

# Theophrastus on Oaks

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## Abstract

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Theophrastus of Eressus (371-286 BC), the founder of Botany, has dealt extensively with oaks in his botanical writings (*ΠΕΡΙ ΦΥΤΩΝ ΙΣΤΟΡΙΑΣ*, *History of Plants* and *ΠΕΡΙ ΦΥΤΩΝ ΑΙΤΙΩΝ*, *Causes of Plants*). He described oaks in general and distinguished many different species (possibly as many as 11), most of them easily identifiable today; he also furnished significant information about the occurrence and distribution of various *Quercus* species throughout the ‘ancient’ world (eg. Mt Ida in Troad, Macedonia, Peloponnesus, Pontus, Thebaid, Crete, Latium). He also discussed various morphological, physiological and ecological traits of oaks: root habits, bark qualities, leaves and leaf shedding habits, time of budding and fruiting, seed germination and propagation; he even dealt with the ‘problem’ whether oaks produce flowers or not. He identified oaks (including kermes oak) as hosts of mistletoes and displayed a case of accidental seed dispersal and regeneration through the caching of acorns by jays and other birds. Probably based on his own measurements, he described a 3-phased pattern of annual growth (polycyclism) for oaks, pines and silver firs. Theophrastus, a native of Lesbos, was well aware of the qualities of oak timber and charcoal, the nutritive value of acorns and the great importance of galls as a source of tannins. In regard to the latter, Theophrastus dealt with them in detail and described the external morphology of ten different types of galls produced by oak trees.

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## Introduction

Oaks were undoubtedly the most venerable trees in the Ancient Greek World (GERASIMIDIS & PARCHARIDOU-ANAGNOSTOU 2003). Well-known examples of particular oak trees were the Sacred Valonia Oak at the Zeus’ sanctuary in Dodona (Epirus) and the Royal Oak in Aiges (now Vergina), the old capital of Macedonia. Excellent samples of the symbolic importance of oak are the two, magnificent golden wreaths, recently found inside the royal tombs of Philip B’ and the ‘Prince’ in Vergina; both wreaths are composed of hundreds of ‘alive-looking’ golden leaves and acorns of the Macedonian oak (*Quercus trojana*).

Theophrastus of Eressus (371-286 BC), natural scientist and philosopher, was a contemporary of Plato, Aristotle, Philip B’ and Alexander the Great and lived a long and exciting life during the last phase of Classical Greece (Fig. 1). He is the founder of Botany and co-founder, with Aristotle, of the science of Biology (MORTON 1981). Theophrastus travelled extensively: Eressus, Athens, Assos (Troad), Lesbos, Pella and

Stageira (Macedonia), Athens (THANOS 2005). He personally became acquainted with the flora and vegetation of Lesbos, Troad, a large part of Macedonia, Attica and probably Arcadia.

Theophrastus' botanical works (*ΠΕΡΙ ΦΥΤΩΝ ΙΣΤΟΡΙΑΣ* - *HISTORIA PLANTARUM* - *ENQUIRY INTO PLANTS* **HP**, *ΠΕΡΙ ΦΥΤΩΝ ΑΙΤΙΩΝ* - *DE CAUSIS PLANTARUM* - *CAUSES OF PLANTS* **CP**), were scrutinised for references to oaks in all available publications. The following editions were searched both through the ancient Greek texts and their respective translations in English: *HP*, HORT 1916, 1926 - *CP*, EINARSON & LINK, 1976, 1990, French: *HP*, AMIGUES 1988, 1989, 1993, 2003 and modern Greek: *HP* and *CP*, CACTOS editions 1998.



Fig. 1. Detail of the mural on the frieze of the interior forefront in the main building of the National and Kapodistrian University of Athens (created after the drawings made by the Austrian painter Karl Heinrich Rahl, 1812-1865). From the left: Alexander the Great, Demetrius of Phaleron, Aristotle, Theophrastus and Strato.

### Textual references to oaks

Taking into account both the appreciation of Ancient Greeks to oaks and Theophrastus' evident expertise on this group, it is not surprising that a number of 92 different passages (83 in *HP* and 9 in *CP*) contain a diverse array of information regarding this large genus of trees. These citations are outnumbered only by those referring to pines, an equally important group of forest trees (more than 100 passages, HADJIKYRIAKOU & THANOS 2002).

### On identifying different 'genera' of oaks

It seems that 9 out of the 11 oak species, indigenous in Greece (STRID & TAN 1997) are described by Theophrastus. In addition, the exotic cork-oak and the doubtful 'φελλόδρυς' are also mentioned and described.

In Mt Ida of Troad (Kaz Dağ, Turkey), Theophrastus describes five sympatric oak species (which he calls genera) as recognised by the locals (*HP* 3.8.2.-6.): *Quercus cerris* (δρυς η αλίφλοιος; δρυς η ευθύφλοιος), *Q. frainetto* (δρυς η πλατύφυλλος), *Q. infectoria* (η ημερίς), *Q. ithaburensis* subsp. *macrolepis* (syn. *Q. aegilops*) (η φηγός) and *Q. robur* (η αγίλωψ) (AMIGUES 1989, THANOS 2003).

Theophrastus also quotes and briefly describes four oak 'genera' recognised by the locals in Macedonia (*HP* 3.8.7.), which according to AMIGUES (1989) correspond,

respectively, to: *Q. ithaburensis* subsp. *macrolepis* (ετυμόδρυσ ή τας γλυκείας [βαλάνους φέρουσα]), *Q. frainetto* and/or *Q. cerris* (δρυσ η πλατύφυλλος ή τας πικράς [βαλάνους φέρουσα]), *Q. trojana* (φιηγός ή τας στρογγύλας [βαλάνους φέρουσα]) and *Q. petraea* (άσπρις).

Other oak 'genera' cited are of course the two evergreen oaks, kermes oak, *Q. coccifera* (ο πρίνος) (HP 1.9.3., 3.3.3.) and holm oak, *Q. ilex* (η αρία, HP 3.3.8., 3.4.2., 3.4.4.; η σμίλαξ by the Arcadians, HP 3.16.2.). Also the cork oak, *Q. suber*, growing in Tyrrhenia (η φελλός) (HP 3.17.1.) and *Q. pseudosuber* (?), growing in Arcadia (HP 3.16.3.) (η φελλόδρυσ by the Arcadians; η αρία by the Dorians).

In regard to the latter species, the Greek word φελλός (cork) was in current use during classical antiquity. KAVVADAS (1956-1964) was the first to suggest that the Arcadian φελλόδρυσ was *Q. pseudosuber*. AMIGUES (1989) based on additional sources (Eratosthenes, Pausanias, Strabo) and the occurrence of the Ancient names Φελλών (a locality), Φελλία (a water stream) and Φελλόη (a village) in the wider area of central Peloponnesus, suggested that φελλόδρυσ might indeed represent *Q. pseudosuber*, an oak species not present currently in Greece (which went extinct as a result of either overexploitation or ecological decline?). The name Φολόη, still persisting today for a village and an oak-pine-forested mountain to the north of Olympia, may well be a linguistic relict of the ancient presence of false cork oak in Peloponnesus.

### On polycyclic growth

Theophrastus describes a 3-phased pattern of annual growth for pines, silver firs and oaks (HP 3.5.1.-2.). This pattern is most probably based on his own observations and measurements from Mt Ida, specifically cited in conjunction to the particular timing furnished for each growth cycle.

This is a quite striking remark and should be further investigated in relation to both Llamas growth and polycyclic growth (reported to include several growth units per year in *Pinus brutia* and *Quercus robur* (THANOS 2003, HEURET & al. 2003).

### On galls

As an obvious result of the great importance of galls as tannin source, Theophrastus deals with them in detail and describes the external morphology of ten different types of galls produced by oak trees (*Quercus* spp., HP 3.7.4.-5.). He further reports several additional ones occurring in kermes oak (*Quercus coccifera*, the well known scarlet 'berry' gall, HP 3.7.3., 3.16.1.),

Although the general belief of his time was that the galls were formations of the plant itself, Theophrastus was well aware of the difference between fruits and galls; furthermore, he had noticed the presence of insects (resembling mosquitoes and flies, respectively) within the hollow bag-like gall of terebinth (HP 3.15.4.) and in the transparent, watery gall of the leaf rib of oak (HP 3.7.5.).

In a very detailed examination of the five passages in which Theophrastus treats oak galls, SENN (1942) showed that, of the ten kinds mentioned therein, nine can be identified with certainty (and the tenth only doubtfully). The list follows the order of Theophrastus, the doubtful *Cynips kollari* being placed at the end (Fig. 2).

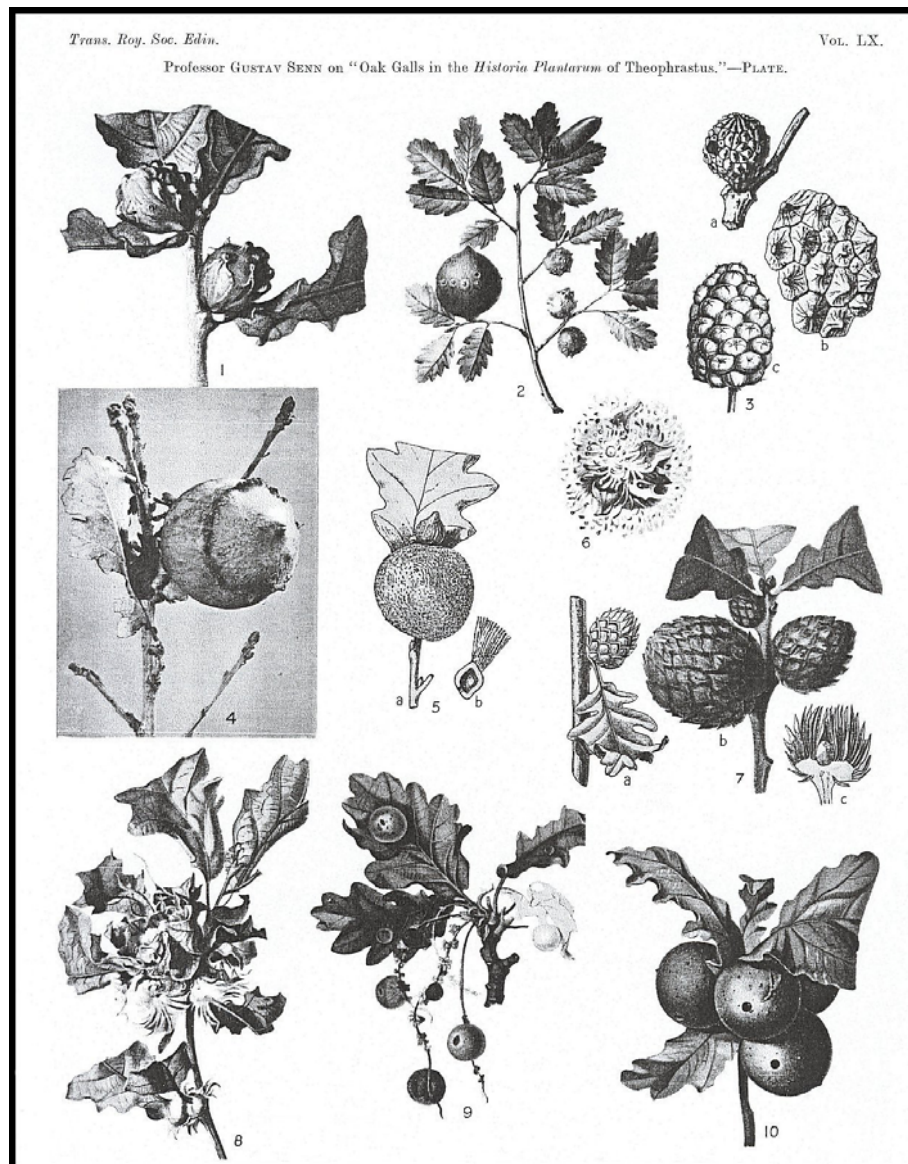


Fig. 2. Drawings of the 10 different types of galls produced on oaks as described by Theophrastus, according to SENN (1942). 1. Aleppo gall (*Cynips tinctoria*); 2. Bassorah gall (*Cynips insana*); 3. Mulberry gall (*Cynips caliciformis*); 4. Phallus gall (*Cynips quercus-tozae*); 5. Felted or Woolly gall (*Andricus theophrasteus*); 6. Hairy Honey gall (*Andricus lucidus*); 7. Axillary (or Hop) gall (*Andricus fecundator*); 8. Crumpled-leaf gall (*Andricus multiplicatus*); 9. Currant (or Translucent, watery leaf) gall (*Neuroterus baccarum*); 10. The doubtful gall by *Cynips kollari*.

AMIGUES (1989) strongly doubts identification of gall number 7 (SENN 1942) but does not propose an alternative option. She also doubts number 9 and considers the gall produced by *Dryofanta folii* (instead of *Andricus fecundator*) as resembling more closely to Theophrastus' description of the 'translucent and watery leaf gall which sometimes bears flies'. Finally, AMIGUES (1989) seems to accept the last gall, number 10, doubted by SENN (1942), as definitely produced by *Cynips kollari*.

### On epiphytes growing on oaks

Theophrastus, after having identified the two species occurring in Greece (*Loranthus europaeus* and *Viscum album*) (CP 2.17.1.), asks questions and provides answers concerning the peculiar habit of these plants not to grow on the ground but only on a host tree (CP 2.17.3.) of various species: *Abies* spp., *Pinus* spp., *Pistacia terebinthus* and *Quercus* spp. (CP 2.17.1.), even *Q. coccifera* (HP 3.16.1.).

Some assert that all mistletoes (that are known with 3 different names, depending on the region) are a single natural unity but because they grow on different plants they are also considered to be different; so the 'hyphear' occurs on silver-fir and pine, and so too the 'stelis' whereas the 'ixia' (mistletoe) occurs on oak, terebinth and a number of other trees). (CP 2.17.1.). [Similar quotations: 'ixia' on the oak and other trees (HP 3.7.6); 'ixia' and 'hyphear' on kermes oak (HP 3.16.1.).]

Kermes oak bears, in addition to its acorn and a scarlet berry gall, both 'ixia' and 'hyphear', with the result that it sometimes has four sets of 'fruit', two of its own and two others ['... And it bears the 'ixia' on the north side, the 'hyphear' on the south'. (HP 3.16.1.)].

### On the growing habits of trees

'In windless and shaded places the trees always grow up erect and undistorted, with fewer knots and taller. ... (CP 2.9.1.). 'for these – oaks – come to have fewer knots and to grow straight and almost to the same height as silver firs, as is reported to be the case in Mt Haemus (Balkan Mountains, central Bulgaria). But such trees also come to have an opener texture, to be fluid and to be weaker, because they acquire no condensation either from the sun or from the winds and the cold'. (CP 2.9.2.).

On bearing and longevity: 'As for abundant bearers that are not short-lived or quick to age, such as the pear, almond and oak, these in fact get to be more fruitful as they grow older'. (CP 2.11.10.)

On tree longevity: 'Oaks are known to belong to the longest-living plants, as additionally witnessed by the mythological tales on ancient plants: the olive at Athens, the palm in Delos, the wild olive at Olympia and the Valonia oaks at Ilium [Troy] planted on the tomb of Ilos.' (HP 4.13.2.).

On root differences: oaks are placed in the group of plants with numerous and long roots (HP 1.6.3.); in addition, oak roots are fleshier (e.g. less fibrous than silver fir) and deep-growing (HP 1.6.4.). However, compared by Mt Ida locals to silver fir, oaks are considered less deep-rooting (and less straight but more voluminous) while the deepest of all trees are plum and filbert. (HP 3.6.5.). On the other hand, the Arcadians believe that the deepest-rooting of all wild trees is kermes oak. (HP 3.6.4.).

### On acorns

The five species occurring in Mt Ida are ranked according to the sweetness of their acorns: the sweetest ones produced by *Q. ithaburensis* subsp. *macrolepis* and the most bitter ones by *Q. robur*. (HP 3.8.2.). However, Theophrastus hastens to add that not all individuals within a species conform to the same pattern of quality, e.g. there exist Valonia oak varieties that produce bitter acorns. (HP 3.8.3.).

When discussing the general characteristics of early and late bearers: acorns (of deciduous oaks) are classed as late maturing (CP 1.17.7.). Furthermore it is stated that: 'Certain fruits are adapted to ripen during the cold weather of the winter, such as acorns.' (CP 2.8.2.). Kermes oak is among those trees that are late in maturing their fruit: 'some say that they take a year to ripen their fruit.' (HP 3.4.1.).

On the death (storage) of seeds: 'Among tree seeds all that are soft and fleshy (such as almond, filbert/walnut and acorn) are preserved by the container (shell).' (CP 5.18.4.).

On the 'excretion' of salinity to the outer surface: 'acorns have their bitterness at the tip ...'. (CP 6.10.7.).

On ornithochory and seed caching: 'Jays (*Garrulus glandarius*) and other birds 'store' (hide) the acorns in the soil.' (CP 2.17.8.). This feeding behaviour (caching of acorns) results in the accidental dispersal (dyszoochory) and, consequently, the erratic regeneration of oaks (*Quercus* spp.) (THANOS 1994).

On peculiar cases of plants growing on other plants (by accidental germination of a seed on another tree): '... instances that strike people as having the character of rarities and portents, [such] as the laurel bay that grew on a plane tree and another that grew on an oak.' (CP 2.17.4.).

On the modification of the properties of selected plants when offspring is grown by seed: 'The oak also deteriorates from seed; at least many persons having raised trees from acorns of the oak at Pyrrha could not produce one like the parent tree'. (HP 2.2.6.). [The particular oak species is *Quercus ithaburensis* subsp. *macrolepis*].

On the basis of the position of radicle and stem emergence in the germinating seedling, Theophrastus identifies 3 discreet patterns; the third germination type is represented by almond, walnut and acorns: the root sprouts at the pole opposite to that of seed attachment on the mother plant (HP 8.2.1.-2.) (AMIGUES 2003).

### On timber and charcoal

On the season of timber cutting: holm and Valonia oaks are cut in summer or autumn; the other oak species are cut latest of all, at the end of autumn or early winter (HP 5.1.2.). According to Theophrastus, if oak wood is cut prematurely, during stem peeling, it rots quickly; on the other hand, if it is cut after the ripening of the fruit, it remains untouched by worms (HP 5.1.2.).

Among the hardest wood for roof-timbers are holm oaks and deciduous oaks; the wood needs to be soaked to enable hole boring (HP 5.3.3.). Among the trees that produce timber naturally proof against decay is holm oak (HP 5.4.2.). Oak wood buried in the soil or soaked in water does not decay; as a consequence it is used for vessel building destined only for rivers and lakes because the wood rots in seawater (HP 5.4.3.). The most difficult woods (to be worked by carpenters) are those of holm oak and oaks (HP 5.5.1.). Oak wood is not appropriate to bear weight (like silver fir

or pine) and is apt to split because it is supposed to contain some 'earth matter' (*HP* 5.6.1.). Oak wood can be used for house building purposes (*HP* 5.7.4.) but for ship-building only the keel of a trireme is made of oak, in order to stand the hauling (*HP* 5.7.2.).

The wood of kermes oak is used for making the axles of wheelbarrows and the crossbars of lyres and psalteries (*HP* 5.7.6.); it is also used as fire sticks (*HP* 5.9.7.).

On charcoal making: 'The best charcoal is made from the most compact wood, such as holm oak, oak and strawberry tree; for these are the most solid and last longest and are the strongest; worst among the three woods mentioned is oak, since it contains most earth matter. Wood of older trees is inferior to that of younger ones, ... for it is very dry and sputters as it burns.' (*HP* 5.9.1.)

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### References

- AMIGUES, S. 1988, 1989, 1993, 2003: Notes. In: AMIGUES, S. (translator and commentator), THÉOPHRASTE. *Recherches sur les Plantes*, I-IV. Paris [in ancient Greek with French translation].
- GERASIMIDIS, A. & PARCHARIDOU-ANAGNOSTOU, M. 2003: Oak and ancient Greeks. Pp. 405-414. In: *Proceedings of the 11<sup>th</sup> Panhellenic Conference of Forestry, Ancient Olympia*, September 30 – October 3, 2003 [in Greek with English summary].
- HADJIKYRIAKOU, G. & THANOS, C. A. 2002: Theophrastus on pines. Pp. 27. In: THANOS, C. A. (ed.), *Book of abstracts, MEDPINE 2, 'Conservation, regeneration and restoration of Mediterranean pines and their ecosystems'*, Chania, Crete, Sept. 8-13, 2002.
- HEURET, P., GUÉDON, Y., GUÉRARD, N. & BARTHÉLÉMY, D. 2003: Analysing branching pattern in plantations of young red oak trees (*Quercus rubra* L., Fagaceae). *Ann. Bot.* 91: 479-492.
- KAVVADAS, D. S. 1956-1964: *Illustrated botanical-plant dictionary*, 3. Athens [in Greek].
- MORTON, A. G. 1981: *History of botanical science*. London.
- SENN, G. 1942: Oak galls in the *Historia Plantarum* of Theophrastus. *Trans. Roy. Soc. Edin.* 60: 343-355.
- STRID, A. & TAN, K. (ed.) 1997: *Flora Hellenica*, 1. Königstein.
- THANOS, C. A. 1994: Aristotle and Theophrastus on plant-animal interactions. Pp. 3-11. In: ARIANOUTSOU, M. & GROVES, R. H. (ed.), *Plant-animal interactions in Mediterranean-type ecosystems*. Dordrecht.
- 2003: Mt Ida in mythology and classical antiquity - a plant scientist's approach. Pp. 85-102. In: *Book of Proceedings, 1<sup>st</sup> National Symposium on the past, present and future of the Kazdağları Mountains*. Ankara [in Turkish].
- 2005: The geography of Theophrastus' life and of his botanical writings (*ΠΕΡΙ ΦΥΤΩΝ*). Pp. 113-131. In: KARAMANOS, A. J. & THANOS, C. A. (ed.), *Biodiversity and natural heritage in the Aegean, Proceedings of the Conference 'Theophrastus 2000'*, Eressos – Sigri, Lesbos, July 6-8, 2000. Athens.
- THÉOPHRASTE 1988, 1989, 1993 & 2003: *Recherches sur les Plantes*, I, II, III & IV (AMIGUES, S., translator and commentator). Paris [in ancient Greek with French translation].

- THEOPHRASTUS 1916 & 1926: Enquiry into plants (History of plants HP), I & II (HORT, A. F., translator). London, Cambridge & Massachusetts [in ancient Greek with English translation].
- 1976 & 1990: De Causis Plantarum (Causes of plants CP), I, II & III (EINARSON, B. & LINK, G. K. K., translators). London, Cambridge & Massachusetts [in ancient Greek with English translation].
  - 1998: The compiled works, 1-7 (Literary group of Cactos, translator). Athens [in ancient Greek with modern Greek translation].