

Fraxinus angustifolia in Europe: distribution, habitat, usage and threats

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Fraxinus angustifolia Vahl, narrow-leaved ash, is a medium-sized tree with a wide range, which covers central-southern Europe and northwest Africa, up to the Caucasus. The northern part of its distribution overlaps with that of common ash (*Fraxinus excelsior*), with which it can naturally hybridise, developing plants with intermediate trait forms. It is a fast-growing pioneer species, occurring in temperate forests. In Mediterranean regions it tends to grow in cooler areas at higher elevations or along rivers and wetlands. It can be found as dominant or secondary species in mixed broadleaved forests. The wood has a lower quality in comparison with the common ash and pure timber plantations are rare. In Turkey it is more used in fast-growing poplar-like plantations on swampy lowlands for the production of pulpwood and bonded wood. Similar to common ash, it is susceptible to dieback caused by the fungus *Chalara fraxinea*, which has caused serious damage in nurseries and in lowland forest stands of central Europe. On the other hand, in Australia it represents an invasive species forming dense monocultures in riparian areas and along drainage lines.

The narrow-leaved ash (*Fraxinus angustifolia* Vahl) is a medium-sized deciduous tree, growing 40–45m in height and up to 1.5m in diameter. The crown is dense, irregular and dome shaped, with short and pendulous shoots. Its bark is grey and becomes finely and deeply reticulate-fissured. The leaves are compound, arranged in groups of 7–13, odd **pinnate**, and are slender, 3–8 cm long and 1–1.5 cm broad, shiny green and hairless. The species is **monoecious** with **hermaphrodite** inflorescences of 10–30 flowers; however some inflorescences with pure male flowers can appear (**andromonoecious**). Flowers are wind pollinated, developing in early spring or even in autumn, without petals, green with dark purple stigmas and anthers. The fruit is a samara 3–4 cm long, flattened, with a distal wing, ripening at the end of the summer^{1–4}.

Distribution

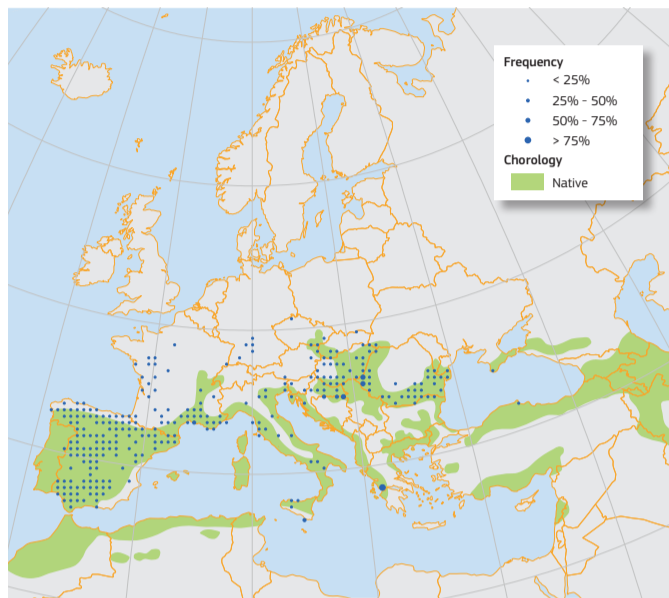
Its distribution covers the central-southern Europe and northwest Africa, up to the Caucasus^{5, 6}. Due to its large morphological variations, this ash species includes a complex of taxa and its taxonomic status is still not clear. However, prevailing opinion recognises three geographical subspecies on the basis of molecular and morphological data: the narrow-leaved ash (*Fraxinus angustifolia* subsp. *angustifolia*) in south-western Europe and north-western Africa, the Caucasian ash (*Fraxinus angustifolia* subsp. *oxycarpa*) in central Europe, Balkans and the Black Sea region, and the Syrian ash (*Fraxinus angustifolia* subsp. *syriaca*) in south-east Anatolia, Middle East to Iran⁷. The northern part of the distribution overlaps with that of common ash (*Fraxinus excelsior*), with which it can naturally hybridise, developing plants with intermediate trait forms^{8, 9}. Exported as an ornamental tree, this ash is naturalised in southern Australia¹⁰.



Shiny green composite leaves with 7–13 slender leaflets. (Copyright Javier Martin, commons.wikimedia.org; PD)

Habitat and Ecology

The narrow-leaved ash is a fast-growing and light-demanding tree, occurring mostly in temperate mild climates, with an annual precipitation between 400 and 800mm. It grows well on moist soils, in temporary flooded lowlands, but also on well-drained slopes, although there it suffers more competition from other tree species. It prefers aerated or only moderately compacted soils, with a pH range between 5 and 8³. It is particularly susceptible to frosts, which damage winter flowers and seeds in spring, limiting its northern distribution. However, it can survive in areas colder than its natural range when planted, although it is difficult to disperse seeds in these conditions^{11, 12}. In central Europe, the **Pannonian** Basin and Balkans, narrow-leaved ash occurs mainly in the lowlands, in riparian and floodplain forests along



Map 1: Plot distribution and simplified chorology map for *Fraxinus angustifolia*. Frequency of *Fraxinus angustifolia* occurrences within the field observations as reported by the National Forest Inventories. The chorology of the native spatial range for *F. angustifolia* is derived after Meusel and Jäger⁶.

large rivers, where it formed vast and continuous populations, now with more limited extent. In the Mediterranean regions its distribution is more patchy and reduced to smaller and more isolated populations along rivers or on wetland sites, but also on drier sites at higher altitudes^{3, 13}. Rarely, it creates pure stands, found only in optimum conditions as a pioneer species. More often this ash is a dominant or a secondary species in mixed broadleaved forests with oak (*Quercus* spp.), elm (*Ulmus* spp.), maple (*Acer* spp.), willow (*Salix* spp.), poplar (*Populus* spp.) and lime (*Tilia* spp.), forming stable and species-rich ecosystems^{3, 4}.

Importance and Usage

The wood of narrow-leaved ash has similar properties to the common ash, although the quality is inferior in terms of strength and elasticity³. Timber plantations are not very common over Europe, as it is mainly planted in combination with other species¹⁴. Higher wood quality, comparable to common ash, can be obtained on drier sites where tree growth is slower³. In the north-west of Turkey, where narrow-leaved ash is more used in fast-growing plantations on swampy lowlands, the wood quality is more similar to the poplars and is suitable for pulpwood and bonded wood products, such as plywood, laminated veneer lumber and glued laminated timber^{15–17}. Leaves are palatable to livestock and in southern Europe this ash was traditionally used as a fodder tree. It is also widely used as an ornamental



Isolated tree in the Spanish countryside during winter. (Copyright Alfonso San Miguel; CC-BY)

tree in cities and along roads³. Like manna ash (*Fraxinus ornus*), the **phloem** sap can be extracted by incising the bark, and dried in the air obtaining edible flakes called manna. Manna was appreciated for its bitter-sweet taste and for its mild osmotic laxative and diuretic properties, more recently used in cosmetics and pharmaceuticals. Following a centuries old tradition, it is still harvested in a few rural areas in Sicily^{18, 19}.

Threats and Diseases

As is the common ash, the narrow-leaved ash is also susceptible to dieback caused by the fungus *Chalara fraxinea*, the anamorphic stage of *Hymenoscyphus albidus*, which has caused serious damage in nurseries and in lowland forest stands of central Europe^{20–22}. This fungus is potentially subject to expansion in the European temperate oceanic ecological zones²². Infected trees show wilt of leaves, necrosis and cankers on shoots, branches and stems, followed by gradual dieback of the crowns^{23, 24}. Like other tree species of floodplain and wetland forests, the narrow-leaved ash has seen reductions in its natural habitats and alterations of the forest dynamics due to the modifications of hydrologic regimes of the rivers^{25, 26}. In Australia *Fraxinus angustifolia* is called desert ash and represents an invasive species in the southern States, where it can form dense monocultures in riparian areas and along drainage lines, spreading via suckers and preventing the regeneration of native species²⁷.



Mature dry samaras at the end of summer. (Copyright Franco Rossi, www.actaplantarum.org; AP)

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