The revision of the genus *Fritillaria* L. (Liliaceae) in the Mediterranean region (Turkey)

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Abstract: This paper presents a systematic revision of *Fritillaria* L. (Liliaceae) in the Mediterranean region of Turkey. The genus used to contain 22 taxa in the Mediterranean region, but in this study it has been evaluated on the basis of 23 taxa. We concluded that *F. armena* Boiss. and *F. zagrica* Stapf are synonyms of *F. pinardii* Boiss. Phylogenetic orders of *F. forbesii* Rix and *F. kittaniae* Sorger in the *Flora of Turkey* were changed. *F. crassifolia* Boiss. & Huet. subsp. *crassifolia* was suggested as an Irano-Turanian element. Red list categories of endemic taxa of Mediterranean *Fritillaria* were revised according to IUCN Red List Categories.

Key words: Turkey, revision, Mediterranean, *Fritillaria*

Akdeniz bölgesi (Türkiye) *Fritillaria* L. (Liliaceae) cinsinin revizyonu


Anahtar sözcükler: Türkiye, revizyon, Akdeniz, *Fritillaria*

Introduction

The species of the *Fritillaria* genus are distributed especially in the Mediterranean regions and eastern parts of Anatolia and Thrace, the Black Sea, and Central Anatolia in Turkey, and in Iran, Iraq, Afghanistan, Russia, Syria, Lebanon, Palaestina, Jordan, Pakistan, China, Japan, Greece, Bulgaria, Italy, Spain, Portugal, North Africa, and California and Oregon in the USA (Jordanov, 1964; Lozina-Lozinskaya, 1968; Heywood, 1978; Tutin, 1980; Pignatti, 1982; Rix, 1984, 2001; Townsend, 1985;

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The species of the genus *Fritillaria* were first described in 1753, as *F. imperialis* L., *F. persica* L., *F. pyrenaica* L., and *F. meleagris* L. (Linnaeus, 1753, 1754).

*Fritillaria* is represented worldwide by 7 subgenera, 2 sections, and 165 taxa (Rix, 2001). The Flora of Turkey, Volume 8 and Volume 11, recognised 41 taxa within Turkey, 19 of which were considered endemic. Eighteen species and 4 subspecies are distributed in the Mediterranean region (Muğla, Antalya, İçel, Adana, Osmaniye, Hatay, Kahramanmaraş, and Gaziantep), 12 of which are endemic.

In this revision, detailed descriptions of the species of *Fritillaria*, illustrations of taxa, and distribution maps according to Davis's (Davis, 1964-1985) grid system were prepared. Keys are given for identification of the species in the flowering and fruiting stages of development.

**Materials and methods**

Research materials of the genus *Fritillaria* were collected from different parts of Turkey in February-July, both in the flowering and fruiting period, between 1998 and 2003. Specimens were collected from as many different parts of the existing distribution area of the genus as possible in order to study the variation patterns. The study area included Muğla, Antalya, İçel, Adana, Osmaniye, Hatay, Kahramanmaraş, and Gaziantep provinces. The examined specimens out of the field of the species in the study area were also added among the “specimens examined”. In addition, type specimens and the collections of the herbaria AEF, ANK, BM, C, E, G, GAZI, GB, HUB, ISTF, ISTO, K, KNYA, RSA, OXF, and S were examined. The author's name of every species was written according to *Authors of Plant Names* (Brummitt & Powell, 2001).

A range of characteristics that were considered to be taxonomically important in the genus was investigated. These include the following: leaf number, measurements, and colour; inflorescence and flower colour; style shape of the apex and structure, filament structure, anther colour, and capsule wing. Measurements were obtained from at least 20 replicates for each of the 20 specimens and the average value of each characteristic was evaluated. The maximum and minimum values of the measurements of these parts are given in the descriptions of the taxa. The seed surface was investigated under a stereozoom microscope.

Red list categories of endemic taxa of Mediterranean *Fritillaria* were revised according to IUCN Red List Categories (IUCN, 2001).


**Taxonomy**


Bulbous, perennial. Bulb, globose, subglobose, ovoid, obovoid, spindle-shape, rarely united-2 reniform; with few tightly packed scales and thin, transparent tunic that usually disappears with increase in size. Basal leaves 1, dry before stem formed or rarely inflorescence. Stem erect; simple; leafy; with papillae at base and around lowest leaf or smooth. Leaves verticillate, opposite or alternate; bracts mostly 1-4 or more. Flowers 1-3 or inflorescence in umbels or raceme, nodding. Perigon broadly or narrowly campanulate, conic or saucer-shape; tepals one colour or tessellated and sometimes with a longitudinal stripe. Nectaries conspicuous, at base or at point of inflection of tepals. Filaments basifixed, with papillae or smooth; anthers yellow or purple. Style undivided, 3-fid or 3-lobed; with papillae or smooth; caducous; stigma entire or clavate. Fruit locolicid capsule, capsule erect, oblong, ovate, obovate, ovate-lanceolate, cuneate at base, sometimes stalked, truncate at apex, sometimes with 6 longitudinal wings. Seeds many, arranged with 2 lines in each septicum, flat, orbicular to ovate; testa pale to dark brown, reticulate-faveolate or faveolate.
Key to the Turkish species of the Mediterranean region

1 - Bulb at least 4 cm diam.; leaves (10-) 20-50; flower in an umbel or raceme (1-4) 6-30
   2 - Leaves shining green; inflorescence umbrella, perigon 40-55 mm, orange to red rarely yellow...........1. *F. imperialis*
   2 - Leaves glaucous; inflorescence raceme; perigon 15-20 mm, purple..................................................2. *F. persica*

1 - Bulb up to 3 cm diam.; leaves 2-14; flower terminal, 1-4 (5)
   3 - Perigon glaucous outside, yellowish-green inside, not tessellated; capsule winged
      4 - Leaves green; style 2-4 mm diam., papillose ..........................................................8. *F. alfredae*
      4 - Leaves glaucous; style 0.5-1 mm diam., smooth..........................................................9. *F. bithynica*
   3 - Perigon yellow, purple, tessellated, with stripe or blotch; capsule unwinged
      5 - Perigon tessellated or with blotch
         6 - Nectary linear, at least 5× as long as broad.................................................................7. *F. crassifolia*
         6 - Nectary ovate, ovate-lanceolate, ovate-oblong, rhomboid, 2× as long as broad
            7 - Style papillose........................................................................................................6. *F. hermonis*
            7 - Style smooth
               8 - Perigon yellow, slightly tessellated........................................................................3. *F. aurea*
               8 - Perigon green, tessellated or with blotch
                  9 - Stem smooth; leaves glaucous.................................................................4. *F. acmopetala*
                  9 - Stem papillose; leaves shining green...........................................................5. *F. whittallii*
   5 - Perigon with striped or concolorous, not tessellated
      10 - Perigon yellow, canary yellow, greenish-yellow
          11 - Nectary brown
             12 - Upper leaves twisted; perigon conic; filament smooth.................................15. *F. serpenticola*
             12 - Upper leaves not twisted; perigon campanulate; filament papillose..........14. *F. carica*
          11 - Nectary green
             13 - Leaves linear, linear-lanceolate
                14 - Leaves green; perigon canary yellow; style undivided; stigma clavate........11. *F. forbesii*
                14 - Leaves glaucous; perigon greenish-yellow; style 3-fid, branches 1-2 mm; stigma entire
                .......................................................................................................................12. *F. mughlae*
                13 - Leaves ovate-lanceolate, oblanceolate, elliptic-ovate, narrowly elliptic-lanceolate
                   15 - Style undivided ..........................................................................................13. *F. sibthorpiana*
                   15 - Style 3-fid..................................................................................................16. *F. pinardii*
   10 - Perigon purple, with green striped or purple with yellow apex or completely purple
      16 - Style smooth
         17 - Style undivided..........................................................10. *F. milasense*
         17 - Style 3-fid..................................................................................................20. *F. latakiensis*
      16 - Style papillose
         18 - Style undivided; stigma clavate...............................................................18. *F. assyriaca*
         18 - Style 3-fid; stigma entire
            19 - Perigon with green striped
               20 - Leaves 4-10, linear, canaliculate...............................................................19. *F. elwesii*
               20 - Leaves 2-5, lanceolate, narrowly lanceolate, elliptic, not canaliculate....17. *F. kittaniae*
            19 - Perigon sometimes yellow at apex, without green striped..............................16. *F. pinardii*

Type: Described from cultivated material. In Persia? e Constantinopoli venit in Europam c. 1570 (Hb. Linn. 421 / 1, photo!) (Figures 1-2).

≡ *Imperialis canosa* Moench, Meth. 395.

≡ *Petilium imperiale* Jaume St.-Hil. Familles, i. 120.


Type: C6 Gaziantep: nr. Aintab (Gaziantep), G. Post. s.n.

≡ *F. corona-imperialis* Gaertn. Fruct. i. 64, t. 17.

Bulb ovoid, 2-8 × 2.5-8 cm, tunica thin and papery. Stem erect, 30-100 cm, smooth. Leaves 22-50, sessile, shining green. Lowest leaves 7-18 × 5-10 cm, verticillaster, lanceolate, ovate, ovate-lanceolate, acute. Median leaves 12-18 × 2-5.1 cm, verticillaster, lanceolate, ovate-lanceolate, acute. Bract 10-23, 6-12 × 0.5-2.5 cm, foliaceous, verticillaster, below tuft of flowers, lanceolate, linear, acuminate. Flowers 1-15. Perigon broadly campanulate, orange to red, inner yellowish-orange, tepals brownish-black at base. Outer segments 35-70 × 13-17 mm, lanceolate, ob lanceolate, acute, ciliate-tufted at apex; inner segments 35-70 × 13-24 mm, ob lanceolate, lanceolate, acute, ciliate-tufted at apex. Nectaries 5 mm diam., circular, white, at base of tepals. Filaments 25-50 mm, smooth, yellow, enlarged to base; anthers 10-17 mm, oblong.
yellow, basifixed. Style 24-50 mm, 3-fid, branches 1-7 mm, smooth; stigma entire. Capsule 20-40 × 30-46 mm, oblong, ovoid, ellipsoid, 6-winged, wings 2-7.5 mm. Seeds 8-15 × 5-9 mm, flat, elliptic, oblong, ob lanceolate, testa brown, reticulate-faveolate.

Fl: 3-5.

Habitat: Edge of fields, rocky slopes, stony places, scrub, 1000-2400 m.

Specimens examined: B8 Muş: Çizmeburun, 1500 m, 14.4.1998, Ekim 7039 (GAZI); Siirt: Sason, cemetery of Seyhan (Erdemli) village, c. 1000 m, 29.III.1978, A.Güner 1628 (HUB).

Distribution: Turkey, Iran, Iraq, Afghanistan, Pakistan, Kashmir. Irano-Turanian element.


Type: Described from cultivated material. In Persia? e Susis venit in Europam 1573 (L!) (Figures 2 & 3).

= Theresia persica K.Koch, Linn. XXII. 233 (1849).


= F. libanotica (Boiss.) Baker in J. Linn. Soc. (Bot.) 14: 270 (1874).


Bulb spindle-shaped, 2.5-6 × 2.5-5 cm; tunica thin and papery. Stem erect, 20-100 cm, smooth. Leaves 10-70, sessile, and glaucous. Lowest leaves 4.4-15 × 1-3 cm, alternate, sometimes subopposite, narrowly lanceolate, lanceolate, acute. Median leaves 5.1-10 × 0.5-1.1 cm, alternate, linear-lanceolate, acuminate. Bract one pair or absent, 1.6-6.5 × 0.4-0.5 cm, linear-lanceolate, acuminate. Inflorescence raceme, 3-28. Perigon narrowly campanulate, dark or pale purple, greenish-purple rarely greenish-yellow, outside glaucous. Outer segments 10-20 × 5-8 mm, lanceolate, ovate-lanceolate, obtuse, ciliate-tufted at apex; inner segments 10-20 × 5-9 mm, lanceolate, ovate, ob lanceolate, obtuse, ciliate-tufted at apex. Pedicels usually longer than tepals. Nectaries 1.5-3 × 1.5-3.5 mm, triangular, purple, 0.5-2 mm above base of tepals. Filaments 5-10 mm, smooth, yellow; anthers 1.5-4 mm, elliptic, brownish or purple, basifixed. Style 5.5-10 mm, undivided, smooth; stigma entire. Capsule 10-30 × 10-30 mm, obvoid, 6-winged, wings 1.5-3 mm. Seeds 6-10 × 4-6 mm, flat, obovate, testa brown, reticulate-faveolate.

Fl: 3-5.

Habitat: Edge of fields, rocky slopes, Quercus scrub, stony places, 600-1873 m.

Specimens examined: C4 İçel: Aydıncık to Gülnar, 600-700 m, 29.05.1993, Koyuncu 9821 (AEF); Gülnar to Aydıncık, 1 km from Boğaziçi, 700-800 m, 22.04.1982, Koyuncu 4894 (AEF); Gülnar, 07.06.1950, A.Atilla 10366 (ISTF); Gülnar, between Bozağaç and Eskiyörük village, S. of Ahırini, 700 m, 19.05.2000, M.Tekşen 1991 (fr.) (GAZI); Aydıncık to Gülnar, 2 km from Bozağaç, 760 m, 25.03.2001, M.Tekşen.
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Distribution: Turkey, Syria, Lebanon, Jordan, Palaestina, Iran, and Iraq. Irano-Turanian element.

*F. persica* is a well known and frequently used ornamental plant (Mancuso & Peruzzi, 2010). *F. persica* is the only species of the genus in Turkey with inflorescence in raceme, stems up to 100 cm, many glaucous leaves, and with triangular nectaries. Therefore, it can be easily distinguished from the other species. It is stated in a footnote in the *Flora of Turkey* that the form named *F. eggeri* Bornm. with greenish flowers occurs west of Rezaiyah, Iran, and so is also likely to be found in the easternmost part of Anatolia. Specimens from “C10 Hakkari: Şemdinli-Yükseko, Şapatan pass, above Altinsu village, 37°20’815”N, 44°31’875”E, 1873 m, 09.05.2007, *Quercus* scrub, *M.Tekşen* 2218 & *M.Aslay*” are a new record and location for *F. persica*. The *F. persica* species, which were previously collected at a maximum elevation of 1200 m, were collected from Hakkari at an elevation of 1873 m.


Type: Turkey, C5 Içel: in Tauro, 1836, *Kotschy* 507 (holo. W) (Figures 2 & 4).


Type: A6 Sivas: Yıldız Da., 2400 m, *Bornm.* 1890: 1647.


Type: C5 Içel: Cilician Taurus above Bulgar Da., 2400 m, *Siehe* 1898: 14.

Bulb ovoid, 0.7-1.1 × 0.9-2 cm, with one or many bulblets, tunica thin and papery. Stem erect, 4-24 cm, smooth. Leaves (3-) 4-8, sessile, glaucous and alternate, rarely opposite at base. Lowest leaves 3.4-8 × 0.5-2.2 cm, lanceolate to ovate-lanceolate, acute. Median leaves 3-7.7 × 0.2-0.7 cm, linear, acuminate. Bract 1, 1.8-5.4 × 0.1-0.25 cm, linear, acuminate. Flowers 1-2. Perigon broadly campanulate, yellow, pale reddish-brown tessellated. Outer segments 20-48 × 5-10.5 mm, lanceolate, ovate to oblong, acute, ciliate-tufted at apex; inner segments 20-48 × 9-15 mm, lanceolate, obtuse, ciliate-tufted at apex. Nectaries 2-2.5 × 1-2 mm, ovate, green, 5-7 mm above base of tepals. Filaments 9-14 mm, enlarged to base, smooth; anthers 4-8 mm, elliptic, apiculate, yellow, basifixed. Style 8-13 mm, 3-fid, branches 1-3 mm, smooth; stigma entire. Capsule 20-35 × 12-18 mm, not winged, oblong-ovoid. Seeds 6-7 × 5-5.5 mm, flat, obovate, testa pale brown, faveolate.
Fl: 3-5.

Habitat: Juniperus forest, N-facing rock ledges, usually on limestone, 1650-3000 m.

**Specimens examined:** B6 Kayseri: Sarız, Binboğa Mt., Yalak, 1700-1900 m, 07.05.1991, Z.Aytaç 3702 & H.Duman (AEF, HUB, GAZI); Pınarbaşı, Eğrisöğüt-Beyçayır village, Şirvan Mt., 1900-2000 m, 25.07.2003, M.Tekṣen 2204 (fr.) (GAZI); 24 km S. of Pınarbaşı, 1800-1900 m, 24.05.1965, Coode & Jones 1423 (ISTO, E, ISTF); Pınarbaşı, Eğrisöğüt-Beyçayır villages, around Kumuk Adil, c. 1700 m, 17.04.2001, A.M.Özkan (AEF), Pınarbaşı to Gürün, Ziyaret hill, 2000 m, 23.05.1965, Coode & Jones 19810 (ISTF); Sivas: Pınarbaşı to Gürün, 2000 m, 26.05.1960, Staiton & Henderson 5179 (E, RSA); Kahramanmaraş: Göksun, Berit Mt., 2000 m, 19.06.1981, B.Yıldız 3005 (HUB); Göksun, Binboğa Mt., above Karli plateau, 2700 m, D.20024 (E). C5 İçel: Toros, Siehe 216 (ANK); Niğde: Ala Mt., SW (south-west) Flank of Demir Kasık, 2400-2800 m, Parry 170 (E); Aladağ, 2700 m, 24.06.1964, Wood & Gibson 106 (E); Aladağ, Tekneli plateau, 2700 m, 15.06.1979, R.Carle & H.Kürschner 79-433 (RSA); Adana: Seyhan, Pozanti, Armutoluk, E of Hondu, 12.5.1952, Ł.Akkaş 11873 (ISTF). C6 Kahramanmaraş: Göksun, between Püren pass and Değirmendere village, Kartallık, 37°56′603″N, 36°30′767″E, 1700-1800 m, 21.05.2000, M.Tekṣen 1994 (fr.) (GAZI); ibid., 22.04.2001, M.Tekṣen 2049 (fl.) (GAZI); ibid., 09.07.2001, M.Tekṣen 2104 (fr.) (GAZI); ibid., 24.05.1993, Ekici 1275 (GAZI).

Conservation status: LC.

Distribution: Endemic. Irano-Turanian element.

_F. aurea_ differs from the _F. acmopetala_ with always yellow and few tessellated flowers (not green, brown markings, purple of apex or perigon green and purple tessellated, rarely perigon yellow).

4. **Fritillaria acmopetala** Boiss., Diagn. ser. 1 (7): 104 (1846) sensu lato.

Bulb globose, 0.5-1.3 × 0.8-3 cm, with one or many bulblets, sometimes absent, tunica thin and papery. Stem erect, 9.5-54 cm, smooth. Leaves 4-11, sessile, glaucous. Lowest leaves 4.7-16 × 0.25-3 cm, alternate, linear, narrowly or broadly lanceolate, acute, acuminate. Median leaves 4.6-16.5 × 0.2-1 cm, alternate, linear, narrowly lanceolate, acuminate. Bract 1-2 (-3), 2.9-10.5 × 0.1-0.5 cm, verticillate, linear, acuminate, rarely uppermost with a tendril-like apex. Flowers 1-2. Perigon broadly campanulate, green, brown markings, purple of apex or perigon green and purple tessellated, rarely perigon yellow. Outer segments 19-47 × 6-14 mm, lanceolate, obtuse, ciliate-tufted at apex; inner segments 19-47 × 7.5-18.5 mm, obovate-ob lanceolate, oblanceolate, spathulate,
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truncate or retuse, usually broadly apiculate, ciliate-tufted at apex. Nectaries 2-12 × 2-8 mm, ovate, lanceolate, green, greenish-brown, 3-6 mm above base of tepals. Filaments 6-13 mm, enlarged at base, smooth or papillose, yellow, yellowish-green; anthers 4-13 mm, elliptic, apiculate, yellow, greenish-yellow, basifixied. Style 6.5-12 mm, 3-fid, branches 1.5-6 mm, smooth or papillose; stigma entire. Capsule 15-33 × 5-10 mm, oblong, cuneate at base, not winged. Seeds 4.5-7.5 × 3-6.5 mm, flat, obovate-orbicular, obovate, testa pale brown or reddish-brown, faveolate.

1. Leaves 5-11, linear, 0.4-1.2 cm broad; tepals tessellated or marked...............subsp. *acmopetala*

1. Leaves 4-7, lanceolate, 1-3 cm broad; tepals not tessellated........................subsp. *wendelboi*

subsp. *acmopetala*.

Type: (Turkey, C6 Hatay) in monte Amano Syriae supra Baylan (Belen), *Aucher* 2181 (holo. G! iso. K) (Figures 2 & 5).


Type: Turkey, Içel: Taurus mountains, 500 m, meadow fragments adjoining brook ravine in *Pinus brutia* forest, on limestone, coll. 30.04.1987, cult. 20.05.1995, J.Persson & K.Persson 87-99 (holo. GB).

Fl: 3-5.

Habitat: Forest, *Populus nigra* opens, *Pinus brutia* forest, scrub, 10-1500 m.

**Specimens examined**: C2 Muğla: Köyceğiz, Hamitköy to Ekincik, 36°54’869”N, 28°37’284”E, 120-150 m, 25.03.2000, M.Tekşen 1970 (fl.) (GAZI); Köyceğiz to Gökova, 100 m, 17.04.1992, Koyuncu 9020 (AEF); Fethiye, Kalkan, 30 m, 30.03.1956, D. 25514 (ANK); Marmaris, 03.1937, 1400 m, *Mark* 339 (ANK); Köyceğiz, Hamitköy, Topalak hill, 140 m, Vural 5748 (GAZI, HUB); Köyceğiz, 2 km from Hamitköy to Ekincik, 13.04.1999, 50 m, A.Duran 4470 (GAZI); Fethiye-Çameli, 13 km north of Üzümlü, 36°47’509”N, 29°11’115”E, 1030 m, 27.04.2008, A.Günner 14615 (GAZI). C3 Antalya: 6 km from Termessos Milli Park entrance, 36°59’860”N, 30°28’816”E, 200-300 m, 19.04.2000, M.Tekşen 1976 (fl.) (GAZI); Konyaalti, 10 m, 28.3.1983, Koyuncu & Erik 3389 (AEF); Manavgat, Başlar village, Kızıldağ, Güzle plateau, 1200 m, 08.05.1982, Koyuncu 5254 (AEF); Kemer, Olympos to Adrasan, 1 km from Çayalanı, 130 m, 23.03.1979, *Peşmen* 4234 & Günner (ANK, HUB, AEF); Güllük Mt., 800 m, 28.04.1985, J.Archibald 6011 (RSA); Konya: Seydişehir, Tinaz Mt.-Çatmakaya, 1500 m,

C5 İçel: Anamur to Ermenek, 25 km, 470-500 m, 24.03.2001, *M. Tekşen* 2019 (GAZI); ibid., 11.07.2001, *M. Tekşen* 2108a (fr.) (GAZI); Anamur to Ermenek, 31 km, 36°12'201"N, 32°54'580"E, 880 m, 24.03.2001, *M. Tekşen* 2021 (fl.) (GAZI); ibid., 11.07.2001, *M. Tekşen* 2108 (fr.) (GAZI); Adana: Osmaniye, Zorkun plateau, Olukbaş, 800 m, 25.04.1971 *Koyuncu* s.n. (AEF), Pozantı-Adana, Gülek gorge, 1150 m, 19.05.1999, *A.Duran* 5024 (GAZI); Seyhan, Pozanti, SE of Bürücek, Katran Sekisi, c. 1600 m, 20.05.1952, *İ.Akkaş* 11957 (ISTF).

C6 Hatay: Belen, Güzelyayla-Bardak villages, 950 m, 08.05.1999, *M. Tekşen* 1953 (fr.) (GAZI); Belen, Belen-Güzelyayla, c. 4 km from Güzelyayla, 36°29'671"N, 36°10'168"E, 500 m, 29.03.2001, *M. Tekşen* 2036 (fl.) (GAZI); Belen, Karlik hill, above Soğukoluk, 900-1000 m, 23.04.1957, *D. 27037 & Hedge* (AEF); İskenderun, Arsuz, Meşelik, Amanos Mt., ca. 840 m, 10.6.1967, *Akman* 39 (ANK); Dörtyol, Kuzucuk to Büke on forest road, c. 1000 m, 04.05.1965, *Coode & Jones* (ISTF 19344); Adana: Zorkun plateau, Amanos Mt., ca. 700 m, 13.04.1968, *Akman* 7889 (ANK); Osmaniye: Nurdagı, Arapçukuru, 750 m, 16.04.1977, *A.Güner* 1509 (HUB).

Distribution: Cyprus, Lebanon, Syria. East Mediterranean element.


Type: Turkey, C3 Antalya: mountains NE of Akseki, 1700 m, 1972, *Wendelbo* 447 (holo. GB!) (Figures 2 & 6).

Fl: 4-6.

Habitat: *Cedrus* forest, *Juniperus* openings, limestone rocky slopes, stony places, 1600-2020 m.

**Specimens examined:** C4 Konya: Taşkent-Alanya, around Çukurkent pass, 24.04.1999, 1800-1850 m, *H.Duman* 6903 (GAZI); Hadim, Aladağ-Kartaltepe, SW of hillside, around fire tower, 2150 m, 08.06.1987, *M.Serin* 1268 (KNYA); Merkez, Kızılören Mt., 1700 m, 19.05.1990, *A.Tatlı* 9479 & *B.Eyce, M.Serin* (KNYA); Hadim, Kandevir plateau, Yukarıkızılkaya, 1700 m, 17.05.1984, *S.Erik* 3663 & *B.Yıldız* (HUB); Karaman: Bayır-Ermenek, 30 km from Ermenek, 36°50’N, 32°55’E, 15.05.1999, 1900 m, *FAK* 2613 (GAZI); İçel: Anamur, 45 km from Anamur to Ermenek, Kayahyasi, 1600 m, 20.04.2000, *M. Tekşen* 1980 (fl.) (GAZI); Anamur-Ermenek, around Suolmaz pass, 1600 m, 19.05.2000, *M. Tekşen* 2109 (fr.) (GAZI); d. Anamur, Kaşyaylası, 1600 m, Markgraf 11180 (ANK); Antalya: Alanya, Cedevet plateau, Çanakpınar, 1150 m, 19.04.1989, *Ekim* 9278 (GAZI); Gazipaşa, Çayırıkası plateau, 1750 m,

**Figure 6. Fritillaria acmopetala** subsp. **wendelboi**. a- habit, b- outer tepals, c- inner tepals, d- stamen, e- pistil, f- capsule.
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20.05.1983, *H. Sümbül* 1870 (HUB, ANK); Gazipaşa, Cimbiti plateau, 1650 m, 18.05.1983, *H. Sümbül* 1823 (HUB); Karaman: Ermenek-Karaman, north of Yellibel, 36°49’419”N, 32°55’412”E, 2030 m, 01.05.2008, A. Güner 14735 (GAZI).

Conservation status: *EN* B2b (iii).


*F. acmopetala* can be easily distinguished from the similar species by usually purple spots at perigon apex and base, sometimes green and purple tessellated. Subsp. *wendelboi* does not have tessellated individuals as subsp. *acmopetala*. It is smaller than subsp. *acmopetala* and it grow at higher altitude (1600-2020 m vs. 10-1500 m). While the flowering period is between March and May in subsp. *acmopetala*, it is April-June in subsp. *wendelboi*.

*F. sororum* was described by J. Persson & K. Persson in 1998. It is stated in the *Flora of Turkey* that *F. sororum* differs from *F. acmopetala* subsp. *acmopetala* with a tessellated perigon, smooth filaments, and uppermost leaves often with a tendril-like apex. *F. sororum* specimens observed in the field lacked the cirrhose tips to the leaves. This characteristic was also stated in the literature (Archibald & Archibald, 2003). The similarity between *F. acmopetala* subsp. *acmopetala* and *F. sororum* was noted during the field study. The *F. sororum* specimens (*M. Tekşen* 2019, 2021, 2108) were compared with *F. acmopetala* subsp. *acmopetala* specimens (in the GAZI, HUB, and AEF herbaria). The *F. acmopetala* subsp. *acmopetala* specimens collected in the field have many individuals with tessellated perigon and smooth filaments. These flower features are very well-matched with *F. sororum*. *F. sororum* differs from *F. acmopetala* subsp. *acmopetala* by the uppermost leaves often with a tendril-like apex. This diagnostic character does not distinguish *F. sororum* from *F. acmopetala* subsp. *acmopetala*. The toptype specimens of *F. sororum* do not have tendril leaves (*M. Tekşen* 2019, 2021, 2108). All the characteristics fall within the variation of *F. acmopetala* subsp. *acmopetala*. Consequently, *F. sororum* is evaluated as a synonym of *F. acmopetala* subsp. *acmopetala*.


Type: Turkey, C?: from the western end of the great Taurus range, (vii.1891), a collector for E. Whittall (holo. K!) (Figures 7 & 8).

Bulb ovoid, as united 2 reniform-like, 0.5-1.0 × 1-1.5 cm, sometimes with many bulblets, tunica thin and papery. Stem erect, 10-35 cm, at margins and around lower leaves papillose. Leaves 5-11, sessile, shining green. Lowest leaves 8-15.3 × 0.4-1.0 cm, alternate, linear, linear-lanceolate, acuminate. Median leaves 9-12.4 × 0.4-0.8 cm, alternate, linear, linear-lanceolate, acuminate. Bract 1-3, 6.3-9.3 × 0.1-0.4 cm, whorls or alternate, linear, acuminate. Flowers 1-2. Perigon broadly campanulate, green, inside and outside brown tessellated. Outer segments 25-32 ×
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5-13 mm, lanceolate, acute or obtuse, ciliate-tufted at apex; inner segments 25-32 × 8-13 mm, oblanceolate, lanceolate, acute or obtuse, ciliate-tufted at apex. Nectaries 3 × 6 mm, ovate, green, 3-5 mm above base of tepals, at corner of bell. Filaments 8-10 mm, papilllose, yellow; anthers 4-10 mm, elliptic, yellow, basifixated. Style 6-11 mm, 3-fid, branches 1-5 mm, smooth; stigma entire. Capsule 25-35 × 8-18 mm, oblong, cuneate at base, not winged. Seeds 3.5-5 × 4-6.5 mm, flat, obovate, narrowly obovate, testa pale brown, reticulate-faveolate.

Fl: 4-6.

Habitat: Rocky slopes, stony places, *Pinus, Juniperus, and Cedrus libani* forest, scrub, 1200-2100 m.

**Specimens examined:**

**B3** Isparta: Şarkikaraağaç, Kızıldağ Milli Parkı, N side of Küçükşivri, 1250 m, 23.04.1994, *B.Mutlu* 330 (HUB); Şarkikaraağaç, Kızıldağ Milli Parkı, N side of Kızıldağ, 1400-1500 m, 11.05.1995 *B.Mutlu* 1357 (HUB).

**C4** Konya: Hadim, Geyvene valley, Tösmür plateau-Beyreli, 10.06.1999, 1980 m, 36°53′57″N, 32°18′12″E, *H.Duman* 6977 (GAZI).

**C3** Isparta: Şarkikaraağaç-Yenişarbademli, Gedikli village-Ççekdağı, 1750-1850 m, 05.06.1999, *A.Duran* 4570 (GAZI);

**C2** Konya: Hadim, Geyvene valley, Köprülü plateau-Beyreli, 10.06.1999, 1980 m, 36°53′57″N, 32°18′12″E, *H.Duman* 6977 (GAZI).

**C1** Isparta: Şarkikaraağaç-Yenişarbademli, Gedikli village-Ççekdağı, 1750-1850 m, 05.06.1999, *A.Duran* 4570 (GAZI);

Conservation status: VU B2b (iii).

F. whittallii differs from the F. acmopetala by shining green leaves (not glaucous), papillose stem (not smooth).


Type: Turkey, C6 Maraş: Zeytun, Kuru Dag, limestone screen and turf, 1678 (as 1700) m, 10 v 1934, Balls 1034 (holo. E, iso. BM, K) (Figures 7 & 9).

Bulb globose, 0.6-1.3 × 0.9-3 cm, with one or many bulblets, with stolon, tunica thin and papery. Stem erect, 8-35 cm, entire. Leaves 4-9, sessile, shining green, alternate. Lowest leaves 4-13.5 × 0.65-2.7 cm, narrowly or broadly lanceolate, oblong, acute. Median leaves 4-13.5 × 0.3-2.2 cm, narrowly or broadly lanceolate, acute. Bract 1, 2.0-8.3 × 0.1-0.7 cm, linear, acuminate. Flowers 1-2 (-3). Perigon broadly campanulate, green, reddish-brown tessellated or yellow, brown tessellated or striped, markings, rarely perigon yellow. Outer segments 22-35 × 7-12 mm, oblong, obtuse, ciliate-tufted at apex; inner segments 22-35 × 8-15 mm, oblanclate, spathulate, obtuse, ciliate-tufted at apex. Nectaries 1.5-4 × 2.5-5 mm, ovate, greenish-brown, 4-7 mm above base of tepals. Filaments 8-10 mm, papillose, yellowish-green, yellow; anthers 4-10 mm, elliptic, apiculate, yellow, basifixed. Style 8-12 mm, 3-fid, branches 1-4 mm, papillose. Capsule 27-42 × 12-17 mm, oblong, not winged. Seeds 4-7 × 3-5 mm, flat, obovate, testa pale brown, reticulate-faveolate.

Fl: 4-5.

Habitat: Rocky and stony places, Cedrus libani forest openings, 1400-2400 m.


Distribution: Turkey, Lebanon. East Mediterranean element.

F. hermonis subsp. amana is distinguished from F. crassifolia subsp. crassifolia, which is a similar species, by its shining green leaves (not glaucous), ovate nectaries (not linear), and papillose style (not smooth). It differs from F. whittallii by its smooth stem (not at margin and around lower leaves papillose) and papillose style (not smooth).

subsp. crassifolia.

Type: B8 Erzurum: in lapidosis montis Techdagh (Palandöken Da.) prope Erzeroum, 1800-2100 m, vi.1853, Huet du Pavilion (lecto. G! isolecto. K) (Figures 7 & 10).


Type: Turkey, A7 Gümüşhane: in glareosis montis Argyridagh, Sintenis 5535 (G7). A8 Gümüşhane: in Armeniae collibus agillosis prope Baibout (Bayburt), Aucher 5376 (G). B7 Erzincan: Erzincan-Refahiye, Alaçatlı village, Kurttepesi, 2100-2300 m, 25.05.2002, M.Tekşen 2141 (fr.) (GAZI). C3 Antalya: Akseki-Seydişehir, S of Tınaztepe recreation service area, 02.04.1999, 1450 m, H. Duman 6883 (GAZI); Akseki, Güzelsu-Gündoğmuş, Pınarbaşı-Güneyyaka village, around Kızıldere, 36°53′34.4″ N, 31°56′24.3″ E, 1170 m, 21.04.2001, M. Tekşen 2047 (fl.) (GAZI); Isparta: Anamas Mt., 04.06.1955, 2400 m, A. & T. Baytop 4383 (HUB); Sütçüler, Çobanisa village, Sarp Mt., 1450-1850 m, 26.05.1974, Peşmen & Güner 1139 (HUB). C6 Kahramanmaraş: Ahr Mt., Yalnizadaç shoulder, 1000-1300 m, 23.04.1992, Aytaç 4519 & H.Duman (GAZI); Ahr Mt., Sulu Tarla shoulder, 1200-1300 m, 22.04.1992, Aytaç 4499 & H.Duman (GAZI).

Conservation status: LC.

Distribution: Endemic. Irano-Turanian element.

F. crassifolia subsp. crassifolia can be easily distinguished from F. hermonis subsp. amana by its linear, narrowly lanceolate, acute or acuminate. Bracts 1-2, 9-37 × 1-3 mm, opposite, linear, narrowly lanceolate, lanceolate, acuminate. Flowers 1-2. Perigon broadly campanulate, green, inside and outside brownish-purple tessellated or with brownish-purple markings. Outer segments 12-28 × 5-10 mm, lanceolate, acute, or obtuse, ciliate-tufted at apex; inner segments 12-28 × 6-12 mm, obovate or spatulate, obtuse, ciliate-tufted at apex. Nectaries 8-16 × 1-2 mm, linear, green, 3-5 mm above base of tepals. Filaments 6-10 mm, smooth or papilllose, yellow; anthers 3-6.5 mm, oblong, yellow, basifixed. Style 5-13 mm, 3-fid, branches 1.5-6 mm, reflexed, smooth; stigma entire. Capsule 15-30 × 15-19 mm, globose or obovoid, truncate at apex, cuneate at base, glaucous, not winged. Seeds 5-7 × 4-5.5 mm, flat, obovate, testa pale orange-brown, faveolate.

Fl: 4-6.

Habitat: Rocky and stony slopes, serpentine, scrub, open Pinus nigra forest, 1000-2600 m.

Specimens examined: A7 Gümüşhane: Argyridagh (12 km SW of Gümüşhane) Sint. 1894: 5535 (G! E!). A8 Gümüşhane: in Armeniae collibus agillosis prope Baibout (Bayburt), Aucher 5376 (G). B7 Erzincan: Erzincan-Refahiye, Alaçatlı village, Kurttepesi, 2100-2300 m, 25.05.2002, M. Tekşen 2141 (fr.) (GAZI). C3 Antalya: Akseki-Seydişehir, S of Tınaztepe recreation service area, 02.04.1999, 1450 m, H. Duman 6883 (GAZI); Akseki, Güzelsu-Gündoğmuş, Pınarbaşı-Güneyyaka village, around Kızıldere, 36°53′34.4″ N, 31°56′24.3″ E, 1170 m, 21.04.2001, M. Tekşen 2047 (fl.) (GAZI); Isparta: Anamas Mt., 04.06.1955, 2400 m, A. & T. Baytop 4383 (HUB); Sütçüler, Çobanisa village, Sarp Mt., 1450-1850 m, 26.05.1974, Peşmen & Güner 1139 (HUB). C6 Kahramanmaraş: Ahr Mt., Yalnizadaç shoulder, 1000-1300 m, 23.04.1992, Aytaç 4519 & H.Duman (GAZI); Ahr Mt., Sulu Tarla shoulder, 1200-1300 m, 22.04.1992, Aytaç 4499 & H.Duman (GAZI).
The revision of the genus *Fritillaria* L. (Liliaceae) in the Mediterranean region (Turkey)

glaucous leaves, linear nectarines, and smooth style. It differs from *F. alfredae* by its green, inside and outside brownish-purple tessellated or brownish-purple markings flowers (not green, inside yellowish-green), smooth style (not papillose) unwinged capsule (not 6-winged). *F. crassifolia* subsp. *crassifolia* was suggested to be an Irano-Turanian phytogeographical element, because of its distribution in Gümüşhane, Erzurum, Erzincan, Konya, Isparta, Kahramanmaraş, Muğla, and Antalya.


Bulb 0.6-1.2 × 1.0-3 cm, globose or ovoid, without bulblets; tunica thin and papery. Stem erect, 10-63 cm, entire. Leaves 5-19, sessile, green. Lowest leaves 4.6-17 × 0.3 -3.3 cm, alternate, opposite or subopposite, linear, linear-lanceolate, oblanceolate-ovate, acute or acuminate. Median leaves 3-15.6 × 0.2-1.3 cm, alternate, linear, linear-lanceolate, acute or acuminate. Bracts 1-5, 2.2-10.1 × 0.1-0.6 cm, opposite, linear, acuminate. Flowers 1-2 (-3). Perigon narrowly campanulate, glaucous, inside yellowish-green. Outer segments 15-33 × 4-8 mm, oblong, lanceolate, obtuse, ciliate-tufted at apex; inner segments 15-33 × 5-9 mm, spatulate, narrowly obovate, obtuse, ciliate-tufted at apex. Nectaries 3.5-6 × 1-2 mm, narrowly ovate, linear-lanceolate, green, 1 mm above base of tepals. Filaments 5.5-10 mm, papillose, papillae decreasing to base, greenish yellow; anthers 3.5-9.5 mm, oblong, yellow, basifixed. Style 5-10 mm, 2-4 mm diam, undivided or 3-lobed at apex, lobes 0.5-1 mm, densely papillose; stigma entire. Capsule 25-47 × 14-33 mm, obovoid or narrowly obovoid, oblong, truncate at apex, cuneate at base, 6-winged, wings 1.5-5 mm. Seeds 3.5-7 × 4-6 mm, flat, obovate, obovate-orbicular, testa yellowish-brown or greyish-brown, reticulate-faveolate.

1. Lowest leaves alternate, linear, linear-lanceolate ...........................................subsp. *platyptera*

1. Lowest leaves opposite or subopposite, oblanceolate-ovate.......................................subsp. *glaucoviridis*


Type: Turkey, C6 Hatay/Syria: Mons Cassius, in regione pinifera, prope transitum ad Ain el Aramie, solo schist.-gneiss., in Querceto Cerris, 600 m, 9.vi.1933, *Samuelsson* 5864 (holo. S!) (Figures 7 & 11).


Type: Syria, Latakia, Mt. Cassius (Yayla Da.), near the crossing at Ain el Aramie, in Querceteum cerris, 1933, *Samuelsson* 5864 (holo. S!).

Figure 11. *Fritillaria alfredae* subsp. *platyptera*. a- habit, b- outer tepals, c- inner tepals, d- stamen, e- pistil, f- capsule.
Fl: 4-5.

Habitat: Quercus forest, Quercus coccifera scrub, 500-800 m.


Distribution: Turkey, Syria. East Mediterranean element.


Type: Turkey, C5 Içel: described from plants cultivated at Glasnevin (Ireland) from bulbs received from W. Siehe, who collected it from the Mersina district of Southern Asia Minor (Cilicia) (holo. K!) (Figures 7 & 12).


Type: Turkey, locality unknown: described from plants cultivated as Glasnevin from bulbs received from W. Siehe (holo. K!).


Type: Turkey, Adana: Amanus, Hasanbeyli, 1908, Haradjian 2219, fruit (holo. W).

Fl: 4-5.

Habitat: Quercus and Fagus forest and scrub, Quercus coccifera scrub, 500-1600 m.

Specimens examined: C6 Hatay: Belen, Güzelyayla village, 10.04.1999, 850-900 m, M.Tekşen 1929 (fl.) (GAZI); ibid., 29.03.2001, M.Tekşen 2107 (fl.) (GAZI); ibid., 10.07.2001, M.Tekşen 2107 (fr.) (GAZI); Fevzipaşa, 12.04.1934, Balls 761 (ANK); Osmaniye to Fevzipaşa, 14.04.1935, Balls 2122 (ANK); Osmaniye, Zorkun plateau, Amanos Mt., 1000 m, 14.04.1968, Akman 5007 (ANK); Kahramanmaras: Engizek Mt., around Aksu district, c. 1000 m, 04.06.1988, Duman 4020 (GAZI); ibid., 25.4.1988, Duman 3859 (GAZI).

C5 Adana: Kozan to Feke, 10 km from Kozan, 550 m, 11.04.1957, D. 26586 (ANK); Feke, Belen village, 650 m, 21.05.1993, M.Vural 6399 & Koyuncu (HUB).

C6 Adana: Osmaniye to Fevzipaşa, Nurdaği pass, 09.04.1986, 1110 m, Max Nydegger (HUB).

Conservation status: VU B2b (iii).


F. alfredae differs from F. bithynica, which is a similar species, by its glaucous leaves (not green), smooth style (not papillose). F. alfredae subsp. platyptera can be distinguished from subsp. glaucoviridis by its alternate and linear to linear-lanceolate lowest leaves, not opposite or subopposite and oblanceolate-ovate.


Type: Turkey, A2 (A) Bursa: Bithynia in Monte Olympo (Ulu Da.), c. 1850, Noe (lecto. K!) (Figures 13-14).
The revision of the genus *Fritillaria* L. (Liliaceae) in the Mediterranean region (Turkey)


Type (Turkey): between Muğla and Aydın, Elwes s.n. (lecto. K).

= *F. schliemannii* Sint ex Rodigos in III. Hort. 31: 106 (1884).

Type: Turkey, Çanakkale: Erenköy, 1883, Sintenis 82 (iso. BM, E, G, K, P, ZU).


Type: Turkey, İzmir: Mahmut Dağ near Armutlu, Schwarz 464 (holo. B, iso. ANK!).

Bulb 0.5-1.1 × 0.9-2 cm, subglobose, ovoid, without bulblets or 1-3, tunica thin and papery. Stem erect, 7-35 cm, entire. Leaves 5-17, sessile, glaucous. Lowest leaves 2-8 × 0.5-2.6 cm, opposite or subopposite, broadly oblanceolate-ovate, narrowly lanceolate, elliptic, acute. Median leaves 2.5-6 × 0.2-0.7 cm, alternate, linear, narrowly lanceolate, acute or acuminate. Bracts (1-) 3 (-4), 1.5-3.9 × 0.15-0.4 cm, verticillate, linear, linear-lanceolate, acuminate. Flowers 1-4. Perigon narrowly campanulate, outside glaucous, inside greenish-yellow, shining. Outer segments 16-26 × 4-9 mm, lanceolate, oblong, acute or obtuse, ciliate-tufted at apex; inner segments 16-26 × 5-12 mm, oblanceolate or obovate, obtuse, ciliate-tufted at apex. Nectaries 3-5 × 1-1.5 mm, lanceolate or narrowly lanceolate, green or yellowish-brown, at base of tepals. Filaments 5-9 mm, papillose, creamy anthers 3-5 mm, oblong or elliptic, yellow, basifixed. Style 7-10.5 mm, undivided, smooth; stigma entire. Capsule 13-28 × 10-18 mm, obovoid, truncate at apex, cuneate at base, 6-winged, wings 2-6 mm. Seeds 4-6.5 × 4-6 mm, flat, obovate, orbicular, oblanceolate, testa brown, reticulate-faveolate.

Fl: 3-5.

Habitat: *Pinus brutia* forest and *Quercus coccifera* scrub, rocky and stony places, 40-1800 m.

**Specimens examined:**

- C2 Muğla: Marmaris, Değirmenyanı, around Kargıcak castle, 36°49'619"N, 28°09'955"E, 50-100 m, 23.03.2000, *M. Tekşen* 1961 (fl.) (GAZI); ibid., 14.07.2001, *M. Tekşen* 2114 (fr.) (GAZI); Marmaris, Değirmenyanı, İçmeler road, Kabasakız, E side, 36°49'545"N, 28°10'300"E, 50-70 m, 24.03.2000, *M. Tekşen* 1962 (fl.) (GAZI); ibid., 18.04.2000, *M. Tekşen* 1984 (fl.) (GAZI); Marmaris, Değirmenyanı, to Kargıcak castle, 36°49'578"N, 28°09'698"E, 40-60 m, 24.03.2000, *M. Tekşen* 1963 (fl.) (GAZI); Marmaris, Gökçe-Çetibeli, 23 km from Marmaris, 37°00'761"N, 28°19'924"E, 150 m, 01.03.2001, *M. Tekşen* 1995 (fl.) (GAZI); Marmaris-Köyceğiz, 20.04.1995, *Koyuncu* (AEF); Yılanlıdağ, 750-1000 m, 11.04.1981, *A. Güner* 3445 & B. Yıldız (HUB); 5 km from Muğla to Fethiye,
F. bithynica differs from the other species by its mostly verticillate bracts 3 (rarely 1 or 4 bracts), glaucous flowers, slender; smooth and undivided style and winged capsule. F. bithynica differs from the F. alfredae, which is a similar species, by its green leaves (not glaucous), papillose style (not smooth).


Bulb subglobose, ovate, 0.5-1.0 × 0.4-1.1 cm, tunica thin and papery. Stem erect, 5-18.5 cm, usually papillose below. Leaves 4-14, sessile, green. Lowest leaves 1.9-6.6 × 0.4-2.1 cm, opposite, subopposite to
alternate, narrowly lanceolate, broadly oblanceolate to obovate, elliptic, spatulate, acute. Median leaves 1.1-5.4 × 0.1-0.45 cm, opposite or alternate; linear, acuminate. Bract 1 (-2), 0.9-3.4 × 0.1-0.25 cm, opposite; linear, acuminate. Flowers 1-3. Perigon narrowly campanulate; segments purple with a clear yellow stripe or yellow with purplish-brown stripe and outside with a yellowish apex. Outer segments 12-23 × 3.5-7 mm, lanceolate or oblanceolate, oblong, acute or obtuse, ciliate-tufted at apex; inner segments 12-23 × 4-8.5 mm, oblanceolate-obovate, obovate, apiculate, ciliate-tufted at apex. Nectaries 3-5 × 1-1.5 mm lanceolate to narrowly lanceolate, green, at base of tepals. Filaments 5-7.5 mm, papillose, yellow; anthers 3-7 mm, oblong or elliptic, yellow, basifix. Style 4-10 mm, undivided and smooth; stigma entire. Capsule 9-11 × 10-12 mm, obovoid-orbicular, truncate at apex, cuneate at base, unwinged. Seeds 3.5-5 × 3-4.5 mm, flat, obovate, triangular, oblanceolate, testa brown, reticulate-faveolate.

Fl: 3-5.

Habitat: In the screen of Pinus pinea L. forest, on sandy soil, Quercus scrub, 700-760 m.


Conservation status: CR B1b (iii, iv).

It is stated in a footnote in the Flora of Turkey that, in the southern part of the distribution of the F. bithynica species, populations with unwinged capsules exist. Morphologically, these specimens differ from F. bithynica by their glaucous leaves (not green); bracts 1 (-2) [not (1-) 3 (-4)]; flowers purple with a clear yellow stripe outside and inside or yellow with purplish-brown stripe and with a yellowish apex outside (not outside glaucous, inside yellowish-green, shining green), capsule 9-11 × 10-12 mm, unwinged (not 13-28 × 10-18 mm, 6-winged).


Type: Turkey, C2 Muğla: Lycia ‘in dumetis rupestribus ad Macri’ (Fethiye), s.l.-1000 m, 1842, E. Forbes 626 (lecto. K!) (Figures 13 & 16).

Bulb globose, 0.6-1.2 × 0.6-1.5 cm; tunica thin and papery. Stem erect, 8-31 cm, papillose below around base and lowest leaves or smooth. Leaves 5-10, sessile and alternate, green. Lowest leaves 4.6-15.8 × 0.1-0.7 cm, linear, acuminate. Median leaves 3.4-16.5 × 0.1-0.5 cm, linear, acuminate. Bract 1, 2.1-13.3 × 0.1-0.3 cm, linear, acuminate. Flowers 1-2. Perigon narrowly campanulate, yellow. Outer segments 14-25 × 3.5-6.5 mm, oblanceolate or lanceolate, obtuse, ciliate-tufted at apex; inner segments 14-25 × 3-6 mm, lanceolate, obtuse, ciliate-tufted at apex. Nectaries 2-5 × 1 mm, lanceolate, greenish-yellow, at base of tepals. Filaments 4-9 mm, enlarged to base, papillose, papillae decreasing to base, yellow; anthers 4-8 mm, oblong-elliptic, yellow, basifix. Style 6-10.5 mm, undivided, papillose; stigma clavate. Capsule 21-22 × 12-14 mm, narrowly obovate, not winged. Seeds 3.5-7 × 3.5-5 mm, flat, ovate, testa pale brown, reticulate-faveolate.
Fl: 2-3.

Habitat: *Pinus brutia* forest, scrub and serpentine, 0-1000 m.

**Specimens examined:** C2 Muğla: Fethiye, Mendos Mt., 1-2 km from Ovacık village, 36°32′743″N, 29°11′586″E, 500-700 m, 02.03.2001, M.Tekşen 1997 (fl.) (GAZI); ibid., 13.07.2001, M.Tekşen 2111 (fr.) (GAZI).

Conservation status: EN B2ab (iii).


*F. forbesii* can be distinguished from the *F. sibthorpiana* species by its linear leaves and clavate style. It is stated in a footnote in the *Flora of Turkey* that *F. forbesii* is close to *F. carica*. However, it differs distinctly from *F. carica* by its linear and small leaves and leaf measurements, greenish-yellow nectary and clavate style. According to the pollen shape and morphological characteristics, it is between *F. bithynica* and *F. sibthorpiana*. *F. forbesii*, which is the only species with linear leaves among the yellow flowered *Fritillaria* species, is rearranged in the *Flora of Turkey*, because it was considered that the species should be placed between *F. bithynica* and *F. sibthorpiana* as phylogenetic. After this rearrangement, it seems that it is morphologically between *F. bithynica* and *F. carica*, since the number of leaves is decreased, broadness of style is increased, style is divided, and the smooth style is changed to the papillose style.


Type: Turkey, C1 Muğla: Marmaris-Datça, Hisarönü-Emecik, 45 km from Datça, 70-80 m, 01.03.2001, rocky slopes, M. Tekşen 1996 (holo. GAZI, iso. ANK, ISTF, HUB) (Figures 13 & 17).

Bulb globose, 0.8-1.2 × 0.8-1.7 cm; tunica thin and papery. Stem erect, 7-25 cm, entire. Leaves 5-12, sessile and alternate, glaucous. Lowest leaves 4.5-12.3 × 0.5-0.8 cm, linear-lanceolate, acuminate. Median leaves 3.2-12.5 × 0.2-0.7 cm, linear, acuminate. Bract 1, 2.8-9.2 × 0.1-0.4 cm, linear, acuminate. Flowers 1-2. Perigon narrowly campanulate, greenish-yellow, fading to purple veins. Outer segments 14-20 × 5-6 mm, lanceolate, obtuse, ciliate-tufted at apex; inner segments 14-20 × 4-5 mm, lanceolate, obtuse, ciliate-tufted at apex. Nectaries 3-4 × 1 mm, lanceolate, greenish-yellow, at base of tepals. Filaments 6.5-8 mm, broaden to base, papillose, yellow; anthers 3.5-5 mm, oblong-elliptic, yellow, basifixed. Style 6-8 mm, 3-fid, branches 1-3 mm, papillose; stigma entire. Capsule 18-21 × 10-13 mm, narrowly obovoid, not winged. Seeds 3.5-6 × 3.5-5 mm, flat, ovate, testa pale brown, reticulate-foveolate.
The revision of the genus *Fritillaria* L. (Liliaceae) in the Mediterranean region (Turkey)

Fl: 2-3.

Habitat: *Quercus* scrub, rocky slopes, serpentine, c. 80 m.


Conservation status: CR B1b (iii, iv).


*F. mughlae* differs from *F. forbesii* by its linear–lanceolate and glaucous leaves, greenish–yellow fading to purple vein flowers and 3-fid style. It is stated in a footnote in the Flora of Turkey that specimens which were collected by Davis from “C2 Muğla: Emecik, Marmaris” were *F. forbesii*. However, after collecting some specimens during our field work in the same location, they were investigated for morphological, palynological, cytological, and molecular data. As a result of these studies, these samples were described as a new species (Tekşen & Aytaç, 2008). In the Flora of Turkey, the mentioned specimen of Davis (D. 25375) was investigated at the ANK and it was observed that these specimens belong to *F. mughlae*.

13. *Fritillaria sibthorpiana* (Sm.) Baker in J. Linn. Soc. (Bot.) 14: 275 (1874).

Bulb globose, 0.5-0.7 × 0.7-2 cm; tunica thin and papery. Stem erect, 8-30 cm, entire. Leaves 2-4 (-7), sessile or small petiolate, glaucous or shining. Lowest leaves 2.5-23 × 1.5 (-10) cm, alternate or subopposite, elliptic, ovate–lanceolate, broadly lanceolate, amplexicaule or not, acute or obtuse. Median leaves 5.3-10.4 × 0.5-1 cm, alternate, lanceolate, narrowly lanceolate, linear–lanceolate, acuminate. Bract 1; 2.7-12 × 0.15-2.0 cm, linear or broadly lanceolate, acuminate. Flowers 1-2. Perigon narrowly campanulate, shining canary yellow or matt yellow to yellowish–green. Outer segments 13-23 × 4.8 mm, lanceolate, obtuse, ciliate–tufted at apex; inner segments 13-23 × 4.9 mm, lanceolate, obtuse or acute, ciliate–tufted at apex. Nectaries 3-4 × 1 mm, linear–lanceolate, green, at base of tepals. Filaments 5-8 mm, papillose, yellow; anthers 3.5-6 mm, oblong, apiculate, yellow, basifixed. Style 5-8 mm, undivided, papillose; stigma entire. Capsule 11-19 × 13-26 mm, orbicular, ovoid, ovoid–oblong, cuneate, not winged. Seeds 4.5-8 × 4-6 mm, flat, obovate, testa brown or pale brown, reticulate–faveolate.

1. Leaves 2-3, ovate–lanceolate, glaucous; perigon canary yellow............................subsp. *sibthorpiana*

1. Leaves 3-5, linear–lanceolate, shining; perigon greenish–yellow...........................subsp. *enginiana*

subsp. *sibthorpiana*.

Type: Turkey, C2 Muğla: prope Cressam (nr Büğüs), hodie Porto Cavalieri (nr Akyar burnu), *Sibthor* (lecto. OXF !) (Figures 18-19).

≡ *Tulipa sibthorpiana* Sm. in Sibth. & Sm., Prodr. Fl. Graec.1: 229 (1809).
Type: Turkey, Muğla: ‘prope Cressam, hodie Porto Cavalieri’, *Sibthorp* (lecto. OXF!).

Fl: 3-4.

Habitat: *Pinus brutia* forest, limestone rocky slopes, open scrub, 30-500 m.

**Specimens examined:** C2 Muğla: Marmaris, Hisarönü, road distinction of Bozburun-Hisarönü, N 36°49’E 28°09’, 30-50 m, 23.03.2000, *M. Tekşen* 1960 (fl.) (GAZI); ibid., 14.07.2001, *M. Tekşen* 2113a (fr.) (GAZI); Marmaris, Değirmenyanı, to Kargıcak castle, 36°49’743”N, 28°09’539”E, 30-50 m, 24.02.2000, *M. Tekşen* 1964 (fl.) (GAZI); ibid., 24.03.2000, *M. Tekşen* 1985 (fl.) (GAZI); - Bozburun-Söğütköy, c. 1 km from yacht harbour, 36°40’529”N, 28°04’762”E, 20-50 m, 24.03.2000, *M. Tekşen* 1965 (fl.) (GAZI); Bozburun, Söğütköy-Taşlıca village, around grinder, 36°38’005”N, 28°05’887”E, 100-150 m, 25.03.2000, *M. Tekşen* 1966 (fl.) (GAZI); Bozburun, Söğütköy-Taşlıca village, 36°38’268”N, 28°05’953”E, 100-150 m, 25.03.2000, *M. Tekşen* 1967 (fl.) (GAZI); Bozburun, Taşlıca-Serçe villages, 36°36’134”N 28°03’777”E, 50-100 m, 25.03.2000, *M. Tekşen* 1968 (fl.) (GAZI); Marmaris-Turunç road, 400 m, 27.04.1993, Koyuncu (AEF); Marmaris, Bozburun road, above Bayır village, 500 m, 30.04.1982, M.Koyuncu 5057 (AEF).

Distribution: Turkey and Aegean Islands. East Mediterranean element.


Type: SW Turkey, C2 Muğla: Köyceğiz, Sandras Mt., Pankuduz hill, under woodland, rocky and moist slopes, 1000 m, 6.iv.1977, E. Özhatay 1077 (holo. ISTE, iso. ISTO, MARA) (Figures 18 & 20).

Fl: 2-4.

Habitat: *Platanus orientalis* and *Pinus brutia* forest, limestone and serpentine rockies, open scrub, 30-1450 m.

**Specimens examined:** C2 Muğla: Köyceğiz, Ekincik village, around Kargıcak, 36°49’670”N, 28°33’876”E, 50-100 m, 26.03.2000, *M. Tekşen* 1971 (fl.) (GAZI); ibid., 26.03.2000, *M. Tekşen* 1972 (fl.) (GAZI); ibid., 14.07.2001, *M. Tekşen* 2113a (fr.) (GAZI); Dalyan, Yıldırımih hill, 26.02.1999, 200 m, H.Duman 6882 (GAZI); Köyceğiz, Ekincik village, around Kargıcak, 19.03.1991, 30-200 m, A.Günér 8324 (GAZI, HUB); Köyceğiz, Çandır village-Boğazarası, 14.03.1992, A.Günér 10358 (HUB); Köyceğiz, Ülemez Tepe, 36°51’225”N, 28°35’016”E, 1884 m, 26.04.2008, A.Günér 14604 (GAZI).

Conservation status: EN B2b (iii).


*F. sibthorpiana* is distinguished by *F. carica* by its brown nectaries, amplexicaul or petiolate lowest leaves. The 2 subspecies can distinguished from each other with the given characteristic key.

Type: Turkey, C1 İzmir: Samsun Dag above Güzelcamli, 800 m, summit ridge in *Pinus brutia* forest, 24.iv.1965, *Davis* 41737 (holo. E !) (Figures 18 & 21).

![Figure 20. *Fritillaria sibthorpiana* subsp. *enginiana*. a- habit, b- outer tepals, c- inner tepals, d- stamen, e- pistil, f- capsule.](image)

![Figure 21. *Fritillaria carica*. a- habit, b- outer tepals, c- inner tepals, d- stamen, e- pistil, f- capsule.](image)

= *F. tulipifolia* Bieb. var. *dasyphlla* Baker in J. Linn. Soc. (Bot.), 14: 266 (1874) non *F. dasyphylla* Baker (1875).

= *F. chia* Boiss. ex Nyman, Consp.: 722 (1882), pro. syn.

= *F. sibthorpiana* sensu. Boiss., Fl. Or. 5: 187 (1884), pro parte (specimen ex Nymph
Dagh) non (Sibth. & Sm.) Baker.

Bulb obovoid, 0.7-2 × 0.8-1.5 cm, tunica thin and papery. Stem erect, 3-22 cm, entire, smooth or around lowest leaves papillose. Leaves 4-8, sessile, alternate, glaucous. Lowest leaves 3.0-12.5 × 0.6-2.1 cm, narrowly lanceolate or narrowly oblanceolate, elliptic-lanceolate, acute, papillose on margins. Median leaves 3.6-8.7 × 0.2-0.5 cm, narrowly lanceolate, acuminate. Bract 1; 2.5-4.4 × 0.1-0.2 cm, linear, acuminate. Flowers 1(-3). Perigon narrowly campanulate, yellow, greenish-yellow, sometimes purple on margins of tepal. Outer segments 13-23 × 4-8.5 mm, lanceolate, obtuse, ciliate-tufted at apex; inner segments 13-23 × 5-6.5 mm, obovate-lanceolate, obtuse, ciliate-tufted at apex. Nectaries 2-5.5 × 1-1.5 mm, linear-lanceolate, obtuse, ciliate-tufted at apex. Filaments 5-11.5 mm, papillose, yellow; anthers 3-5 mm, yellow, elliptic, basifixed. Style 6-10 mm, undivided or 3-lobed, lobes up to 1 mm, densely papillose; stigma entire. Capsule 10-25 × 13-19 mm, globose, obovoid, oblong, cuneate, not winged. Seeds 4.5-8 × 3-6.5 mm, flat, obovate, testa brown, faveolate.

Fl: 3-5.

Habitat: Pinus brutia and P. nigra forest, Quercus coccifera scrub, Cedrus libani, Juniperus excelsa forest, limestone rocky and stony places, alpine steppe, 200-2200 m.

Specimens examined: C1 Muğla: Bodrum, Gündoğan road, c. 150 m, 19.03.2001, F.Ertuğ 488 (GAZI). C2 Muğla: Yılanlıdağ, 750-1000 m, 11.04.1981, A.Güner 3437 & B.Yıldız (HUB); Fethiye, Mendos Mt., 36°32'743"N, 29°11'586"E, 1350 m, 23.03.2001, M.Tekşen 2009 (fl) (GAZI); ibid., 13.07.2001, M.Tekşen 2112 (fr) (GAZI); C3 Antalya: Kemer, Tahtalı, 1000-2200 m, 06.06.1979, Peşmen & Güner 4292 (AEF, ANK, HUB); Çakırlar, Hisarçandır village, Sarıçınar hill-Karlık, 1380-1810 m, 24.03.1979, Peşmen & A.Güner 4263 (HUB).

Distribution: Turkey and Aegean Islands. East Mediterranean element.

F. carica can be easily distinguished from F. serpenticola by its narrowly lanceolate lowest leaves, not twisted leaves, narrowly campanulate flower, papillose filaments.


Type: Turkey, C2 Antalya: between Karaçulha and Altinyayla, in bare brown scree, 1700 m, 5.iv.1980, O. Sonderhousen 680 (holo. E!) (Figures 18, 22).


Type: Turkey, C2 Antalya: between Karaçulha and Altinyayla, in bare brown scree, 1700 m, 5.iv.1980, O. Sonderhousen 680 (holo. E!).

Bulb 0.8-1 × 0.8-1.5 cm, globose or obovoid, tunica thin and papery. Stem erect, 3-15 cm, smooth. Leaves 3-5, sessile, alternate and glaucous. Lowest leaves 2.7-7.5 × 0.5-1.8 cm, lanceolate, acute. Median leaves 1.7-6.7 × 0.1-0.7 cm, linear, acuminate, usually twisted at apex. Bract 1; 1.6-3.1 × 0.1 cm, linear,
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acuminate, twisted at apex. Flowers 1(-3). Perigon conical, outside and inside yellow, fading to orange. Outer segments 11-20 × 3-7 mm, lanceolate, obtuse, ciliate-tufted at apex; inner segments 11-20 × 3.5-9 mm, oblanceolate, obtuse, ciliate-tufted at apex. Nectaries 2-4 × 1 mm, linear-lanceolate, brown, at base of tepal. Filaments 5-9 mm, smooth, yellow; anthers 2.5-3 mm, elliptical, yellow, basified. Style 6-10 mm, scarcely papillose; undivided or 3-lobed, lobes up to 1 mm, stigma entire. Capsule 11-24 × 13-19 mm, obovoid, cuneate, not winged. Seeds 4-7.5 × 3-6.5 mm, flat, obovate, testa shining, brown, faveolate.

*Fl*: 3-4.

**Habitat:** In serpentine with *Pinus* and *Juniperus* species, 1100-1700 m.

**Specimens examined:** B3 Eskişehir: Gökçekaya road, 59 km, 1100 m, *H.Malyer* 1454 (ANK, AEF).


Conservation status: EN B2b (iii).

**Distribution:** Endemic. East Mediterranean element.

*F. serpenticola* can be distinguished by its conic flowers and blackish-brown nectaries. *F. serpenticola* differs from *F. carica* in having the lowest leaves broadly lanceolate (not narrowly lanceolate); upper leaves twisted (not twisted); perigon conical (not narrowly campanulate); inner tepal 3.5-5 mm width (not 6-8 mm width); filaments smooth (not papillose); style 0.5 mm in diameter, sparsely papillose or only papillose at apex (not style 1 mm in diameter and densely papillose). Type specimens of these taxa were also investigated in the Kew Herbarium. As result of this taxonomic study, *F. carica* subsp. *serpenticola* was raised to species level (Tekşen & Aytaç, 2004).


**Type:** Turkey, C2: in Lycia, 1843, *Pinard* (holo. G!)(Figures 23-24).


**Type:** Turkey, A8 Erzurum: in Armenia, prope Erzurum, *Aucher* 5377 (holo G!).

= *F. fleischeri* sensu Boiss., Fl. Or. 5: 186 (1884) non Steudel & Hochst. (1827)(G!).


**Type:** Iran: vom Elwend, on Sultanabad und vom Kuh-i-barf bei Schiras, 1885, *Polak* (holo WU).


**Type:** A5 Kastamonu: d. Tosya, Giaur (Gavur) Da., *Sint.*, 1892: 3931 (GB!).

![Figure 23. Distribution in Turkey of Fritillaria pinardii (●), F. kittaniae (□), and F. assyriaca subsp. melananthera (○).](image-url)
Fritillaria pinardi. a- habit, b- outer tepals, c- inner tepals, d- stamen, e- pistil, f- capsule.
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Distribution: Turkey, Iran, Armenia, Syria, Lebanon. Irano-Turanian element.

*F. pinardii* is distinguished from *F. kittaniae* by its outside and inside purple or outside purple and yellow at apex or exactly purple, glaucous, inside yellowish-orange or greenish-yellow or greenish, rarely outside and inside yellow.

There are very large variation limits in *F. pinardii*. Differences in morphological features are observed in the north-east, north-west, south, B5 and B6 squares of Turkey. Moreover, transitions exist among these populations.

*Fritillaria* specimens collected in the field were investigated in this study and within the project of the Scientific and Technological Research Council of Turkey (TÜBİTAK). *F. armena* and *F. zagrica* were noted to have similarities to *F. pinardii*. In the *Flora of Turkey*, it is stated that *F. armena* differs from *F. pinardii* by its outside and inside purple flowers and dark anthers. Many individuals in the *F. armena* specimens collected in the field have an inside greenish-yellow perigon together with outside and inside purple flowers. This perigon colour feature is exactly well-matched to *F. pinardii*. Purple anthers are the only difference between these 2 species. All the characteristics fall within the variation of *F. pinardii*. Also type specimens of these species have been examined in G. Consequently, *F. armena* is evaluated as synonymous with *F. pinardii*.

The similarity between *F. pinardii* and *F. zagrica* was noted during the field study. It is stated in a footnote in the *Flora of Turkey* that *F. zagrica* is close to *F. pinardii*, but differs from *F. pinardii* by having an outside and inside purple perigon with a yellow apex and a slender undivided style. Frequently the *F. pinardii* specimens collected in the field during our field work had a perigon with a yellow apex. Also *F. pinardii* has the slender undivided style characteristics in the *Flora of Turkey*. These characteristics do not differ from those of *F. pinardii* and *F. zagrica*. Although it is not stated in the *Flora of Turkey*, *F. zagrica* has dark anthers. This characteristic is not considered to be diagnostic in separating the 2 species. The anther colour is changeable in young and older individuals. *F. zagrica* is therefore considered to be a synonym of *F. pinardii*.

Some specimens were collected from Kahramanmaraş with yellow flowers during the field study. All the characteristics fit except for perigon colour with *F. pinardii*.

Varieties of these characteristics (inside and outside perigon colour and colour of anthers) in the *F. pinardii* group are not considered to be a different species of these taxa. All the characteristics fall within the variation of *F. pinardii*. *F. armena* and *F. zagrica* can be evaluated in the *F. pinardii* group (sensu lato).


Type: Turkey, C2 Antalya: south of Sinekcibeli pass, on limestone rock in *Cedrus libani* forest, 1500 m, 23.04.1984, F. Sorger & Kit Tan 84-18-8 (holo. Hb. F. Sorger; iso E, RSA) (Figures 23 & 25).
Bulb 0.6-1 × 0.6-1 cm, globose, bulblet absent or 1-3, tunica thin and papery. Stem erect, 3-13 cm, entire. Leaves 2-5, sessile, alternate, glaucous. Lowest leaves 2-6.8 × 0.2-1.2 cm, lanceolate, narrowly lanceolate, elliptic, spathulate, acute, subacute. Median leaves 0.9-4.5 × 0.1-0.3 cm, linear, acuminate. Bract 1; 0.7-3.5 × 0.05-0.1 cm linear, acuminate. Flowers 1-2. Perigon narrowly campanulate. Outer segments 10-18 × 3-6 mm, lanceolate, elliptic-ovate, narrowly obovate, acute, outside and inside pale purple, yellowish-green striped or yellow, recurved at apex, ciliate-tufted at apex; inner segments 10-18 × 3-6 mm, elliptic, ovoblate, obovulate, obtuse, yellow, purple at apex or yellowish-green striped, ciliate-tufted at apex. Nectaries 3 × 0.75-1 mm, elliptic, apiculate, yellow, basifixied. Style 4.5-9 mm, broaden to base, papillose; anthers 2.5-5.5 mm, green, 1-2 mm above base of tepals. Filaments 6-11 mm, linear-lanceolate, elliptic, green, yellowish-striped, ciliate-tufted at apex. Nectaries 3 × 0.75-1 mm, elliptic, apiculate, yellow, purple at apex or yellowish-green striped or yellow, recurved narrowly obovate, acute, subacute. Leaves 2-6.8 × 0.2-1.2 cm, lanceolate, narrowly obovate, acute, outside and inside pale purple, yellowish-green striped or yellow, recurved at apex, ciliate-tufted at apex; inner segments 10-18 × 3-6 mm, elliptic, oblong, not 3-lobed, branches 0.1-5 mm, papillose; stigma entire. Elliptic, apiculate, yellow, basifixied. Style 4.5-9 mm, broaden to base, papillose; anthers 2.5-5.5 mm, elliptic, apiculate, yellow, purple at apex or yellowish-green striped or yellow, recurved narrowly obovate, acute, subacute. Leaves 2-6.8 × 0.2-1.2 cm, lanceolate, narrowly obovate, acute, subacute.

Fl: 4-5.

Habitat: Limestone area in Cedrus libani forest, Juniperus forest, stony, rocky places, 1300-1500 m.


Conservation status: EN B2b (iii).


F. kittaniae can be easily distinguished from the other close species by its glaucous leaves, purple perigon with a green stripe. The perigon of F. kittaniae, which was described by the approach to F. acmopetala subsp. wendelboi, is not broadly campanulate. It is narrowly campanulate. It was not stated in the description whether or not the flowers are broadly or narrowly campanulate. Specimens collected in type location and, according to the classification of Rix in 2001, must be in the group with narrowly campanulate flowers, undivided or 3-lobed and stout and papillose style. It is close to F. pinardii with all of these characteristics. At the same time, it is close to F. assyriaca subsp. melanantha with outside and inside purple and with a perigon with a yellowish-green stripe. It is differs from F. assyriaca subsp. melanantha by the characteristics of the shape and size of the leaves and apex of style. Consequently, F. kittaniae can be placed between F. pinardii and F. assyriaca.


Type: Turkey, C4 İçel: 2 km N. of Mut, sandige Lehnhügel, 290 m, 5.vi.1966, Sorger 66-18-28 (holo. Hb. Sorger) (Figures 23 & 26).

Bulb 0.5-2 × 0.6-3 cm, globose or obovoid, united-2 kidney shaped, tunica thin and papery. Stem erect, 3.5-20 cm, elongating in fruit, usually papillose below. Leaves 4-12, sessile, glaucous, canaliculate. Lowest leaves 1.6-9 × 0.2-0.6 cm, alternate or subopposite, linear, acuminate. Median leaves 1.8-7.5 × 0.1-0.3 cm, alternate, linear, acuminate. Bracts 1-3, 1.2-6.2 × 0.5-2 cm, opposite, linear, acuminate. Flowers 1-2. Perigon narrowly campanulate, outside and inside purple, green striped. Outer segments 10-18 × 3-6 mm, narrowly lanceolate, acute or obtuse, ciliate-tufted at apex; inner segments 10-18 × 3-6 mm, obovulate, acute, ciliate-tufted at apex. Nectaries 2-4 × 1 mm, linear-lanceolate, green, 1 mm above base of tepals. Filaments 5-11 mm, papillose, papillae decreasing to base, yellow; anthers 3-5.5 mm, elliptic, purple, blackish, basifixied. Style 5-10 mm, undivided, papillose; stigma clavate. Capsule 11-18 × 11-16 mm, orbicular-ovoid, not winged. Seeds 4-6 × 3-5.5 mm, flat, obovate, orbicular-ovoid, testa brown, faveolate.

Fl: 3-5.

Habitat: Rocky slopes, stony places, steppe, sandy places, 0-700 m.


Conservation status: EN B2b (iii).
**Fritillaria assyriaca** subsp. *melananthera* differs from *F. elwesii* by its shorter and papillose stem, undivided style, capitate stigma.

19. **Fritillaria elwesii** Boiss., Fl. Or. 5: 181 (1884).

Type: Turkey, C2 Muğla: in Lycia prope fluvium Dollomon (Dalaman Çay), *Elwes* (holo. G) (Figures 27-28).


Bulb 0.5-1 × 0.8-3 cm, globose or ovoid, bulblets 1-many, tunica thin and papery. Stem erect, 9-30 cm, smooth. Leaves 4-10, sessile, glaucous and canalicate. Lowest leaves 2-11 × 0.2-1.1 cm, alternate, linear, acuminate. Median leaves 2.7-14 × 0.2-0.7 cm, alternate, linear, acuminate. Bracts 1-3, 2.8-11 × 0.1-0.5 cm, opposite, linear, acuminate. Flowers 1-4. Perigon narrowly campanulate, outside and inside brownish-purple and green striped. Outer segments 14-32 × 4-8 mm, lanceolate or oblanceolate, acute or obtuse, ciliate-tufted at apex; inner segments 14-32 × 4.5-11 mm, lanceolate or oblanceolate, acute or obtuse, ciliate-tufted at apex. Nectaries 2-7 × 1-1.5 mm, lanceolate, green, at base of tepal. Filaments 6-10 mm, papillose, yellow; anthers 3.5-7.5 mm, elliptic, apiculate, usually blackish-purple before dehiscence, after yellow, basifix. Style 5-11 mm, 3-fid or 3-lobed, branches 1-3.5 mm, papillose; stigma entire. Capsule 15-24 × 9-16 mm, ovoid, oblong, cuneate or with stalk, glaucous, not winged. Seeds 3-5.5 × 3-4.5 mm, flat, obovate, obovate-orbicular, triangular, testa pale brown or yellowish-brown, faveolate.

Fl: 3-5.

Habitat: *Pinus brutia* forest and opens, *Quercus coccifera* scrubs, edge of field, rocky, stony places, 10-1600 m.

**Specimens examined:** C2 Antalya: Kaş-Antalya, 10 km, 400-500 m, 27.04.2002, *M.Tekşen* 2126 (fl.) (GAZI); ibid., 08.04.2003, *M.Tekşen* 2166 (fl.) (GAZI). C3 Antalya: Akseki, Emirüşiklar village-Ibradi, 19 km from İbradi, 600-700 m, 19.04.2000, *M.Tekşen* 1977 (fl.) (GAZI); Akseki, Güzelsu-Gündoğmuş, Sadıklar-Pınarbaşı village, 1050-1100 m, 20.04.2000, *M.Tekşen* 1978 (fl.) (GAZI); ibid., 08.06.2002, *M.Tekşen* 2162 (fr.) (GAZI); Akseki, Güzelsu-Gündoğmuş, Pınarbaşı-Güneyyaka village, 1 km from Güneyyaka, around Karasu, 700-800 m, 20.04.2000, *M.Tekşen* 1979 (fl.) (GAZI); Akseki, Güzelsu-Gündoğmuş, Pınarbaşı-Güneyyaka village, around Kızıldere, 1170 m, 21.04.2001, *M.Tekşen* 2046 (fl.) (GAZI); Alanya, around Bademtaş village, 600 m, 08.04.1995, *Koyuncu* 11148 (AEF); Gündoğmuş, Gazi Kemal plateau, 1200 m, 08.04.1994, *Koyuncu* 10732 (AEF); Kemer, Tahtalı Mt., Yayla Kuzudere, Peynirlik-Kızılalan, 800-1600 m, 04.05.1979, *P eşmen & Güner* 4628 (ANK, HUB); Manavgat to Akseki, 700 m, 08.04.1956, *D.* 25773 (ANK); Kirkgoz marshy, 290 m, 07.05.1972, *R.Cetik* 3946 (KNYA). C4 Antalya: Gazipasa, Çöriş village, Sariciğer district, GöcükKayaa-Tatlus, 1200 m, 19.04.1983, *H.Sümübel* 1606 (HUB); Akseki-Çukurköy, Karataş, 08.04.1995,
The revision of the genus *Fritillaria* L. (Liliaceae) in the Mediterranean region (Turkey)

800-900 m, *Duran* 2142 (GAZI); Akseki, Otluk Mt., Şimşirli Gözet hill, 1000-1200 m, 07.05.1995, *Duran* 2255 (GAZI); Alanya-Taşkent, Eriklidere (Kuşyuvası), 1330 m, 30.04.2008, A.Güner 14682 (GAZI); Alanya-Taşkent, Cebelireis mountains, Kaplanhanı, 36°34′580″N, 32°22′362″E, 1236 m, 30.04.2008, A.Güner 14682 (GAZI); Alanya-Taşkent, Eriklidere (Kuşyuvası), 1330 m, 30.04.2008, A.Güner 14682 (GAZI); İçel: Anamur-Aydıncık, Tekmen I-Yenikaş, 150-200 m, 25.03.2001, *M.Tekşen* 2023 (fl.) (GAZI); Mut-Ermenek, pass 40 km from Çamlı village, 650-700 m, 21.03.1981, *Koyuncu* (AEF). C5 İçel: Arslanköy road, 800 m, 08.04.1971, *Uslu* (ANK); Fındıkpınar above Mersin, 1200 m, 07.04.1957, D. 26500 (ANK).

**Distribution:** Turkey and Aegean Islands. East Mediterranean element.

It is similar to *F. assyriaca* subsp. *melananthera* and *F. latakiensis*. *F. elwesii* is distinguished from *F. latakiensis* by its stout filament, purple before dehiscing anthers, yellow after dehiscing, slender and papillose style. It differs from *F. assyriaca* subsp. *melananthera* by its longer and unpapillose stem; with 3-lobed style and lanceolate nectary.


**Type:** Syria, Latakia, Ain Aramie, 20 iv 1938, *Fr. Louis* 454 (holo. P) (Figures 27 & 29).


Bulb 0.7-1 × 0.9-2 cm, globose or ovoid, bulblets absent or 1-2, tunica thin and papery. Stem erect, 8-45 cm, smooth. Leaves 5-10, sessile, glaucous. Lowest leaves 3-9.8 × 0.2-1.0 cm, alternate or subopposite, linear, obtuse, canalicate. Median leaves 2.5-10.6 × 0.15-0.85 cm, alternate, linear, acuminate. Bract 1; 1.8-9.2 × 0.1-0.4 cm, linear, acuminate. Flowers 1-2. Perigon narrowly campanulate, outside purple, inside greenish-yellow or outside brownish-purple and green striped, inside greenish-yellow, purple and inner segments yellow at apex. Outer segments 18-30 × 4-8 mm, narrowly lanceolate, linear, obtuse, ciliate-tufted at apex; inner segments 18-30 × 6-15 mm, oblanceolate, spathulate, apiculate or obtuse, ciliate-tufted at apex. Nectaries 2-6 × 1-1.5 mm, narrowly or broadly lanceolate, green, 1 mm above base of tepals. Filaments 6-9.5 mm, papillose, whitish-yellow; anthers 2.5-7.2 mm, elliptic, apiculate, yellow, basifixed. Style 6.5-11 mm, 3-fid, branches 2-7 mm, smooth; stigma entire. Capsule 15-30 × 9-19 mm, ovoid, oblong, cuneate, glaucous, not winged. Seeds 4-6.5 × 3.5-5 mm, flat, obovate, narrowly obovate, testa pale brown or yellowish-brown, faveolate.

Fl: 3-4.

Habitat: Deciduous scrub and forest, scrub, stony areas, 500-950 m.

**Specimens examined:** C6 Hatay: Road junction of Yayladağ-Kışlak village, 13.04.1999, c. 750 m, A.Güner 12694 & H.Duman (GAZI); Yayladağ, Yayladağ-Kışlak road junction, 1-2 km from Kışlak road junction 920-930 m, 22.04.2000, *M.Tekşen* 1982 (fl.) (GAZI); ibid., 29.03.2001, *M.Tekşen* 2034

![Figure 27. Distribution in Turkey of *Fritillaria elwesii* (●) and *F. latakiensis* (■).](image-url)
Distribution: Turkey and Syria. East Mediterranean element.

*F. latakiensis* can be easily distinguished from *F. elwesii*, which is a close species, by its narrowly lanceolate, linear outer segments (not lanceolate or oblanceolate) and smooth style (not papillose). It is stated in a footnote in the *Flora of Turkey* that it was collected only by Rückbrodt from C2 Kaş (Antalya) in 1978. Moreover, it is stated that those which were described from the Latakia region in Syria could also exist in Yayladağ, Hatay. We saw only the *F. elwesii* populations during our field work in Kaş. Probably, the record of *F. latakiensis* which is in the *Flora of Turkey* belongs to *F. elwesii*.

**Conclusions**

We have come to the following conclusions from our morphological studies on a wide range of herbarium material from a number of herbaria and from material collected in the wild.

After this study, *F. armena* and *F. zagrica* are reduced to synonyms of *F. pinardii*, and *F. sororum*...
is reduced to a synonym of *F. acmopetala* subsp. *acmopetala*.

The phylogenetic orders of *F. forbesii* and *F. kittaniae* were changed based on morphological, palynological, cytological, and molecular studies (Çelebi et al., 2008).

There were 18 species and 4 subspecies recognised in the genus in the Mediterranean region before this study. The number has now increased to 20 species and 3 subspecies, 12 taxa of which are endemic. Eighteen taxa belong to the Mediterranean phytogeographical region, 10 taxa of which are endemic, and 5 taxa belong to the Irano-Turanian phytogeographical region and 2 of them are endemic for the region. The genus *Fritillaria* is represented by 34 species and 7 subspecies in the *Flora of Turkey*. In this study, the number of taxa was determined as 35 species and 6 subspecies. Twenty-one of them are endemic.

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