

Hippophae rhamnoides

sea buckthorn

LOCAL NAMES

Danish (tindved); English (sea buckthorn); French (grisset, argousier, argasse); German (sanddorn); Lao (Sino-Tibetan) (star-bu, dhar-bu); Spanish (espino falso, espino armarillo); Swedish (finbar); Trade name (sea buckthorn)

BOTANIC DESCRIPTION

Hippophaë rhamnoides is an arborescent armed, deciduous shrub or tree sometimes reaching up to 18 m. Crown irregular in shape with spiny, grey branches.

Leaves linear-lanceolate, alternate, 2-6 cm long, covered on both sides with silvery-white scales, undersides with brown dots.

Flowers inconspicuous, yellow, unisexual appearing before leaves.

Fruit a 1-seeded drupe, reddish orange, varying in length from 5-12 mm.

The ancient Greeks named the genus *Hippophaë* or "glittering horse," its leaves were part of the diet for racing horses, and they also believed that horses became plump and healthy when maintained on pastures with these trees. According to another legend, sea buckthorn leaves were one of the preferred foods of the Pegasus (flying horse).

The species is distributed in more than 20 countries of Europe and Asia, and its morphological traits vary considerably according to this wide range of climatic conditions.

BIOLOGY

H. rhamnoides is dioecious and wind pollinated. Shrubs usually begin to bear fruit after three years and give maximum yields after seven to eight years. Male trees flower slightly earlier than females and for a period of 6-12 days. *H. rhamnoides* requires about 12-15 weeks from flowering until fruit become fully mature. Ripening can be as early as late July until early October in China, depending on subspecies, location and altitude. Leaves begin to fall at the end of October, when the average daily temperature falls below zero.

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Eleagnaceae



Leaves and fruits. (Arnoldo Mondadori Editore SpA)



Close up of plant with fruit, Kura River. This plant is endemic to the Caucasuse region and is considered a threatened or sensitive species. (William M. Ciesla, Forest Health Management International, www.forestryimages.org)

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ECOLOGY

Sea buckthorn is native to the temperate zones of Asia and Europe, where it is widely distributed. It is also well represented at higher altitudes in the sub-tropical zones of Asia. China has the largest area (920 000 ha) under Hippophaë of any country, and also the largest variety of Hippophaë species. Sea buckthorn grows on sand dunes near the sea to the Eurasian plateau at 5 200 m. However, they are extremely drought tolerant, with extensive root systems that scavenge soil humidity and groundwater aggressively.

BIOPHYSICAL LIMITS

Altitude: 0-5 200 m

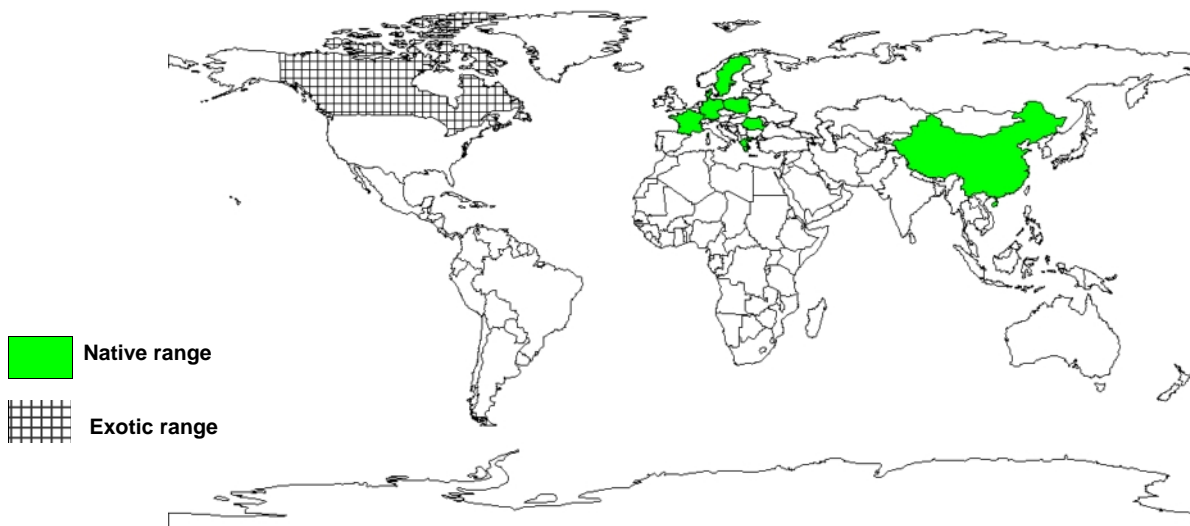
Mean annual rainfall: 250-800 mm

Soil type: Prefers sandy soils with pH 9.5.

DOCUMENTED SPECIES DISTRIBUTION

Native: China, Denmark, France, Germany, Greece, Poland, Romania, Russian Federation, Sweden

Exotic: Canada, United States of America



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: The fruit is edible and has a tart, bittersweet taste. Sea buckthorn fruit is rich in vitamins C, E, K, B1 and B2, as well as niacinamide, pantothenic acid, carotenoids and other substances such as oil, sugar, malic acid, amino acids and pectin. The vitamin C content of the Chinese sea buckthorn subsp. *sinensis* fruit can be as high as 1253 mg/100 g-1. In China, peasants have become prosperous by collecting and processing the fruit. Hippophaë leaves also contain various nutritious substances and minerals. A nutritious herbal tea, (shaji tea) high in vitamin C and trace elements is made from hand picked, young and tender leaves of *H. rhamnoides*.

Fodder: Herdsmen in northwest China often feed sea buckthorn leaves to their animals. In Russia, fodder supplements of sea buckthorn by-products are reported to improve liveweights and coat condition. Feeding poultry with meal made from sea buckthorn fruit and fruit oil has been observed to increase the pigmentation of egg yolks and body fat. The oil also increases flesh pigmentation in rainbow trout.

Fuel: The tree yields good quality fuelwood.

Lipids: A valuable natural oil, sea buckthorn oil (shaji oil) rich in vitamin C, E, carotene (vitamin A) and essential fatty acids is obtained from the seeds.

Alcohol: Sea buckthorn wine is well known in Russia where a new variety has been bred by hybridizing geographically distant plants.

Medicine: The plant is considered a general panacea and extensive use is made of its roots, stems, leaves, flowers, fruits and seed. Oil from the fruit acts as an antioxidant and may thus be used to treat wounds, frost bite and pathological problems of the alimentary mucous membranes. Serotonin (5-hydroxy-tryptamine) extracted from sea buckthorn possesses antitumor capabilities.

SERVICES

Erosion control: A good soil protector, useful for soil conservation, conserving water, and stabilizing sand dunes.

Shade or shelter: *H. rhamnoides* is a shade provider.

Reclamation: Sea buckthorn shows a strong tolerance for toxic pollutants in the soil and air. It can thus be used to revegetate heavily industrialized areas or to reclaim mining sites. With its hardy drought resisting attributes, this species is ideal for afforestating marginal areas.

Nitrogen fixing: Hippophaë possesses a strong capacity to fix atmospheric nitrogen in its root nodules when associated with the actinomycete, Frankia. Most soils possess enough Frankia to support nodulation. In one stand on the east coast of England, annual nitrogen fixation was estimated as high as 179 kg/ha⁻¹. All of the plant's characteristics, especially its strong nitrogen-fixing ability and rapid growth, make it a good species for improving soil fertility. In mixed plantings, it can promote the growth and development of adjacent plants.

Ornamental: Sea buckthorn is also useful as an ornamental shrub.

Boundary or barrier or support: It is used successfully as a windbreak and to stabilize sand dunes, and several of its products have high value.

Other products: Cosmetics derived from sea buckthorn are widely used in creams. Medicinal value of sea buckthorn oil is linked with its apparent ability to promote skin cell and mucous membrane regeneration, explaining its long use as a skin remedy and cosmetic aid with nourishing, revitalizing and restorative action. Day creams and a shampoo developed in Romania have received international patents.

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TREE MANAGEMENT

Management varies according to objectives and environment factors. Sea buckthorn is a light-demanding species, trees growing in forested areas die if the canopy density exceeds 50%. However, its wide adaptability and varied reproductive strategies indicate it could be a serious weed in some environments. Its extensive, suckering root system may make it unsuitable for agroforestry technologies that include close tree/crop associations. Removal of six year old sea buckthorn plantations can produce 6.32 t/ha of wood. To ensure adequate pollination, orchards should have between 7-12% of the trees as pollinators. In China six year old sea buckthorn plantations can produce 6.32 t/ha of wood. Thorny stems and branches often make it difficult to harvest the fruits. Estimates of 1500 hours/hectare for fruit harvesting can be expected. Mechanical harvesters have been tried with little success, removing branches from the tree works well, but is still very labour intensive. Expected yields are around 5-7 kg per plant or 4-5 t/ha. Plants should be spaced between 1-4 m. An annual growth of 10-20 cm is estimated for this species.

GERMPLASM MANAGEMENT

With indoor storage seeds retain viability for 3-4 years. Under suitable conditions, they will germinate during any season of the year. In China plantation establishment has been successful by broadcasting seed from aircraft.

PESTS AND DISEASES

Holotrichia oblita, Gryllotalpa unispina and Agrotis segetum are the main underground pests in nurseries, attacking young roots. These can be controlled with poisonous baits and lamplight luring. Holcocerus arenicolus is another root-boring cossid.

Defoliating pests include Malacosoma neustria testacea and Maladera orientalis. Fruit-eating pests include Rhagoletis batava and Curculio spp. Flooding in combination with pesticide applications can be used to control Gelechia hippophaes (sea buckthorn moth). Fusarium and Pythium diseases can be important diseases at the seedling stage.

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FURTHER READING

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NFTA. 1993. Hippophae rhamnoides: An NFT valued for centuries. NFTA 93-02. Waimanalo.

SUGGESTED CITATION

Orwa C, A Mutua, Kindt R, Jamnadass R, S Anthony. 2009 Agroforestry Database: a tree reference and selection guide version 4.0 (<http://www.worldagroforestry.org/sites/treedbs/treedatabases.asp>)