Ilex aquifolium in Europe: distribution, habitat, usage and threats

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The European holly (*Ilex aquifolium* L.) is an evergreen small tree or shrub, with characteristic coriaceous dark green leaves with spines and red berry fruits. Holly grows in Western Europe, Western Balkans and North Turkey up to the Caucasus, preferring Atlantic climates. It adapts to different soil conditions, occurring mainly as understorey vegetation in oak and beech temperate forests. It is widely planted as an ornamental plant and hedge shrub, and is also well known for Christmas decorations. Various fungi of genus *Phytophthora* cause roots to rot in cultivated hollies. However there are no critical threats for the conservation of this species.

The European holly (*Ilex aquifolium* L.) is a small evergreen tree or shrub 8-10 m in height, which rarely exceeds 20 m[1, 2]. It has a dense pyramidal crown and a straight woody stem with grey bark. The leaves are up to 10 cm long, simple, alternate, coriaceous and glabrous. Their upper surface is dark-green and glossy and the lower surface is yellowish and matt. With an ovate, elliptic or oblong shape, the leaf margin may be undulate with spines, especially in the lower part of the tree. Flowers are small (6 mm in diameter), white and placed in axillary cymes. Holly is normally dioecious and flowers between May and August[2, 3]. The fruit is a bright red drupe of 7-12 mm size[2]. Its seeds ripen in late autumn and usually last throughout the winter, when birds, rodents and larger herbivores eat them[2-5].

Distribution

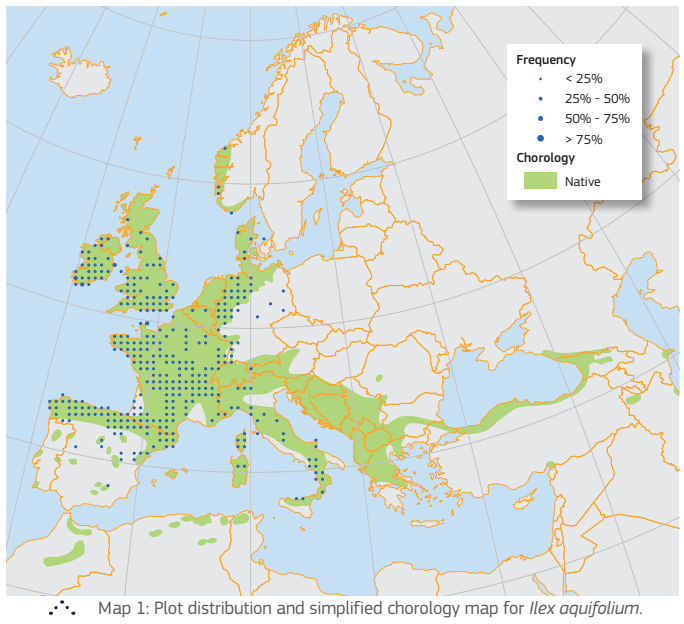
This species occurs in Western Europe, from Spain to western Norway, North-West Africa in the Atlas Mountains, western Balkan Peninsula, North Turkey up to the Caucasus[2, 6, 7]. It grows in northern ranges at sea level, up to 2600 m in Morocco[6]. It is widely planted outside its natural range as an ornamental shrub in Europe and in other continents. On the west coast of the United States it is considered an invasive plant[8]. Its distribution range is now starting to move over Europe, as a consequence of increased winter temperatures in northern regions and drought in the south[4, 9], and in Scandinavia its range is spreading eastwards due to the hybridisation of native with ornamental genotypes[10].

Habitat and Ecology

The holly grows in Atlantic and sub-Atlantic climates, also in a sub-Mediterranean climate at higher elevations, characterised by mild winter temperatures, relatively high summer precipitation and limited temperature ranges[2]. This species is very plastic, growing in a wide variety of soil moistures and pH, but grows best in acid conditions[2, 11]. Regarding light tolerance, holly is a semi-shade species while in Mediterranean climates it is an obligate shade plant[9]. It is a slow-growing species with a lifespan of 300 years in optimal conditions[1]. Reproduction takes place mostly by seed; however vegetative regeneration (suckers or adventitious roots) may be important within dense holly formations[2, 9]. This species occurs within different plant communities, mainly as an understorey tree or in edges of temperate deciduous forests and woodlands dominated by oaks (*Quercus robur, Quercus petraea, Quercus pubescent*) or beech (*Fagus sylvatica*). In the Mediterranean region it can be found in evergreen oak forests (*Quercus ilex*) in the scrub communities[2, 4, 9, 11].

Importance and Usage

Holly is cultivated as an ornamental shrub, appreciated for the contrast between its dark green permanent foliage and the red fruits and traditionally used for Christmas decoration[2, 12, 13]. Many varieties and hybrids have been developed for garden use; e.g. 'Argentea Marginata' with white-edged leaves, 'Bacciflava' almost spineless and with yellow fruits[14]. Holly is also often used in hedges as it has spiny leaves, bears pruning well and it grows slowly[15]. Since it is a dioecious species, commercial hollies usually have grafted female or male branches to produce fruit from a single plant[16]. The wood of holly is greyish white, hard, heavy and uniform, and used for woodcraft, turnery, handles, sleeves, sticks[11, 15]. It is a cheap substitute for ebony if dyed black[15]. Its leaves are browsed by mammals[5] and in the past were used as cattle fodder[2]. The mucilaginous bark of young shoots is used to produce birdlime[2, 3, 15]. Its drupes are purgative and emetic with strong effects, so considered toxic to humans[2, 3].



Map 1: Plot distribution and simplified chorology map for *Ilex aquifolium*. Frequency of *Ilex aquifolium* occurrences within the field observations as reported by the National Forest Inventories. The chorology of the native spatial range for *I. aquifolium* is derived after Peterken and Lloyd[2].

The classic holly berries: bright red spherical drupes of 7-12 mm in size. (Copyright liz west, www.flickr.com: CC-BY)

Tree form of the holly; it usually does not exceed 10 m tall. (Copyright Sean MacEntee, www.flickr.com: CC-BY)

Threats and Diseases

There are no critical diseases affecting the European holly in its natural habitat. Principally they are recorded for the ornamental plants in gardens and parks. Among the phytophagous insects, the most known is the holly leaf miner *Phytomyza ilicis*: a fly whose larvae burrow into leaves[17, 18]. The fungus *Phytophthora ilicis* causes black leaf spots and then cankers and shoot dieback[19-21]. The holly tree is host for other *Phytophthora* root rot and dieback fungi, such as *Phytophthora cinnamomi*[22] and *Phytophthora psychrophila*[19].

Male flowers with 4 white petals and 4 stamens blossoming at the base of the leaves. (Copyright AnRo0002, commons.wikimedia.org: CC0)

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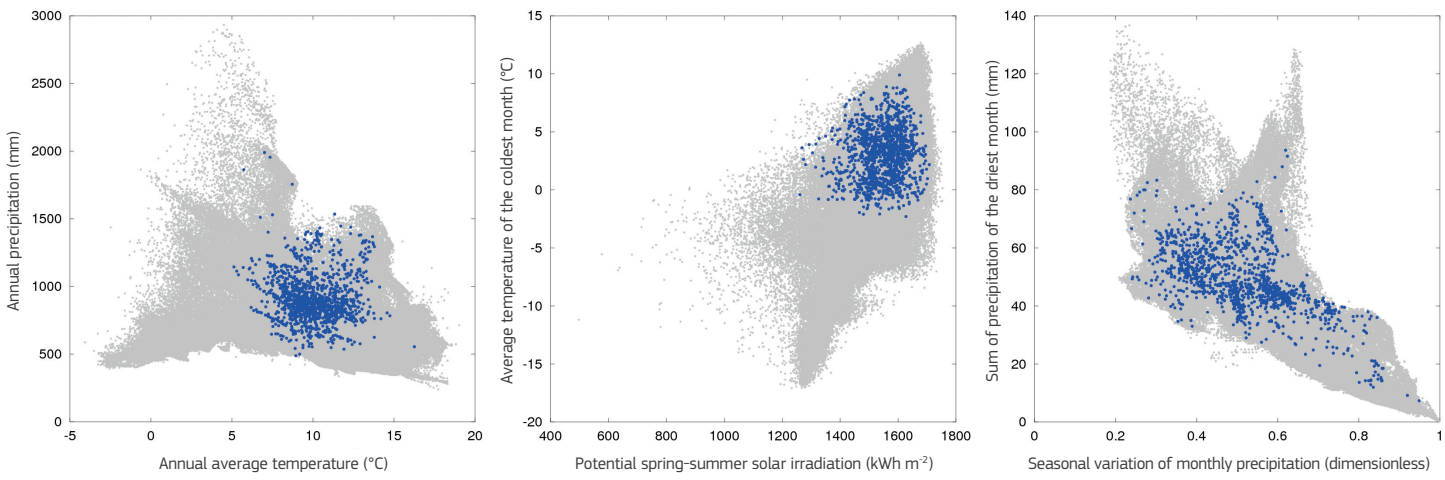
Field data in Europe (including absences) ● Observed presences in Europe ●

Autoecology diagrams based on harmonised field observations from forest plots.



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Guerrero Hue, N., Caudullo, G., de Rigo, D., 2016. ***Ilex aquifolium* in Europe: distribution, habitat, usage and threats**. In: San-Miguel-Ayanz, J., de Rigo, D., Caudullo, G., Houston Durrant, T., Mauri, A. (Eds.), *European Atlas of Forest Tree Species*. Publ. Off. EU, Luxembourg, pp. e011fbc+