**Pinus halepensis and Pinus brutia in Europe: distribution, habitat, usage and threats**

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*Pinus halepensis* Miller (Aleppo pine) and *Pinus brutia* Ten. (Turkish or Calabrian pine) are drought tolerant and fast growing coniferous species native of the Mediterranean region. *P. halepensis* widely covers the Mediterranean coasts concentrating in the western side of the basin, while *P. brutia* is located mainly on the eastern coasts. They are commonly found in coastal zones, and because of their drought tolerance, are well adapted to dry summer conditions. They are among the species most affected by wildfires in Europe, although they are fire resilient trees due to the high production of serotinous cones that favour a quick post-fire regeneration. These species have been widely planted between the thirties and seventies in Mediterranean areas for soil protection and wind breaks near the coasts.

Aleppo pine (*Pinus halepensis* Miller) and Turkish pine (*Pinus brutia* Ten.) are two systematically close tree species, which can naturally hybridize where they co-occur. Although some authors consider them as subspecies, in this chapter they are described as

The diameter of the trunk ranges from 80 to 100 cm in *P. halepensis*, reaching up to 150 cm in *P. brutia*. In both species, the bark is greyish, initially smooth, turning to reddish-brown and finely fissured with age. Needles are light green in *P. halepensis* arranged in groups of two (occasionally three), between 6 and 12 cm long and less than 1 mm wide. In *P. brutia* the needles are instead dark green and between 10 and 18 cm long. In both species, star-shaped cover the whole surface of the leaves. Both have several branches forming a broadly conical to dome-shaped crown, flattening and opening up with age. Both are obligate seeders characterised by a high production of conical cones (pedunculate in *P. halepensis* and sessile in *P. brutia*), moderately to highly serotinous, which remain closed on the tree for one or more years after seed maturation to open quickly as a result of fire related high temperatures. Their colour is grey to reddish-brown. *P. halepensis* is derived from the city of Aleppo (Haleb) on the coast of Syria, while the name *P. brutia* is thought to derive from an ancient Roman district (Brutium). *P. brutia* is also called Calabrian pine after its first botanical description in Calabria (South Italy).

**Distribution**

The range of *P. halepensis* and *P. brutia* is in the Mediterranean, Anatolian and Macaronesian regions. *P. halepensis* is the most widely distributed and abundant among the Mediterranean pines, covering nearly 6.8 million ha of this region, extending from the Western Mediterranean (Spain, Morocco), where it is most abundant, to Lebanon through Southern France, Italy, Greece and Turkey in South Europe and Algeria, Tunisia, Libya in North Africa. *P. brutia* is instead mainly located in Turkey, Crete, Cyprus, Syria and Lebanon with a few remnants in Iraq and Iran. Bioclimatic envelope models predict that the suitable climatic area of *P. halepensis* is in expansion. It can already be observed that in the mountainous regions close to the coast *P. halepensis* is shifting upwards, replacing species from lower elevations such as Scots pine (*Pinus sylvestris*) in Southern France. A decrease in summer rainfall will also probably favour *P. halepensis* at the expense of evergreen oaks.

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*P. halepensis* is mainly found at lower altitudes, occurring mostly in the thermo- and meso-Mediterranean zone, although it is also present at higher altitudes (more than 2 000m in Morocco). Its habitat ranges from the lower ard or semiarid to humid bioclimates favouring absolute minimum temperatures of between -2 and 10°C and precipitation between 350 and 700 mm on partly stony limestones and marls. It is a very drought resistant, thermophilous species that grows very well in the hotter parts of the Mediterranean where forest fires are frequent. *P. halepensis* can successfully colonise limiting dry conditions areas creating highly resilient forest stands, but more often it is found scattered in garrigue or maquis vegetation colonising abandoned lands and burnt areas. In the absence of fire for long periods it can be replaced by holm oak (*Quercus ilex*) and cork oak (*Quercus suber*) as an intermediate step in the successional series to broadleaved trees. In the past, unplanned exploitation and intensive harvesting have considerably disturbed the original forest structure of Aleppo pine promoting monospecific stands where pine growth is maximised by decreasing interspecific competition with other trees. *P. brutia* is a stricter species in terms of water requirements and it is not frequent in arid and semiarid climates. *P. brutia* is often found together with cypress (*Cupressus sempervirens*) and Greek juniper (*Juniperus oxycedrus*) to form mixed open forests or with kermes oak (*Quercus coccifera*) and Palestine oak (*Quercus calliprinos*), mastic (*Pistacia lentiscus*) and other drought tolerant trees and shrub to form open woodlands.

**Importance and Usage**

*P. halepensis* is not used in commercial forestry due to its size, shape and poor wood quality. However, being the main source of wood in many Mediterranean countries it is used for various purposes including firewood as well as raw material for the pulp and paper industry. In the past it was also used for mine props, railway sleepers and telephone poles. By being well adapted to drought, poor soil and recurrent fires, Aleppo pine...
Threats and Diseases

The most widespread pests of *P. halepensis* include *Thumetopoea pityocampa*, *Orthotomicus erosus*, *Monochamus galloi*, *Metschnikowia josephi*, *Leucaspis pinus*, *Leucaspis putsilis*, *Ceratodiplosis warmannii* and *Hylurgus linuivorus*. The bacteria *Pseudomonas carotovora* might also be the cause of the knot disease of *P. halepensis*. A threat recently identified in France is the canker *Crumenulopsis sororia*. In the Mediterranean region *Aleppo pine* is characterised by large-scale dieback that starts from the desiccation of the lower branches and extends to the whole tree. Similarly to many pines, the Aleppo pine is vulnerable to the pitch canker (*Gibberella circinata*, syn. *Fusarium circinatum*), with an outbreak in Italy and with a virulence which might expand due to climate change.

References