

Artemisia annua

L.

Asteraceae

LOCAL NAMES

Chinese (qinghao); English (sweet wormwood, sweet annie, annual worm wood); Vietnamese (ng[air] si, thanh hao hoa v[af]ng, thanh hao)

BOTANIC DESCRIPTION

Artemisia annua is a large vigorous weedy annual shrub often reaching more than 2 m tall, usually ribbed single-stemmed with alternate branches and stem covered with fine, silky grey-green hairs.

Leaves aromatic, alternate, deeply dissected, glabrous, up to 12 cm long. Leaves contain both 10-celled biseriate trichomes and 5 cell filamentous (T) trichomes.

Flowers tiny nodding (capitula) only 2 or 3 mm across, greenish or yellowish, enclosed by numerous, imbricated bracts, displayed in loose panicles, bisexual central (disc) florets containing little nectar and pistillate marginal (ray) florets, the latter extruding stigmas prior to the central flowers. Both flowers have synpetalous tubular corolla with the top split into five lobes in the hermaphroditic florets and 2-3 lobes in the pistillate florets; ovaries inferior and unilocular; receptacle triangular in shape. Both florets and receptacle bear abundant 10-celled biseriate trichomes; T-trichomes (filamentous) occur at the pedicel and bracts.

Fruit an achene, obovoid, 0.6-1 mm long, faintly nerved and glabrous.

The genus name *Artemisia* refers to the Greek goddess of hunting, Artemis or a plant sacred to the goddess.

BIOLOGY

A. annua is a determinate short-day plant where non-juvenile plants are very responsive to photoperiodic stimulus and flower about two weeks after induction. The critical photoperiod seems to be about 13.5 hours, but there are likely to be photoperiod x temperature interactions. It is in flower from August to September with mature seeds produced in September and October. In the tropics, flowering is induced when the plants are very small. The scented flowers are pollinated by insects and wind action (something unusual within the Asteraceae)



Seven month old *Artemisia annua* seedlings at the ICRAF tree nursery (AFT team)



Seven month old *Artemisia annua* at the ICRAF campus (AFT team)



Seven month old *Artemisia annua* at the ICRAF campus (AFT team)

ECOLOGY

It occurs naturally as part of a steppe vegetation in the northern China, at 1000-1500 m altitude. It is usually a naturalized weed of waste places, roadsides, fallow fields and neglected gardens. The plants are longer-lived, more hardy and aromatic when grown in poor dry soils.

BIOPHYSICAL LIMITS

Altitude: 1000 to 1500 m

Mean annual temperature: °C

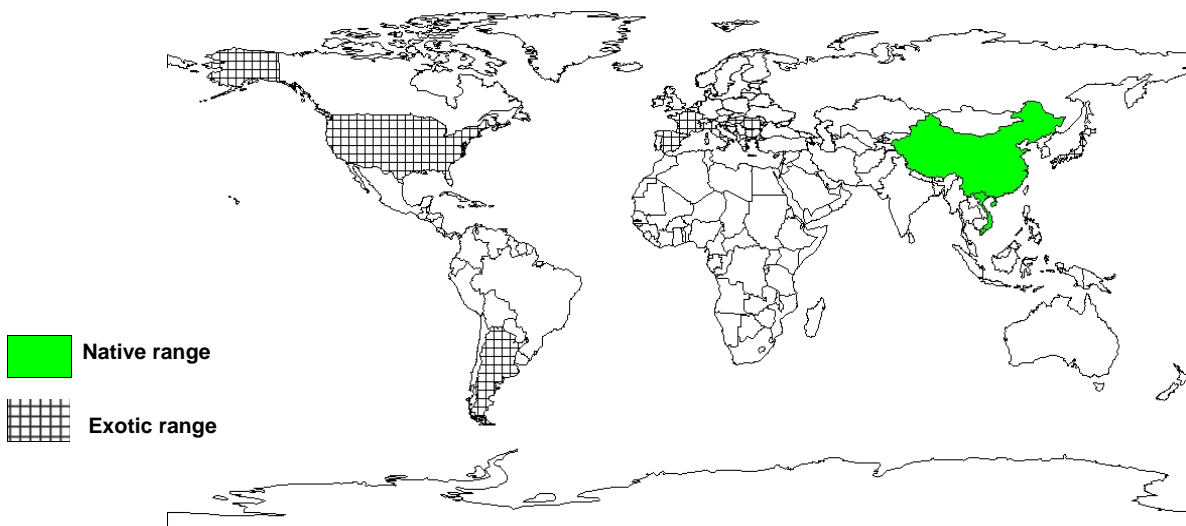
Mean annual rainfall: mm

Soil type: The plant prefers light (sandy) and medium (loamy) soils that are well-drained but can grow also in nutritionally poor soil.

DOCUMENTED SPECIES DISTRIBUTION

Native: China, Vietnam

Exotic: Argentina, Bulgaria, France, Hungary, Italy, Japan, Romania, Spain, Taiwan, Province of China, US, Yugoslavia (Former)



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.

PRODUCTS

Essential oil: Used in the crafting of aromatic wreaths, as a flavoring for spirits such as vermouth, as a source of essential oils (yields 0.3%), and contains at least 40 volatile compounds and several non-volatile sesquiterpenes, that has an agreeable, refreshing and slightly balsamic odour and has been used in perfumery.

Poison: Pollen is extremely allergenic

Medicine: An important natural anti-malarial drug efficacious against drug-resistant strains of Plasmodium, the malarial parasite. Artemisinin has a chemical structure called a peroxide bridge, which can be cleaved by iron ions to form free radicals that attack a range of proteins and other bio-molecules. Some researchers suspected that such an attack would be fatal for the parasites. Others speculated that, like the malaria drug chloroquine, artemisinin frustrates the removal of haem, a toxic by-product formed during the parasite's consumption of human haemoglobin.

The leaves are antiperiodic, antiseptic, digestive and febrifuge. Traditionally an infusion of the leaves is used internally to treat fevers, colds, diarrhea etc. Externally, the leaves are poulticed onto nose bleeds, boils and abscesses. The seeds are used in the treatment of flatulence, indigestion, tuberculosis and night sweats.

Other products: Artemisinin has phytotoxic activity, even on *A. annua*, and it can be used as a natural herbicide.

SERVICES

Other services: The plant is used as a medium for growing *Aspergillus* which is used in brewing wine in China

TREE MANAGEMENT

Field production of *A. annua* is presently the only commercially viable production method because the synthesis of the complex molecule is uneconomical. Due to the low levels of artemisin in leaves and inflorescence, coupled with early flowering caused by short days, high biomass production is required to make production in the tropics economical. The plant spacing can be high density, 30 cm x 30 cm (111,000 plants/ha); intermediate density, 30 cm x 60 cm (55,000 plants/ha); and low density, 60 cm x 60 cm (27,778 plants/ha) to get high biomass production. The leaves are harvested after 4 months. The yield is about 30 tonnes/ha with 10-12 kg oil/ha at a spacing of 0.3m x 0.6 m.

In one experiment, the seedlings transplanting in May produced the highest fresh yields and tallest plants, while the May and June plantings had the highest percentage of essential oil. Regardless of planting date, all plants began to flower by mid-August, with maximum concentration of essential oil produced in mid-September (peak flowering stage). The most essential management task is to achieve uniform stands and weed control.

PESTS AND DISEASES

The plant is extremely vigorous and essentially disease and pest free.

FURTHER READNG

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SUGGESTED CITATION

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