

# Taxonomic Revision of the Genus *Pistacia* L. (Anacardiaceae)

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## ABSTRACT

*Pistacia* is an economically important genus because it contains the pistachio crop, *P. vera*, which has edible seeds of considerable commercial importance whose value has increased over the last two decades reaching an annual value of about \$2 billion (harvested crop). The taxonomic relationships among its species are controversial and not well understood due to the fact that they have no genetic barriers. The taxonomy of this genus is revised in detail through our research. It includes the following taxa: *Pistacia atlantica* Desf., *P. chinensis* Bunge subsp. *chinensis*, *P. chinensis* subsp. *falcata* (Bess. ex Martinelli) Rech. f., *P. chinensis* subsp. *integerrima* (J.L. Stew. ex Brandis) Rech. f., *P. eurycarpa* Yalt., *P. khinjuk* Stocks, *P. lentiscus* L. subsp. *lentiscus*, *P. lentiscus* subsp. *emarginata* (Engl.) AL-Saghir, *P. mexicana* Humb., Bonpl., & Kunth, *P. X saportae* Burnat, *P. terebinthus* L., *P. vera* L., and *P. weinmannifolia* Poiss. ex Franch. The genus is divided into two sections: section *Pistacia* and section *Lentiscella*. A key to the 14 taxa that have been recognized by this study is included. The new combination *P. lentiscus* subsp. *emarginata* (Engl.) AL-Saghir is made, and the names *P. chinensis* subsp. *integerrima* (J. L. Stew. ex Brandis) Rech. F., *P. terebinthus* L., and *P. vera* L. are lectotypified.

**Keywords:** Taxonomy; Phylogeny; *Pistacia*; Anacardiaceae; Genus; *Pistacia vera*

## 1. Introduction

*Pistacia* L. belongs to the family Anacardiaceae (cashew family), order Sapindales [1]. It contains nine species and five subspecies according to the current study.

*Pistacia vera* L. (cultivated pistachio) is by far the most economically important species in the genus. The value of *P. vera* fruits has increased over the last two decades reaching an annual value of about \$2 billion (harvested crop) [2]. It has edible seeds and considerable commercial importance. Pistachios are utilized mostly in the shell, for fresh consumption; processed uses include candy, baked goods, and ice cream. They also have traditional, medicinal, and non-food uses such as toothache relief. The resin is used as a blood-clotting agent in Europe and the Middle East, while husks are used in India for dyeing and tanning. Pistachios have been reported as a remedy for scirrhus and sclerosis of the liver, abscesses, poor circulation, and other medical problems [3]. Currently, Iran, the United States, Turkey, and Syria are the main pistachio producers in the world, contributing over 90% of the world production [2].

Members of the genus are dioecious trees or shrubs

with well-developed vertical resin canals. Leaves are alternate, deciduous or persistent, pinnately compound, but sometimes trifoliolate or unifoliolate, pari- or imparipinnate, membranaceous or leathery. Inflorescences are determinate and terminal or axillary. Flowers are almost always unisexual, radial, small, with well developed staminodes or carpelodes, and apetalous; sepals are usually 5, distinct to slightly connate; stamens are 4 - 5, filaments are very short, usually glabrous, and usually distinct; pollen grains tricolporate or triplicate; carpels are usually 3 and variously connate; ovary superior, with only 1 fertile and well developed carpel; gynoecium asymmetrical and unilocular with apical placentation, ovule 1; stigma capitate. Nectariferous disk present, usually intrastaminal. Fruit a flattened asymmetrical drupe, embryo curved; endosperm scanty or lacking.

*Pistacia* is believed to have originated in Central Asia [4-7]. Two centers of diversity have been described. One comprises the Mediterranean region of Southern Europe, Northern Africa, and the Middle East. The second comprises West and Central Asia [6-9]. The species of the genus occur naturally from North Africa to the Philippines and from Texas to Nicaragua.

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Few systematic studies have been published on this important genus. The first complete classification of the genus was published by Zohary (1952) [10]. Today, there are many questions about Zohary's taxonomic treatment, the status of many of his species, and the accuracy of dividing the genus into four sections. This disagreement is mainly because of little information being available on the phylogeny of the genus. Studies such as the one performed by Zohary (1952) were hampered by the small sampling size, weak representation of the species, and unefficient methods. Consequently, the studies failed to resolve the relationships between species within the genus. Moreover, species of *Pistacia* easily form interspecific hybrids, suggesting close relationships, which limit the previous studies and make the actual level of speciation and relationships within the genus unclear [4]. A better understanding of these relationships is also needed to make the species more useful for plant improvement or genetic studies.

A comprehensive taxonomic revision, utilizing different types of data, is urgently needed for *Pistacia* in order to clarify the phylogenetic relationships between the species and to characterize the collective germplasm. This will provide a framework and guidelines for plant improvement and help to preserve the genetic resources of this important crop, especially since these genetic resources are under threat by extensive forest cutting in their native countries (especially in the Mediterranean countries, and Central and Western Asia).

## 2. Taxonomic History

Linnaeus was the first to establish the genus. In his *Species Plantarum*, Linnaeus (1753) [11] recognized six species of *Pistacia*: *P. lentiscus*, *P. narbonensis*, *P. simaruba*, *P. terebinthus*, *P. trifolia*, and *P. vera*. *Pistacia narbonensis* and *P. trifolia* are synonyms of *P. vera*; *P. simaruba* is *Bursera simaruba* (L.) Sarg. of the closely related Burseraceae.

Prior to Linnaeus, Tournefort (1700) [12] considered *P. lentiscus* a distinct genus, *Lentiscus*, while he classified *P. terebinthus* and *P. vera* under the genus *Terebinthus*.

At present, the most complete taxonomic study is that of Zohary (1952), who included 11 species in the genus and divided them into four sections: *Lentiscella* Zohary (containing *P. mexicana* Humb., Bonpl. & Kunth and *P. texana* Swingle); *Eu Lentiscus* Zohary (containing *P. lentiscus* L., *P. saportae* Burnat, and *P. weinmannifolia* Poiss. ex Franch.); *Butmela* Zohary (containing *P. atlantica* Desf.); and *Eu Terebinthus* Zohary (containing *P. chinensis* Bunge, *P. khinjuk* Stocks., *P. palaestina* Boiss., *P. terebinthus* L., and *P. vera* L.).

Since Zohary's (1952) treatment, several new species have been added to *Pistacia*. Yaltirik (1967a, 1967b) [13,

14] classified *Pistacia* species in Turkey and described a new species, *P. eurycarpa*. This had been called *P. atlantica* var. *kurdica* by Zohary (1952), a synonym. Zohary considered *P. palaestina* as a separate species, whereas Yaltirik (1967a, 1967b) retained it as a variety of *P. terebinthus*. Kokwaro described a new species from East Africa, *P. aethiopica*, in Kokwaro and Gillett (1980).

Fifty-five binomials for *Pistacia* were found in the International Plant Names Index [15], only 14 were recognized by the authors (all those listed in this section). The hybrids will be further discussed in the taxonomic section of this study.

Yi *et al.* (2008) [16] assessed the phylogeny of *Pistacia* using five molecular sets, sequences of nuclear ribosomal ITS, the third intron of the nuclear nitrate reductase gene (*NIA-i3*), and the plastid *ndhF*, *trnL-F*, and *trnC-trnD*. Their molecular data were largely consistent with our independently derived intrageneric classification based on morphology. They recognized the following species: *P. atlantica*, *P. chinensis*, *P. integerrima*, *P. khinjuk*, *P. lentiscus*, *P. mexicana*, *P. palaestina*, *P. saportae*, *P. terebinthus*, *P. texana*, *P. vera*, and *P. weinmannifolia*. Except for *P. palaestina* and *P. texana*, our study recognized these taxa (*P. integerrima* as a subspecies of *P. chinensis*), plus *P. chinensis* subsp. *falcata*, *P. eurycarpa*, and *P. lentiscus* subsp. *emarginata*. *Pistacia* was shown to be monophyletic in all analyses. The two accessions of *P. vera* formed a clade with *P. khinjuk* in all molecular data sets. Some of the ITS and *NIA-i3* sequences of these two species were identical, suggesting a close relationship. Earlier molecular results also suggested a close relationship between them [4-6, 17]. *Pistacia palaestina* was not well separated from *P. terebinthus* in either the plastid or the nuclear DNA data sets, and Yi *et al.* (2008, p. 245) stated that, "*Pistacia palaestina* may need to be merged into *P. terebinthus*." Close relationships between these two species were also suggested by the AFLP and the RAPD results [17-19]. These results are consistent with Engler (1936) [20] and Yaltirik (1967a), along with our classification, in considering *P. palaestina* to be a synonym of *P. terebinthus*. *Pistacia mexicana* and *P. texana* were not distinguishable in plastid restriction analyses [4]. The ITS data suggest that *P. mexicana* and *P. texana* are sister taxa; and the sequence divergence between these two species is low. Our morphological data indicate that there is too little variation to warrant the recognition of two species. *Pistacia saportae* was shown to be a hybrid between *P. lentiscus* (maternal) and *P. terebinthus* (paternal), as others had hypothesized (e.g., Zohary 1952).

Neighbor joining and parsimony analyses were performed on the morphological data for section *Pistacia* using PAUP 4.0 b10 [7,21]. Both analyses show that

Section *Pistacia* contains three groups, the first group includes *P. atlantica*, *P. mutica*, and *P. eurycarpa*, the second includes *P. chinensis*, *P. falcata*, and *P. integerrima* and the third group contains *P. khinjuk*, *P. palaestina*, *P. terebinthus*, and *P. vera*. Neighbor joining and parsimony analyses were performed on the morphological data for section *Lentiscella* using PAUP 4.0 b10 [7,21]. Section *Lentiscella*, as indicated by the two analyses, is monophyletic

### 3. The Genus *Pistacia* and Its Sectional Subdivision

*Pistacia* L., Sp. Pl. 2:1025. 1753. Type: *Pistacia vera* L. Hitchcock and Green, Prop. Brit. Bot.: 191. 1929 (lectotype: not designated. Reg. Veg. 127: 77. 1993). *Pistacia vera* is lectotypified under its treatment below.

*Terebinthus* Mill., Gard. Dict. Abr. Ed. 4. 1754.

*Lentiscus* Mill., Gard. Dict. Abr. Ed. 4. 1754.

*Evrardia* Adans., Fam. Pl. 2: 342. 1763.

Members of the genus are dioecious trees or shrubs with well-developed vertical resin canals. Leaves are alternate, deciduous or persistent, pinnately compound, but sometimes trifoliolate or unifoliolate, pari- or imparipinnate, membranous or leathery. Inflorescences are determinate and terminal or axillary. Flowers are almost always unisexual, radial, small, with well developed stamodes or carpelodes, and apetalous; sepals are usually 5, distinct to slightly connate; stamens are 4 - 5, filaments are very short, usually glabrous, and usually distinct; pollen grains tricolporate or triporate; carpels are usually 3 and variously connate; ovary superior, with only 1 fertile and well developed carpel; gynoecium asymmetrical and unilocular with apical placentation, ovule 1; stigma capitate. Nectariferous disk present, usually intrastaminal. Fruit a flattened asymmetrical drupe, embryo curved; endosperm scanty or lacking.

*Common names*.—Pistache, Pistachio [10].

#### 3.1. Key to the Species of the *Pistacia*

1. Leaves large, 8 - 23 cm long, 5.2 - 23 cm wide.
  2. Leaf rachis not winged.
    3. Leaves coriaceous or becoming coriaceous
      4. Petiole flattened; leaflets 3 - 5, obtuse or mucronulate.....*P. vera*
      4. Petiole rounded, rarely flattened; leaflets (3-)6-11, mucronate.....*P. terebinthus*
    3. Leaves membranaceous.
      5. Petiole angled or rounded; leaflets 1 - 9, acuminate.....*P. khinjuk*
      5. Petiole angled or flattened; leaflets 6 - 15, attenuate.
        6. Leaves imparipinnate.....*P. chinensis* subsp. *falcata*

6. Leaflets paripinnate.
  7. Leaflets broadly lanceolate, 6 - 11.5 cm long, 2 - 4 cm wide, average ratio 3.4-1.....*P. chinensis* subsp. *integerrima*
  7. Leaflets lanceolate, 4 - 10 cm long, 9 - 24 mm wide, average ratio 4.1-1.....*P. chinensis* subsp. *chinensis*
2. Leaf rachis winged.
  8. Leaves coriaceous, to 10 cm long, evergreen.....*P. × saportae*
  8. Leaves membranaceous. 8 - 18.2 cm long, deciduous
    9. Leaflets (1-3-)5-7, 4.5 - 6.5 cm long, 1.5 - 3.8 cm wide, average ratio 2.3-1.....*P. eurycarpa*
    9. Leaflets (5-)7-11, 3 - 7 cm long, 5 - 20 mm wide, average ratio 3.5-1.....*P. atlantica*
  1. Leaves small, 2 - 15.1 cm long, 1.8 - 10 cm wide.
    10. Leaves coriaceous.
      11. Leaflets 4 - 10, mucronate, lacking large distinct veins.....*P. lentiscus* subsp. *lentiscus*
      11. Leaflets 6 - 16, emarginate, with large distinct veins.....*P. lentiscus* subsp. *emarginata*
    10. Leaves membranaceous.
      12. Leaves paripinnate; leaflets (4-6)12-20, often alternate.....*P. weinmannifolia*
      12. Leaves imparipinnate; leaflets 10 - 30, never alternate.....*P. mexicana*.

#### 3.2. *Pistacia* L. sect. *Pistacia*, Zohary, Palestine J. Bot. Jerusalem Ser. 5:194. 1952

*Eu Terebinthus* Zohary, Palestine J. Bot. Jerusalem Ser. 5: 196. 1952. *Terebinthus* Parfitt & Badanes, Proc. Natl. Acad. Sci. USA. 94:7991. 1997. *Pistacia* section *Butmela* is a taxonomic synonym based on *P. atlantica* Desf. *Pistacia* section *Eu Terebinthus* is an illegitimate name, because the epithet in the name of a subdivision of a genus is not to be formed from the name of the genus to which it belongs by adding the prefix *Eu-*(ICBN, Art. 21.3, [22]). *Pistacia* section *Terebinthus* was published without a Latin diagnosis. Type: *Pistacia vera* L.

Deciduous small trees or shrubs; leaves pari- or imparipinnate, rarely trifoliolate or simple; leaflets 4 - 24; rachis winged or wingless; drupes with bony endocarp.

Includes the following species: *P. atlantica* Desf., *P. chinensis* Bunge, *P. eurycarpa* Yaltirik, *P. khinjuk* Stocks, *P. terebinthus* L., and *P. vera* L.

##### 3.2.1. *Pistacia atlantica* Desf., Fl. Atlant. 2:364. 1799

*Lentiscus atlantica* (Desf.) Kuntze, Revis. Gen. Pl. 152. 1891. Type: Probably Algeria, *Desfontaines* (BM) [10]

**(Figure 1).**

*Pistacia chia* Desf., Tabl. Ecol. Bot. 199. 1804. TYPE: not designated.

*Pistacia atlantica* var. *latifolia* DC., Prodr. 2:61. 1825. TYPE: GREECE: Chios, 1822, *Olivier* (G).

*Pistacia mutica* Fisch. & C.A. Mey., Bull. Soc. Imp. Naturalistes Moscou 4:338. 1838. *Lentiscus mutica* (Fisch. & C.A. Mey.) Kuntze, Revis. Gen. Pl. 153. 1891. *Pistacia atlantica* subsp. *mutica* (Fisch. & C.A. Mey.) Rech. f., Fl. Iranica 63:4. 1969. TYPE: AZERBAIJAN: Goygol Rayon, Helenendorf (Goygol), *Serahäzi* (LE).:

*Pistacia cabulica* Stocks, J. Bot. Kew Gard. Misc. 4: 143. 1852. *Pistacia mutica* subsp. *cabulica* (Stocks) Engl. in A. & C. DC., Monogr. Phan. 4:288. 1883. *Pistacia atlantica* subsp. *cabulica* (Stocks) Rech. f. Fl. Iranica 63:5. 1969. TYPE: PAKISTAN: Balochistan, *Stocks*, 1849 (K).

*Pistacia choulettei* Gand., Dec. Pl. Nov. 1:44. 1875. nom. illeg. (based on *P. atlantica* Desf.)

*Pistacia mutica* f. *multijuga* Engl. in A. & C. DC., Monogr. Phan. 4: 288. 1883. TYPE: ARMENIA: *J.N. Szovits* (W).

*Pistacia atlantica* var. *cypricola* H. Lindb., Acta Soc. Sci. Fenn. Ser. B, Opera Biol. 7:20. 1942. *Pistacia mutica* var. *cypricola* (H. Lindb.) H. Lindb., Acta Soc. Sci. Fenn. Ser. B, Opera Biol. 7:22. 1946. TYPE: CYPRUS: presumably a Harald Lindberg specimen at H.

*Pistacia atlantica* f. *oxycarpa* Zohary, Palestine J. Bot. Jerusalem Ser. 5:206. 1952. TYPE: AFGHANISTAN: *Griffith* 1269 (K).

Shrubs or trees, 3 - 15 m high; crown wide, rounded. Leaves deciduous, imparipinnate, 8 - 17.6 cm long, 5.2 - 14 cm wide, membranaceous; petiole flattened; rachis narrowly winged. Leaflets (5-)7-11, 3 - 7 cm long, 5 - 20 mm wide, average ratio 3.5-1, opposite, lower subopposite, lanceolate, obtuse, minutely puberulent; rachis



**Figure 1.** *Pistacia atlantica* tree. The picture shows the species leaves. This species is located in Baqqawaeh, Safawi, Jordan. Bar Scale 1:1000.

minutely puberulent; terminal leaflet 2.7 - 7 cm long, 5 - 20 mm wide, same size or smaller than laterals. Staminate panicles to 7(-11) cm long, often clustered, stout, branched from base, densely flowered, pubescent; flowers red. Pistillate panicles to 15 cm long, subterminal with leaves, stout, branched from base, minutely pubescent; flowers pinkish. Drupes many, red or reddish, 3 mm long, mesocarp fleshy, endocarp bony.

**Phylogeny.**—*P. atlantica* is close and sister to *P. eurycarpa* [7].

**Phenology.**—Flowering December, January, March to May; fruiting March to September.

**Habitat and ecology.**—Stony hillsides, steep dry slopes, limestone and sandstone hills; 30 - 2500 m.

**Use.**—Iran: Galls common, “used for dyeing (black)” (*Lace* 3677, 3678).

**Common names.**—Betoum, Butum (*Zohary* 1952). Cyprus: Gum Tree, Trimithia (*Ecoyomides* 1019). Iraq (Kurdish): Kazwan (*Gillett* 7800, 7940). Libya: Batum (*Keith* 146), Bitam (*Sandwith* 2780; *Sandwith & Simpson* 39730). Pakistan: Gwan (*Ghafour & Goodman* 5164), Khanjak (27 Apr 1888, *Lace*).

**Distribution.**—From the Canary Islands, across North Africa, to Greece, Turkey, and Cyprus, and through the Middle East and Saudi Arabia to Ukraine, Georgia, and Azerbaijan, and Afghanistan and Pakistan.

**Specimens examined.** **AFGHANISTAN. Baluchistan:** Khojak Pass, 04 Nov 1888, *J.F. Duthie* 8627 (BM). **Heart:** between Qala Charak and Chisht, 34° 18'N 64° 00'E, 1800 m, 08 Apr 1962, *K.H. Rechinger* 19192 (MO). **Konar:** Asmar Barikot, 900 m, 1949, *L. Edelberg* 1639 (K). **Paktia:** Kurrum [Karram] Valley, Alisai, 04 Apr 1879, *J.E.T. Aitchison s.n.* (BM, K). **Shalina:** May 19 1879, *JETA* 361 (BM, K). **ALGERIA. Djelfa:** 15 km N of Berriane, 800 m, 23 Jul 1982, *Baxter et al.* 4078 (E). **Batna:** NW foot of Col de Telmet, W of Batna, 1300 m, 21 May 1971, *Davis* 52568 (BM). **Laghouat:** Djebel Amour, between Aflou and El Ghicha, 1350 m, 04 Jun 1975, *Davis* 58745, (BM). **Naama:** Djebel Mekter, near Aïn Safra, 1600 - 2000 m, May 1913, *E. Hartert s.n.* (BM). **Mila:** between Grarem and Mila, 200 m, 22 May 1975, *Davis* 58207A (BM). **Saïda:** Saïda, May 1858, *G. Munby s.n.* (K); near Saïda, 22 May 1852, *B. Balansa* 340 (K). **Tlemcen:** Tlemcen, 1867, *G. Munby s.n.* (K). **Unknown region:** 1803, *Desfontaines s.n.* (BM). **ARMENIA. Szovits** 46 (K); near Shvanidzov, Gerundara Valley, 03 May 1967, *E. Gabrizhan & P. Gambarian s.n.* (K). **AZERBAIJHAN. Zangelan:** between Pircheran and Chari-Mushulag (cult.), 400 m, 09 May 1948, *A. Grossheim et al. s.n.* (MO); between Razadara and frontier with Armenia, 600 m, 10 May 1948, *A. Grossheim et al. s.n.* (MO). **Unknown region:** near Shamkhoz, 130 m, 22 May 1982, *A.K. Shvortsov s.n.* (MO). **CANARY ISLANDS. Gomera:** Hermigua, 24 Apr 1845, *E. Bourgeau*

812 (BM); La Roque, 600 m, Mar 1906, *C.J. Pitard* 545 (MO). **Gran Canaria:** E of Agaete, 100 m, 18 Apr 1981, *Davis* 67350 (E). **Tenerife:** Anaja Hills?, *Cabrera s.n.* (K); Sitio del Pardo, Orotara (cult?), 19 Jun 1899, *R.P. Murray s.n.* (K). **CYPRUS. Kambyli:** 520 ft, 27 Feb 1955, *L.F.H. Merton* 1988 (K). **Neophytos:** 1000 ft, 25 Jul 1967, *S. Ecoyomides* 1019 (K). **EGYPT. Sharqiya:** Tell-el-Kebîr, Jan 1913, *R. Muschler s.n.* (MO). **GEORGIA. Dedoplistskaro:** Vashlovani Forest Reserve, 41° 14'N 46°22'E, 13 May 1999, *J.F. Gaskin* 175, 192 (MO). **GREECE. Crete:** Gorges de Imbros, N of Chora Sfakion, 660 m, 09 May 1984, *R. Deschamps* 9093 (MO). **Do-dekanisos:** Rhodes, near the Acropolis, 18 Apr 1971, *C.C. Townsend* 71/37 (K). **Drama:** 4 km from Paranestion toward Drama, 41°15'N 24°28'E, 220 m, 22 Jun 1988, *Strid et al.* 27266 (E). **Voreio Aigaio:** Lesbos, Apr 1968, *O.M. Bedford s.n.* (BM). **IRAN. Baluchistan va Sistan:** Dilkuna, 6000 ft, 30 Mar 1888, *J.H. Lace* 36777, 3678 (E); 74 - 100 km from Khash-Iranshar road toward Bazman, 1600 m, 29 Apr 1977, *K.H. Rechinger* 54955 (E); between Khash and Iranshahr, 1500 - 1600 m, 16 - 17 May 1948, *K.H. Rechinger & F. Rechinger* 4033 (MO); 17 mi W of Saravan toward Suran, 3900 ft, 18 Mar 1971, *C. Grey-Wilson & T.F. Hewer* 202 (K). **Fars:** 25 km N of Firusabad, 1400 m, 08 Nov 1963, *M.L. Grant* 15032 (MO); 20 - 30 km W of Qir, 1300 m, 02 Apr 1974, *Davis & Bokhari* 56337 (K, MO). **Ilam:** near Nargesi, 12 May 1975, *T. Antonio et al.* 256 (MO). **Kerman:** between Dasht-e-Lut and Jaz Murian, 29°04'N 57°57'E, 1850 m, 19 Apr 1972, *J. Léonard* 5630 (K); near Khabr, W side of Kuh-e-Khabr, 28°51'N 56°23'E, 2300 m, 02 May 1975, *B.S. Parris* 75.298 (E). **Khorasan:** near Jangal, 1500 m, 01 Jun 1963, *G. Popov* 233 (BM). **IRAQ. Arbil:** Sefin Dagh, 11 Jul 1972, *F. Karim* 39400 (K). **As Sulaymaniyah:** Pir Omar Gudrum, above Qarachitan, 19 Apr 1947, *J.B. Gillett* 7800 (K); Qaradagh, 1000 m, 01 Jul 1948, *G. Chapman* 12312 (K); Qara Dagh Mt., 900 - 1750 m, 23 Apr 1947, *J.B. Gillett* 7940 (K). **Ninawa:** Iskeftendiwar, near Shaikh Adi, 2500 ft, 14 Jul 1933, *Crambquest* 3666 (K). **JORDAN. Ajloun:** Ajloun, 877 m, 24 May 2004, *M.G. AL-Saghir JOR3* (VPI); 960 m, 24 May 2004, *M.G. AL-Saghir JOR4* (VPI); 1092 m, 24 May 2004, *M.G. AL-Saghir JOR6* (VPI); Bair Al Dabaghat, Shobak, 04 Jun 2004, *M.G. AL-Saghir JOR 22, JOR 23* (VPI); 771 m, 04 Jun 2004, *M.G. AL-Saghir JOR 20, JOR 21* (VPI); Baq-qawaeh, Safawi, 02 Jun 2004, *M.G. AL-Saghir JOR15a* (VPI); Jebel Salab, W of Ain Labaha, 30°42'N 35°36'E, 1530 m, 24 Apr 1963, *J.B. Gillett* 15844 (K); Wadi above Khasr Amra, 16 Sep 1965, *J. Hemsley s.n.* (K); Nayma, 1017 m, 29 May 2004, *M.G. AL-Saghir JOR8, JOR10* (VPI); near Qasr 'Amra, Azraq Oasis, 25 Apr 1974, *L. Boulos et al.* 7084 (BM, K); Qasr 'Amra, 25 km SW of Azraq Oasis, 14 May 1976, *V. Täckholm et al.* 9168 (K); Umm Qays, 275 m, 29 May 2004, *M.G. AL-Saghir JOR1* (VPI); Wadi AL-Botom, Azraq, 02 Jun 2004, *M.G. AL-Saghir JOR16* (VPI); Wadi AL-Botom, Sahaab, 02 Jun 2004, *M.G. AL-Saghir JOR17* (VPI); 610 m, 02 Jun 2004, *M.G. AL-Saghir JOR18* (VPI); 617 m, 02 Jun 2004, *M.G. AL-Saghir JOR19* (VPI). **LIBYA. Beni Snassen:** 10 km SSW of Berkane, 34°50'N 2°21'W, 630 m, 29 Oct 1993, *S.L. Jury & T.M. Upson* 13056 (BM); Gebel Nefoussa, Ain Zarga, 600 - 700 m, 17 Mar 1970, *Davis* 49685 (E); near Iefren, 700 m, 15 Mar 1970, *Davis* 49540 (E, K); Oroban, N of Senam Ulaad Brekk, 900 m, 11 May 1957, *H.G. Keith* 146 (K). **Gharyan:** Gharyan plateau, near El Rumia, 700 - 750 m, 25 Apr 1939, *N.Y. Sandwith* 2780 (K). **Yafran:** Jefren [Yafran], near Rumia, 25 Apr 1939, *N.Y. Sandwith & N.D. Simpson* 39730 (BM). **MOROCCO. Wiwam to Jouner Oum En Rbie,** 1700 m, 18 Jun 1991, *J. Lewalle* 13550 (MO). **Agadir:** Immouzer Valley, N of Agadir, 28 Mar 1972, *D. Bramwell et al.* 280 (K, MO). **Er-Rachidia:** near Gorge du Ziz, N of Er-Rachidia toward Midelt, 32°06'N 04°23'W, 1110 m, 12 Jul 1997, *S. L. Jury et al.* 17804 (BM). **Marrakech:** 63 km from Asni toward Tizi-n-Test, 30°54'N 08°20'W, 1650 m, 20 Jul 1989, *M. Ait Lafkih et al.* 780 (BM); 1 km NNE of Ijoukak, 45 km SW of Asni, 31°01'N 08°09'W, 1170 m, 10 Jul 1993, *S.L. Jury & L.S. Springate* 11959 (BM, K); 65 km from Marrakech toward Tizi-n-Tichka, 31°29'N 07°26'W, 1510 m, 10 Jul 1987, *S.L. Jury et al.* 9157 (BM); Monildikht, between Tizi n'Test and Ichoukak, 5000 ft, 26 Jun 1936, *E.K. Balls* 2938 (BM). **Rabat-Sale:** 12 km SE of Aïn-el-Aouda, 09 May 1968, *G. Mines & J. Veilex s.n.* (MO). **Taroudanut:** Oued Issen, 16 Jun, *H. Lynes 13a & 13b* (BM). **Tiznit:** 11 km from Tafraout toward Titeki, 1250 m, 28 Mar 1969, *P. & J. Davis* 48863 (E); above Tafraout toward pass to Ait-Baha, 1200 m, 30 Mar 1972, *Davis* 53888 (BM); Tazerwalt, Ihlwane, 800 m, 27 Mar 1981, *J. Lewalle* 9731 (BM, MO). **PAKISTAN. Balochistan:** Fort Sandeman [Zhoh], 4500 ft, 17 Jun 1976, *I. Dar & A. Mohd* 5 (MO); Gwâl, 6000 ft, 27 Apr 1888, *J.H. Lace s.n.* (E); Hazarganji, near Quetta, 23 Aug 1962, *R.R. Stewart* 831 (K); Juryi Pass, 28°49'N 66°39'E, 11 May 1990, *A. Ghafoor & S.M. Goodman* 5164 (F); between Loralai and Qila Saifullah, 19 May 1984, *S. Omar & A. Ghafoor* 1635 (MO). **North West Frontier Province:** Ayun, 26 Jul 1976, *M. Shah et al.* 2227 (MO); Birmoghlasht, 7 - 8000 ft, 02 Aug 1954, *M.A. Saddiqui & A. Rahman* 26767 (BM); Maroi, between Chitral and Mastuj, 6000 ft, 28 May 1958, *J.D.A. Stainton* 2532 (BM). **PALESTINE. Asher,** 29 Feb and 15 May 1913, *F. Myers* 9239 (K); Jerusalem, 29 Mar and 15 May 1913, *J. E. Dinsmore* 9239 (F); 20 Apr 1903, *F. Meyers* 712 (F); Lower Galilee, between Yagur and Tiv'on, 01 Jun 1951, *M. Zohary* 441 (BM, K, MO). **SAUDI ARABIA. Hejaz:** near Suq ar Rubu, S of Taif, 7000 ft, 07 Apr 1977, *I.S. Collette* 258 (K). **Mintaqat Jizan.** Al-Khadra to near Ghamid-Al-Zinad, 15 Jul 1976, *J. Dwyer & A. El-Sheikh*

13772 (MO). **Tabuk:** Jabal Dabbagh, 100 km SW of Tabuk, 3000 ft, 03 Mar 1984, *I.S. Collette* 4785 (K). **SOUTH AFRICA. Ganteng:** Pretoria (cult.), 21 Sep 1961, *coll. unknown* (K). **TUNESIA. Sidi Bouzid:** Marabat Sidi Khaled, between Sidi Bouzid and Maknassi, 01 Apr 1968, *L. Boulos* 273 (MO). **TURKEY. Antalya:** Seldsjuk bridge about 5 km E of Serik 30 m, 23 Apr 1959, *E. Hennipman et al.* 638 (K). **Icel:** Yenege [Yenice], between Tarsus and Adana, 50 ft, 10 Apr 1934, *E.K. Balls* 712 (BM). **Istanbul Ili:** Western Thracia, Tarabya, 50 m, 23 Apr 1961, *K.H. Rechinger* 21958 (MO). **Karabak:** Igdır to Safranbolu, 350 m, 02 Aug 1962, *Davis et al.* 38799 (K, MO). **Mugla Ili:** Bodrum, Musgebi [Ortakent] to Karatoprak, 50 - 100 m, 12 Apr 1965, *Davis* 41003 (K). **UKRAINE. Republika Krym:** Tauria, near Nikita, 100 m, 25 Jul 1967, *A.K. Shvortsov* 82 (MO). **ZIMBABWE. Harare:** Harare, Greenwood Park (cult.), 22 Oct 1937, *R.J. Finlay m140/37* (BM).

### 3.2.2. *Pistacia chinensis* Bunge, Enum, Pl. China Bor. 15. 1833.

Type: "Peking leg. *Bunge*, in Herb, Petropol." [LE] (Zohary 1952, p. 215).

#### 3.2.2.1. *Pistacia chinensis* subsp. *chinensis*

*Pistacia formosana* Matsum., Bot. Mag. (Tokyo) 15:40. 1901. TYPE: not designated.

*Pistacia chinensis* f. *latifoliata* Loes. in Gilg. & Loes., Beih. Bot. Jahrb. Syst. 34, 75:49.1904. TYPE: not designated.

*Pistacia philippinensis* Merr. & Rolfe, Philip. J. Sci. 3: 107.1908. TYPE: not designated. Zohary (1952, p. 215) refers to *Vidal* 1825 from Benguet Province, Luzon, Philippines (K) as an "isotype".

Trees, 4 - 20 m high. Leaves deciduous, paripinnate, 8.2 - 23 cm long, 8 - 20 cm wide, membranaceous; petiole angled or flattened, minutely reddish-pubescent; rachis not winged, minutely reddish-pubescent. Leaflets 8 - 14, 4 - 10 cm long, 9 - 24 mm wide, average ratio 4.1-1, lanceolate, attenuate, apiculate, uppermost opposite, lower usually subopposite, midvein and margin pubescent, becoming glabrate. Staminate panicles to 4 cm long, many-flowered, catkin-like when young, pubescence reddish-brown. Pistillate panicles to 17 cm long, many-flowered, stout, branched from base, minutely puberulent with reddish-brown trichomes, which are longer on younger inflorescences. Drupes green turning red, drying grayish, apiculate, 5 mm long.

**Phylogeny.**—*P. chinensis* is sister to *P. falcata* and *P. integerrima* [7].

**Phenology.**—Flowering April, September, and October; fruiting March, and May to November.

**Habitat and ecology.**—On limestone; 200 - 2500 m.

**Uses.**—China: "large tree, young leaves of which are

eaten by the Chinese" (*A. Henry* 340); "fruit edible (for oil)" (*Sino-British Expedition to Cangshan* 125).

**Common names.**—China: Huang-lien-shur or Huang-m-ya shu [10]; Chinese pistachio [22]; Huang-lien-ya (*Henry* 3402). Taiwan (Japanese): Ransinboku (*Matuda*, 07 Jan 1918).

**Distribution.**—Native to China, Taiwan, and the Philippines.

**Specimens examined.** **CHINA. Beijing:** near Peking [Beijing], 1867, *S.W. Bushell s.n.* (F); *S.W. Williams s.n.* (BM); Tehé-hai, 2500 m, Nov, *Léveillé s.n.* (E); Tongtehoun [Tongtian? 10 km N of Ganzhou?], 2500 m, Apr, *Léveillé s.n.* (E). **Fujian:** *H.H. Chung* 6228 (F); Tiger Hill, Amoy Island, 30 Apr 1923, *H.H. Chung* 1445 (K). **Gansu:** Shuijiawan, Wen Xian, 630 m, 26 May 1992, *X. Wang* 159 (MO). **Guangdong:** Aug 1887, *C. Ford* 308 (K); Lian Xian, 02 Oct 1950, *T. Peixiang* 59618 (MO); S of Linchow, Yang Shan District, Jul-Sep 1932, *T.M. Tsui* 495 (F); near Lo Tsi Tsui, Lin District, 14 Oct 1918, *N.C. Lam s.n.* (MO); Ruyuan, 23 Oct 1956, *C. Wang* 42275 (MO); Yunfu Xian, 22 May 1934, *C. Wang* 37030 (MO). **Guangxi:** Fushi Town, Liuliao, 20 km S of Ronggan, 500 m, 10 May 1997, *P.J. Cribb et al.* 485 (K); Kweilin, 220 m, 1979, *P.P. Wan & K.S. Chow* 79169 (BM, K, MO); Lingyun Xian, 28 Jul 1937, *L. Xinqi* 28776 (MO); Loh Hoh Tsuen, Ling Yün Hsien, 1150 m, 18 May 1933, *A.N. Steward & H.C. Cheo* 443 (BM). **Guizhou:** Holupe, Tungtze, 400 m, 17 May 1930, *Y. Tsiang* 4898 (BM). **Hong Kong:** Kowloon, Tai-Hung Tung, 27 Aug 2002, *S.Y. Hu & K.H. Yung* 514 (K, MO). **Hunan:** Sing-Ch'u, Sintien Hsien, 600 m, 23 Aug 1935, *C.S. Fan & Y.Y. Li* 374 (BM). **Hubei:** W Hupeh [Hubei], Apr 1907, *E.H. Wilson* 380 (BM, E); Oct 1907, *coll. unknown* (BM). Ichang [Yichang], Oct 1887, *A. Henry* 3402 (K). **Jiangsu:** 28 Aug 1995, *W. Wenxiang* 9963 (MO); I-hing, 10 Oct 1979, *W.Z. Fang* 7939 (MO); Jiangsu Botanical Institute (cult.), 08 Nov 1982, *K. Yao* 8535 (MO); Yun-tai-shan, Lian-yun-gang (cult.), 200 m, 22 Sep 19, *K. Yao* 848481 (MO). **Shandong:** Chefoo [Chi-Fu; Yantai], 17 Sep 1880, *F.B. Forbes s.n.* (BM, 2 colls.); Ching Shan, Lao Shan, 600 m, 20 Jul 1930, *C.Y. Chiao* 2834 (E); Pao Shan, near Tsinanfu, 200 m, 20 Sep 1930, *C.Y. Chiao* 3152 (F); Tsing-tao, 29 May 1979, *C.R. Lancaster s.n.* (BM). **Shanghai:** near Shanghai, Apr and May 1887, *W.R. Carles* 275 (E, K); 1873, *C. Cooper* 275 (K). **Sichuan:** Bai Di Cheng, 280 m (cult.), 06 Jun 1996, *C. Zhiduan et al.* 96099 (MO); Kuan-hsien, 08 Apr 1938, *W.P. Fang* 12132 (BM); near Techang, 03 Apr 1914, *C. Schneider* 710 (K); Tianci Forest Farm, 960 m, 21 May 1996, *C. Zhiduan et al.* 960417 (MO). **Yunnan:** Cao Xi Temple, Anning, 42 km W of Kunming, 2025 m, 29 Apr 1981, *Sino-British Expedition to Cangshan* 126 (E, K), 127 (E, K); near Guylieangbien and Loulantchean, 30 May 1897, *E. Bodinier* 2304 (E); Liao-mi-lan, near Cali, 19 Jul 1895,

*Delavay* 1953 (K); Lichiang Range, 1933, *H. D. McLaren's collectors* 241c(BM); Lunan Xian, Chang-hu, 24°43'N 103°25'E, 1850 - 2000 m, 02 Aug 1984, *Sino-American Botanical Expedition* 1581 (MO); Merchse, 4500 ft, *A. Henry* 10254A (E); S. loc., 06 Mar 1993, *T. Ceming* 93159 (MO); S. loc., 700 m, 23 Sep 1958, *L. Hanlin* 9938 (MO); S. loc., 21 Aug 1957, *Y.Y. Ho* 27651 (MO); 09 May 1982, *Y. Huagu* 730 (MO); S. loc., 16 Jun 1936, *Z. Jixin* 205 (MO); 22 Jul 1978, *Jurong Group of Nanjing Forestry University Expedition* 7064 (MO); 19 Nov 1931, *C. Naingu* 42986 (MO); 19 Oct 1979, *L. Qinghua* 5072 (MO); S. loc., *Z. Shaoyao* 2218, NA (MO); S. loc., 05 Jul 1958, *Z. Shaoyao* 2381 (MO); S. loc., 680 m, 27 May 1962, *L. Tianwei* 230 (MO); S. loc., 16 Jun 1993, *L. Tianwei & Z. Zhaofen* 258 (MO); S. loc., 29 Aug 1958, *H. Xianyu* 30203 (MO); S. loc., 07 Feb 1996, *H. L. Yin* 6062 (MO); S. loc., 08 May 1996, *L. Yongshan* 96296 (MO); S. loc., 28 Aug 1996, *L. Zhao* 53 (MO); S. loc., 12 Jun 1984, *L. Zhiyou* 72 (MO); S. loc., 300 m, 24 Oct 1963, *L. Linhan & H. Guanzhou* 16476 (MO); S. loc., 15 Aug 1959, *Z. Zhiying* 14018 (MO). **Zhejiang:** Ningpo [Ningbo] District, Aug 1884, *Cooper s.n.* (K); Ou-Kiang, S of Ping Yang, 21 Jun 1924, *R.C. Ching* 1920 (K). **Unknown region:** Kew Kiang [173 mi N of Han-Kow], 1873, *D. Shearer s.n.* (K); Western China, dry valleys, Sep 1903, *E.H. Wilson* 3363(K). **PHILIPPINES. Benguet:** Baguio, Mar 1907, *A.D. E. Elmer* 8779 (BM, MO). **Ifugao:** Bontoc, May 1923, *Zschokke & Laraya* 29400 (BM). **Ilocos Sur:** Oct 1915, *P. de la Peña* 24687 (F). **TAIWAN. Hualien:** Hsiulin, Holiu, 24°10'N 121°30'E, 450 m, 23 Apr 1994, *B.J. Conn & C.-I Peng* 4089 (MO). **Nanshan:** Ilan Hsian, Chi-Lan Shan, 1200 m, 24°38'N 121°28'E, 11 Nov 1993, *S. Clarke et al.* 339 (E). **Nantou:** Hsinyi Hsiang, Chunta Forest Road, 23°39'N 120°52'E, 625 - 695 m, 28 Sep 1994, *K.Y. Yang et al.* 226 (MO). **Tainan:** Nanhsi Hsiang, 150 m, 23°14'N 120°31'E, 04 Apr 1993, *W.P. Leu & W.-M. Wang* 2011 (E); Shishto, E of Kousha, 11 Jul 1912, *W.R. Price* 858bis (K). **Taipei:** Taipei City, Taipei Botanical Garden (cult.?), 25°03'N 121°31'E, 17 May 1996, *C. Liou et al.* 148 (E); Takubun, Jan 1918, *E. Matuda s.n.* (BM). **USA. California:** Berkeley (cult.), 09 Sep 1942, *N.F. Bracelin* 2283 (F); 25 Jun 1944, *coll. unknown* 2597? (F). **Texas:** Houston (cult.), "Ju" 1938, *coll. unknown* (F).

3.2.2.2. *Pistacia chinensis* Bunge subsp. *falcata* (Becc. ex Martelli) Rech. f., Fl. Iranica 63:8.1969

Basionym: *Pistacia falcata* Becc. ex Martelli, Fl. Bogos. 24. 1886. *Rhus falcata* (Becc. & Martelli) Penz., Atti Congr. Bot. Genova 337. 1893. *Pistacia chinensis* var. *falcata* (Becc. ex Martelli) Zohary, Palestine J. Bot. Jerusalem Ser. 5:217. 1952. Type: ERITREA: Keren, sul Monte, Deban frai 1400 - 1700 m, 1870, *Beccari* 273 (HOLOTYPE: FI).

Trees, 4 - 10 m high; twigs minutely brownish-yellow pubescent. Leaves deciduous, imparipinnate, 13 - 21 cm long, 11.4 - 18.2 cm wide, membranaceous; petiole flattened; rachis not winged. Leaflets 11 - 15, 5.2 - 9.1 cm long, 1 - 2 cm wide, average ratio 5.5-1, narrowly lanceolate, falcate, attenuate, glabrous, opposite to subopposite below; terminal leaflet commonly present, 2 - 4 cm long, 5 - 11 mm wide, smaller than laterals or reduced. Staminate panicles to 8 cm long, branched from base, branches spike-like, trichomes pale; flowers yellow, turning red. Pistillate panicles to 15 cm long, not branched from base, stout. Drupes to 7 mm long, greenish-white, turning reddish.

**Phylogeny.**—*P. falcata* is sister to *P. chinensis* and *P. integerrima* [7].

**Phenology.**—Flowering February and April; fruiting February, April to August, and November.

**Habitat and Ecology.**—Savannahs, on calcareous or volcanic soils and old or recent lava flows; 1100 - 2600 m.

**Common Names.**—Somalia: Sisaye (*Glover & Gilliland* 1114), Sisei (*Glover & Gilliland* 1164).

**Distribution.**—Egypt, Saudi Arabia, and Yemen, to Eritrea, Ethiopia, and Somalia.

**Specimens examined. EGYPT. Al Bahr Al Ahmar:** Wadi Haikwal, Gebel Elba, 17 Sep 1936, *M. Drar* 57/884 (K); South Galala, Wadi Rigba, 520 m, 04 Apr 1944, *P.H. Davis s.n.* (BM). **ERITREA. Hamasien:** Monte Zagher, 2600 m, 20 May 1902, *A. Pappi* 5308 (BM, F). **ETHIOPIA. Afar:** about 50 km SW of Awash Station, 700 m, 05 Apr 1966, *W.J.J.O. de Wilde* 10484 (MO). **Amhara:** Fantalle Volcano crater, Awash National Park, 08°59'N 39°55'E, 1500 m, 16 Feb 1970, *J.J.F.E. de Wilde* 6350 (MO); Garibaldi Pass, 28 km W of Metahana, 1100 m, 10 Feb 1974, *J.W. Ash* 2360 (MO); just W of Garibaldi Pass, 08°49'N 39°43'E, 1260 m, 01 Feb 1963, *W. Burger* 3616, 3618 (F); 29 km on Metahana to Nazret road, 8°52'N 39°45'E, 1450 m, 21 May 1980, *M. Thulin et al.* 3875 (MO). **Oromia:** Darro Mts, 18 Nov 1894, *A. Donaldson Smith* 266 (BM); 5 km E of Wolenchetti [Welench iti], 8°04'N 39°30'E, 1300 m, 16 Feb 1965, *W. Burger* 3695 (F). **SAUDI ARABIA. Al-Bahah:** Beni Ghamid, 6500 ft, 14 Jun 1946, *W. Thesiger s.n.* (BM). **Asir:** 5 km S of Abha, 18°11'N 42°29'E, 2050 m, 04 Aug 1982, *U. Baierle & P. König s.n.* (E); Taif, 2000 m, 1985, *A.R. Pittaway s.n.* (BM). **SOMALIA. Sanaaq:** Tabah Gap [Pass], 05 Jul 1945 *P.E. Glover & H. B. Gilliland* 1114 (BM). **Woqooyi Galbeed:** Gan Libah, 5300 ft, 25 Jul 1945, *P.E. Glover & H.B. Gilliland* 1164 (BM). **YEMEN. San'a:** Jebel Bura, near Maghraba, 1700 m, 27 May 1977, *J.R.I. Wood* 1642 (BM); Djebel Dhûrân, 1931, *H. van Wissmann* 1849 (BM); Jebel Melhan, between Markah and Maghraba, 1800 m, 02 Jun 1978, *J.R.I. Wood* 2372 (BM).

3.2.2.3. *Pistacia chinensis* Bunge subsp. *integerrima*  
(J.L. Stew. ex Brandis) Rech. f., Fl. Iranica 63:8.  
1969

Basionym: *Pistacia integerrima* J.L. Stew. ex Brandis, Forest Fl. NW. India 122. t. 22. 1874. *Pistacia chinensis* var. *integerrima* (J.L. Stew. ex Brandis) Zohary, Palestine J. Bot. Jerusalem Ser. 5:216. 1952. Type: not designated, nor are any specimens cited (lectotype, here designated: t. 22, Brandis 1874).

*Rhus kakrasingee* Royle, Ill. Bot. Himal. Mts. 5:175. 1835. *nom. nud.*

*Rhus integerrima* Wall., Numer. List 8474.1847. *nom. nud.*

*Pistacia khinjuk* var. *stocksii* Engl. in A. & C. DC., Monogr. Phan. 4:291. 1883. TYPE: not designated.

*Lentiscus kakrasingee* (Royle) Kuntze, Revis. Gen. Pl. 1:152.1891.

Trees, 6 - 8 m high. Leaves deciduous, usually paripinnate, 11 - 22 cm long, 12 - 23 cm wide, membranaceous; petiole angled or flattened; rachis not winged, reddish-pubescent when young, becoming glabrate. Leaflets 6-(9)-10, 6 - 11.5 cm long, 2 - 4 cm wide, average ratio 3.4-1, opposite to subopposite, broadly lanceolate, attenuate, glabrous. Staminate panicles to 10 cm long, branched from base, branches spike-like, reddish-pubescent, young parts especially pubescent. Pistillate panicles to 16 cm long, branched from base, stout in fruit. Drupes red.

*Phylogeny*.—*P. integerrima* was sister to *P. chinensis* and *P. falcate* [7].

*Phenology*.—Flowering March and April; fruiting April to June.

*Habitat and ecology*.—800 - 2900 m.

*Common names*.—Gusgu, Kakrangche, Kakrat, Kakring, Kakroi, Kanroi, Masua (Afghanistan), Sarawan, Shue, Tungu [10]. Pakistan: Kangar (*Barrett* 64).

*Distribution*.—Armenia, Afghanistan, Pakistan, and Nepal.

*Specimens examined*. **AFGHANISTAN. Paktia:** Kurram [Kurram] Valley, near Shálizán, 06 Apr 1879, *J.E.T. Aitchison* 38 (K). **ARMENIA.** *Szovits* 2510 (BM). **NEPAL.** Purini, Pultanto Dara (cult.?), 7000 ft, 21 Apr 1952, *O. Polunin et al.* 802 (BM). **PAKISTAN. Kashmir:** Bhimber, 2500 ft, 28 Jun 1876, *C.B. Clarke* 28117 (K); M'Tilla, Cabilica (cult.), 27 Mar 1893, *Aitchison* 4 (K). **North West Frontier Province:** Bromboret Gol, Chitral, 35°41'N 71°38'E, 6800 ft, 15 May 1958, *S.A. Bowes Lyon* 651 (BM); Hazara, Bisian, 3000 ft, 24 Apr 1978, *M. Shah & D. Khan* 1808 (K); Hazara, Manchora, 14 May 1976, *M. Shaikat & N. Ahmad* 266 (K); Jaunsar District, Thadyar, 8000 ft, May 1891, *J.S. Gamble* 23024 (K); Jaunsar, Kachanu, 4000 ft, Mar and Jun 1890, *K. Nand* 214 (BM); Swat, Miadam, 6000 ft., 29 May 1976, *M. Shah & D. Khan* 1073 (MO). **Punjab:** *Barrett* 21602 (K);

Banahul, 05 Nov 1848, *J. Thomson s.n.* (K); Harara District, 3000 - 5000 ft, 2003?, *Barrett* 84 (K); Rawalpindi, Margalla Hills, 14 Apr 1976, *I. Dar et al.* 1 (MO). **Unknown region:** *W. Roxburgh s.n.* (BM); Ramaon, Jun 1845, *J. Thomson* 1213 (K); Karrot [Kanof], 2300 ft, 07 May 1969, *S. ul-Abidin* 2775 (MO, 2 colls.).

3.2.3. *Pistacia eurycarpa* Yalt., Notes Roy. Bot. Gard. Edinb. 28:11. 1967

Type: TURKEY: Prov. Bitlis, Bilitus gorge below Tutu, S of Kambos (Humus) Da., 1250 m, 16 Aug 1956, *McNeill* 600 (holotype: E).

*Pistacia atlantica* var. *kurdica* Zohary, Palestine J. Bot. Jerusalem Ser. 5:206. 1952. *Pistacia atlantica* subsp. *kurdica* (Zohary) Rech. F., Fl. Iranica 63:5. 1969. TYPE: not designated.

Shrubs or small trees, to 5 m high. Leaves deciduous, usually imparipinnate, 10.2 - 18.2 cm long, 9 - 13.5 cm wide, membranaceous; petiole flattened; rachis narrowly winged. Leaflets (1-3-) 5 - 7, 4.5 - 6.5 cm long, 1.5 - 3.8 cm wide, average ratio 2.3-1, lanceolate, obtuse, puberulent, margin ciliated to glabrous; terminal leaflet 5.2 - 8 cm long, 2.5 - 4 cm wide. Staminate panicles not seen. Pistillate panicles to 18 cm long, branched from above base, stout. Drupes bright red, wider than long, to 7 mm long and 8 mm wide.

*Phylogeny*.—*P. eurycarpa* is close and sister to *P. atlantica* [7].

*Phenology*.—Flowering season unknown; fruiting May to August, October.

*Habitat and ecology*.—Stony slopes, shale or limestone; 1400 - 1800 m.

*Uses*.—Turkey: "Fruits eaten" (*Sperling et al.* 6787).

*Common names*.—Badwar, Butum, Gazwan, Giwan, Habbat, Khadra, Khayak (Zohary 1952). Turkey: Derehti Sakhus (*Loftus*, 01 Aug 1851); Fistik (*Sperling et al.* 6787); Wann (Kurdish) (*Loftus*, 01 Aug 1851).

*Distribution*.—Turkey, Armenia, Iraq, Iran, Afghanistan, and Pakistan.

*Specimens examined*. **AFGHANISTAN.** 1884-1885, *J. E.T. Aitchison* 1039 (BM). **Farah:** 60 Km SSW of Farahbad, 1600 m, 15 Jul 1969, *J.S. Andersen & I.C. Petersen* 434 (K). **ARMENIA.** Artashatskii region, between Arazdayn and Kiarkii, 26 Jun 1969, *A.L. Takhtajan s.n.* (BM). **IRAN. Fars:** S shore of Daryacheh-e Bakhtegan, 70 km WNW of Neyriz, 29°33'N 53°40'E, 1700 m, 17 Jun 1977, *M.H. Bokhari & J.R. Edmondson* 2093 (E); 3 km W of Saadatabad, 1800 m, 22 May 1964, *M.L. Grant* 15835 (MO). **Gharbi:** 25 km from Sardasht toward Baneh, 1400 m, 21 Oct 1977, *Fliegner & Simmons* 486 (K). **Kermanshah:** Tauk i Girrah, near Kirrind, 01 Aug 1851, *W. K. Loftus s.n.* (BM, 2 colls.). **Kordestan:** 101 km S of Baneh toward Marvan, 1700 m, 22 Oct 1977, *Fliegner & Simmons* 501(K); between Sardasht and Baneh, 1500 m,



09 Jul 1974, *K.H. Rechinger* 49144 1974 (K). **IRAQ. Arbil:** Jebel Baradost, near Diana Rawandiz, 28-29 Jun 1934, *H. Field & Y. Lazar* 942, 944 (F). **Arbil & Dahuk [Erbil & Duhok]:** Serv-i-Rust, 5300 ft, 07 Aug 1956, *B. R. Haley* 102 (BM). **As Sulaymanigah:** Penjuin, 29 May 1932, *B.P. Urazov s.n.* (BM); Penwyn [Penjuin], 1600 m, 28 Aug 1953, *E. Guest* 12944 (K). **Ninawa:** Jebel Khat-chra, near Balad Sinjar, 05 Jun 1934, *H. Field & Y. Lazar* 652, 654 (F); Sheikh Adi, near Ain Sifni, 13 Jun 1934, *H. Field & Y. Lazar* 714 (F). **PAKISTAN. North West Frontier Province:** Markanda, 6000 ft, 20 May 1895, *S.A. Harris* 16013 (BM). **TURKEY. Hakkari:** 9 mi S of Hakkari/Yuksekovia road junction, 1550 m, 08 Jun 1966, *Davis* 44665 (E); above Zap River, 39 km N of Hakkari, 37°53'N 44°02'E, 1530 m, 19 Jul 1985, *C.R. Sperling, et al.* 6787 (E).

### 3.2.4. *Pistacia khinjuk* Stocks, Hooker's J. Bot. Kew Gard. Misc. 4:143. 1852

Type: PAKISTAN: Balochistan ("Beloochistan"), 1849, *Stocks* 719 (K).

*Pistacia acuminta* Boiss. & Buhse, *Nouv. Mém. Soc. Imp. Naturalistes Moscou* 12:53. 1860. TYPE: not designated.

*Pistacia khinjuk* var. *populifolia* Boiss., *Fl. Orient.* 2:7. 1872. TYPE: AFGHANISTAN: Heart, between Heart and Tabas (Iran), 1858, *Bunge* (HOLOTYPE: G).

*Pistacia khinjuk* var. *heterophylla* Engl. in *A. & C. DC. Monogr. Phan.* 4:290. 1883. TYPE: not designated.

*Pistacia khinjuk* var. *glabra* Schweinf. ex Engl. in *A. & C. DC. Monogr. Phan.* 4:292. 1883. TYPE: EGYPT: middle desert, eastern part, *W. Rigbe* (HOLOTYPE: B).

*Pistacia khinjuk* var. *glaberrima* Schweinf. ex Boiss., *Fl. Orient. Suppl.* 154. 1888. TYPE: EGYPT: Al Bahr al Ahmar, Wadi Righbeh, 1887, *Schweinfurth* 228 (HOLOTYPE: G).

*Pistacia khinjuk* var. *microphylla* Boiss., *Fl. Orient. Suppl.* 154. 1888. TYPE: EGYPT: Al Bahr al Ahmar, upper Wadi Rigbeh, *Schweinfurth* 96 (HOLOTYPE: G; ISOTYPE: P).

*Pistacia khinjuk* var. *macrocarpa* Zohary, *Palestine J. Bot. Jersulam Ser.* 5:212. 1952. TYPE: IRAQ: Ninawa, Iskeftendivan, N of Shaaikh Adi, 1933, *E. Guest* 3666 (HOLOTYPE: K).

Trees, 2 - 5(-10) m high. Leaves deciduous, imparipinnate, 11 - 17.7 cm long, 8 - 15.5 cm wide, membranaceous; petiole angled or rounded; rachis not winged. Leaflets 1 - 9, 4.5 - 8.5 cm long, 1.5 - 4 cm wide, average ratio 2.3-1, opposite to subopposite, ovate to broadly ovate, acuminate, glabrous; terminal leaflet 2.9 - 8.5 cm long, 1.2 - 4 cm wide, often larger than laterals. Staminate panicles to 9 cm long, loosely branched, with large, white-pubescent bracts; flowers crimson. Pistillate panicles to 16 cm long, branched from base, stout, minutely

pubescent to glabrous. Drupes red, to 8 mm in diameter.

*Phylogeny.*—The closest relative of *P. vera* [7].

*Phenology.*—Flowering March to May; fruiting April to October.

*Habitat and ecology.*—Rocky limestone slopes, sandy loam, and granite; 400 - 2400 m.

*Uses.*—Afghanistan: "The nuts are roasted and eaten" (*Aitchison* 234, 606). "They make oil from the seeds for lighting" (*Thesiger* 1670). Iraq: "The kernel and the stone is eaten (the flesh of the fruit is bitter and cannot be eaten)" (*Just* 1643). Pakistan: "seeds edible" (*Ghafoor & Goodman* 4586). Saudi Arabia: "red berries. edible" (*Collette* 710).

*Common names.*—Gulungoor, Gwun, Khinjuk, Shurumma (Afghanistan), Ushgai Buzgai (Baluchistan) [10]. Iran: Baneh (*Popov* 51/203); Guan (*Léonard* 5889). Iraq: Butum, Gazwan (Kurdish), Habbat (*Just* 1643). Pakistan: Gwan (*Ghafoor & Goodman* 4936); Ushgai (Pushtu) (*Wace* 3693).

*Distribution.*—Turkey south to Egypt and Saudi Arabia and east to Tajikistan, Afghanistan, Pakistan, and Nepal.

*Specimens examined.* **AFGHANISTAN. Paktia:** Kurrum [Kurram] Valley, 23 Nov 1878, *J.E.T. Aitchison* 234 (K); Kurrum [Kurram] Valley, Apr 1879, *J.E.T. Aitchison s.n.* (K); Kurrum [Kurram] Valley, 08 Sep 1880, *J.E.T. Aitchison* 606 (BM). **Konar:** Kargal Valley, 6000 ft, 01 Sep 1956, *W. Thesiger* 1670 (BM). **Unknown region:** *Griffiths* 1270 (K). **EGYPT. Janûb Sîna':** Sinai, 1930, *A. Kaiser* 693 (K); Wadi Thoneimin, near Wadi Islm, 30 mi S of St. Catherines Monastery, 1300 m, 11 Feb 1968, *N. Tadmor* S-74 (MO). **IRAN. Jamal Basiz Mts.,** 7-9000 ft, 05 May 1951, *G. Popov* 51/203 (BM). **Baluchestan:** Zahedan, 19 mi S of Zaboli toward Sarbaz, 4400 ft, 19 Mar 1971, *C. Grey-Wilson & T.F. Hewer* 216 (K). **Kerman:** Kuh-e Khabr, 10 km E of Khabr, 28°49'N 56°25'E, 2400 m, 09 Jun 1977, *Assadi et al.* 1723 (E). **Kerman-shahah:** Bisitun, 34°23'N 47°25'E, 1350 - 1650 m, 23 Jun 1963, *M. Jacobs s.n.* (K). **Hormozgan:** Quest du Jaz Murian, Route vers Bandar Abbas, 27°25'N 57°15'E, 530 m, 28 Apr 1972, *J. Léonard* 5889 (K). **Lurestan:** May 1852, *J. Olguin s.n.* (BM); Sheshom, 32°45'N 48°15'E, 500 - 800 m, 25 Apr 1963, *M. Jacobs* 6417 (E). **Sastan:** Harmuk (cult.), 27 Mar 1964, *M.L. Grant* 15336 (MO). **IRAQ. Arbil:** Rawandiz Gorge, 1500 ft, 20 Apr 1932, *E. V. Just* 2142 (K). **As Sulaymanigah:** Garai Goran-Tawilah-Haraman, 25 Jun 1973, *Weinert & Mousawi s.n.* (F); Jarmo [E of Kirkuk], along wadi W of camp, 30 Apr 1955, *H. Helbaek* 1272 (K). **Dahûk:** Bikhair Mt., near Zakhö (90 km NW of Mosul), 800 - 1200 m, 02 Jul 1957, *A. Rawi* 23063 (K). **Nin:** Tel Sinjar, 14 Nov 1962, *F.A. Barkley & S. Haddad* 3889 (MO). **Ninawa:** Sheikh Adi, N of Mosul, 2750 ft, 10 Oct 1931, *E.V. Just* 1643 (K); near Ain Sifni, 13 Jun 1934, *H. Field & Y. Lazar* 708 (F).

**JORDAN. Ma'an:** Bada, Little Petra, 04 Jun 2004, *M.G. AL-Saghir JOR24* (VPI); Bada, Little Petra, 04 Jun 2004, *M.G. AL-Saghir JOR2* (VPI); Petra, 04 Jun 2004, *M.G. AL-Saghir JOR26* (VPI); Petra, 04 Jun 2004, *M.G. AL-Saghir JOR 27* (VPI). **NEPAL.** Shimi, 28°59'N 82°35'E, 1300 m, 23 Apr 1974, *J.F. Dobremez 2707* (BM). **PAKISTAN. Balochistan:** about 100 km from Bella toward Khuzdar, 07 May 1990, *A. Ghafoor & S.M. Goodman 4936* (F); between Khash and Iranshahr, 1500 - 1600 m, 16 - 17 May 1948, *K.H. Rechinger & F. Rechinger 4025* (MO); about 3 km from Kikin, between Shahrak and Turbat, 13 Mar 1990, *A. Ghafoor & S.M. Goodman 4586* (F); about 18 mi from Larma, 11 Jun 1970, *O. Qaisn et al. 1447* (MO); Onza, between Zhob and Shinghar (cult.), 03 Jul 1988, *T. Ali & T. Ahmed 1063* (BM); Quetta, Lorelei to Harnai, Torkhan Pass above Dilkuna, 1400 m, 14 May 1965, *J. Lamond 1245* (E); Murdar Range, 31 Aug 1942, *J. Sinclair 2144* (E); Wám Tangi Forest, 4000 ft, 05 Apr 1889, *J.H. Lace 3693* (K). **North-West Frontier Province:** Waziristan, *J.D. Hooker 254* (K). **Punjab:** Sufaid Koh, *J.D. Hooker 138* (K). **SAUDI ARABIA. Al Madinah:** Harrat Rahah, 32 km SW of Badiyah, 5600 ft, 27 Apr 1995, *I.S. Collenette 9368* (E). **Hijaz:** Jabal Harb, near Wadi Sawawin, 5000 ft, 03 May 1978, *I.S. Collenette 710* (K). **Tabuk:** Jabal Dubbeagh, 85 km SW of Tabuk, 4500 ft, 23 Apr 1983, *I.S. Collenette 4380* (E, K); NW side of Jabal Dubbeagh, 5500 ft, 22 Mar 1978, *I.S. Collenette 470* (K). **TAJIKISTAN. Leninobad:** near Buldzhuan, along Surkhob River, 11 Jul 1963, *Khamilov s.n.* (K). **TURKEY. Mardin:** Kasrik Bogazi [Gurpindar], 9 - 11 km from Gizre, 400 m, 07 May 1966, *Davis 42652* (E, K). **Siirt:** Baykan to Siirt, 24 Jun 1954, *Davis 22130* (BM); Botan Çay gorge, 19 km from Siirt, 1646 m, 19 May 1966, *Davis 43285* (K).

### 3.2.5. *Pistacia terebinthus* L., Sp. Pl. 2:1025. 1753

*Lentiscus terebinthus* (L.) Kuntze, Revis. Gen. Pl. 153. 1891. Type: Annotated "Terebinthus 4" (in Linnaeus' script). "Hispania 690" (in unknown script). (lectotype, selected here: LINN 1170.4).

*Comments*—Both Stearn (1957) [23] and Jarvis (2007) [24] emphasise the importance of the numbers that Linnaeus wrote on the sheets of many of the specimens in his herbarium for the typification of his names. "Such numbers almost always link these specimens with the corresponding account in the first edition of *Species Plantarum*" (Jarvis 2007: 43). Furthermore, "Stearn, from long study of the herbarium specimens and protologues over many years, reached the conclusion that the presence of such a number provided extremely strong evidence that the collection in question was in Linnaeus' possession by 1753" (Jarvis 2007:44). *Pistacia terebinthus* is species number 4 in *Species Plantarum*, This specimen is not the holotype, as it is not cited in Linnaeus'

protologue.

*Lentiscus vulgaris* Garsault, Trait. Pl. Anim, Med. 1: 63. 1767. TYPE: not designated.

*Pistacia terebinthus* Scop., Fl. Carniol. ed. 2. 2:262. 1771. nom. illeg. (based in part on *P. terebinthus* L. ICBN, Art. 52).

*Pistacia crassifolia* Salisb., Prodr. Stirp. Chap. Allerton 2:172. 1796. nom. illeg. (*P. terebinthus* L. is listed as a synonym; ICBN, Art. 52).

*Pistacia palaestina* Boiss., Diagn. Pl. Orient.Ser. 1, 9: 1. 1849. *Pistacia terebinthus* subsp. *palaestina* (Boiss.) Engl. in A. & C. DC. Monogr. Phan. 4:290. 1883. TYPE: PALESTINE: Galilee, Boissier (LECTOTYPE: G).

*Pistacia terebinthus* var. *angustifolia* Lec. & Lamot. ex Lamot., Prodr. Fl. Plat. Centr. 180. 1877. TYPE: not designated.

*Pistacia terebinthina* St.-Lag., Ann. Soc. Bot. Lyon 7: 132. 1880. nom. illeg. (based on *P. terebinthus* L.; ICBN, Art. 52).

*Pistacia terebinthus* var. *vulgaris* Engl. in A. & C. DC. Monogr. Phan. 4:289. 1883. TYPE: not designated.

*Pistacia terebinthus* var. *macrocarpa* Zohary, Palestine J. Bot. Jerusalem Ser. 5:209. 1952. TYPE: ALGERIA:

Tissemsilt, Col de l'Oued Massin, near Teniet-el-Had, 1871, Chebert (HOLOTYPE: FI).

*Pistacia terebinthus* var. *oxycarpa* Zohary, Palestine J. Bot. Jerusalem Ser. 5:209. 1952. TYPE: TUNISIA: Jebel Ichkeut, 1887, Letourneux (HOLOTYPE: C).

Shrubs or small trees, 2-6(-12) m high. Leaves deciduous, impari- or paripinnate, 10 - 19 cm long, 6 - 19 cm wide, becoming coriaceous; petiole rounded, rarely flattened; rachis not winged. Leaflets (3-) 6 - 11, 3.5 - 8 cm long, 1 - 3.1 cm wide, average ratio 2.7 - 1, opposite to subopposite, ovate to narrowly ovate, mucronate, minutely pubescent to glabrous; terminal leaflet if present 1 - 6 cm long, 5 - 20 mm wide, smaller than laterals. Staminate panicles to 8 cm long, diffusely branched, with large bracts bearing long white trichomes. Pistillate panicles 15(-23) cm long, larger in fruit, stout, minutely puberulent to glabrous, large bracts with long white trichomes soon falling. Drupes reddish, ripening blue.

Phylogeny.—*P. palaestina* and *P. terebinthus* are closely related (they are the same species) [7].

Phenology.—Flowering March to July; fruiting April to October.

Habitat and ecology.—Limestone, dolomite, schist; 225 - 1850 m.

Common names.—Adharia (Arabic), Butum (Arabic), Ela (Hebrew), Scornabecco, Terebinte, Terebintha, Terebinto [7]. Cyprus-turpentine, Pistachier, Térébinthe, Terebinth, Turpentine-tree [22].

Distribution.—Native to the Mediterranean basin, from Spain to Turkey, Croatia, and Bosnia, and Morocco to Saudi Arabia, Jordan, and Syria.

*Specimens examined.* **ALGERIA.** **Ain Defla:** below Ain N'Sour, Tipasa to Miliana, 900 - 1000 m, 30 May 1975, *Davis* 58367 (BM, E). **Bejaïa:** Cap Carbon, near Bejaïa, 250 m, 29 May 1971, *Davis* 52964 (BM). **Djelfa:** near Takesane Forest House, 45 - 50 km SW of Djelfa, 1400 m, 08 Jun 1971, *Davis* 53383 (BM, E). **Sidi Bel Abbès:** near Bossuet, 1300 m, 11 Sep 1929, *A. Faure s.n.* (K). **Tiaret.** Gueurtoafa, near Tiaret, Aug 1846, *Romais s.n.* (BM); Ras el Ain, *Romais s.n.* (BM). **BOSNIA-HERZEGOVINA.** Szovito, 1848, *G. Zohcabése* 100 (K). **CROATIA.** Dalmatia, *Aeschinger s.n.* (K). **Dubrovnik-Neretva:** Narenta [Neretva], *Kargl s.n.* (F). **Istria:** Lavrana, 09 May 1898, *M.F. Spencer s.n.* (F); between Parenzo [Porez] and Revigno [Rovinj], 16 Aug 1922, *W.B. Turritt* 996 (K). **Primorje-Gorski-Kotar:** near Fiume [Rijeka], *Noe* 345 (K); 14 May 1869, *A.M. Smith s.n.* (K); 19 May 1870, *coll. unknown* (K); 29 Aug 1871, *coll. unknown* (K). **Sibenik-Knin:** N of Sibenik, 12 May 1969, *R.K. Brummitt* 6629 (K). **CYPRUS.** Castello Kantara, 18 Apr 1880, *Sintenis & Rigo* 17 (K); Karaman, 300 m, 18 Jul 1994, *DV* 1451 (K); mountain above Kykko Monastery, 1150 m, 11 May, *T.F. Hewer* 4629 (K). **FRANCE.** **Ain:** Culoz, base of Colombier, 08 Jun and 02 Jul 1879, *A. Déséglise* 96 (BM). **Alpes-Maritimes:** Cipières Commune, 580 m, 07 Jun 1994, *F.N. Hepper* 9887 (K); Nice, Coteau du Vinaigrier, 04 May 1862, *Canut* 2 (F); Roquefort Notre Dame, 225 m, *Taton* 2012 (MO); **Ardeche:** 12 mi N of Pont St Esprit, 350 ft, 13 Sep 1953, *P.A. Rawdon* 46 (K). **Gard:** W of Rhône, opposite Avignon, 10 Jun 1952, *J. Soustas* 1247 (K); Vigan, 23 Apr to Jul 1859, *G. Tuezkiewicz s.n.* (F). **Lot:** Cénevieres, 07 Mar 1874, *J.R. Bousquet s.n.* (F); 08 Sep 1872, *L. Giraudias s.n.* (F); between Eleges and St. Denis près Martel, Oct 1990, *coll. unknown* (K). **Hautes Pyrénées:** Gèdre, Rochers d'Agos, 05 Jul 1878, *Bordère s.n.* (F). **Hérault:** Grammont, 14 May 1888, *Cinbract s.n.* (F). **Pyrénées Orientales:** Sorède, 24 Apr to 20 Jun 1900, *L. Conill s.n.* (F). **Unknown region:** Pech de l'Aguel, 09 Jun 1888, *Cinbract s.n.* (F); L'Sauveur, 22 Jun 1886, *Cinbract s.n.* (F). **GREECE.** **Agionoros:** near Stavronikita [Athos Peninsula], 21 Apr 1934, *A.W. Hill et al.* 2559 (K). **Crete:** Gorge de Aradaena, W of Chora Sphakion, 580 m, 10 May 1984, *R. Deschamps* 9018 (MO); La Caneé, Cheriso, 08 Jun 1914, *M. Gandoger* 4375 (MO); Lakki, S of Kania, 08 May 1984, *R. Deschamps* 9059 (MO); Melidosis, 04 Aug 1893, *A. Baldacci* 152 (K); Rethymo, Arkadi, 18 Jun 1914, *M. Gandoger* 5113 (MO). **Dodekanisos:** Rhodes, between Maritsa and Psinthos, 19 May 1983, *K. Boratynska et al.* 189 (K); Mt. Marmara, near Lardos, 13 May 1983, *K. Boratynska et al.* 145 (K). **Drama:** Bozdag, 10 mi NW of Drama, 500 ft, 19 May 1959, *J.D.A. Stainton* 7490 (K). **Kefallonia:** S Cephalonia, 16 Oct 1834, *Schimper & Wiest s.n.* (K). **ITALY.** **Toscana:** Filettole, May 1861, *coll. unknown* (F); Pisan to Pietro and Padule, Apr 1857 and

May 1860, *P. Savi s.n.* (F). **Trentino-Alto Adige:** Riva, May 1872, *Porta s.n.* (K). **Triesta:** Trieste, 1826, *Fleischer s.n.* (K). **Unknown region:** near Benaeum, 230 - 500 m, 17 May 1865, *Porta s.n.* (F, K); Brix, near Benaeum, 2 - 500 m, 25 Apr 1869, *Porta s.n.* (K). **JORDAN.** **Ajloun:** Ajloun, 1029 m, 24 May 2004, *M.G. AL-Saghir JOR05* (VPI); Ajloun, 1032 m, 24 May 2004, *JOR07* (VPI); Ajloun City, 857 m, 24 May 2004, *M.G. AL-Saghir JOR11* (VPI); Ajloun City, 740 m, 29 May 2004, *M.G. AL-Saghir JOR12* (VPI). **Al Balqa':** As-Salt, 830 m, 01 May 1911, *F.S. Myers & J.E. Dinsmore* 52 (K). **Irbid:** Umm Qays, 275 m, 29 May 2004, *M.G. AL-Saghir JOR02* (VPI). **Jerash:** Jerash, 1048 m, 29 May 2004, *M.G. AL-Saghir JOR14a* (VPI); 29 May 2004, *M.G. AL-Saghir JOR14b* (VPI); Nyma, 1017 m, 24 May 2004, *M.G. AL-Saghir JOR09* (VPI). **Ma'an:** Mt. Hor & Petra, Nov 1883 - Feb 1884, *H.C. Hart s.n.* (BM). **LEBANON.** **Al Janub:** Barghoutié [Barghut] valley, near Saida [Sidon], 25 Aug 1857, *Gaillardot* 978 (BM, F). **Beyrouth:** Beirut, 23 May 1871, *G.E. Post* 261 (BM). **Jabal Lubnan:** Aley ['Aleih], 800 m, 19 Apr 1933, *G. Samuelsson* 1116 (MO); Wadi Sistrine above El Hermel, 3000 - 5000 ft, 16 Aug 1945, *P.H. Davis* 9853 (K). **LIBYA.** **Tarabulus:** Suk et Sebet, km 40 between Tripoli and Tarhunan, 300 m, 28 Apr 1963, *Mazzocchi* 1217 (K). **MO-ROCCO.** Beni-Bu-Yahi, Djebel Kerker, 850 - 1000 m, 14 Jun 1933, *Sennen & Mauricio* 8727 (BM); Jebel Tisouka, above Xanen, 900 - 1000 m, 05 Jul 1975, *Davis* 54792 (BM); West Rif, Jbel Lakraa, 35°07'N 5°08'W, 1450 - 1560 m, 11 Jun 1995, *A. Boratynski & A. Romo R-8599/6* (BM); Zarkat, 1250 m, 16 Jul 1927, *Font Quer* 374 (BM); Zerhoun, Jebel Kemfoud, 550 m, 10 May 1929, *E. Jahandiez* 179 (BM). **Beni Mellel:** S of El Ksiba, 01 Aug 1966, *R.M. & A.M. Harley* 855 (BM); between Zaouia Ahanesal and Tilougguite, 1850 m, 15 Jul 1973, *Davis* 55241 (BM). **Moyen Atlas:** Azrou, 1500 m, 08 Aug 1924, *E. Jahandiez* 906 (BM); near Azrou, 25 Jun 1919, *H. Lynes* 123 (BM). **PALESTINE.** Deires Sheikh, 20 Aug 1945, *E. Hardy s.n.* (BM); Jerusalem, 30 May 1902 *F. Meyers* 28 (F); 12 Apr and 09 Jul 1904, *F.S. Meyers* 2028 (F); 22 Apr 1905, *J.E. Dinsmore* 4028 (F); Upper Galilee, Wadi Qarn, 30 May 1926, *A. Eig & M. Zohary s.n.* (MO); Mt. Carmel, 1863-1864, *B.T. Lowe s.n.* (BM); Wadi Fallah (Carmel), 25 Mar 1942, *P.H. Davis* 4180 (K); Wadi Shomaza (Carmel), 18 Aug 1942, *P.H. Davis* 4928 (K). **SAUDI ARABIA.** Grande Lavone, 3000 ft, 04 Apr 1982, *J. Grainger* 447 (E). **Al Madinah:** Jabal Radhua, N of Yenbo [Yanbu 'al Bahr], 6500 ft, 10 Oct 1981, *I.S. Collette* 2896 (K). **SPAIN.** **Granada:** Sierra Nevada, Guejar Sierra, 1000 - 3500 ft. 28 Aug 1846 & Mar 1847, *H.M. Willkomm* 1312 (K). **Jaén:** Jabalcuz, 750 m, 01 Jul 1986, *C. Fernández s.n.* (K). **León:** Villafranca del Bierzo, 06 Jul - 15 Jul 1860, *J. Lange s.n.* (K). **Mallorca:** Gorg Blau, 19 km from Soller toward Pol-

lensa, 500 m, 13 Jul 1969, *L.F. Ferguson & I.K. Ferguson* 2472 (MO). **Oviedo:** Río Salla gorge, 18 km S of Cangas de Onis, 29 Jul 1985, *P. Frost-Olsen* 7471 (MO). **SYRIA. Al Ladiquiah:** below Kessab, 2000 - 2500 ft, 11 May 1945, *F.H. Norris s.n.* (BM). **Al Qunaytirah:** Baniyas [Banaiyas], 05 Apr 1877, *G.E. Post* 426 (BM). **Halab:** mountains between Aleppo & Antioch, *P. Russell s.n.* (BM). **TUNESIA. Bizenta:** Parc National d'Iehkeul, 1978-1979, *J.M. Fay* 1250 (K). **TURKEY. Adana:** Feke, 750 m, 14 Apr 1957, *Davis & Hedge* 26699 (E). **Amasya:** Amasia [Amasya], Mar - Apr 1889, *Bornmüller* 209 (BM). **Antalya:** Gebiz, Pisidie, 1100 m, 27 Jul 1949, *P.H. Davis* 15779 (E); 50 km from Kas toward Finike, 350 m, 30 May 1988, *S. Zmarzty & S. Atkins* 166 (K); Termessos, 900 m, 36°59'N 30°30'E, 25 Sep 1989, *M.P. Frankis* 89.25 (E). **Asia Minor:** Hafis Pasha, 800 m, 12 Apr 1936, *T.A. Tengwall* 282 (K). **Gümüşhane:** near Torul, 10 Sep 1993, *M. Pitman & A. Wickham* 238 (K). **Hatay:** 30 km S of Antioch, 800 m, 08 Jun 1938, *J.E. Dinsmore* 20392 (K); Rabat, 100 m, 05 May 1965, *M.J.E. Coode & B.M.G. Jones* 486 (K). **Kütahya:** Gediz, 850 m, 07 Jul 1962, *Davis & Coode* 36958 (E). **Manisa:** S of Demiroi toward Salihli, 600 m, 20 Jun 1965, *M.J.E. Coode & B.M.G. Jones* 2769 (K). **Mugla:** Hisarönü to Turgut, 50 - 100 m, 15 Apr 1965, *Davis* 41140 (E); Kalkan, 30 m, 30 Mar 1956, *Davis & O. Polunin* 25503 (K). **Sakarya:** W of Adapazari [Sakapari], 50 m, 08 Aug 1962, *Davis & Coode* 39181 (E). **Sinop:** above Gerze, 300 m, 07 Sep 1954, *Davis & O. Polunin* 25010 (BM, E). **Tokat:** Tokat-Niksar, 04 Sep 1954, *Davis & O. Polunin* 24881 (K). **Trabzon:** Sumela Gorge, S of Trabzon, 03 Jun 1977, *C.R. Lancaster s.n.* (BM). **Vilayet:** near Magmur Dag, 400 m, 01 Jun 1963, *C. Tobey* 205 (E).

### 3.2.6. *Pistacia vera* L., Sp. Pl. 2:1025. 1753

*Lentiscus vera* (L.) Kuntze, Revis. Gen. Pl. 153. 1891. Type: illustration, "*Pistacia*." in J. Bauhin, *Historia plantarum*, 1(1): 275. 1650. (lectotype, selected here).

**Comments**—Both Stearn (1957) and Jarvis (2007) strongly make the point that when choosing a lectotype for a Linnean name it is best to choose a specimen rather than an illustration. However, in this case it not possible to do so. None of the specimens of *P. vera* in Linnaeus' herbarium can be used to typify this name. No. 1170.1 (not annotated by Linnaeus) appears to have been added after 1753. No. 1170.2 (annotated "2 narbonensis Kh" [Linnaeus' student Martin Kahler] in Linnaeus' script) is a type of *P. narbonensis*. No. 1170.3 (annotated "*Pistacia* 3" in Linnaeus' script) is from George Clifford's herbarium (BM), but *Hortus Cliffortianus* (Linnaeus 1738) is not cited in his protologue; it is also annotated "an a *P. Terebinthus* diversa? Non es vera" by J.E. Smith and indeed is *P. terebinthus*.

There is a specimen in Joachim Burser's herbarium at

Uppsala (Herb. Burser XXII: 60. UPS) that Linnaeus identified as *P. vera* [26,27]. Burser's herbarium was arranged according to C. Bauhin (1623) (see Stearn 1957: 116-118). Linnaeus consulted Burser's herbarium at the University of Uppsala and entered his identifications of the species into his own copy of a later edition of C. Bauhin (1671) [28]. Linnaeus cited Bauhin in numerous species' protologues in *Species Plantarum*, including that for *P. vera*. Unfortunately, the specimen is unidentifiable: "Junge Zweige, vielleicht von *Pistacia vera* L." (Juel 1936:145).

Three of the references cited by Linnaeus in his protologue contain illustrations. That of J. Bauhin (1650) is the most complete and recognizable as *P. vera*, with leaves, infructescences, and fruits. Lobel (1576:413) is poorer, with leaves and fruits. Tournefort (1700, 3:380; "Cotinus"), with flowers and fruits, is unidentifiable.

*Pistacia trifolia* L., Sp. Pl. 2:1025. 1753. TYPE: not designated.

*Pistacia narbonensis* L., Sp. Pl. 2:1025. 1753. *pro parte* TYPE: see above discussion.

*Pistacia nigricans* Crantz, Inst. Rei Herb. 1:184. 1766. TYPE: not designated.

*Pistacia officinarum* Aiton, Hortus Kew. 3:398. 1789. *nom. illeg.* (*P. trifolia* L. is listed as a synonym; *ICBN*, Art. 52).

*Pistacia variifolia* Salisb., Prodr. Stirp. Chap. Allerton 171. 1796. *nom. illeg.* (*P. trifolia* L. and *P. officinarum* Aiton are listed as synonyms).

*Pistacia reticulata* Willd., Sp. Pl. ed. 4. 4(2):751. 1806. *nom. illeg.* (*P. narbonensis* L. is listed as a synonym).

*Pistacia macrophylla* Pers., Syn. Pl. 2(2):615. 1806. *nom. illeg.* (*P. trifolia* L. is listed as a synonym).

*Pistacia badghysi* K. P. Popov, Izv. Akad. Nauk Turkmen. SSR, Biol. Nauk 5:5. 1978. TYPE: TURKMENISTAN: Mary Welayaty: Kushkam mountains, Shor-Safel, E of Morgunovskiy, 28 Aug 1977. *K. Popov* (holotype: LE; isotype: WIR).

Shrubs or trees, 1 - 5 m high, young branches minutely pubescent. Leaves deciduous, imparipinnate, 10.2 - 17 cm long, 8.4 - 16 cm wide, coriaceous, clustered at ends of branches; petiole flattened; rachis flattened but not winged, minutely pubescent. Leaflets 3 - 5, 4 - 8 cm long, 3 - 5.5 cm wide, average ratio 1.6 - 1, lower often subopposite, ovate to broadly ovate, obtuse or mucronulate, midveins and margins minutely pubescent; terminal leaf-let 6 - 10 cm long, 3 - 8 cm wide, often larger than laterals. Staminate panicles to 5 cm long, forming globose clusters. Pistillate panicles to 5.5 cm long and 2 cm in diameter in flower, cylindrical, minutely pubescent. Drupes reddish to pale green, to 18 mm long and 10 mm wide.

**Phylogeny.**—*P. vera* is sister to *P. khinjuk* [7].

**Phenology.**—Flowering May, June, August, October;

fruiting April to June.

**Common names.**—Pistachio, Pistache, Fistashka (Russian), Pista (Persian), Pistacchio (Italian), Pistacier (French), Fustuq Halabi (Arabic), Botne (Hebrew) [10]. Green almond, Pistachier cultivé, Pistazie, Pistazienbaum, Pisutachio, Alfóncigo, Pistachero [22].

**Distribution.**—Wild *P. vera* is native to the eastern Mediterranean from Turkey to Palestine and Syria, and east to Central Asia (Turkmenistan, Uzbekistan, Afghanistan, Tajikistan, and Kyrgyzstan).

**Specimens examined.** **AFGHANISTAN. Badakhshan:** Faisabad to Meshed [Mashad], Warduj Valley, 30 mi W of Faisabad, 4500 ft, 01 Jun 1964, *P. Furse* 6443 (K). **Badghis:** 150 mi NE of Herat, pass NE of Qala-i-Naw, 4500 ft, 28 Jun 1971, *C. Grey-Wilson & T.F. Hower* 1275 (K). **Baghlan:** Kataghan, Paigah, Kotal, between Pul-i-Khumri [Pol-e Khomri], 35°55'N 68°45'E, and Hai-bak, 36°15'N, 68°03'E, 1500 m, 1967, *K.H. Rechinger* 33910 (K). **Unknown region:** 14 May 1885, *J.E.T. Aitchison s.n.* (K); 03 May 1885, *coll. unknown* 390? (K). **CYPRUS.** Castello Kantara, 18 Apr 1880, *Sintenis & Rigo s.n.* (BM); Limassol, 50 ft (cult.), 20 Apr 1938, *J. Michalides* 360 (K). **KAZAKHSTAN. Vostochnyy Kazakhstan:** Tumkubassk, Kara-Taun [Karatan], upper Konbular Valley near Uvala Ridge, 22 Aug 1939, *A.V. & V.A. Yarmolenko* 112 (MO). **Yuzhnyy:** [Turkestan] Alatan. Dschil Aryk (Roamschlucht), Sep 1876, *A. Regel s.n.* (BM). **PALESTINE.** Jerusalem (cult.), Oct 1908 & 23 Apr 1909, *J.E. Dinsmore* 21942 (F). **SYRIA. Dimashq:** Aïn Tinéh, NE of Damascus. 29 Aug 1856, *Gaillardot* 979 (F). **Halah:** near Aleppo [Halah], *Frere s.n.* (BM). **TAJIKISTAN:** near Dushanbe, 08 Jun 1960, *Romahnof s.n.* (E); 25 May 1960, *Shtsbahkobah s.n.* (MO); 930 m, 24 Jun 1967, *G. Nyehpdn s.n.* (K, MO). **TURKEY. Saniurfa:** Cümçüme, near Samsat, 37°27'N 38°27'E, ca 400 m (cult.), 1983-1984, *N.F. Miller* 886 (K). **TURKMENISTAN. Ahal Welayaty:** Ashkhabad [Ashgabat], 500 - 600 m, 13 May 1975, *V.V. Neketen & E.A. Evahnov s.n.* (BM, K); Badchys [Reserve, Eriolanduz, Marey District], 30 Jul and 10 Aug 1910, *N. Samokisch & N. Androssov* 7428 (K, MO); SW Kopet-Dag Mts, Palvan-Zau [Kora-Kok region], 1975, *N. Belianina & G. Proskuriakova* 165 (MO); W Kopet Dag, W part of valley of Tersakan, 38°23'N 55°57'E, 30 Jun 001, *D. Kurbanov* 776 (MO). **USA. California:** Chico, USDA Plant Introduction Station, (cult.), 10 Aug 1960, *USDA s.n.* (F, 2 colls). **UZBEKISTAN.** Buchara [Bukhara] or Ticket, May 1883, *Regel s.n.* (BM).

### 3.3. *Pistacia* L. sect. *Lentiscella* Zohary, Palestine J. Bot. Jerusalem Ser. 5:194. 1952

*Pro parte Eu Lentiscus* Zohary, Palestine J. Bot. Jerusalem Ser. 5:194. 1952. *pro parte Lentiscus* Parfitt &

Badnes, Proc. Natl. Acad. Sci. USA. 94:7987-7992. 1997. Type: *Pistacia mexicana*.

*Pistacia* section *Eu Lentiscus* Zohary is an illegitimate name because the epithet in the name of a subdivision of a genus is not to be formed from the name of the genus to which it belongs by adding the prefix *Eu-* (ICBN, Art. 21.3). *Pistacia* section *Lentiscus* Parfitt & Badnes was published without a Latin diagnosis.

Small trees or shrubs; leaves evergreen, paripinnate or imparipinnate; leaflets 6-32; rachis narrowly winged.

Includes the following species: *P. lentiscus* L., *P. mexicana* HBK, and *P. weinmannifolia* Poiss. ex Franch.

#### 3.3.1. *Pistacia lentiscus* L., Sp. Pl. 2:1026. 1753

*Terebinthus lentiscus* (L.) Moench, Methodus 345. 1794. Type: Herb. Linn. No. 1170.8 (LINN) (Siddiqi in Jafri & El-Gadi (ed.), *Fl. Libya* 52:3. 1978) (lectotype: LINN 1170.8).

##### 3.3.1.1. *Pistacia lentiscus* subsp. *lentiscus*

*Pistacia messiliensis* Mill., Gard. Dict. ed. 8. n. 6. 1768. *Pistacia lentiscus* var. *massiliensis* (Mill.) Duhamel, Traité Arbr. Arbust. 4:72, 1809. *Lentiscus massiliensis* (Mill.) Fourr., Ann. Soc. Linn. Lyon. Sér. 2, 17:195. 1869. TYPE: not designated (Figure 2).

*Pistacia gummifera* Salisb., Prodr. Stirp. Chap. Allerton 2:172. 1796. *nom. illeg.* (*P. lentiscus* is listed as a synonym; ICBN, Art. 52).

*Pistacia lentiscus* var. *chia* Duhamel, Traité Arbr. Arbust. 4:72, [t. 8. delete] 1809. TYPE: not designated.

*Pistacia lentiscus* var. *angustifolia* DC., Prodr. 2:65. 1825. *nom. illeg.* (*P. messiliensis* Mill. is listed as a synonym).

*Pistacia lentiscus* var. *latifolia* Coss., Notes Pl. Crit. Ser. 1, 54. 1850. TYPE: not designated.

*Pistacia brevifolia* Gand., Dec. Pl. Nov. 1:44. 1875.



Figure 2. *Pistacia lentiscus* subsp. *lentiscus* shrub. This picture shows the sub species subcoriaceous leaves. This species is located in Jerash, Jordan. Scale bar 1:1000.

TYPE: not designated.

*Pistacia subfalcata* Gand., Dec. Pl. Nov. 1:44. 1875.

TYPE: not designated.

*Pistacia multiflora* Gand., Dec. Pl. Nov. 1:44. 1875.

TYPE: ITALY: Pisa: Monte Pisano, near Pisa, *P. Savi* (LY).

*Pisacia lentisca* St.-Lag, Ann. Soc. Bot. Lyon, 7:132. 1880. *nom. illeg.* (based on *P. lentiscus* L.; ICBN, Art. 52).

*Pistacia lentiscus* f. *leptophylla* Albo ex Fiori, Nuov. Fl. Italia 2:117. 1923. TYPE: not designated.

Shrubs or rarely small trees, 1 - 5 m high. Leaves evergreen, usually paripinnate, 2 - 7.5 cm long, 3.4 - 10 cm wide, subcoriaceous; petiole flattened; rachis narrowly winged. Leaflets 4 - 10 (-12), 1.6 - 4.5 cm long, 4 - 17 mm wide, average ratio 2.8 - 1, more or less opposite to subopposite, sessile, ovate to narrowly ovate or elliptical, rarely obovate, mucronate or rarely mucronulate, glabrous, margin thick, undersurface noticeably lighter than upper surface; terminal leaflet rarely present, 1.4 - 2.1 cm long, 4 - 9 mm wide, same size or smaller than laterals. Staminate panicles and racemes axillary, 4 - 5 cm long, greenish, densely-flowered and spike-like when young. Pistillate panicles and racemes axillary, clustered with leaves, to 4 cm long, greenish, spike-like when young. Drupes yellow-green turning crimson, 4 - 5 mm in diameter.

*Phylogeny*.—*P. lentiscus* subsp. *lentiscus* and *P. lentiscus* subsp. *emarginata* (*P. aethiopica*) form a close pair [7].

*Phenology*.—Flowering December to September; fruiting April and July to November.

*Habitat and ecology*.—Scrub, matorral, open oak forest; calcareous gravelly soil, rocky limestone, loamy sand; 0 - 2000 m.

*Common names*.—Akind, Droug, Elath, Hamastiq, Lentischio, Lentisque, Ochinos, Saris, Sondro [7]. Almecegueiralentisco, Arbre au mastic, Chios mastictree, lentisque, Mastixbaum [22]. Canary Islands: Almacigo (*s. coll.* 56). Palestine: Balm (*American Colony* 815); Mastic (*American Colony* 815, *Dinsmore* 4815). Spain: Lentisco (*Schinini & Sánchez García* 30609); Mata (*Martindale* 54, 158). Tunisia: Battum (*Keith* 166).

*Distribution*.—From the Canary Islands across southern Europe from Portugal to Greece and Turkey, across North Africa from Morocco to Egypt and the Middle East.

*Specimens examined*. **ALBANIA**. Vadica to Valona [Vlora], 01 Aug 1892, *A. Baldacci* 189 (K). **ALGERIA**. **Algiers**: Alger [Algiers], May 1849, *P. Jamin s.n.* (F); Algiers, Apr 1857, *coll. unknown* (K); Forêt du Bainem, 13 km W of Algiers, 37°N 03°E, 1000 ft, 14 Jan 1978, *R. P. Croston s.n.* (MO); Hussein-Dey, near Alger [Algiers], 14 Apr 1860, *C. Romain* 1963 (F, 2 colls.). **Boumerdes**:

El Kaddous, 06 Apr 1851, *P. Jamin* 141 (K, 2 colls.).

**Oran**: Oran to Santa-Cruz, 31 Aug 1930, *A. Faure s.n.* (MO); Forêt Moulay-Ismaël, near Tlélât, 27 Jul 1930, *A. Faure s.n.* (MO). **CANARY ISLANDS**. **Fuerteventura**: Rio Palmas, 06 Apr 1859, *R.T. Lowe* 212 (BM); Virgenes de la Peña, *coll. unknown* 56 (BM). **Gran Canaria**: *Findley s.n.* (K); *R.T. Lowe* 54 (BM); El Dragonál, Mar 1846, *E. Bourgeau* 406 (K); Monte Lentiscal, 26 Apr 1894, *R.P. Murray s.n.* (K); 400 m, 01 Feb 1969, *G. Kunkel* 12438 (BM, MO); Tafira, Apr 1897, *A.C. Cook* 523 (F, MO); Tafira Alta, 400 m, 28 Mar 1969, *D. Bramwell* 1096 (E). **CROATIA**. **Cres**: Monte Ossero [Oser], 21 May 1887, *O. Stapf s.n.* (K). **Dalmatia**: Biograd, 23 Apr 1962, *F. Höpflinger s.n.* (F); Molunat, 15 km W of Hercegnovi [Herzegovina], 0 - 30 m, 19 Aug 1977, *P. Frost-Olsen* 1414 (MO). **Dubrovacko-Neretvanska Zupanija**: near Gravosa [Gruz], Lapad Peninsula, 04 Aug 1925, *Turrill W.B.* 1027 (K). **CYPRUS**. near top of Bofarento, 29 Jul 1898, *coll. unknown* (BM); Karaman, 250 m, 8 Jul 1994, *DV* 1450 1 (K); W of Karmakiti, 09 Apr 1967, *Landfenton* 134 (K); Kyrenia, 0 m, 20 Mar 1956, *J. C. Atherton* 1198 (K). **EGYPT**. **Aswan**: Abu Simbel (cult.), Feb 1904, *R. Muschler s.n.* (MO). **Port Said**: Port Said, Feb 1904, *R. Muschler s.n.* (MO). **FRANCE**. **Alpes Maritimes**: Cannes, May 1900, *K.H. Marguerite s.n.* (F); Cap d'Antibes, Nov 1876, *Dyer s.n.* (K); Coteau du Sinaigrié, near Nice, 04 May 1862, *Canul* 842 (F, 2 colls.); Frèjus, 19 Apr 1861, *E. Bourgeau* 109 (F); Menton, Cap Martin, 09 Feb 1869, *coll. unknown* (K); Therebontauae, *coll. unknown* (F). **Bouches-du Rhône**: Aix-en-Provence, May 1854, *E.A. Willmott s.n.* (K). **Hérault**: Pic St. Loup, 10 km E of St. Martin de Londres, 43°46'N 03°49'E, 400 m, 06 Oct 1993, *B. Summers et al.* 6511 (MO). **Orles**: Cousolation, Penchinat, May 1851, *Billot* 1640 (F). **Var**: Brignoles, 10 Nov 1928, *coll. unknown* (F); Le Luc (8ar), Apr 1869, *Faure s.n.* (F); Toulon-sur-mer, Apr 1857, *J. Parseval s.n.* (F). **GREECE**. **Chalkidiki**: head of Cassandra Gulf, 12 Apr 1934, *A.W. Hill et al.* 2608 (K, 2 colls.). **Crete**: Akrotiri, 13 Apr 1914, *M. Gandoger* 3317, (MO); Kisamos, Gonia, 23 Mar 1914, *M. Gandoger* 4709 (MO); Sitia, Toplon, 25 Apr 1914, *M. Gandoger* 357 (MO). **Dodekanisos**: Rhodos, Istrios, Kaiserswald, Jun 1855, *F.W. Areschoug s.n.* (F). **East Macedonia & Thrace**: Kizil Ada, 200 ft, 18 Apr 1937, *H.G. Tedd* 1958 (K). **Evvoia**: Euboea, Sotir Hagios Monestary, near Kymi, 05 Sep 1969, *K.H. Rechinger* 38178 (MO). **Kerkyra**: Corfu [Kerkyra], Castello Hotel, 300 m, 23 Apr 1971, *W.R. Presl* 369 (K). **Kyklades**: Melos [Milos], 300 m, 17 Apr 1976, *A.M. Young* 393 (K). **Notio Aigai**: Sifnos, Profitus Illias, 800 ft, 22 Aug 1963, *Royal Liberty School* 55 (K). **Thespratia**: Epiros, Parga, S of Igoumenitsa, 21 Aug 1964, *B. Verdcourt* 4129 (K). **Voreio Aigai**: Chios, *Aucher-Eloy* 927 (BM). **ITALY**. **Foggia**: Lesina, Apr 1843, *R.C. Alexander s.n.* (K). **Im-**

**peria:** Ospedalletti, between San Remo and Bordighera, Apr 1931, *Metcalfe s.n.* (K, 2 colls.). **Napoli:** Capri, 06 Apr 1892, *M.F. Spencer s.n.* (F); Naples, Kings Park Portici, 1854, *coll. unknown* (K); Pozzuoli, *P. Savi s.n.* (F). **Pisa:** Monte Pisano, 1846, *Maggio s.n.* (F); Pisa, Botanic Garden (cult.), 1863, *H.H. Babcock s.n.* (F). **Reggio di Calabria:** Scilla, 21 Jun 1965, *R.K. Brummitt et al.* 5256 (K). **Sardinia:** Aranci Bay, Apr 1907, *J.S. Gamble* 28269 (K, 2 colls.). **Savona:** Capo di Noli, *coll. unknown* (F). **Unknown region:** (cult.), Mar 1907, *R. Park* 3 (F). **JORDAN. Jerash.** Jerash, Akhasheiba, 503 m, 29 May 2004, *M.G. AL-Saghir JOR13a, JOR13b* (VPI). **LEBANON. Jabal Lubnan:** Beirut, 500 ft, Apr 1945, *F.H. Norris s.n.* (BM). **LIBYA. Al Fatih:** Farzuga, near Barce [Al Marj], 16 Aug 1957, *K. Prichard CYR/57/31* (BM). **Al Jabal Al Akhdar:** Tocra Pass, between Benghazi and Derna [Darnah], 19 Aug 1952, *O. Brittan* 9 (BM); Wadi Kouf, W of Beida [Al Bayda'], 300 m, 28 Mar 1970, *Davis* 50201 (E). **Darnah:** Derna [Darnah], 23 Jul 1908, *T.F.W. Gregory s.n.* (BM, 2 colls.); Ras el Hilal, 500 m, 28 Feb 1958, *H.G. Keith* 626 (K). **MOROCCO. Agadez:** between Cap Ghir and Agadir, 26 Mar 1972, *D. Bramwell et al.* 254 (MO); Immouzer Valley, N of Agadir, 28 Aug 1972, *G. Bramwell et al.* 280 (K, MO). **Agadir:** between Cap Ghiv and Agadir, 26 Mar 1972, *D. Bramwell et al.* 254 (K). **Al Hoceima:** Beni Bu-Frah [Boufrah], 50 m, 05 Jun 1927, *Font Quer* 373 (BM); between Ketama and El Hoceima, 920 m, 16 May 1972, *J. C.M. Alexander & F.K. Kupicha* 235 (BM). **Ben Silmane:** Bouznika, 60 m, 23 Apr 1979, *J. Lewalle* 9019 (BM, 2 colls.). **Beni Mellal:** Afouer to Bin-el-Ouidane, 1300 m, 13 Jul 1973, *Davis* 55163 (BM, MO). **Essaouira:** Djebel Hadid, near Mogadore [Essaouira], Apr - May 1871, *J.D. Hooker s.n.* (K); Mogador [Essaouira], 25 Apr 1859, *R.J. Lowe* 32 (BM); Feb 1934, *A.W. Trethewy* 120 (K). **Fes:** Bir-Tamtam, 12 Nov 1965, *A. Taton* 1669 (BM). **Kenitra:** 10 km SW of Kenitra toward Mehdiya Plage, 34°13'N 6°41'W, 30 m, 27 Oct 1994, *S.L. Jury et al.* 15170 (K). **Khemisset:** Imouzzet-des-Ida-Outanane to Oulma, 500 m, 21 Mar 1969, *P. & J. Davis* 48503 (E). **Marrakech:** 5 km from Asni toward Imlil, 31°12'N 07°58'W, 1285 m, 19 Jul 1989, *M. Ait Lafkih et al.* 683 (BM); Imigdal, 5 km N of Tizi-n-Test, 31°01'N 08°09'W, 2000 m, 06 Apr 1974, *Miller et al.* 778 (BM; MO, 2 colls.); N of Tiz-n-Test Pass toward Marrakech, 31 Mar 1972, *D. Bramwell et al.* 515 (K, MO). **Meknes:** Jebel Zerhoun, above Moulay Idriss, 34°02'N 05°30'W, 1080 m, 23 Oct 1993, *S.L. Jury et al.* 12611 (BM); 9 km E of Moulay Idriss toward Nzala-des-Beni-Ammar, 34°04'N 05°27'W, 600 m, 04 Jun 1994, *S.L. Jury et al.* 14951 (BM). **Nader:** Hemis de Tensaman, 04 Jun 1931, *Sennen & Mauricio* (BM). **Oujda:** near Debdon, 900 - 1000 m, 03 Apr 1928, *E. Wilczek et al.* 170 (MO). **Skhirat-Temara:** Rabat toward Zaen., 200 m, 23 Jun 1992, *J. Lewalle*

13877 (MO); Temara (Rabat), Oued Iquem, 100 m, 13 Mar 1981, *J. Lewalle* 9710 (BM, MO); 50 m, 18 Mar 1984, *coll. unknown* 10893? (BM). **Tanger:** Grottes d'Hercules, NW of Tanga, 35°46'N 05°56'W, 10 m, 16 Oct 1993, *S.L. Jury et al.* 12194 (BM, K); Oued Dliane, E of Tanga toward Sebta, 35°50'N 05°39'W, 5 m, 17 Oct 1993, *S.L. Jury et al.* 12243 (BM); Tangier and Tetuan, Apr 1871, *J.D. Hooker s.n.* (K). **Tetouan:** Djebel Habibi, 1910-1911, *M. Gandoger s.n.* (MO); El Fandek Pass, W of Tetouan toward Zarache, 24 Mar 1972, *D. Bramwell et al.* 42 (K, MO); Ouriba, Apr - May 1871, *J.D. Hooker s.n.* (K); Reraja, Jun 1872, *Rein & von Fritsh* 449 (K). **PALESTINE.** Ahuya Sir Henry Samuel, Sep 1946, *J.L. Gilbert* 36 (K); Bet. Masir, 02 Sep 1903, *F. Meyers* 815 (F); Caiffa [Haifa], 15 Oct 1860, *J.D. Hooker & D. Hanbury s.n.* (K); Jerusalem, 03 May 1907, *J.E. Dinsmore* 4815 (F); Kiryath-Anavim, near Jerusalem, 16 Oct 1933, *A. Eig et al.* 260 (E); Lower Galilee, top of Mt. Tabor, 31 Mar 1954, *D. Jaffe & C. Shenkar s.n.* (MO); Mt. Carmel, 200 m, 28 Mar 1911, *F.S. Meyers & J.E. Dinsmore* 7126 (F); Valley of Ajalon, *American Colony* 815 (MO); Wadi Fallah, Carmel, 16 Feb 1942, *P.H. Davis* 3947 (K). **POR-TUGAL.** Alrantes, Oct 1850, *J. Ball s.n.* (F). **Coimbra:** between Cabo Mondego and Sierra de Boa, 9 km from Viagem, 209 m, 16 Sep 1967, *R. Wilczek* 2464 (MO). **SPAIN. Andalucia:** Sierra de la Cruz, 1000 m, 24 Jul 1925, *coll. unknown* (K). **Cadiz:** Cadiz, 1826, *Pignant s.n.* (K). **Jaén:** Pozoalcón, Cerro Miguel, 900 - 1000 m, 09 Jun 1987, *E. Villanueva et al.* 1042EVG (F); Sierra Morena, Andújar, 15 May 1953, *A. Rodríguez s.n.* (K). **Majorca:** Pollensa, 300 ft, 22 Oct 1934, *G. Martindale* 54 (K); 200 - 300 ft, 27 Jan 1936, *coll. unknown* 158? (K). **Murcia:** Venta de los Pinos, 24 May 1996, *A. Schinini & S. Sánchez García* 30609 (F). **Valencia:** 5 km from Finestrat, 38°35'N 00°12'W, 08 Apr 1993, *C.C.H. Jongkind & R.M.J. Nieuwenhuis* 772 (MO); 5 km from La Nucua and 8 km from Benidorm, 38°35'N 00°08'W, 10 Apr 1993, *C.C.H. Jongkind & R.M.J. Nieuwenhuis* 795 (MO). **SYRIA.** Sep - Oct 1860, *J.D. Hooker & D. Hanbury s.n.* (F); 1863-1864, *B.T. Lowne s.n.* (BM, K). **TUNISIA. Jendouba:** Forêt de l'Oued Zeen, 20 km SE of Tabarka [Tabarqah], 600 m, 14 Jun 1965, *J.W.A. Jansen* 564 (MO); Forêt du Feidja, 20 km W of Ghardimaou, 16 Apr 1965, *J.W.A. Jansen* 166 (MO); Kroumirie, between Les Chenes and Ain Draham, 400 m, 07 May 1984, *Davis* 70025 (E). **Le Kef:** between Nehenh and Le Kef, 1000 ft, 15 Mar 1925, *W.P. Lowe & D.A. Bannerman* 155 (BM). **Siliana:** 14 km from Maktar [Makthar] toward Kairouan, 820 m, 03 May 1975, *Davis & Lamond* 57146 (BM, E). **Zaghuan:** Zriba, on road to Enfidaville, km 72 from Tunis, 18 Sep 1957, *H.G. Keith* 166 (K). **TURKEY. Adana:** Misis, near Adana, 200 ft, 11 Apr 1934, *E.K. Balls* B729 (BM). **Antalya:** [Okulu, 13 Feb 1966, *coll. unknown* 8515 (MO)]; Antalya to Alauya jolu,

20 km from Alanyaya, 23 Feb 1966, *A. Baytop* 8515 (E); Kiremi-thaneler, 15 km SW of Antalya, 40 m, 07 Apr 1959, *E. Hennipman et al.* 136 (K). **Mersin:** between Tarsus and Ulas, 200 m, 05 Apr 1957, *Davis & Hedge* 26417 (BM).

### 3.3.1.2. *Pistacia lentiscus* L. subsp. *emarginata* (Engl.)

AL-Saghir, Comb. Nov.

Basionym: *Pistacia lentiscus*. var. *emarginata* Engl. in *A. & C. DC.*, Monogr. Phan. 286. 1883. Type: SOMALIA: Meid Ahlgeb, 1000 m, 1875, *J.M. Hildebrandt* 1531. (holotype: BM!).

*Pistacia aethiopica* Kokwaro in Kokwaro & Gillett, Kew Bull. 34:755. 1980. TYPE: SOMALIA: Meid Ahlgeb, 1875, *J. M. Hildebrandt* 1531 (HOLOTYPE: K; ISOTYPE: BM!).

Trees or shrubs, 2 - 15 m high. Leaves evergreen, paripinnate, 4 - 10 cm long, 3.8 - 8.4 cm wide, coriaceous; petiole flattened or angled; rachis winged. Leaflets 6 - 16, 1.9 - 4.2 cm long, 6 - 16 mm wide, average ratio 2.6 - 1, subopposite to alternate, ovate to narrowly ovate, rarely obovate, emarginate, glabrous. Staminate panicles to 2.5 cm long, dark red, branched from base, spike-like when young; flowers reddish. Pistillate panicles to 5.5 cm long in fruit, branched from base; flowers reddish. Drupes reddish, ca. 5 mm in diameter.

*Phylogeny.*—*P. lentiscus* subsp. *emarginata* (*P. aethiopica*) and *P. lentiscus* form a close pair [7].

*Phenology.*—Flowering January, April, May, and October; fruiting January, February, May, July, and November.

*Habitat and ecology.*—1200 - 2700 m.

*Uses.*—Somalia: “gum called Gubelli” (*Glover & Gilliland* 550).

*Common names.*—Hamar, Heis, Sisaye, Ulaaso (Zohary, 1952). Ethiopia: Borana (*Ash* 2447). Kenya (Masai): Oldaangudwa (*Rammell* 3488). Somalia: Hais (*Glover & Gilliland* 550).

*Distribution.*—East Africa (Ethiopia, Somalia, Kenya, Uganda, Tanzania).

*Specimens examined.* **ETHIOPIA. Oromia:** Neghelle [Negale], 05°20'N 39°40'E, 4850 ft, 22 Jan 1954, *H.F. Mooney* 5607 (K); 27 mi SE of Neghelle, 13 Apr 1974, *J.W. Ash* 2447 (K, MO); 20 km S of Neghelle toward Melka Guba, 1500 m, 18 May 1982, *I. Friis et al.* 3119 (K); 34 km on Negele-Filtu road, 05°15'N 39°47'E, 1650 m, 09 May 1980, *M. Thulin et al.* 3450 (K). **KENYA. Eastern:** Mt. Kulal, Gatab, 1600 m, 21 Nov 1978, *F.N. Hepper & P.M.L. Jaeger* 6972 (K, MO). **Rift Valley:** *J.C. Rammell* 3488 (K); Chyulu hills, 02°34'S 37°48'E, 20 Oct 1969, *J.B. Gillett & F. Kariuki* 18816 (K, MO); Kilima Kiu, 1926, *Mrs. P. Decie s.n.* (BM); 9 mi SE of Narok, 6200 ft, 23 Jul 1957, *C.G. Trapnell* 2339 (K). **Tere:** native reserve, 6200 ft, 1914, *Ms. P. Decie s.n.* (BM). **Un-**

**known region:** *E.R. Napier* 2325 (K). **SOMALIA. Sanaag:** Erigavo, Daloh Forest, 26 Jan 1945, *P.E. Glover & H.B. Gilliland* 550 (BM); Obda doho, Daloh Forest, 07 Jul 1945, *P.E. Glover & H.B. Gilliland* 1129 (BM); Surud [Shimbiris], 2350 m, 17 Jan 1973, *J.J. Lavranos & Horwood* 10359 (E); Surud Forest Reserve, 20 - 24 km NW of Erigavo, 17 Jan 1973, *P.R.O. Bally & R. Melville* 16001 (K, MO). **Woqooyi Galbeed:** Gan Libah, Golis range [Gar Golis], 5400 ft. 16 Jul 1945, *P.E. Glover & H. B. Gilliland* 1162 (BM, K); Libah Mele Mt., above Biyu Suldan [Buja Soldan], 5200 - 5950 ft, 03 Dec 1932, *J.B. Gillett* 4697 (K). **Unknown region:** Meid Ahlgeb, 1100 m, Apr 1875, *J.M. Hildebrandt* 1531 (BM, holotype). **TANZANIA. Arusha:** Gendabi, Mt Hanang, 7500 ft, 10 Feb 1946, *P.J. Greenway* 7690 (K); M'bulu, 17 May 1954, *L. Matalu* 3124 (K). **UGANDA. Karamoja:** Timu forest, 5000 - 6000 ft, Apr 1960, *J. Wilson* 1017 (K).

### 3.3.2. *Pistacia mexicana* Humb., Bonpl. & Kunth, Nov. Gen. Sp. 7:22, t. 608.1824

*Lentiscus mexicana* (Humb., Bonpl., & Kunth) Kuntze, Revis. Gen. Pl. 153. 1891. Type: MEXICO. Guerrero: Chilpancingo, 1825, *Bonpland* (BM).

*Pistacia texana* Swingle, J. Arnold. Arbor. 2:107. 1920. TYPE: TEXAS: Valverde Co.: Rio Grande valley near mouth of Pecos River, near Hinojose Spring, 18 Mar 1911, *S.C. Mason* (HOLOTYPE: US; ISOTYPE: AA).

Trees or shrubs, 2 - 15 m high. Leaves evergreen, clustered towards ends of branches, usually imparipinnate, 5.1 - 15.1 cm long, 1.8 - 5.3 cm wide, membranaceous; petiole flattened; rachis narrowly winged. Leaflets 10 - 30, 1 - 2.5 cm long, 3 - 10 mm wide, average ratio 2.7 - 1, narrowly ovate, slightly falcate, mucronate, glabrous; terminal leaflet 5 - 25 mm long, 3 - 10 mm wide, same size or smaller than laterals. Staminate panicles to 4 cm long, reddish to yellowish, clustered at branch tips with and below expanding leaves, densely flowered, pubescent. Pistillate panicles to 10(-17) cm long in fruit, branches spreading, clustered towards ends of branches below leaves; flowers red. Drupes red, purple, blue, or black, 4 - 5 mm in diameter, pendulous.

*Phylogeny.*—*P. mexicana* and *P. texana* form a close pair (AL-Saghir, 2010).

*Phenology.*—Flowering February, March, May, August; fruiting April to August.

*Habitat and ecology.*—Hillsides, deciduous scrub, dry forest, open pine-oak woods; limestone mountains, calcareous soil over limestone, rocky or gravelly areas; 550 - 2200 m.

*Common names.*—Copall [7]. Mexican Pistachio [22]. Guatemala: Copalillo (*Steyermark* 32975). Mexico: Copál (*Hinton et al.* 10258); Lantrisco (*Wilson M-11*); Tezelpom (Tzeltal, *Ton* 5589).

*Distribution.*—Native to southern Texas, Mexico, Gu-



atemala, and Honduras.

*Specimens examined.* **GUATEMALA. Baja Verapaz:** near Santa Rosa, 1500 m, 04 Apr 1941, *P.C. Standley* 91089 (F); N of Santa Rosa, 30 Mar 1939, *P.C. Standley* 69749 (F). **Chiquimula:** Quetzaltepec, El Guatalón, 900 m, 17 May 1999, *M. Vélez* 99.7046 (BM). **Guatemala:** Estancia Grande, 600 m, 08 Dec 1938, *P.C. Standley* 59171 (F); near Fiscal, 1080 - 1140 m, 12 Dec 1938, *P.C. Standley* 59573 (F); 1100 m, 18 Dec 1940, 80412 (F). **Huehuetenango:** near Aguacatán, near spring of San Juan, 1600 m, 27 Dec 1940, *P.C. Standley* 81370 (F); Ochuptaj, Río Nentón, 15°48'N 91°45'W, 800 m, 30 Nov 1993, *J.J. Castillo & J.A. Castillo* 2081 (F); Puente El Aguilar, E of San Rafael Pézcal, 1730 m, 29 Dec 1940, *P.C. Standley* 81411 (F); above San Sebastián H., 2000 - 2200m, 13 Aug 1942, *J.A. Steyermark* 50518 (F). **Jalapa:** between Jalapa and San Pedro Pinula, 1400 - 1800 m, 12 Nov 1940, *P.C. Standley* 77021 (F); W of San Pedro Pinula, 1000 m, 12 Nov 1940, *P.C. Standley* 77124 (F); near Zapote, 1 mi NE of San Pedro Pinula, 1500 m, 09 Dec 1939, *J.A. Steyermark* 32975 (F). **Quiché:** 1942, *J.I. Aguilar* 846, 1157(F). **HONDURAS. Comayagua:** Rancho Grande, San Luis, 4000ft, 22 May 1932, *J.B. Edwards* P-269 (F). **Francisco Morazán:** between Cantarranas and San Juancito, 722 m, 24 Mar 1957, *A. Molina R.* 7789 (F); Pinares, 20 km W of Cedros, 900 - 1000 m, 28 - 30 May 1976, *C. Nelson & E. Vargas* 3481 (MO); Puente Colorado, N of Tegucigalpa, 900 - 1000 m, 07 Dec 1949, *P.C. Standley* 24932 (F); Quebrada El Chimbo, SW of Tegucigalpa, 1200 m, 17 Mar 1957, *A. Molina R.* 7760 (F); Quebrada la Orejona, 750 m, 24 May 1985, *G. Rodríguez M. s.n.* (MO); Quebrada de Suyapa, near Suyapa, 1100 - 1200 m, Sep - Dec 1948, *P.C. Standley* 12938 (F); Quebrada Suyapa, Aldea de Suyapa, NE of Tegucigalpa, 1200 m, 07 Oct 1948, *A. Molina R.* 1206 (F, MO); 1100 m, 10 Aug 1949, *coll. unknown* 2551?, (F, MO); between Quebrada Tarán and Valle de Angeles, 1300 m, 03 Aug 1962, *A. Molina R.* 11094 (F); near Suyapa, 1200 m, 25 Nov - 14 Dec 1946, *P.C. Standley & L.O. Williams* 1421 (F, 2 colls.); 13 Dec 1946, *L.O. Williams & A. Molina R.* 1421 (F, 2 colls.); Tegucigalpa, 07 May 1975, *M. Erazo* 86 (MO). **Olancho:** Campo Abierto, 960 m, 08 May 1984, *R. Ramos* 109 (MO); 2 km NE San Francisco de la Paz toward Gualaco, 700 m, 04 Apr 1983, *McCarter & Hughes* 4 (MO). **MEXICO. Chiapas:** S of Amatenango del Valle, 5900 ft, 14 Mar 1967, *A.S. Ton* 2144 (F, MO); Arroyo Jeshab, 900 m, 05 Mar 1983, *A.M. Ton* 5589 (MO); 800 m, 20 Apr 1983, *coll. unknown* 5874? (MO); junction of Mexican Highway 190 and road to Bochil and Simjovel, 3400 ft, 10 Apr 1965, *D.E. Breedlove* 9624 (F); above El Chorreadero, 800m, 16 Apr 1972, *D.E. Breedlove* 24568 (F); 4 mi W of Comitán, 5750 ft, 26 Apr 1949, *M.C. Carlson* 1994 (F); 10 km NE of Las Margaritas toward La Soledad, 1700 m, 17 Feb 1973, *D.*

*E. Breedlove* 33391 (MO); Reserva del Ocote, road from Bajada del Macho, to rancho La Cruz, 08 May 1983, *J.I. Calzada et al.* 10098 (F); Trapichito, 1350 m, 02 Jun 1945, *E. Matuda* 15660 (F); 3 km N of Tuxtla Gutiérrez toward El Sumidero, 1800 ft, 07 Apr 1965, *D.E. Breedlove* 9567 (F); 1 km SE of Tzimol toward Uninajob, 16°08'N 92°11'W, 1110 m, 24 Feb 1988, *A. Reyes García et al.* 338 (BM); 5 km SW of Tzimol, 1150 m, 04 May 1988, *A. Reyes García* 483 (BM); 80 km SE of Villa las Rosas toward Tzimol, 800 m, 22 Apr 1987, *E. Martínez & A. Reyes* 20230 (BM). **Coahuila:** Cañon de la Gavia, S of Rancho de la Gavia, 26°18' - 20°N 101°15' - 18'W, 1250 - 2200 m, 02 - 03 Aug 1973, *M.C. Johnston et al.* 12001 (MO); N end of Cañon de la Hacienda, Sierra de la Madera, 27°06'N 102°25'W, 1500 m, 11 May 1973, *M. C. Johnston et al.* 10985 (MO); Cañon de la Madera, 4 km E of Rancho Buena Vista, Sierra de los Guajes, 07 Sep 1941, *R.M. Stewart* 1495 (F); Cañon de Milagro, E side of Sierra de los Guajes, 12 km W of Hacienda de la Encantada, 10 - 16 Sep 1941, *R.M. Stewart* 1509 (F); Mina El Aguirreno, Sierra de la Paila, 26°06'N 101°36'W, 1550 m, 06 Jul 1973, *M.C. Johnston et al.* 11718 (F, MO); Monclova, 06 Aug 1939, *E.G. Marsh* 1982 (F); Muzquiz, 1935, *E. Marsh* 91 (F); Yerda spring, 07 Jul 1936, *coll. unknown* 358? (F); near El Puerto de San Lázero, 16 Jun 1936, *F.L. Wynd & C.H. Mueller* 105 (K, MO); 1 km N of Rancho de la Gavia, Sierra de la Gavia, 26°20'N 101°14'W, 1200 m, 18 Mar 1973, *M.C. Johnston et al.* 10278 (F, MO); 5 km SE of Rancho Cerro de la Madera, Sierra de la Madera, 27°07'N 102°23'W, 1250 m, 20 Sep 1972, *F. Chiang et al.* 9388 (MO); about 2 km SW of Rancho San Miguel, N side of Serranías del Burro, 29°12'N 101°31'W, 575 m, 02 Jun 1972, *F. Chiang et al.* 7502B (UT); Saltillo, 1898, *E. Palmer* 140 (BM, F, MO); Sierra del Carmen, 178 km from Múzquiz, 28°47'N 102°30'W, 1200 m, 20 Aug 1994, *M.A. Carranza et al.* 2107 (MO); 4 km E of San Francisco, 27°30'N 102°33'W, 1450 m, 10 Jun 1972, *F. Chiang et al.* 7605 (MO); Sierra de la Paila, N side just below Mina El San Luis, Aug 1878, *C.C. Parry* 98 (BM, K); Sierra Pata Galana, Mar 1905, *C.A. Purpus* 1117 (F). **Guanajuato:** 10 km N of Atarjea toward Los Cocos, 1100 m, 17 Apr 1989, *E. Ventura & E. López* 6664 (MO); Rancho Beltran, 10 km S of Xichú, 1600 m, 15 Jun 1989, *E. Ventura & E. López* 6782 (MO). **Guerrero:** Chichihualco, 11 km W of Xochipala, toward Filo de Caballo, 1640 m, *E. Martínez S.* 701 (2 colls.); 12 Apr 1982, *coll. unknown* 714? (F); 10.3 mi W of Chilpancingo toward Omiltemi, 1800 m, 27 - 28 Jul 1968, *W. Anderson & C. Anderson* 4916 (MO); San Antonio, 900 m, 06 Jan 1937, *Hinton et al.* 10258 (F, MO). **Hidalgo:** 7 km N of Atotonilco el Grande, 1900 m, 07 May 1981, *R. Hernández M. et al.* 6016 (MO); Barranca de Venados, Metzquititlan, 1800 m, 06 Aug 1979, *R. Hernández M.* 3615 (MO); Jacala, 4500 ft, 13 Jul

1939, V.H. Chase 7445 (F, MO); 1 km N of Jacala, 08 Jun 1987, A. García M. & J. Miller 3192 (F, MO); near Lagunilla, Cerro Santa María, 2200 m, 03 Feb 1971, Rzedowski 28059 (F); near Pedrerito, 28 Apr 1981, D.H. Lorence & D.L. Venable 3341 (MO). **Jalisco:** near El Salto del Río Jiquilpan, 28 Jun 1981, E.J. Lott & J.A. Magallanes 387 (MO); Cerro Viejo, above Santa María Cuyutlán, 1850 m, 22 Jun 1991, T.S. Cochran & M. Cházaro B. 12617 (MO). **Michoacán:** Coalcoman, 1260 m, 09 May 1938, G.B. Hinton et al. 12135 (K); Zitacuaro to La Florida, 21 Jun 1938, G.B. Hinton et al. 11983 (MO). **Nuevo Leon:** below Alamar, about 15 mi SW of Galeana, 45 - 5000 ft, 30 May 1934, C.H. & M.T. Mueller 630 (F); Diente Canyon, near Monterrey, Jul 1933, C.H. & M.T. Mueller 333 (F); 8 km SE of Galeana, toward Linares, 1700 m, 24 Mar 1970, J. Rzedowski 27177 (F); Huajuco Cañon, 35 mi S of Monterrey, 3500 ft, 29 Mar 1954, A.F. Wilson M-11 (F); Lampazos, 21 Jun 1937, M. T. Edwards 286 (F); Montemorelos, Las Adjuntas, 25°18' N 100°08'W, 750 m, 05 Sep 1992, T.F. Patterson et al. 7098 (UT); Monterrey, Pastora, 550 m, Jul 1911, G. Arsène & Abbon 6332 (MO); Rancho Las Adjuntas, Cañon Marisio Arriba, 24 Jun 1935, C.H. Mueller 2040 (BM, F, MO); Sierra Madre near Monterrey, Jun 1888, C. G. Pringle 1930 (F); Monterrey, 1835, C.G. Pringle s.n. (F). **Oaxaca:** Barranca Ceniza, NNW of El Parian, 17° 25'N 97°W, 1500 - 1600 m, 30 May 1992, A. Salinas T. et al. 6906 (MO); Cañada de Carrizalillo, Cerro Verde, 1600 - 1820 m, 17 Jul 1984, P. Tenorio L. et al. 6976 (F); Cerro El Ramón, 1 km W of El Rodeo, 2200 m, 08 Jul 1986, A. García M. et al. 2421 (MO); between Cuicatlán and Telixtlahuaca, 1800 m, 04 May 1978, E. Hernández X. 16746 (F); Hierve el Agua, SW of San Lorenzo Albarradas, 16°52'N 96°17'W, 1760 m, 05 Feb 1986, R.E. Gereau et al. 2038 (MO); Hierve el Agua, E of Mitla, 16°52'N 96°17'W, 1730 m, 23 Apr 1989, S.C. Caran 5 (UT); 8 km E of Ixtlán de Juárez, 03 Apr 1981, R.C. Trigos & D. Lorence 635 (BM, MO); Las Sedas, 1900 m, 19 May 1907, C. Conzatti 1802 (F); Río El Molino, 4.5 km N of Ixtlan, 2000 m, 27 May 1983, R. Cedillo T. & D. Lorence 2327 (MO); San Juan Coatlan, 16°15'N 96°53'W, 1600 m, 18 Apr 1990, A. Campos V. et al. 3018 (F); San Miguel del Río, 1400 m, 18 Aug 1979, F. Ventura A. 16367 (MO); 2.5 km W of Oaxaca-Puerto Escondido highway toward San Sebastián de las Grutas, 1480 m, 16 May 1982, R. Torres C. et al. 452 (MO); 3 km N of Santos Reyes Tepejillo, 17°27'N 97°56'W, 1510 m, 19 Apr 1996, J.I. Calzada 20923 (MO); Sierra de San Felipe del Agua, 24 May 1984, A. Saynes V. 11 (MO); Telixtlahuaca, "Parián-Las Sedas", 17°23'N 97°W, 1500 - 1625 m, 29 May 1992, A. Salinas T. et al. 6882 (MO); Tonaltepec, 1900 m, 26 Mar 1980, F. Gonzalez M. et al. 843 (F). **Puebla:** Agua Socoya, Barranca Agua Palenque, 18°13'N 97°24'W, 2070 m, 14 Mar 2001, P. Tenorio L. 19998

(MO); Cañada de Mamacla, 12 km W of Molcaxac, 04 May 1982, F. González Medrano et al. 12380 (MO); Cerro Mezize, N of San Luis Atolotitlan, 2100 m, 10 Apr 1984, P. Tenorio L. & C. Romero de T. 5771 (F); Colonia San Miguel, 6 km SW of Acatepec, 23 Mar 1980, F. Gonzales M. et al. (MO); Majada Salea, SW of San Simón, 1870 m, 24 Jun 1983, P. Tenorio L. & C. Romero de T. 3957 (MO); Tehuacan, May 1912, C.A. Purpus 5848 (F); near Tehuacan, 5500 ft, 01 Aug 1901, C.G. Pringle 8553 (E, F, K); W of Tehuacán, 02 Aug 1901, J.N. Rose & R. Hay 5858 (K); 5.5 km from Zamarilla toward Magdalena y Clavijero, 18°28'N 97°46'W, 2025 m, J.I. Calzada. 24053 (K). **Queretaro:** Río Moctezuma, 2.5 km S of Casa de Máquinas, Cadereyta, 1120 m, 28 Apr 2000, S. Zamudio et al. 11387 (UT); **San Luis Potosí:** 6 km S of Acatepec, 23 Mar 1980, F. Gonzalez et al. F-734 (MO); Buena Vista, Nov 1911, C.A. Purpus 4889 (F); Minas de San Rafael, May 1911, C.G. Purpus 5362 (F); 8 mi E of San Francisco, 22°03'N 100°32'W, 5500 ft, 05 Jun 1979, W. Hess & L. Byrne 4643 (F). **Tamaulipas:** Cerro de los Armadillos, near San José, 10 Jul 1930, H.H. Bartlett 10206 (F); road to Cerro el Diente de San Carlos, 700 m, 03 Jun 1986, M. Yanez 805 (MO); 10 km S of Padron y Juarez toward Guerrero, 1100 m, 23 Mar 1985, M. Yanez 57 (MO); La Tamaulipeca, near San Miguel, 29 Jul 1930, H.H. Bartlett 10700 (F); near Victoria, 320 m, 01 Feb - 09 Apr 1907, E. Palmer 204 (F, K); between Victoria and Jaumave Valley, 31 May 1898, E.W. Nelson 4445 (F). **Veracruz:** 4 km from Acultzingo toward Orizaba, 2000 m, 28 Jul 1971, Nevling & Gomez-Pompa 2222 (F); Cerro de Achichuca above Tuzamapan-Huatusco highway, 19°23'N 96° 49'W, 600 m, 09 May 1981, A. Vovides & I. Calzada 665 (F). **Unknown region:** 1791, T. Haenke 1007, 1199, 1693 (F). **USA. Texas:** Val Verde Co., Hidden Trail Canyon, NW of Rio Grande about 8 mi below mouth of Pecos River, 18 Feb 1977, A.M. Powell 3055 (UT).

### 3.3.3. *Pistacia weinmannifolia* J. Poiss. ex Franch., Bull. Soc. Bot. France 33:467. 1887

Type: CHINA: "Yun-nan, circa Tapin-tze; fl. mart.; fr. jun. (Delav[ay]. n. 562 [P])."

*Pistacia coccinea* Collett & Hemsl., J. Linn. Soc. Bot. 28:36. 1890. TYPE: MYANMAR: Shan. Shan Hills, 1888, Collett 649 (HOLOTYPE: K).

*Pistacia malayana* M.R. Hend., Gard. Bull. Straits Settlement. 7:97, t. 19. 1933. *Pistacia weinmannifolia* var. *malayana* (M.R. Hend.) Zohary, Palestine J. Bot. Jerusalem Ser. 5:202. 1952. TYPE: MALAYSIA: Perak, Gunung Runto, Lenggong, 1930, Henderson 23,831 (K).

Trees or shrubs, 1 - 15 m high. Leaves evergreen, paripinnate, 5 - 10.2 cm long, 2 - 6.4 cm wide, membranaceous; petiole flattened or angled; rachis narrowly winged. Leaflets (4 - 6)12 - 20, 1 - 3.2(-9) cm long, 5 -

16(-37) mm wide, average ratio 2.6-1, alternate to subopposite, ovate to narrowly ovate, rarely obovate, glabrous, margin revolute. Staminate panicles to 4 cm long, spike-like when young, branches short; flowers bright pink. Pistillate panicles to 10 cm long, clustered among terminal leaves, minutely pubescent; flowers red. Drupes bright green, red when mature, ovoid, to 7 mm long.

*Phylogeny*.—*P. weinmannifolia* is sister to *P. Mexicana* [7].

*Phenology*.—Flowering November to May, July; fruiting December, May to July.

*Habitat and ecology*.—Limestone outcrops; 480 - 2500 m.

*Uses*.—leaves used for making incense (Henry 1913).

*Common names*.—China: Chin hsiang (Henry 1913).

*Distribution*.—Southwestern China, Myanmar, Vietnam, and Malaysia.

*Specimens examined*. **CHINA. Guangxi.** 1.5 km W of Hongdong, NW of Huanjiang, 960 m, 07 Mar 1997, *P.J. Cribb et al.* 433 (K). **Guizhou:** Po Gang, S of Xingyi, 1100 m, 13 Mar 1996, *Z.H. Tsi et al.* 52 (K). **Sichuan:** between Hualinpin and Chinchih sien, 1600 m, 29 Jun 1934, *H. Smith* 10275 (MO); Nin-yüan-fu, 13 May 1922, *H. Smith* 1762 (MO). **Xizang Zizhigu [Tibet]:** Li Liching, Tsékeu, 17 Apr 1891, *R.P. Soulie s.n.* (K); Tsé-Kou, 17 Mar 1912, *Monbeig* 62 (E, K). **Yunnan:** NW, 1907, *Monbeig s.n.* (K); Baihualing, E side of Gaoligong Shan, 1460 m, *coll. unknown* 13953 (F); Chuxiong Xian, near Longtang, 159 km W of Kunming, 25°04'N 101°47'E, 1820 m, 25 Jul 1984, *Sino-American Botanical Expedition* 1251 (E); Cao Xi Temple, Anning, 42 km S of Kunming, 2025 m, 29 Apr 1981, *Sino-British Expedition to Cangshan K127* (E, K); Lao-Koui-Chan, 2500 m, Apr 1923, *E.E. Maire* 4 (K); Lijiang Hillside, 07 Jul 199, *S.Y. Hu & Y.C. Kong* Y1179 (K, MO); Liekiang Valley, 27°30'N, 9000 - 10000 ft, Jun 1913, *G. Forrest* 10153 (E); Lunan, *A. Henry* 9600A (BM); Machang, near Kieonyapin, 20 Feb 1909, *F. Ducloux* 1244 (E); *coll. unknown* 6236? (K); Mengsa, 4500 ft, *A. Henry* 9600, 9600B (K); Shonggui, 2100 m, 01 Jul 1996, *Y. Lou* 43 (K); Szemao, 8000 ft, 05 May, *A. Henry* 11913 (BM). **Unknown region:** 2000 m, 14 May 1988, *C.D. Chu* 1218 (MO); Western China, dry warm valleys, 3000 ft, Jul 1903, *E.H. Wilson* 3367 (BM, K). **MALAYSIA. Selangor:** Bukit Takun, Kanching, 500 ft, 03 Nov 1937, *M Nur* 34398 (BM). **MYANMAR. Tenasserin:** Molodaung Ridge, 480 m, 21 Jan 1927, *R.N. Parker* 2457 (K). **VIETNAM. Cao Bang:** near Ban Lung and Lung Phuc, about 50 km E of Cao Bang, 22°46'N 106°44'E, 650 - 700 m, 25 Nov 1998, *L. Averyanov et al.* 661 (MO); about 39 km SSE of Cao Bang, 22°21'N 106°27'E, 600 m, 03 Dec 1998, *Averyanov et al.* 839 (MO); near Lung Hoai, about 43 km E of Cao Bang, 22°43'N 106°40'E, 600 - 650 m, 28 Nov 1998, *L.A. Averyanov et al.* 746 (MO); near Lung

Mu, about 14 km N of Cao Bang, 22°47'N 106°18'E, 800 m, 13 Dec 1998, *L. Averyanov et al.* 1194 (MO); near Thang Heng and Lung Tao, 650 - 1000 m, 25 May 1997, *L. Averyanov et al.* 4891 (MO). **Hà Giang:** Bat Dai Son, 27°09'N 105°00'E, 1200 - 1250 m, 04 Apr 2000, *D.K. Harder et al.* 5039 (MO); 28°08'N 105°00'E, 1310 m, 06 Apr 2000, *D.K. Harder et al.* 5238 (MO). **Ninh Binh:** Cuc Phoung National Park, 600 m, NE of headquarters, 20°14'N 105°43'E, 20 Dec 1999, *N.M. Cuong et al.* 768 769 (MO).

#### 4. Hybrids

*Pistacia* × *saportae* Burnat, Fl. Alpes Marit. 2:54. 1896. Type: Presumably in Burnat's herbarium at G.

*Pistacia lentisco-terebinthus* Saporta & Marion, Ann. Sci. Nat. Bot. ser. 5, 14(1):2. 1871. *nom. illeg.* (a formula, not a true epithet; *ICBN* Art. H.10.3).

*P. × hybrida* Gasp. ex Parl., Fl. Ital. 5:383. 1875. *nom. illeg.* (a generic name followed by one or more words not intended as a specific epithet; *ICBN* Art. 23.6.b).

*Pistacia lentiscus* × *terebinthus* Saporta & Marion ex Engl. in A. & C. DC., Monogr. Phan. 4:286. 1883. Type: FRANCE: Var: St. Zacharie, *Saporta & Marion* (P).

*Pistacia saportae* var. *oxycarpa* Zohary, Palestine J. Bot. Jerusalem Ser. 5:204. 1952. TYPE: ITALY: Liguria, near Ventimiglia, 1898, *Bickwell* (C).

Shrubs, 2 - 3 m high; branches grayish-brown. Leaves evergreen, imparipinnate, to 10 cm long coriaceous; rachis narrowly winged. Leaflets 7 - 9, to 5.8 cm long and 2.2 cm wide, ratio 2.6 - 1, subopposite, sessile, oblong, often falcate, acute, mucronate, glabrous, upper surface darker, margins slightly revolute; terminal leaflet smaller than laterals, linear-lanceolate. Staminate inflorescences not seen. Pistillate inflorescences clustered in racemes or panicles, to 7.5 cm long. Drupes greenish-pink, globose, 3 - 5 mm in diameter.

*Phenology*.—Flowering March to May; fruiting February, September, and October.

*Habitat and ecology*.—Maquis, calcareous soils; elevation is 450 m.

*Distribution*.—Scattered through the Mediterranean basin where its supposed parent species, *P. lentiscus* subsp. *lentiscus* and *P. terebinthus*, occur. Zohary (1952: 14) discusses several other putative hybrids, but we have seen only those specimens cited below.

*Specimens examined*. **CYPRUS.** Akamas Forest, Feb 1955, *E. Chapman s.n.* (K); between baths of Aphrodite and Fontana Amorosa, 28 Oct 1981, *R.D. Meikle* 5043 (K). **PALESTINE.** Upper Galilee, Nabi Yusha, 16 Sep 1951, *D. Zohary s.n.* (MO); 16 Sep 1951, *D. Zohary & I. Amdursky* 440 (BM, MO). **SPAIN. Tarragona:** Cardó, 450 m, 08 Jun 1946, *Font Quer* 458 (F).

## 5. Excluded and Problematic Species

*Pistacia americana* Mill., Gard. Dict. Ed. 8. N. 7. 1768. = *Simarouba glauca* DC., Ann. Mus. Par. 7:424. 1811 (Simaroubaceae)?

*Pistacia* × *cappadocica* Planch., Bull. Soc. Bot. France 11(Sess. Extraord.):46:?. 1864. = *Pistacia. terebinthus* × *Pistacia. vera*?

*Pistacia cucphuongensis* T.D. Dai, J. Biol. (Vietnam) 3(3):24. 1981. = ? (does not appear to be a *Pistacia*)

*Pistacia fagaroides* Willd., Enum. Pl. Suppl. 66. 1814. = ?

*Pistacia narbonensis* L. Sp. Pl. 2:1025. 1753. *pro parte* = *Pistacia. terebinthus* X *Pistacia. vera*.

*Pistacia nemausensis* Req. ex Planch., Bull. Soc. Bot. France 11(Sess. Extraord.):46:?. 1864. = *Pistacia terebinthus* × *Pistacia vera*.

*Pistacia occidentalis* Baill., Adansonia 11:181. 1874. = *Dacyrodes hexandra* Griseb., Fl. Brit. W.I. 174. 1859.

*Pistacia oleosa* Lour., Fl. Cochinch. 615. 1790. = *Schleichera trijuga* Willd., Sp. Pl., ed. 4. 4(2):1096. 1806. (Sapindaceae). Zohary (1952), as *Schleicheria*.

*Pistacia simaruba* L., Sp. Pl. 2:1026. = *Bursera simaruba* (L.) Sarg., Gard. & Forest 3:200. 1890 (Burseraeae).

*Pistacia vitex* Steud., Nomencl. Bot. 627. 1821. = *Vitex pubescens* Vahl, Symb. Bot. 3:85. 1794 (Lamiaceae).

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