is also distributed in Taiwan, South and North Korea. There are also unverified records from Russia (e.g., Kuril Islands).



ECOLOGY

Z. serrata favours a mild climate, growing particularly well in limestone valleys on rich, moist soils, although it can also develop in drier environments and under poorer soil conditions. Its deep and laterally extended root system makes the species highly wind-resistant. Occurring from lowland to mountain forests (mainly between 500 and 2,000 m a.s.l.), *Zelkova serrata* is usually encountered in riparian habitats, in ravines and on shady slopes. In Japan, *Z. serrata* is often found in association with *Acer japonicum*, *A. mono*, *Aesculus turbinata*, *Castanea crenata*, *Celtis jessoensis*, *Juglans ailanthifolia*, *Pterocarya rhoifolia*, *Quercus serrata*, and a variety of shrubs comprising *Callicarpa japonica*, *Cornus controversa*, *Kerria japonica*, *Wisteria floribunda* and *Sasa senanensis*. In Taiwan, in the southernmost part of its range, woody plants occurring with *Z. serrata* include *Carpinus kawakamii*, *Quercus variabilis*, *Q. tarokoensis*, *Ulmus parvifolia*, *Dodonaea viscosa*, and various species of *Acer*.

1-2. Natural forests with *Z. serrata*: (1) Kamagase Gorge, Kyushu Island; (2) Chichibu, Honshu Island, Japan (sb)

3. *Pterocarya rhoifolia* (Juglandaceae). Alluvial forests of Tataoki River, Kyushu Island, Japan (sb)

4. In Japan, *Z. serrata* is one of the most popular trees planted in parks. Tokyo (sb)

1. *Aesculus turbinata* (Sapindaceae). This species is very closely related to the Balkan endemic *A. hippocastanum*. Tataoki River, Kyushu Island, Japan (sb)

2. *Z. serrata* growing along Tataoki River. Kyushu Island, Japan (sb)

3. *Wisteria floribunda* (Fabaceae) climbing on *Z. serrata*. Tataoki River, Kyushu Island, Japan (sb)

4. *Cornus controversa* (Cornaceae). Tataoki River, Kyushu Island, Japan (sb)

5. Plantation of *Cryptomeria japonica* (Cupressaceae). Chichibu, Honshu Island, Japan (sb)

THREATS

Natural *Z. serrata* populations remain preserved to the present day only in remote and inaccessible areas, including steep mountain slopes and ravines. Although widely planted as an ornamental tree in Japan, the summergreen, broadleaved forests in which *Z. serrata* naturally occurred had been largely replaced by monocultures comprising *Cryptomeria japonica*, *Larix leptolepis* and *Chamaecyparis obtusa* by the middle of the 20th century. On the other hand, large areas with *Z. serrata* are being planted today for timber production. Plant material sourced for plantations is often of unknown provenance and comprises predominantly fast-growing cultivars with limited genetic variability that are bred mostly for quality timber. Recent studies have confirmed the very low levels of genetic diversity of *Z. serrata* plantations, especially in northern Japan (Fukatsu et al. 2012). Limited data are available regarding the threats to and conservation status of *Z. serrata* in China. Its relative rarity however suggests that wild populations are at great risk of being lost, especially as a result of increasing habitat degradation and transformation.