



Taxonomy of the genus *Pistacia* L., description and distribution of species in the Mediterranean area

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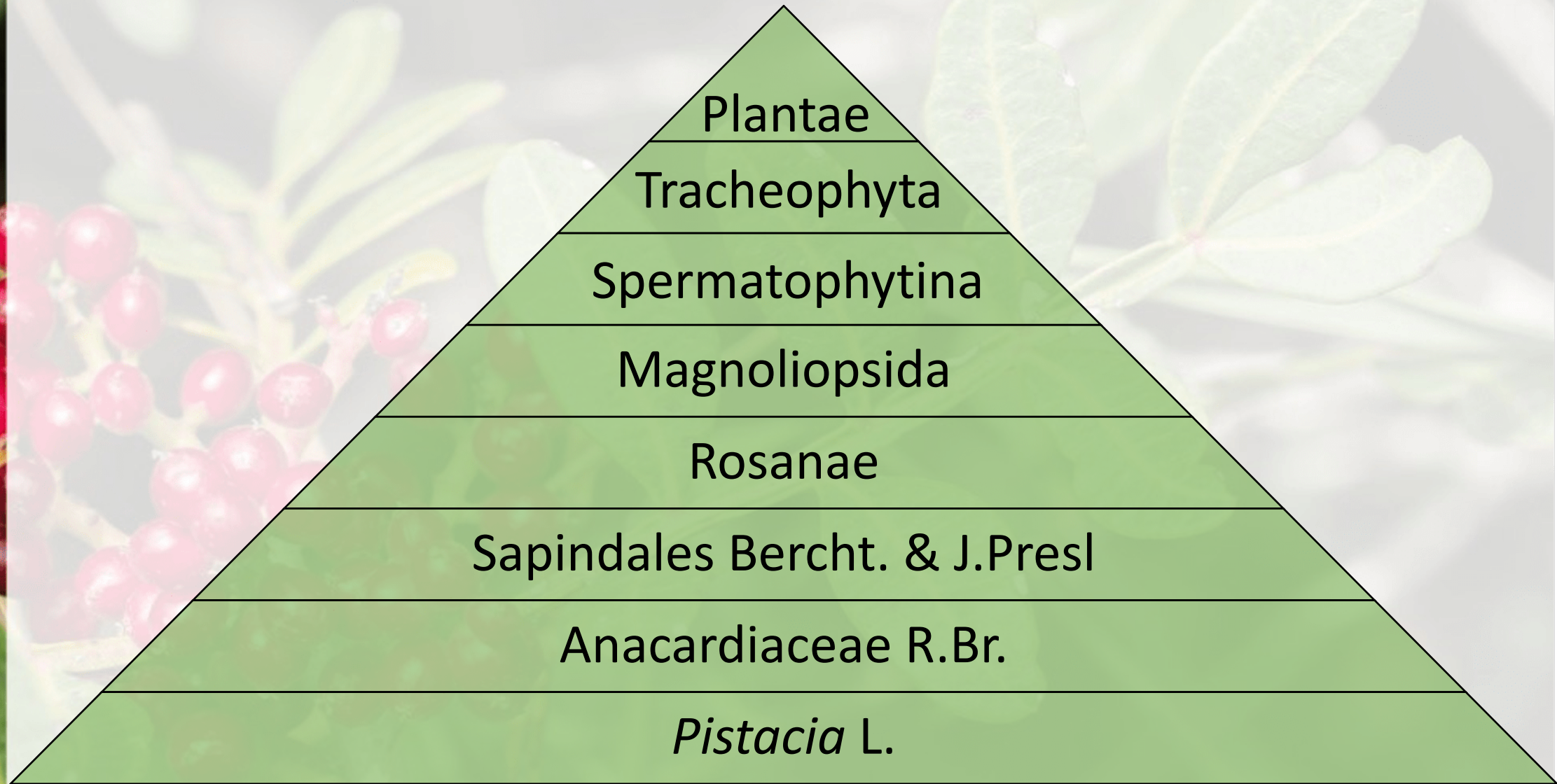
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Taxonomy (Euro+Med Plantbase)



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Anacardiaceae family

Flowering plant family with about 80 genera and 870 taxa of evergreen or deciduous trees, shrubs, and woody vines.

Most members of Anacardiaceae are native to tropical and subtropical areas of the world. Few species occur in temperate regions. Several species are economically important fruit and nut crops.

The family is mainly known for its fruits:

Anacardium occidentale (cashew) and *Mangifera indica* (mango) are famous tropical fruit trees;

Pistacia vera (pistachio) is well known for its nuts.



Anacardium occidentale



Mangifera indica



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Pistacia genus

The species of the genus *Pistacia* are evergreen or mainly deciduous resin-bearing shrubs and trees.

Different parts of *Pistacia* species including resin, leaves, fruits, and aerial parts have been traditionally exploited for a wide range of uses (Bozorgi et al. 2013):

- in traditional medicine they have been claimed to have properties as a tonic, aphrodisiac, antiseptic, antihypertensive and are widely used for the management of dental, gastrointestinal, liver, urinary tract, and respiratory disorders. However, those properties should be properly tested in preclinical and clinical studies;
- seemingly, as it concerns a variety of claimed pharmacological activities, (i.e antioxidant, antimicrobial, antiviral, anticholinesterase, anti-inflammatory, antinociceptive, antidiabetic, antitumor, antihyperlipidemic, antiarteriosclerotic) have been so far established in vitro and in experimental models;
- in food industry, pistachio (*Pistacia vera*) nut is consumed as food and food component, *Pistacia terebinthus* fruit as snack food or in making coffee-like drink, *Pistacia lentiscus* fruit is used as food colorant due its anthocyanin content.



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Pistacia genus

It counts about 13 accepted taxa (Plantlist.org):

1. *Pistacia aethiopica* Kokwaro
2. *Pistacia atlantica* Desf.
3. *Pistacia chinensis* Bunge
4. *Pistacia chinensis* subsp. *integerrima* (J.L.Stewart ex Brandis) Rech. f.
5. *Pistacia eurycarpa* Yalt.
6. *Pistacia khinjuk* Stocks
7. *Pistacia lentiscus* L.
8. *Pistacia mexicana* Kunth
9. *Pistacia raportae* Burnat
10. *Pistacia terebinthus* L.
11. *Pistacia texana* Swingle
12. *Pistacia vera* L.
13. *Pistacia weinmanniifolia* J.Poiss. ex Franch.



Pistacia texana



Pistacia weinmanniifolia



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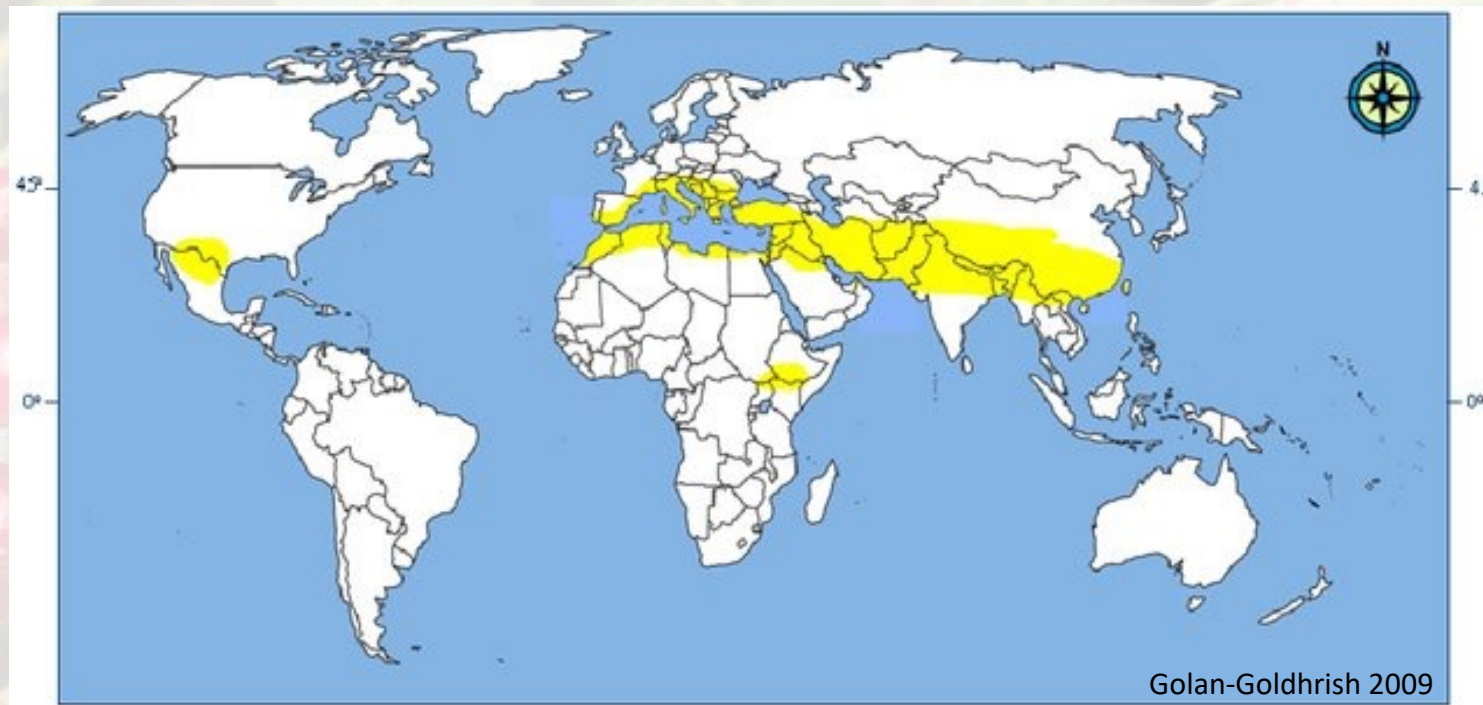
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Global distribution of *Pistacia* genus

Pistacia have probably originated in Central Asia. Two centers of diversity have been described:

- 1) the Mediterranean region of Southern Europe, Northern Africa, and the Middle East;
- 2) West and Central Asia (Mohannad and Duncan, 2012).

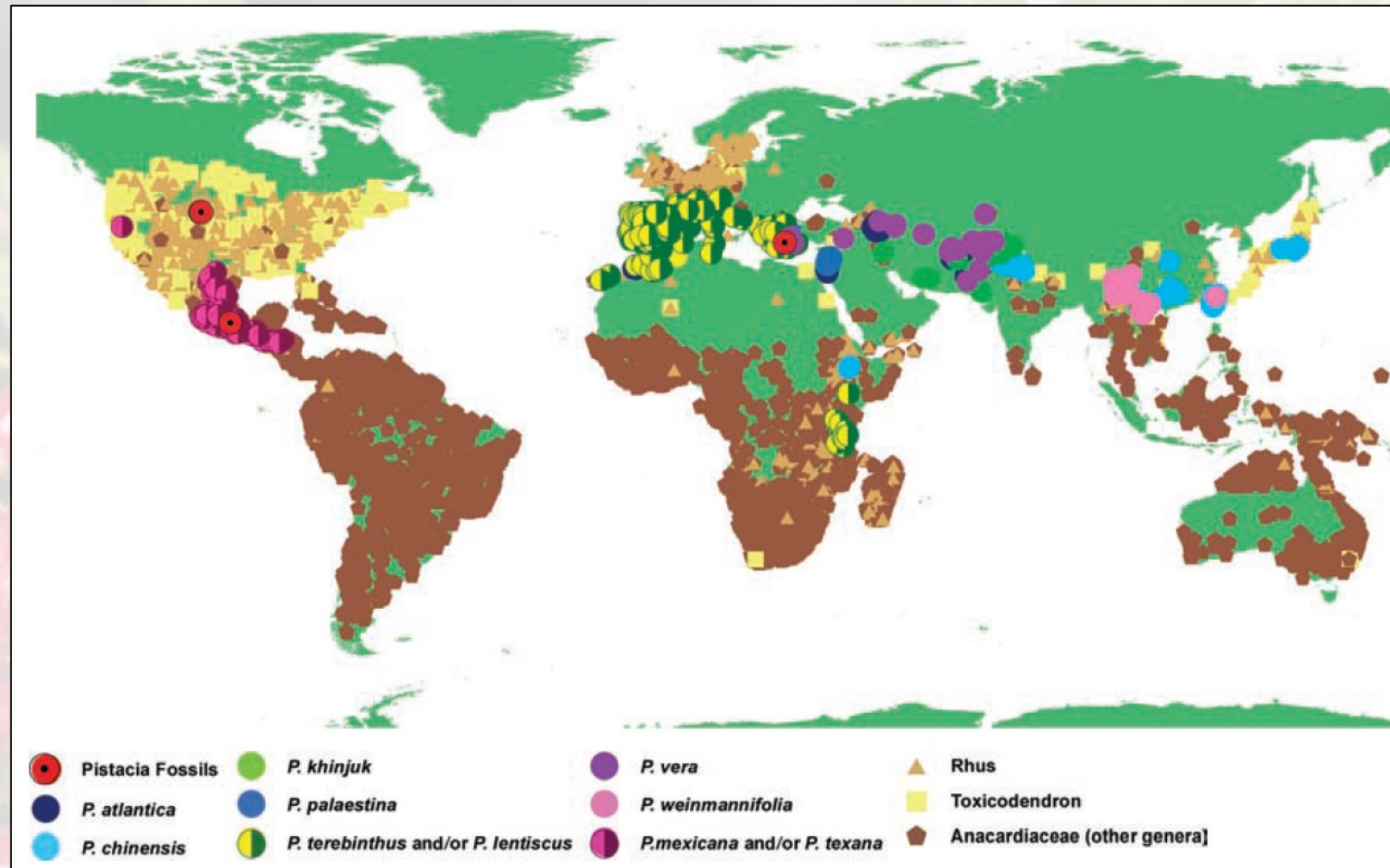


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Global distribution of *Pistacia* genus



Kozhoridze et al. 2015



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Mediterranean *Pistacia* taxa

The Euro-Mediterranean area counts 9 taxa (from Euro+Med Plantbase):

1. *Pistacia atlantica* Desf.
2. *Pistacia atlantica* subsp. *cypricola* H.Lindb. (preliminary accepted)
3. *Pistacia atlantica* subsp. *mutica* (Fisch. & C.A.Mey.) Rech. f.
4. *Pistacia eurycarpa* Yalt.
5. *Pistacia khinjuk* Stocks
6. *Pistacia lentiscus* L.
7. *Pistacia terebinthus* L. subsp. *palaestina* (Boiss.) Engl.
8. *Pistacia terebinthus* L. subsp. *terebinthus*
9. *Pistacia vera* L.

One hybrid and one variety:

1. *Pistacia* × *saportae* Burnat (hybrid between *P. lentiscus* and *P. terebinthus*)
2. *Pistacia lentiscus* L. var. *chia*



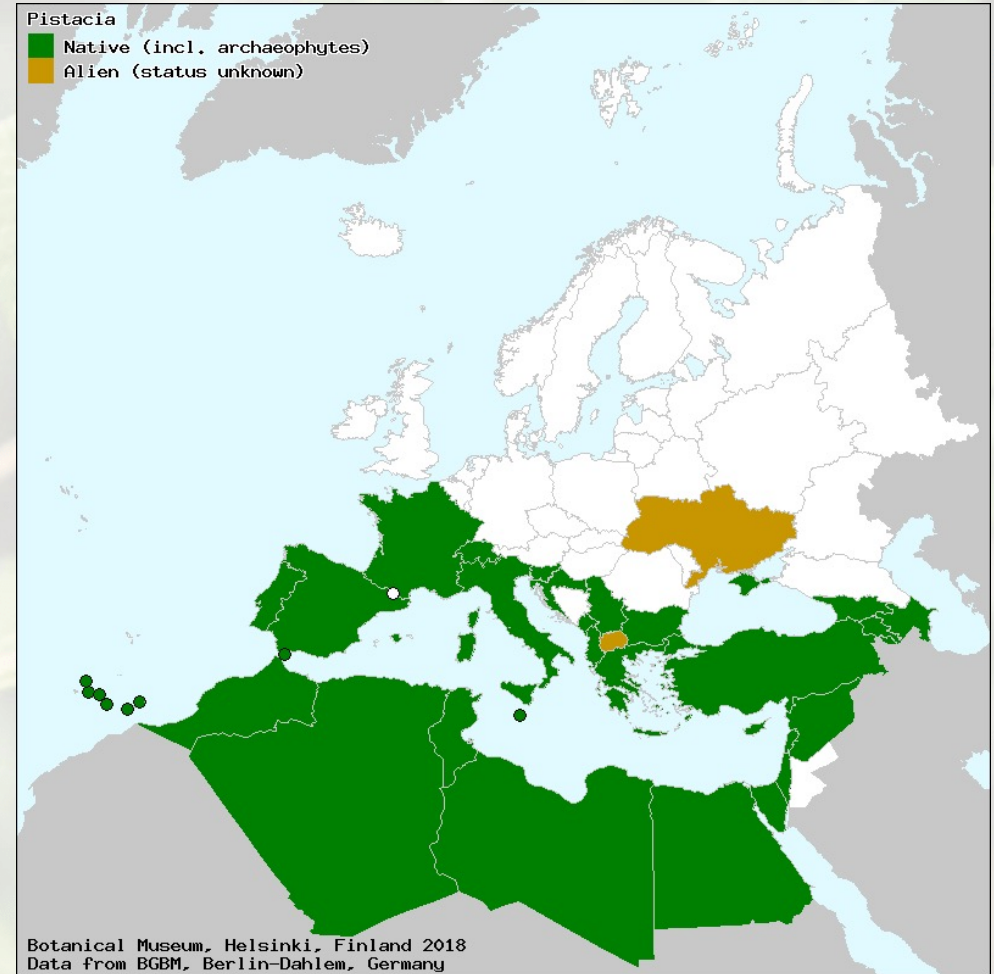
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Euro-Mediterranean distribution of *Pistacia* genus

28 countries:

Armenia	Libya
Albania	Makedonija
Algeria	Malta
Azerbaijan	Montenegro
Croatia	Morocco
Cyprus	Portugal
Egypt	Serbia
France	Slovenia
Greece	Spain
Georgia	Switzerland
Israel	Syria
Italy	Tunisia
Jordan	Turkey
Lebanon	Ukraine



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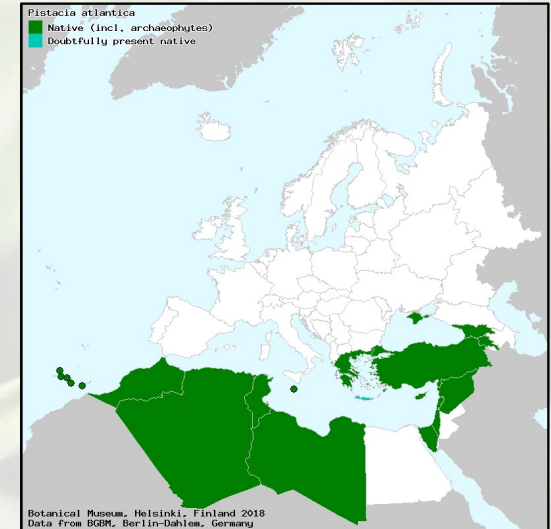
Pistacia atlantica Desf.

Synonym(s): *Pistacia atlantica* Desf. subsp. *atlantica*, *Terebinthus atlanticus* (Desf.) Dum. Cours.

Common names: Almacigo (Spanish), Pistachier de l'Atlas (French), Betum (Arabic), Sakızlık, Çitlenbik (Turkish), ramythia –ραμυθιά (Greek)

Description: shrub or tree (3-15 m) crown wide, rounded. Leaves deciduous, imparipinnate (8-17.6 cm), membranaceous; petiole flattened. Leaflets (3-7 cm) opposite, lower subopposite, lanceolate, obtuse, minutely puberulent. Staminate panicles (7-11 cm) often clustered, stout, branched from base, densely flowered, pubescent; flowers red. Pistillate panicles (up to 15 cm) subterminal with leaves, stout, branched from base, minutely pubescent; flowers pinkish. Drupes many, red or reddish, mesocarp fleshy, endocarp bony.

Uses in traditional medicine: (*not confirmed yet by preclinical and clinical studies*) the resin has been proposed as gum tissue strengthener, in breath deodorizer, in the treatment of cough, chill, and stomach disease.



AL-Saghir et al. 2012



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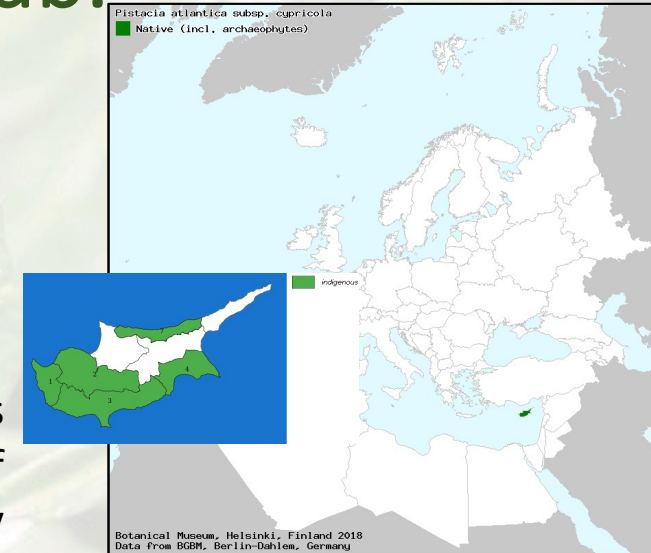
Pistacia atlantica subsp. *cypricola* H.Lindb.

This subspecies seems to have a dubious validity; there is no agreement yet in its taxonomy. Here below, information is provided for *P. atlantica* Desf. in Cyprus, according to the taxonomic treatment by Meikle 1977 (Flora of Cyprus), who also notes that probably, all the Cyprus material should be referred to ***P. atlantica* Desf. var. *latifolia* DC.**, since most of it differs from typical *P. atlantica* for having broader, blunter leaflets. (Photos, map of Cyprus from <http://www.flora-of-cyprus.eu/>)

Common names: tremithos- τρέμιθος, ο / trimithos-τρήμιθος, ο (Cyprus)

Description: Robust, broad-crowned deciduous tree 7-10 (-20) m high; leaves imparipinnate, 10-15 (-20) cm long, 5-12 cm wide, divided into 3-5 pairs of leaflets; rachis narrowly but distinctly winged; leaflets lanceolate or narrowly oblong or ovate-oblong 3-7 cm long, 0.6-3 cm wide; male panicles at first very compact becoming looser at maturity, 3-10 cm long, flowers solitary or in small clusters; female panicles lax, diffusely branched, flowers solitary or in small groups; fruit obovoid or subglobose, little compressed, 6-7 mm long, mesocarp fleshy, blue-black when ripe.

Uses in traditional medicine: the trees can be used as ornaments or with symbolic character, the fruits are consumed raw [Paphos; not reported to be consumed raw in other regions in Cyprus (Maria Rousou's personal observations)], extraction of chewing gum (Paphos villages, before 1963 the production of Paphian gum was produced especially by people of the Turkish community), oil extraction from the fruits (Della et al. 2006, Gennadios 1914, Tsintides et al. 2007, The Cyprus Food Museum).



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Pistacia atlantica subsp. *mutica* (Fisch. & C.A.Mey.) Rech.

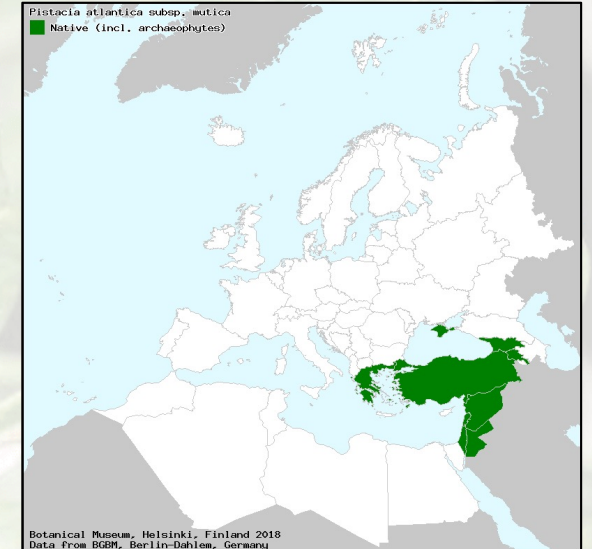
Synonym: *Pistacia mutica* Fisch. & C.A.Mey., *Terebinthus atlanticus* (Desf.) Dum.Cours.

Common names: ramythia –ραμυθιά (Greek for *P.atlantica*)

Description: tree to 7 m tall, deciduous. Branches form a dense, rounded crown. Bark is often fissured. Branches often wavy disposed with alternate, compound leaves. Leaflets 7–9, oblong-ovate or lanceolate, dark green above, paler below. Flowers unisexual, male flowers with 4–5 anthers disposed from a disc. Female flowers with a short 3-parted style. Flowers with 1–3 bracts below. Fruit at least as long as broad, 1-seeded.

Uses in traditional medicine: the oil has been used as protective against oxidative stress.

Other uses: many parts have been traditionally used in food, medicine, cosmetic, perfumery and as source of wood.



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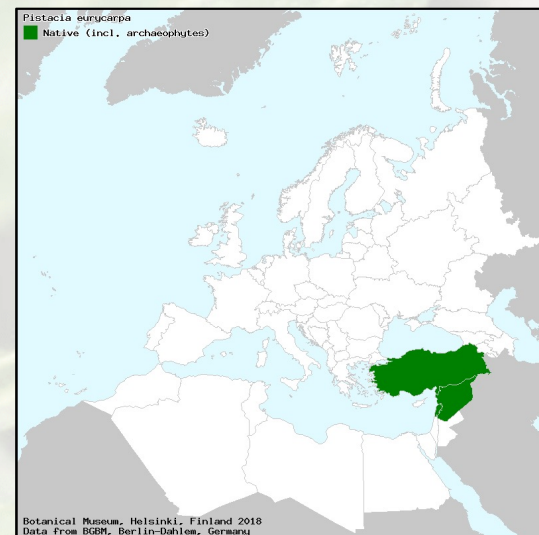
Pistacia eurycarpa Yalt.

Synonym: *Pistacia atlantica* var. *kurdica* Zohary; *Pistacia atlantica* subsp. *kurdica* (Zohary) Rech. f.

Common names: Derekhti Sakhus (Kurdish), Bendek (Turkish)

Description: shrubs or small trees (to 5 m). Imparipinnate, membranaceous, deciduous leaves, 10.2 - 18.2 cm long. Rachis is narrowly winged. Leaflets (1-3-) 5 - 7, 4.5 - 6.5 cm long, lanceolate, obtuse, puberulent, margin ciliated to glabrous. Staminate panicles not seen. Pistillate panicles to 18 cm long, branched from above base, stout. Bright red drupes, wider than long, to 7 mm long and 8 mm wide.

Uses in traditional medicine: the oleo-gum has been used for the treatment of skin infections, burns and scalds. The oleo-gum's essential oil resin has antioxidant, antimicrobial and antifungal properties.



Ahmed et al. 2017



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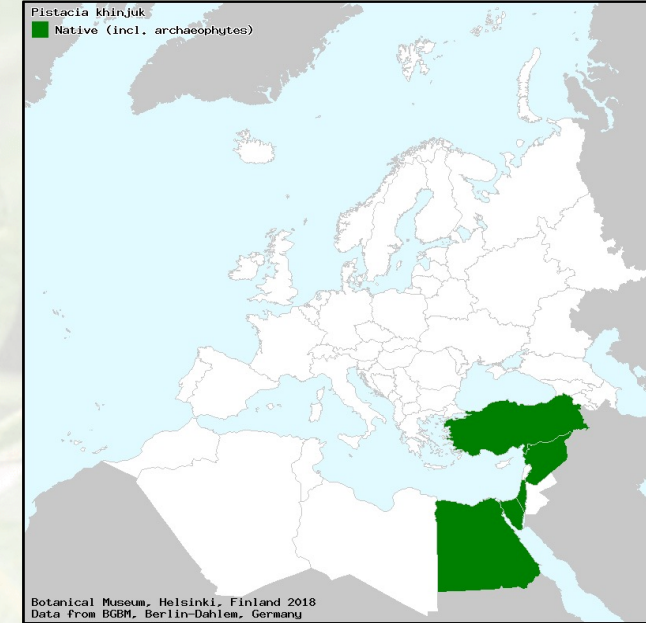
Pistacia khinjuk Stocks

Synonym: *Pistacia acuminata* Boiss. & Buhse

Common names: Bittim (Turkish), Haasheit (Egyptian)

Description: trees (2-5 m). Imparipinnate, membraneaceous, deciduous leaves (11 - 17.7 cm). Rachis not winged. Leaflets 1 - 9, 4.5 - 8.5 cm long, opposite to subopposite, ovate to broadly ovate, glabrous, acuminate. Staminate panicles (up to 9 cm) loosely branched, with large, white-pubescent bracts; flowers crimson. Pistillate panicles (up to 16 cm) branched from base, stout, minutely pubescent to glabrous. Red drupes to 8 mm in diameter. Yellowish seeds.

Uses in traditional medicine: the resin has been proposed for the treatment of gastric problems (i.e. nausea, vomiting). The crude extract has shown significant antioxidant activity in vitro. The seed's oil is generally used for lighting. In Egypt, it has various uses: leaves are used in tanning leather and the resin from its wood is used for making local perfumes. It is also used as animal feed and for medicinal purposes.



Ezatpour et al. 2015

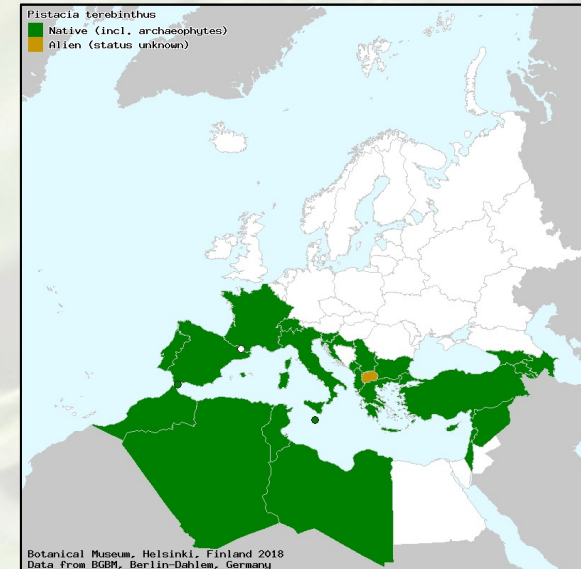
Pistacia terebinthus L. subsp. *terebinthus*

Common names: Terebinto (Italian), Noguerola (Spanish), Térébinthe (French), Menengiç (Turkish), Trimithkia–τριμιθκιά / Tremithia-τρεμιθιά, η (Cypriot), Andramythia-αντραμυθιά / Kokkorevythia-κοκκορεβυθιά / Tsikoudia-τσικουδιά (Greek)

Description: small deciduous tree or shrub up to 10 m. Imparipinnate leaves; leaflets usually 1.6-2.2 x 3.0-4.5 cm, 3-9, ovate to obovate or oblong, mucronate, coriaceous; rachis not winged; petioles glabrous. Inflorescence with long branches. Flowers brownish. Drupe 5-7 x 4-6 mm obovoid, compressed, apiculate, at first reddish, becoming brown.

Uses in traditional medicine: the bark yields a resinous liquid called terebinthine, which has been claimed to possess antiseptic, antispasmodic, cytostatic, expectorant and vulnerary.

Other uses: Immature fruits and stems are preserved in vinegar and salt ("atsjaar"). Young leaves are cooked and used as a vegetable. In Cyprus, fruits (tremythkia) are claimed to be consumed raw, roasted, or fried.



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Pistacia terebinthus L. subsp. *palaestina* (Boiss.) Engl.

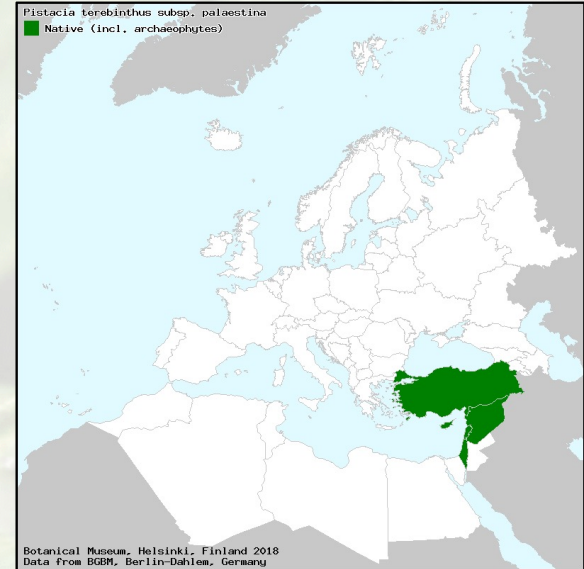
Synonym: *Pistacia palestina* Boiss.

Common names: Palestine Terebinth (English), Terevinthos (Greek), Çöğre (Turkish), Trimithkia–τριμιθκιά / Tremithia-τρεμιθιά, η (Cypriot) (In Cyprus, *P. palaestina* is treated as a synonym of *P. terebinthus*)

Description: it is a deciduous bushy tree or small tree which grows slowly up to 5-6 m. Leaves are shiny with a strong resinous smell, reddish-purple flowers appear between March and April. The visible difference between the two subspecies is that in the Palestine terebinth the leaflets are pointy, while in the Mediterranean Terebinth they are rounded. A genetic study showed that these are almost identical species, so they were united formally, and today the Palestine Terebinth is considered a subspecies of the *P. terebinthus*.

Uses in traditional medicine: fruits and leaves have been claimed that may be used as coadjuvant for the treatment of stomachache, rheumatism, coughs, sunstroke, asthma and bronchitis.

Other uses: fruits are used in special bread of some villages and consumed as coffee, cooking oil and appetizer; it is specially used in soap production.



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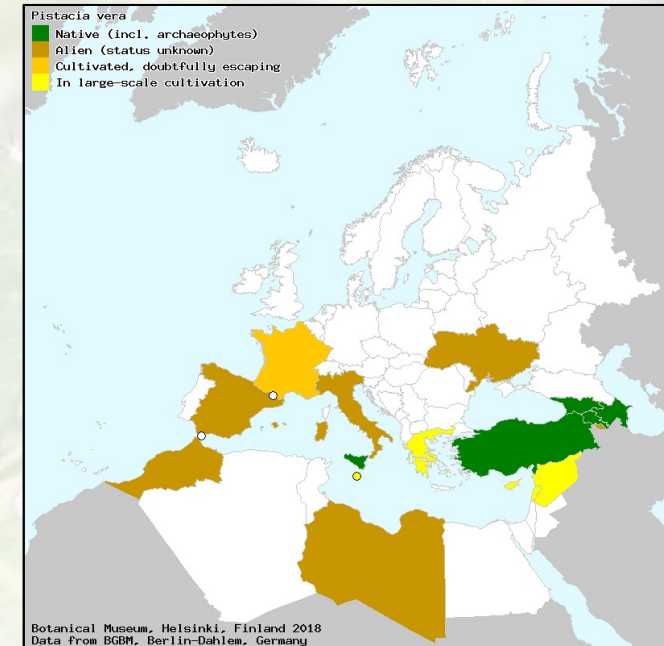


Pistacia vera L.

Common names: Pistachier (French), Pistacchio (Italian), Fistikia-Φιστικιά (Greek), Antep fıstığı (Turkish), fozdok (Arabic), halepiani-χαλεπιανή, η (Cypriot)

Description: tree that grows up to 10 m tall, with a single or several trunks. Deciduous, compound-pinnate leaves, 10–20 cm long, with three to five oval leaflets. *P. vera* is dioecious with apetalous flowers, with aeolian pollination. Fruit is a drupe with an exocarp, a mesocarp (hull), and a hard, dehiscent endocarp (shell) that splits longitudinally when the fruit has ripened. Commercial pistachios comprise the shell and the edible yellow-green kernel, which has a papery seed coat (skin) (Hormaza & Wunsch, 2007). This species is also cultivated in Tunisia and Algeria.

Uses: it is the only species of the genus cultivated and commercialized. The rest of the deciduous species are mostly used as rootstocks for this taxon.



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Pistacia vera L. in Italy

The pistachio plants cultivated in Italy are exclusively female individuals of *P. vera* grafted on *P. terebinthus* subsp. *terebinthus*, pollinated by male individuals of *P. terebinthus* or hybrids between the two species.

Excluding misidentifications or mistakes with residuals of cultivated plants or with individuals of *P. terebinthus* provided with larger leaves (these are the cases recorded from Italy), authentic plants of *P. vera* found in the wild may originated from pruning waste.



<http://dryades.units.it/floritaly>



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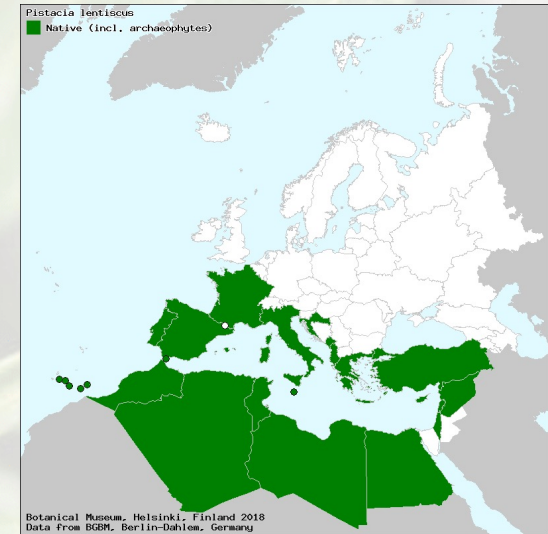
Pistacia lentiscus L.

Common names: Lentisque (French), Lentisco (Italian), skinos-σκίνος /σχίνος (Greek), Sakız ağacı (wild) (Turkish), Dherw (Arabic), shinos-ᾠόίννος, ο /shinia-ᾠόίννιά, η (Cypriot)

Description: shrub (1–8 m), evergreen and characterized by a strong resinous smell, with 4–10 elliptical-obtuse leaflets. It is resistant to water stress conditions (cold, frost or dryness). The flowers are in dense spike-like clusters: on male trees are deep red, on female tree are yellow. The fruit is a drupe, first red and then black at maturity, about 4 mm in diameter. Seeds are dispersed by birds.

Uses in traditional medicine: it is known to have several beneficial effects, with antioxidant, antimicrobial, sedative, anti-inflammatory properties. Fruit oil may aid in the treatment of ulcers or to heal psoriasis.

Other uses: aerial part's essential oils are used in the food industry as flavoring agents in alcoholic beverages and chewing gum. Fruits are consumed raw or roasted. Also, leaves and bark, along with *Pinus* and *Quercus*, traditionally used in leather tannery.

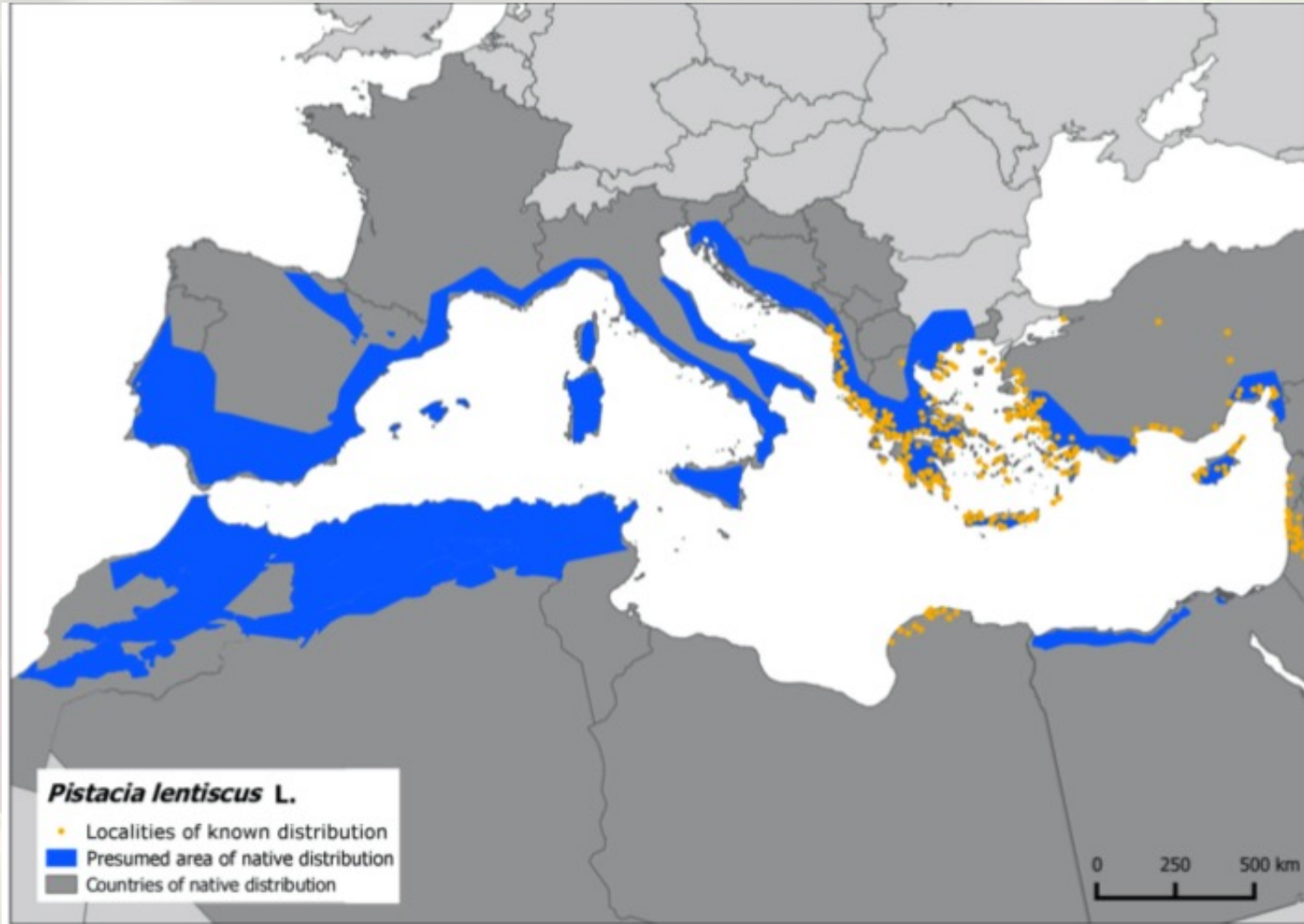


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Pistacia lentiscus L. in Mediterranean



Map from the technical report « Geographic distribution of 24 major tree species in the Mediterranean and their genetic resources », January 2015.

Part of the project "Maximize the production of goods and services of Mediterranean forest ecosystems in the context of global changes", funded by the French Global Environment Facility (FFEM) for the period 2012-2016.



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Pistacia lentiscus L. in Italy

Abruzzo; Basilicata; Calabria; Campania; Emilia-Romagna; Lazio; Liguria; Marche; Molise; Puglia; Sardegna; Sicilia; Toscana; Umbria.



<http://dryades.units.it/floritaly>



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Pistacia lentiscus L. in France

Pyrénées Orientales; Aude; Hérault; Gard; Bouches-du-Rhône; Var; Alpes-Maritimes; Haute-Corse; Corse-du-Sud.

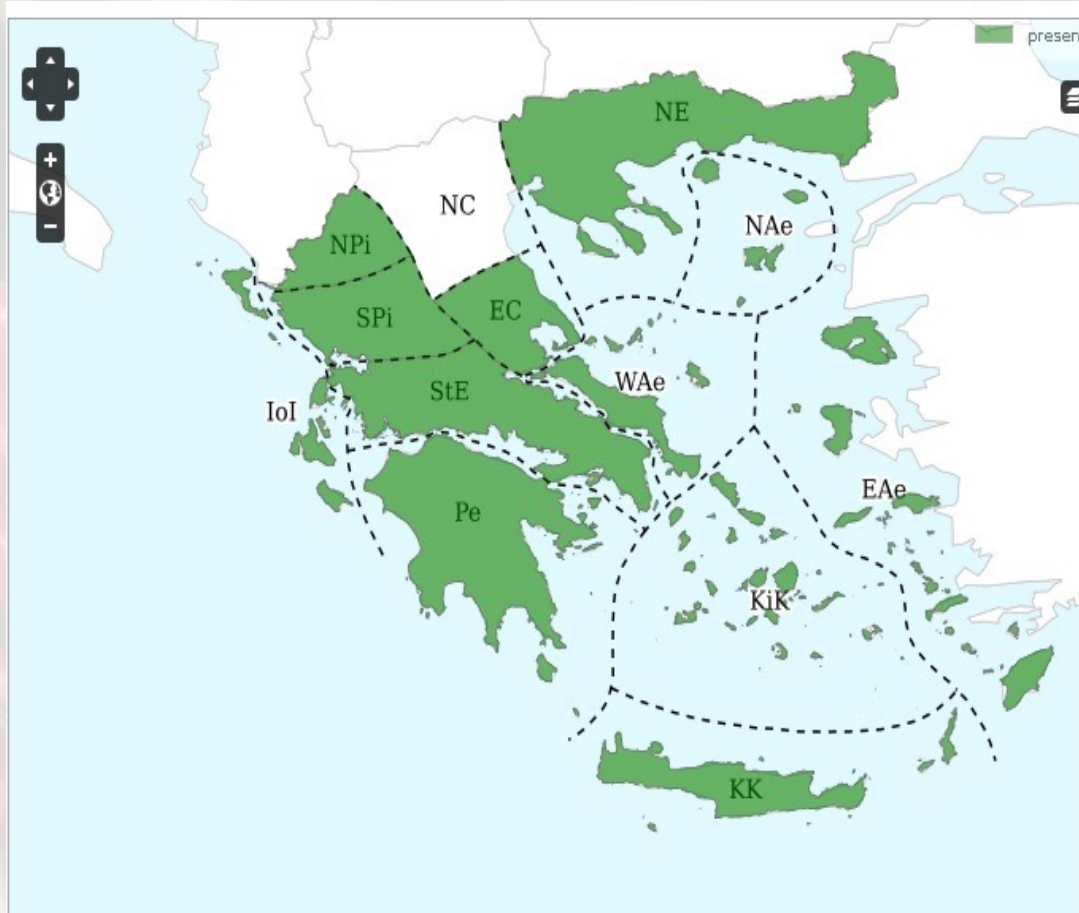


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Pistacia lentiscus L. in Greece



 **Flora of Greece web**
Vascular Plants of Greece
An Annotated Checklist



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<https://portal.cybertaxonomy.org/flora-greece/>



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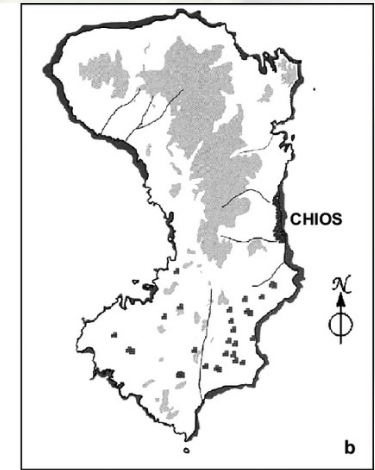
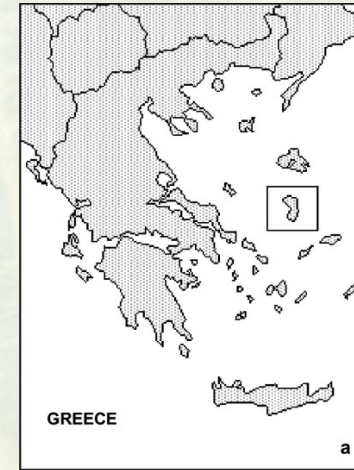


Pistacia lentiscus L. var. *chia*

Synonym: *Pistacia chia* Desf.

Common names: Mastihodendro – μαστιχόδενδρο (Greek), Mastic tree (English), Sakız ağacı (cultivar-cv) (Turkish)

Description: mastic (or mastiha) is secreted only from trees on the southern part of Chios (Figure b), where large-scale mastic production takes place (Figure c – d). Besides the production of mastic, there are some differences with *P. lentiscus*, mainly due to thousands of years of cultivation and selection of the var. *chia*.



Sawidis et al. 2010



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Uses of *Pistacia lentiscus* L. var. *chia*

The mastic gum, is a natural resin extracted from the stem. It is used as a culinary aid to provide flavor for a wide range of traditional foods and in fondants and alcoholic distilled drinks such as the Greek “Mastiha”. It is also used to flavor and stabilize ice cream in some countries of the Middle East.

Mastic has been suggested as a useful bioactive capable of alleviating the inflammation of ulcerative colitis in experimental models (Ostovan et al. 2020).

It has been used for a variety of gastric ailments in the Mediterranean and Middle Eastern countries for at least 3000 years.



Sawidis et al. 2010



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Pistacia x saportae Burnat

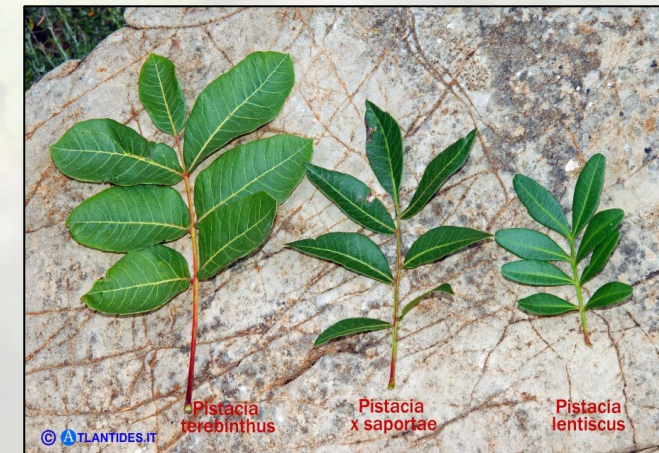
Synonym: *Pistacia saportae* Burnat; *Pistacia hybrida* Gasp.; *Pistacia* × *terebinthoides* H.Lév

Common names: Hybrid Mastic Tree (English), Pistachier hybride (French), Deru baġħal (Maltese), Çetem (Turkish)

Description: it is considered a hybrid between *P. terebinthus* and *P. lentiscus*. It looks very similar to *P. terebinthus* and is often impossible to distinguish them. Normally, hybrids have sterile seeds, and it could be the best physical character to distinguish them in the field; however, the chromosome numbers or other laboratory-based techniques are useful for this purpose. *Pistacia x saportae* has semi-deciduous leaves, with the rachis slightly winged and with an undecided number of leaflets; most leaves end in a leaflet smaller than the lateral ones, narrow and poorly formed. In winter, the leaves turn red without falling, or fall partially. Colored dark red in the cold months, *Pistacia x saportae* has its most elegant appearance.

P. x saportae has been also identified in two localities in Cyprus (Paphos and Larnaka area) in regions where the two parents (*P. terebinthus*, *P. lentiscus*) are common; but rare, no uses reported)

Uses: the plants are important as possible rootstocks for the cultivation of *Pistacia vera*, since they offer resistance to *Verticillium* infections.



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Thanks



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