

## Ailanthus altissima

tree of heaven

### LOCAL NAMES

Chinese (chun shu, chou chun, bai chun); Dutch (hemelboom); English (varnish tree, tree of heaven, copal tree, China sumac, ailanthas); French (arbre du ciel, arbre des dieux, ailante glanduleux); German (Götterbaum); Italian (ailanto); Trade name (tree of heaven)

### BOTANIC DESCRIPTION

*Ailanthus altissima* is a deciduous tree, usually dioecious, 6-10(-30) m tall, trunk crooked, 30(-100) cm, crown open. Bark light brown or grey, smooth, thin, becoming rough with long fissures and dark ridges.

Leaves alternate, pinnately compound 30-60 cm long, hairy when young, crushed foliage with disagreeable odour but suggestive of peanuts. Leaflets 13-41, short-stalked, broadly lanceolate, 7.5-13 cm long, 1.5-5 cm wide, acuminate, with 2-5 teeth near inside base.

Panicles large, 15-25 cm long; flowers many, 6 mm long, greenish or greenish-yellow, with 5-lobed calyx, 5 narrow petals. Male flowers with 10 stamens and disagreeable odor. Female flowers with 2-5 nearly separate pistils united at base.

Fruit a samara, 1-5 per flower, 3-5 cm long, 1 cm wide, with reddish or purplish-brown, flat, slightly twisted wing.

Seed, 1, in the middle of the fruit, 6 mm long, elliptical, flattened.

The generic name 'Ailanthus' comes from 'ailanthos' (tree of heaven), the Indonesian name for *Ailanthus moluccana*.

### BIOLOGY

The tree bears unisexual flowers on different trees. Both male and female flowers appear during July to August. Flowering occurs during May to June and seeds ripen in large, crowned clusters in September to October of the same season, and are dispersed from October to the following spring. Early flowering of vegetatively propagated trees is common.

(Mill.) Swingle

Simaroubaceae



Leaves and fruits. (Arnoldo Mondadori)



Photography courtesy of Western Weeds CD-ROM. A guide to the weeds of Western Australia by B.M.J. Hussey, G.J. Keighery, R.D. Cousens, J. Dodd and S.G. Lloyd. Web version by R. Randall. (Western Weeds)



Flowers and foliage Courtesy of Smithsonian Institution, Dept. of Systematic Biology, Botany. (William S. Justice @ USDA-NRCS PLANTS Database)

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(Mill.) Swingle

Simaroubaceae

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## ECOLOGY

The tree extends from subtropical dry to wet through cool temperate dry to wet forest zones. It tolerates frost and chilling winters, annual precipitation of 300-2 500 mm (tolerating a dry season of up to 8 months), annual temperature of 10-20 deg C, and pH of 5.5-8.

## BIOPHYSICAL LIMITS

Altitude: 0-2000 m

Mean annual temperature: 10-20 deg C

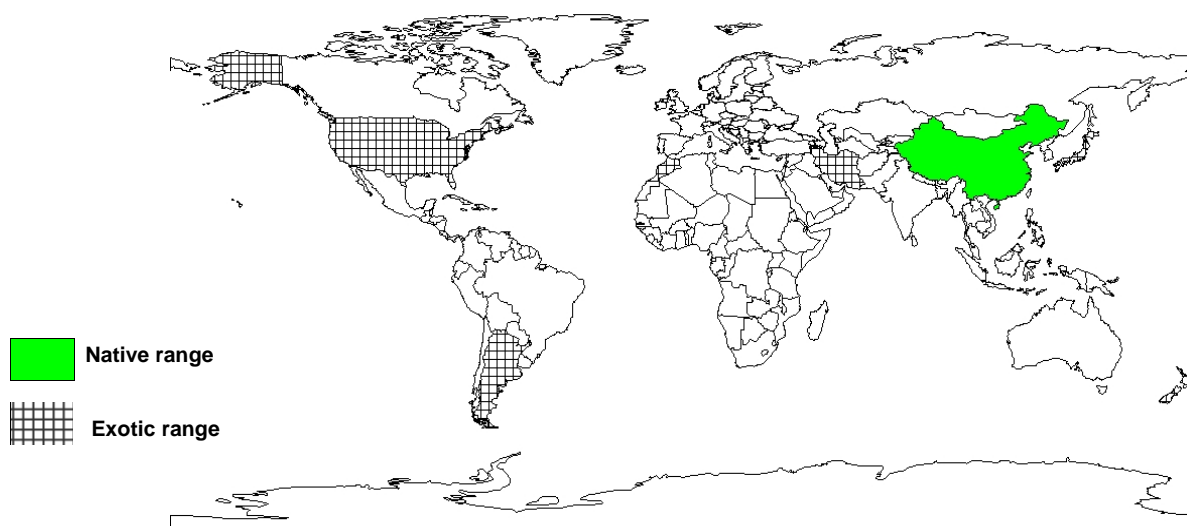
Mean annual rainfall: 300-2 500 mm

Soil type: The tree grows on a wide array of soils, from acid to alkaline (pH of 5.5-8), sand to light clay, well-drained to swampy, poor to rich. It is said to do poorly on chalky soils or compact clay.

## DOCUMENTED SPECIES DISTRIBUTION

Native: China, Taiwan, Province of China

Exotic: Argentina, Iran, Japan, Korea, Republic of, Morocco, New Zealand, US



The map above shows countries where the species has been planted. It does neither suggest that the species can be planted in every ecological zone within that country, nor that the species can not be planted in other countries than those depicted. Since some tree species are invasive, you need to follow biosafety procedures that apply to your planting site.

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### **PRODUCTS**

**Food:** Leaves have been used as adulterants of belladonna and senna products. The seed is reported to contain 27 g protein and 56-59 g fat per 100 g.

**Apiculture:** Honey greenish-brown; flavour initially poor but after a few weeks becomes very fine, with aroma reminiscent of Muscat wines; granulates finely after several months.

**Fuel:** The wood is used for charcoal and firewood.

**Timber:** The wood is yellow, ring-porous, moderately hard and heavy (up to 650 kg/cu m at 12 % moisture content). Though little used, except in poorer countries, the wood is suitable for cabinetry, cellulose manufacture, furniture, lumber, pulp, utensils and woodwork. It is difficult to split but easy to work and polish.

**Gum or resin:** The bark contains oleoresin, resin, and mucilage.

**Tannin or dyestuff:** The leaves contain 12% tannin.

**Poison:** Leaves are toxic to domestic animals and gardeners who fell the tree may suffer rashes. The odour of the foliage is intensely disagreeable and can cause headache and nausea, rhinitis and conjunctivitis. The pollen can cause hay fever. Plant parts steeped in water are said to yield an insecticidal solution.

**Medicine:** The tree is used in homeopathic remedies for cancer. It is reported to be antiseptic, astringent, bactericidal, cardiac, cathartic, deobstruent, depressant, emetic, protistocidal, taenifuge, and vermifuge. Tree-of-heaven is a folk remedy for asthma, diarrhea, dysentery, dysmenorrhea, dysuria, ejaculation (premature), epilepsy, eruption, fever, gonorrhoea, hematochezia, leucorrhoea, malaria, metrorrhagia, sores, spasms, spermatorrhea, stomachic, tumors of the breast (China), and wet dreams. The fruits are used for ophthalmic diseases. In China, it is bechic, emmenagogue, and used for hemorrhoids. In Korea, the root bark is used for cough, gastric and intestinal upsets. Resin extracted from the roots and leaves is a revulsive or vesicant. The disagreeable odor of the plant may cause some people to feel sleepy. The leaves, bark of the trunk, and roots are put into a wash for parasitic ulcers, itch, and eruptions.

**Other products:** The bark contains ceryl alcohol, ailanthin, quassiin, calcium oxalate crystals, and isoquercetin (quercetin 3-glycoside), phlobaphene, ceryl palmitate, saponin, quassin, and neoquassin, the leaves contain quercetin, as well as isoquercetin, and the alkaloid linuthine. Seeds contain quassiin. From the root bark, cathin-6-one, 1-methoxy-cathin-6-one, methyl 6-methoxy- beta -carboline-1-carboxylate and an unidentified alkaloid have been isolated.

### **SERVICES**

**Erosion control:** It is used for erosion control in subtropical and temperate countries.

**Shade or shelter:** The sumac provides shade and is widely planted in shelterbelts where few other trees will thrive.

**Reclamation:** The tree has been used to cover bare alpine slopes.

**Ornamental:** The weed tree can be a handsome tropical-looking ornamental with its compound leaves sometimes overtopped by reddish to yellowish clusters of winged fruits.

**Pollution control:** The tree has potential for cultivation in heavily polluted areas where other species may grow poorly or not at all.

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### **TREE MANAGEMENT**

The tree can grow to 3-4 m in height during a 5-month growing season. *Ailanthus* is a prolific seeder but also spreads by root suckers and coppices readily. Planting root cuttings of male trees would eliminate the seeding problem. Root suckers can be problematic in fields as well as sidewalks and buildings. Branches should be lopped for fuel before the seeds mature.

### **GERMPLASM MANAGEMENT**

100 kg fruits will yield 30-90 kg seed. Seed storage behaviour probably orthodox, viability is lost within 6 months hermetic storage at room temperature with 13 % moisture content. After 1 year open storage at fluctuating temperatures of -6-40 deg C, 75 % of the seeds germinated. Long term storage can be achieved in air-dry storage at low temperatures (Hong TD et al,1996).

### **PESTS AND DISEASES**

*Armillaria mellea* (mushroom root rot), *Botryodiplodia ailanthi* var. *chromogena*, *Camarosporium berkeleyanum*, *Cercospora glandulosa* (leaf spot), *Colletotrichum tertium*, *Coniothyrium insitivum*, *Cytospora ailanthi*, *Daedalea unicolor* (butt rot), *Diaporthe medusaea*, *Dimerosporium robiniae* (black mildew), *Diplodia ailanthi*, *D. natalensis* (twig blight), *Eutypella glandulosa*, *E. microcarpa*, *Fusarium lateritium* (twig blight), *Gloeosporium ailanthi* (leaf spot), *Guignardia ailanthi*, and *Haplosporella ailanthi* have been reported to attack the sumac. Tent caterpillars are occasionally a problem in the USA, completely defoliating, but rarely, if ever, killing the trees.

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### **FURTHER READING**

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### **SUGGESTED CITATION**

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