



# Oaks of Cyprus

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## ABSTRACT

The dendroflora of the island of Cyprus shows some remarkable features. The oaks, with only three indigenous species, are a prominent part of the dendrological inventory, including the endemic *Quercus alnifolia* Poech. The three indigenous oak taxa, together with a recently described form of *Q. alnifolia* and a recently described hybrid between *Q. alnifolia* and *Q. coccifera* L. subsp. *calliprinos* (Webb.) Holmboe are described, and their taxonomic status discussed.

**Keywords:** Cyprus, oaks, Mediterranean oaks, *Quercus alnifolia*, *Quercus coccifera* subsp. *calliprinos*, *Quercus infectoria* subsp. *veneris*, *Quercus* ×*campitica*, *Quercus alnifolia* var. *argentea*

## Introduction

Cyprus is the third largest island of the Mediterranean, situated in the eastern Mediterranean Sea, about 60 km (40 miles) south of the Turkish coast, and 100 km (65 miles) west of Syria, with an area of approximately 9,251 km<sup>2</sup> (3,572 mi<sup>2</sup>). From sea level at the coastal belt the land rises to steep, rocky, diabase and serpentine peaks at the Troodos range with the highest peak at Olympos (Chionistra) at 1,952 m (6,401 ft.). The climate is typical arid Mediterranean, with a short, cool, wet winter and a long, dry, hot summer. Winter temperatures in the Troodos range can drop down to -10 °C/14 °F, with an average of 10 weeks of snow above 1,400 m (4,000 ft.) Rainfall varies between only 300 mm/year (12 in) on the central plain and more than 1,100 mm (43 in) on the upper slopes of Olympos peak.

In ancient times Cyprus was largely covered with forests but today most of this woodland is long gone. Remnants of it survive on the Troodos and Kyrenia ranges, with 18% of the island's vegetation being classified as woodland (31% of the land above 1,000 m/3,280 ft), that in some places is replaced by tall, shrubby *maquis* (4-6 m/13-20 ft high: *Arbutus andrachne* L., *Pistacia terebinthus* L., *Olea europaea* L., *Styrax officinalis* L. and *Quercus coccifera* L.), or mostly by sub-shrubby garigue (less than 3 m/9.9 ft high: *Cistus* spp., *Lithodora hispidula* (Sibth. & Sm.) Griseb. *Genista sphacelata* Decne. etc.

The flora of Cyprus is remarkably diverse, due to the varied edaphic and topographic character of the island. There are 128 plant species endemic to Cyprus, including the well-known Cyprus cedar (*Cedrus brevifolia* (Hook. f.) A. Henry) and the golden oak of Cyprus (*Q. alnifolia*). The plant endemism rate of the eco-region is about 7% of the total flora of 1,750 species (WWF, 2007). Human impact has been disastrous for the woodlands over the last 1,000 years, and today only small forest habitats are left intact. Old-growth black pine forest (*Pinus brutia* Tenore) is found only in the high mountain rocky summits. The endemic *Cedrus brevifolia* forest is represented by only a few hundred hectares. These forests owe their existence to none other than Winston Churchill. In 1907, as Under Secretary of State (and Junior Minister) responsible for Cyprus, he initiated a reforestation program to replace the famous forests destroyed by centuries of felling that provided fuel for smelting but also caused extensive systematic erosion (Barton, 2002).

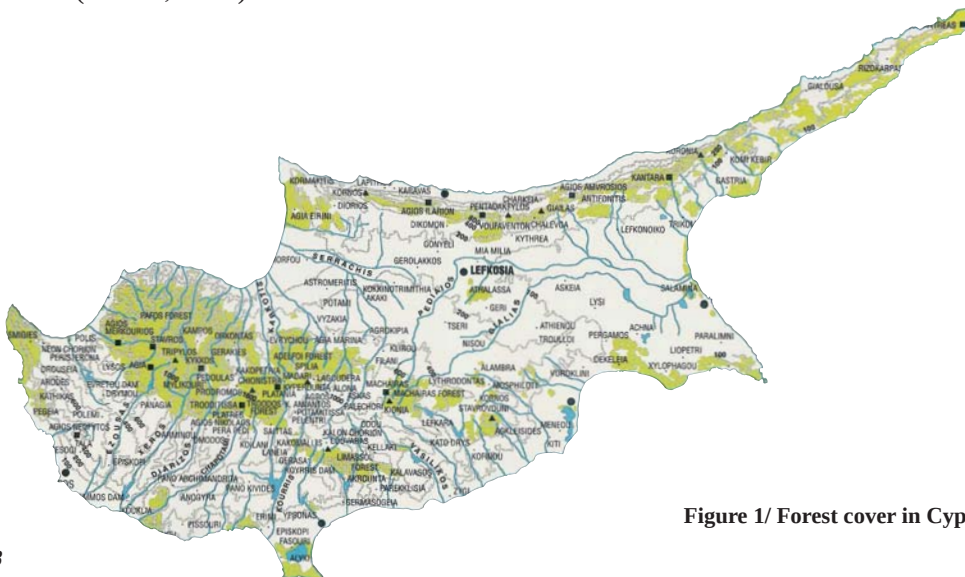


Figure 1/ Forest cover in Cyprus.



1/ Ripening acorns of *Q. infectoria* subsp. *veneris*.

## Native oak species of Cyprus

Three species of oak are indigenous to Cyprus: the deciduous *Q. infectoria* Oliv. subsp. *veneris* (A. Kern) Meikle (Section *Quercus*) and two evergreen species, *Q. coccifera* L. subsp. *calliprinos* (Webb) Holmboe and *Q. alnifolia* Poech. (Section *Cerris*). Additionally, one possibly distinct variety of *Q. alnifolia* and one rare hybrid have been observed.

### *Quercus infectoria* Oliv. subsp. *veneris* (A. Kern) Meikle (Section *Quercus*)

Cyprus oak, Aleppo oak: Deciduous to semi-deciduous tree, up to 18 × 25 m/59 × 82 ft (old specimens often wider than high with a spreading crown and a trunk that can easily reach a girth of more than 7 m/23 ft), bark dark grey, vertically fissured on the trunk; twigs hairy when young, leaves variously shaped, up to 15 × 7 cm (6 × 2.7 in), glabrous, shiny green abaxially, slightly tomentose beneath, margins sinuate to sinuate-serrate, petiole 5-30 mm (0.2-1.2 in); acorn shortly peduncled or sessile, 3-5 cm (1.2-1.6 in) long, cupule with adpressed scales, enclosing one-third of the acorn, ripening in the first year.

Nomenclatural note: Like other species of the genus, the taxonomy of *Q. infectoria* subsp. *veneris* is still controversial and several authors do not accept the subspecies epithet.

Basionym: *Q. veneris* A. Kern. (1904). Often incorrectly referred to as *Q. infectoria* subsp. *boissieri* (Reut.) O. Schwarz (1934), but with the inclusion of *Q. veneris* A. Kern. (1904) at subspecific rank within this taxon, the name has to be *Q. infectoria* subsp. *veneris* due to its priority at that rank being established by *Q. lusitanica* subsp. *veneris* (A. Kern.) Holmboe (1914); see ICBN Art 11.4 and its Ex. 15. Some authors refer to *Q. infectoria* subsp. *boissieri* (Reut.) Gürke, but Gürke in K. Richter, *Plantae Europaea* 2: 69 (1897) was unclear as to which rank he applied the epithet, so his combination cannot be taken into account for purposes of priority; see ICBN Art. 35.3. (Trehane, 2010).

Some authors place this taxon at species level because it is tree-like with larger, distinctly petiolate leaves, and large acorns, whereas *Q. infectoria* subsp. *infectoria* is shrub-like with small leaves, short petioles and smallish acorns.

This subspecies grows in Cyprus, Turkey and eastwards to Iran. In Cyprus, it is found in all districts in open woodland and cultivated fields from sea level up to 1,700 m (5,576 ft) altitude, but particularly in the western parts of Cyprus, in deep soils. A small forest of *Q. infectoria* subsp. *veneris* is found near the village of Agros, on the southwestern slopes of the Troodos Range, at 1,100 m (3,608 ft). Although the durable hard wood would make excellent fire wood or could be used in making tools, the tree is rarely cut down, possibly because the shade cast by their enormous crown was important for the people and husbandry (Chapman, 1945) or because of sacred connotations. In Cyprus many old, giant trees of this species are found, scattered on the island and often as single trees or in small stands, many of them now protected as natural monuments. The acorns have been an important fodder source for semi-wild pigs.



2/ One of the many impressive *Quercus infectoria* subsp. *veneris* that can be found in Cyprus. The age of this tree is estimated at 500 years.

*Q. infectoria* subsp. *veneris* is today overall a rare tree in the Mediterranean and only found in Cyprus within the European Union. The natural stands of this species were added in 2003 as an Annex I Habitat of Community Interest under the Habitats Directive (Anonymous, 2006). Natural factors contributing to the problems of *Q. infectoria* subsp. *veneris* include poor seed dispersal, probably due to the absence in the lowlands of the Eurasian jay (*Garrulus glandarius*) that normally feeds on acorns and thus spreads them accidentally. Survival of young oaks is also jeopardized by drought periods that have become more frequent in recent years (Anonymous, 2006).

Trees grown from wild-collected provenances have proven their hardiness in central Western Europe (Luxembourg, Germany). These mainly deciduous trees grow slowly but without major frost damage in these climates where winter temperatures drop below  $-20\text{ }^{\circ}\text{C}$  ( $-4\text{ }^{\circ}\text{F}$ ).

#### *Quercus coccifera* L. subsp. *calliprinos* (Webb) Holmboe (Section *Cerris*)

Kermes oak: Evergreen shrub to small tree, up to  $10 \times 7\text{ m}$  ( $33 \times 23\text{ ft}$ ), bark grey, smooth when young but vertically fissured with age; young twigs slightly pubescent; leaves variable in shape, up to  $5 \times 2.5\text{ cm}$  ( $2 \times 0.98\text{ in}$ ), leathery, shiny light dark green above, glabrous to slightly pubescent below; margins mostly spinose-dentate, often undulate; petiole up to  $5\text{ mm}$  ( $0.2\text{ in}$ ); acorn up to  $3 \times 1.5\text{ cm}$  ( $1.2 \times 0.6\text{ in}$ ), cupule up to  $3\text{ cm}$  ( $1.2\text{ in}$ ) in diameter, covered with loosely adpressed or distinctly recurved scales, enclosing one-third to three-fourths of the acorn; ripening the second year after flowering.

Native also in Turkey, Syria and Israel, the Kermes oak is found all over Cyprus from  $100\text{-}1300\text{ m}$  ( $328\text{-}4,264\text{ ft}$ ) in maquis and pine forests, forming small stands of shrubs. A few giant Kermes oaks are known. The wood was used for fuel, the acorns for pig fodder.

*Q. coccifera* subsp. *calliprinos* is host to the insect responsible for carmine scale, *Coccus ilicis* Planch. (Hemiptera: Coccoidae: Dactylopididae); the larvae appear as red



berries on twigs and leaves. A red dye was obtained from it in the past, and gave the species its name (*coccus coccineus*: red berry).

Like in other species of the genus, the taxonomy of *Q. coccifera* is still controversial and several authors do not accept the proposed subspecies. Until there is a modern revision of the species complex, it seems wise to accept the splitting and accept subsp. *calliprinos*, the eastern, more tree-like form of *Q. coccifera*.

*Quercus alnifolia* Poech (*Q. infectoria* Gaud., *Q. cypria* Jaub. & Spach, *Q. ilex* Sibth.) (Section *Cerris*)

golden oak of Cyprus: Evergreen shrub to small tree, up to 10 × 5 m (33 × 16.4 ft), bark grey, smooth when young and vertically fissured with age; young twigs at first densely grey tomentose; leaves thick and leathery, slightly convex, ovate, oblong, obovate or suborbicular, up to 6(-10) × 5(-8) cm/2.3(-3.9) × 2(-3.1) in, dark shiny green and glabrous above, below densely golden to brown or greenish tomentose (rarely silvery-grey) when young, turning dark brown or nearly black with age; margins dentate or lobulate; tomentose petiole 6-12 mm (0.23-0.47 in); acorn narrowly obovate or subcylindrical, up to 4 × 1.2 cm (1.6 × 0.47 in), cupule enclosing one-sixth to one-quarter of the acorn, covered with strongly recurved, linear scales; acorn ripening the first year.

Endemic to Cyprus, very common, but occurring only on the ultra-basic rock formations of the Troodos Massif from 300-1800 m/984-5,904 ft (rarely below 450 m/1,476 ft and scattered above 1,600 m/5,248 ft), *Q. alnifolia* is the dominant species of dry habitats in *Pinus brutia* forest or forms dense high maquis in mesic habitats. Very few giant trees of *Q. alnifolia* (10 m/33 ft) are known, and these are exceptional. The species has a high ecological value, since it thrives on stony and rocky mountainsides, preventing erosion. It coppices well from the base and thus reinstates itself after fires. The acorns form an important diet for the mountain fauna, the hard wood is suitable for the construction of tool handles and other small articles (Tsintides et al., 2002). The wood was also one of the principle fuel species used to make high-grade charcoal (Chapman, 1945).

The habitat type “Scrub and low forest vegetation of *Q. alnifolia* (9390)” is a priority habitat of Annex I, Directive 92/43/EEC. Therefore, large forest expanses have been proposed for inclusion in the *Natura 2000* network, to protect the endemic forests of golden oak. *Q. alnifolia* as a species is protected by Cyprus forest law. *The Red List of Oaks* (Oldfield & Eastwood, 2007) lists *Q. alnifolia* as a vulnerable species [Vu B1 ab(ii)] saying that “habitat degradation by fire, grazing, wood cutting and development” threatens the species. *Q. alnifolia* is the National Tree of Cyprus.

Drummond, who visited Cyprus in 1754, speaks of it as “...a kind of alder, the leaves of which shine like a green orange; the backs of them, when young, are yellow, but as they grow old, they turn brown.” (Chapman, 1945). The Austrian botanist



3/ *Quercus alnifolia* with the author.

Theodor Kotschy collected this oak at the end of October in 1840 “...with ripe acorns, on the eastern slopes of Olympos.” (Kotschy, 1862). He sent this material to his colleague Joseph Alois Poech in Vienna, who described *Q. alnifolia* in 1842 as well as a couple of the other plants of Cyprus collected by Kotschy. Already a couple of years earlier, in 1834, the French botanist Pierre Martin Rémi Aucher-Éloy collected “insufficient material from shrubby specimen, with undeveloped acorns” (Kotschy, 1862). One year after Poech’s description of *Q. alnifolia*, the French botanists Hippolyte François Comté



4/ The elegant acorns of *Quercus alnifolia*.

de Jaubert and Edouard Spach published in 1843 a description of the oak collected by Aucher-Éloy under the name *Q. cypria* Jaub. & Spach. The drawings of *Q. alnifolia* in Camus (1934) are made from the original material of Poech and also of Aucher-Eloy No. 2861, and the not fully developed acorn from the latter collection is clearly visible.

Kotschy (1862) states that the species may be hardy in southern Europe as it is covered more than a month with snow in its natural habitat. The species was introduced into Kew in 1885, where it proved to be “...perfectly hardy, but slow growing...the yellow indumentum of the leaves is only slightly developed with a more grayish undersurface.” (Bean, 1976). Semi-deciduous trees grown from wild-collected provenances have proven their hardiness in central Western Europe (Germany: Black Forest, 850 m/2,788 ft, Hardiness Zone 7a), growing slowly but without major frost damage in these climates where winter temperatures drop below -20 °C (-4 °F), under snow cover.

#### *Quercus alnifolia* Poech var. *argentea* Hadjik. & Hand (2005)

In 2005, Hadjikyriatou and Hand described a new variety of *Q. alnifolia*. They observed a number of populations of *Q. alnifolia* as small groups of plants with flattish leaves with slightly revolute margins and a silvery-tomentose lower surface. The authors consider this constant variation as remarkable enough to support the creation of a varietal level taxon (Hand, 2006), describing it as “*Quercus alnifolia* var. *alnifolia* foliis adultis

*complanatis argenteis glanduloso-pilosis infra differt.*” As the leaves of the golden oak are quite polymorphic, the above observed variation may not prove sufficient to maintain this varietal level taxon. *Etymology*: *argentea* = silvery

***Quercus* × *campitica* Hadj. & Hand**

(*Quercus* × *campitica* nothosubsp. *hylatis* Hadj. & Hand) [*Q. alnifolia* × *Q. coccifera* subsp. *calliprinos*]. Recently, hybridization between two species of Cyprus oaks has been described: The two evergreen Cyprian oak species, *Q. alnifolia* and *Q. coccifera* subsp. *calliprinos*, form mixed populations around the Troodos mountain range. It was known for quite a long time that the local inhabitants of the village of Kampos in the northwest part of the Troodos range had observed that some oaks within these mixed populations bear characteristics of both taxa. They adopted for them the vernacular name “*Lakopernia*” (from the Cyprian expressions for *Q. alnifolia* = *lakia*, and *Q. coccifera* subsp. *calliprinos* = *pernia* [*prinos*]). In 1999 several specimens were collected and the holotype was described in 2005 (Hand, 2006) as *Q. ×campitica* nothosubsp. *hylatis* Hadj. & Hand, which was contrary to Art. 34.2 ICBN (2006). In 2007 Greuter & Raus published the name validly as: *Quercus* × *campitica* Hadj. & Hand (*Q. alnifolia* × *Q. coccifera* subsp. *calliprinos*) (2005). (holotype: B, isotype: CYP. herb. Hadjikyriakou): Shrub to 5 m (16.4 ft), lamina up to 6.5 × 4 cm (2.5 × 1.6 in), ovate, ovate-oblong or oblong, leathery, dark shiny green above, rather densely silvery to pale golden yellow-tomentose below in young leaves and densely silvery-tomentose in mature leaves, except in the region of the rather prominent midrib; apex acute, spinose, base shallowly or distinctly cordate, margins spinose dentate with usually upwards directed pungent teeth; petiole 4-10 mm (0.16-0.39 in), stellate-tomentose. Cupule ca. 10 mm/0.4 in in diameter, with strongly recurved, hooked scales; acorns narrowly obovate or subcylindric, 2-3 cm/0.78-1.2 in long (Hand, 2006).

The hybrid is closer to *Q. alnifolia* with the leaves being a dark shiny green above with a rather dense indumentum below, and closer to *Q. coccifera* subsp. *calliprinos* in the acute, spinose apex, the distinctly or shallowly cordate base and the spinose dentate margins of the leaves.

It has been observed in the original location that *Q. coccifera* subsp. *calliprinos* flowered 10 days earlier than *Q. alnifolia*, and the hybrid of these two taxa about 10 days later than *Q. alnifolia*. Also, hybrid plants in all locations have been found growing near *Q. coccifera* subsp. *calliprinos*, with *Q. alnifolia* at some distance. This would indicate that *Q. alnifolia* pollinates the Kermes oak; equally acorns collected from Kermes oak produce hybrids (Hand, 2006). The hybrid was found in three widely separated localities. At the original locality near Kampos village only one specimen was found, in the other two sites respectively, 6 and 3 plants have been observed. In total not more than 10 specimens are known growing in the wild. *Etymology*: the epithet *campitica* is derived from the Latinized form of the word “*Kampitikoz*” meaning “coming from Kampos village”.

*Q. coccifera* subsp. *calliprinos* does show wide phenotypic variability, which may reflect a greater genetic variability than *Q. alnifolia*, which has a reduced morphological variability, possibly attributed to its narrower ecological range (Neophytou et al., 2006).

Recent studies on genetic differentiation and hybridization between *Q. coccifera* and *Q. alnifolia* in Cyprus (Neophytou, 2010) show that the two species are both morphologically and genetically distinct, with very limited chloroplast DNA introgression. Evidence for interspecific pollination was rare. Specifically, no interspecific pollination was detected

in *Q. alnifolia*, but rare pollination of *Q. coccifera* by *Q. alnifolia* could be inferred. This coincides with the observations made by Hand (2006). Reproductive barriers may be the reason for the limited genetic introgression between the two species.

An allozyme characterization of four Mediterranean evergreen oak species based on cladistic analysis (Toumi & Lumaret, 2001) has shown a cluster of four species (*Q. ilex* L., *Q. coccifera* and *Q. alnifolia*, with the Tibetan *Q. aquifolioides* Rehd. & Wils., whereas *Q. suber* L. and the Himalayan *Q. semecarpifolia* Sm. in A. Rees were both genetically very distinct). According to Toumi & Lumaret (2001) both *Q. alnifolia* and *Q. coccifera* should be classified in the same cluster of Mediterranean oaks that corresponds with Section *Cerris* sensu Nixon (subgenus *Sclerophyllodryis* sensu Schwartz).

## Introduced oak species

In addition to the indigenous oaks, several species have been introduced, either for economical or ornamental reasons. These include *Q. ilex* L., *Q. ithaburensis* Decne. subsp. *macrolepis* Hedge & Yalt., and *Q. suber* L.

## Conclusion

The flora of Cyprus shows a high diversity, with a total of 1,750 plant species known, due to the edaphically, climatic and topographic variation. The three indigenous oaks *Q. infectoria* subsp. *veneris*, *Q. coccifera* subsp. *calliprinos* and the endemic *Q. alnifolia* are described, as are the recently described hybrid *Q. ×campitica* and a purported variety *Q. alnifolia* var. *argentea*. Their taxonomic status and the possibility of occurrence is subject to discussion.

**Photographers.** Title page: Béatrice Chassé (*Quercus alnifolia*). Photos 1-4: Eike Jablonski.

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