

Crocus chrysanthus s. lato (Iridaceae) in Turkey

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New taxa in *Crocus* are described from Turkey: *C. chrysanthus* subsp. *chrysanthus* var. *bicoloraceus* F. Candan & N. Özhatay var. nov. and *C. chrysanthus* subsp. *chrysanthus* var. *atroviolaceus* F. Candan & N. Özhatay var. nov.; *C. chrysanthus* subsp. *punctatus* F. Candan & N. Özhatay subsp. nov., *C. chrysanthus* subsp. *kesercioglu* F. Candan & N. Özhatay subsp. nov. and *C. chrysanthus* subsp. *sipyleus* F. Candan & N. Özhatay subsp. nov. A new classification of the species is based mainly on the colour of flowers and anthers, type of pollen grains, seed surface ornamentation, and chromosome numbers.

The genus *Crocus* (Iridaceae) presently consists of 90 species, distributed mainly in the Mediterranean region and the drier floristic areas of the Irano-Turanian region. The majority of the species are restricted to Turkey and the Balkans. According to Kerndorff and Pasche (2004) southwestern Turkey is the center of diversity of the genus with 40 species and 70 taxa, of which 40 are endemics (Maw 1886, Mathew 1982, 1984, 1998, 2000, 2002, Kerndorff & Pasche 2004, 2006, 2011, Yüzbaşıoğlu & Varol 2004, Erol *et al.* 2010, 2011).

In Turkey, *Crocus chrysanthus* is exceedingly variable in both anther and flower colours. According to Mathew (1982), this very variable species presents great problems in that the phenotypic variation does not correlate with distribution, habitat or chromosome number. Since the publication of *Flora of Turkey* (Mathew 1984), a number of ecological, anatomical, cytological and palynological studies concerning *Crocus*

have been published (Işık & Oybak Dönmez 2006, Candan & Kesercioğlu 2007, Candan *et al.* 2009a, 2009b, Kandemir 2009, Şik & Candan 2009, Coşkun *et al.* 2010).

Crocus chrysanthus was described by W. Herbert in 1837. It is distributed in the Balkans and eastern Romania. A note under the *C. chrysanthus* account in Mathew (1984) reads “A variable plant, possibly consisting of more than one taxon but detailed field studies are needed to determine the status of the various cytotypes”.

Candan (2007) determined three cytotypes as $2n = 8, 12, 20 + 2B$ and described the morphological differentiation of some populations of *C. chrysanthus*. After that study, she examined more populations of *C. chrysanthus*. The results of those detailed studies including morphology, anatomy, cytology, palynology and seed micromorphology, provide evidence that phenotypic variation does correlate with anther and flower colours, chromosome numbers, pollen grain

characteristics and seed surface micromorphology (see also Candan 2013)

A number of investigations into *Crocus* genetics have been made (Şik *et al.* 2008, Petersen *et al.* 2008). According to Şik *et al.* (2008), *C. chrysanthus* is highly variable. This also applies to the chromosome numbers, which in this species are $2n = 10$, $2n = 12$, $12 + 3B$, $2n = 14$, and $2n = 20$, $20 + 2B$.

We recognize four subspecies and three varieties in *C. chrysanthus* (Table 1). Detailed descriptions of the species based on collected specimens are given below. The specimens are deposited in the herbarium ISTE.

Crocus chrysanthus (Herbert) Herbert

Bot. Reg. 29, misc. 27. 1843. — *C. annulatus* Herbert var. *chrysanthus* Herbert, Bot. Mag. 67: sub t. 3862. 1841. — TYPE: (Bulgaria) ‘prope Byzantium’ (later corrected to read ‘in Roumelia’: in the 1843 work previously, p. 83), *Friwaldsky* (holotype K!).

Corm ovoid, globose or subglobose, 0.5–2.5 × 0.8–2.2 cm, tunic coriaceous or membranous, splitting into rings at base, rings entire or with tooth-like projections. Cataphylls 3–5(6), creamy-yellow, upper ones sometimes green or brown stained. Leaves (2)3–7(8), synanthous, shorter or longer than flowers in flowering time, green or greyish green, 0.5–1.2(1.5) mm wide, margin and carina usually papillose. Prophyll absent. Bract and bracteole unequal, bracteole much narrower, membranous, white or brownish. Flowers 1–4(5), throat and perigon tube creamy white, yellow, or yellowish orange; sometimes greyish, purplish, brownish, blue speckled, striped or suffused on exterior. Throat glabrous or pilose. Tepals obovate or oblanceolate; obtuse to subacute. Outer tepals 0.25–1.30 × 1.7–3.5 cm; yellow, yellowish orange; sometimes purplish, brownish, blue or blue speckled, striped, veined striate or suffused from throat to upper parts. Inner tepals 0.3–1.2 × 1.5–3.1 cm; yellow, yellowish orange; sometimes pale purplish, brownish, blue speckled, veined striate or lined from base sometimes decreasingly to upper parts or suffused. Filaments yellow, yellowish orange, orange; 3–9 mm long, pubescent, puberulent, papillose or rarely glabrous. Anthers

wholly yellow, yellow with greyish black basal lobes or with greyish black longitudinal lines, wholly greyish black, black or rarely with yellowish spots, 6–16 mm long, basifixed, extrorse. Style dividing into 3 fimbriate or expanded branches; yellowish orange, orange, red; shorter than to exceeding the anthers. Capsule ellipsoid, sometimes purple-tinged, carried above ground level at maturity. Seeds brown or reddish brown, ellipsoid, 1.4–2.4 × 2.0–5.1 mm diameters, usually with a distinct raphe and caruncle; testa colliculate-aculeate, regular or irregular-aculeate and finely vesiculate. Type of pollen grains spiraperturate, polyrugoidate, polycolpate or nonaperturate. Chromosome numbers $2n = 8$, 10, 12, $12 + 3B$, 14, 16, 20, $20 + 2B$. Flowering time February–April

HABITAT: Open forest, stony or rocky places, associated with *Crocus fleischeri*, *C. pulchellus* and other geophytes (*Colchicum*, *Muscari*, *Galanthus*, *Ornithogalum*).

DISTRIBUTION IN TURKEY. Based on the examined specimens, *Flora of Turkey* grid squares: A1, A3, B1, B2, B3, B6, C2, C3, C4, C5 (see Appendix).

Crocus chrysanthus subsp. *chrysanthus* var. *chrysanthus* (Fig. 1A–D)

Corm 0.8–2.5 × 0.8–2.0 cm, leaves 0.5–1.0(1.1) mm wide. Flowers 1–4(5); throat and perigon tube creamy white or yellow. Tepals yellow, sometimes yellowish orange; outer tepals (0.4)0.5–1.3 × 1.8–3.5 cm; inner tepals (0.35)0.4–1.2 × 1.5–3.1 cm. Filaments yellow to yellowish orange; (3.2)3.5–6.5(7.4) mm; anthers yellow (6.0)7.0–13.5 mm. Seeds reddish brown, (1.4)1.6–2.0(2.2) × (2.5)2.8–3.8 mm, testa colliculate-aculeate. Pollen grains spiraperturate. Chromosome number $2n = 8$.

Crocus chrysanthus subsp. *chrysanthus* var. *bicoloraceus* F. Candan & N. Özhatay, var. nov. (Fig. 1E–H)

TYPE: Turkey. B1 Manisa, Spil Mountain, right and left of the road to the horse place, 1240 m, 2 April 2006 F. Candan 86037 (holotype ISTE). — PARATYPES: Turkey. B6

Table 1. A comparison of main diagnostic characters of subspecies and varieties of *Crocus chrysanthus* in Turkey.

| Characters | subsp. <i>chrysanthus</i> var. <i>chrysanthus</i> | subsp. <i>chrysanthus</i> var. <i>bicoloraceus</i> | subsp. <i>chrysanthus</i> var. <i>atroviolaceus</i> | subsp. <i>punctatus</i> | subsp. <i>kesercioglu</i> | subsp. <i>sipyleus</i> |
|-------------------------------|--|---|--|---------------------------------------|---|---|
| Anther color | wholly yellow | wholly yellow | wholly yellow | yellow with greyish black basal lobes | wholly greyish black, black or rarely with yellowish spots | yellow with greyish black longitudinal lines |
| Throat and perigon tube color | creamy white or yellow | yellow; greyish, purplish, brownish or blue speckled, striped or suffused on the exterior | throat purplish, brownish or blue; perigon tube wholly yellowish orange or purplish, brownish speckled or suffused on the exterior | creamy white or yellow | yellow, yellowish orange; purplish, brownish or blue speckled or suffused on the exterior | purplish, brownish or blue speckled, striped or rarely suffused on the exterior |
| Tepal color | yellow, sometimes yellowish-orange | yellow; sometimes greyish, purplish, brownish or blue speckled, striped or suffused on the exterior | often yellowish orange, rarely yellow | yellow, yellowish orange | outer tepals yellowish orange in the edge; purplish, brownish or blue speckled or suffused on the exterior; inner tepals yellowish orange on the edge; sometimes pale purplish, brownish or blue speckled or suffused | outer tepals yellowish orange; sometimes with 3–5 prominent lines or purplish, brownish or blue speckled, veined striate or rarely suffused on exterior; inner tepals generally pale purplish, brownish, blue veined striate or lined from base sometimes decreasingly to upper parts |
| Pollen grain type | spiraperturate | spiraperturate | spiraperturate | polygoidate | polycopate | nonaperturate |
| Seed surface structure | colliculate-aculeate | colliculate-aculeate | irregular aculeate | regular aculeate | colliculate-aculeate | finely vesiculate |
| Chromosome numbers | 2n = 8 | 2n = 10 | 2n = 14 | 2n = 12, 12 + 3B | 2n = 16 | 2n = 20, 20 + 2B |

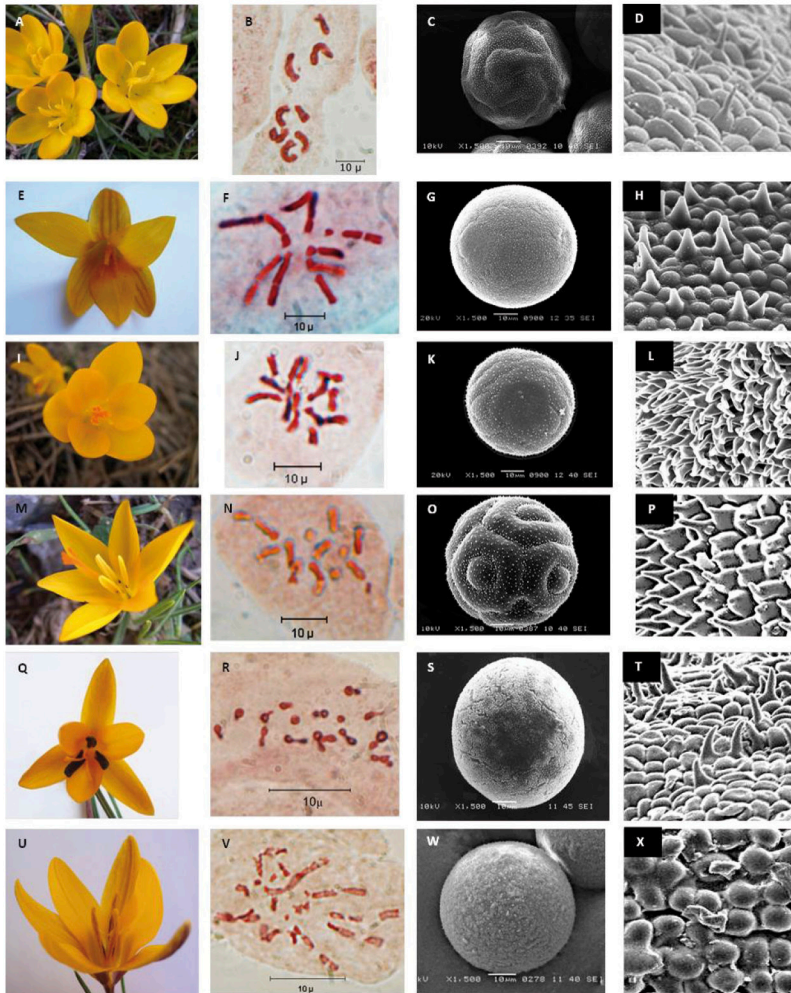


Fig. 1. — **A–D:** *Crocus chrysanthus* subsp. *chrysanthus* var. *chrysanthus*. **A:** Habit. **B:** Chromosomes, $2n = 8$. **C:** Spiraperturate pollen grain. **D:** Colliculate-aculeate seed surface. — **E–H:** *C. chrysanthus* subsp. *chrysanthus* var. *bicoloraceus*. **E:** Flower from above. **F:** Chromosomes, $2n = 10$. **G:** Spiraperturate pollen grain. **H:** Colliculate-aculeate seed surface. — **I–L:** *C. chrysanthus* subsp. *chrysanthus* var. *atroviolaceus*. **I:** Habit. **J:** Chromosomes, $2n = 14$. **K:** Spiraperturate pollen grain. **L:** Irregularly aculeate seed surface. — **M–P:** *C. chrysanthus* subsp. *punctatus*. **M:** Habit. **N:** Chromosomes, $2n = 12, 12 + 3B$. **O:** Polyrugoidate pollen grain. **P:** Regularly aculeate seed surface. — **Q–T:** *C. chrysanthus* subsp. *kesercioglu*. **Q:** Flower from above. **R:** Chromosomes, $2n = 16$. **S:** Polycolpate pollen grain. **T:** Colliculate-aculeate seed surface. **U–X:** *C. chrysanthus* subsp. *sipyleus*. **U:** Flower from above. **V:** Chromosomes, $2n = 20, 20 + 2B$. **W:** Nonaperturate pollen grain. **X:** Finely vesiculate seed surface. Pollen surface structural terminology follows Erdtman (1969); seed surface structural terminology follows Barthlott (1984), Bojňanský and Fargašová (2007), and Stearn (1983).

Kahramanmaraş, Göksun, Kaman Mountain, 1400–1600 m (HUB 35991)! with var. *chrysanthus*; C3 Antalya, Akseki, 1400–1500 m (AEF 19650)!; C4 Karaman, Hadim, Bolay village, 1500–1800 m (HUB 35998)! with var. *chrysanthus* and var. *atroviolaceus*.

Corm 1.2–1.6 × 1.2–1.6 cm, leaves 0.6–1.2 mm width. Flowers 1–3, throat, perigon tube and tepals yellow, greyish, purplish, brownish

or blue speckled, striped or suffused on exterior. Outer tepals 0.3–0.4 × 2.0–2.8 cm; inner tepals 0.30–0.45 × 1.90–2.50 cm. Filaments yellow, yellowish orange; 3.5–5.5 mm; anthers yellow, 11–16 mm. Capsule sometimes purple-tinged. Seeds brown, reddish brown, 1.5–2.3 × 2.5–3.9 mm; testa colliculate-aculeate. Pollen grains spiraperturate. Chromosome number $2n = 10$.

***Crocus chrysanthus* subsp. *chrysanthus*
var. *atroviolaceus* F. Candan & N. Özhatay,
var. nov. (Fig. 11–L)**

TYPE: Turkey. B2 Kütahya, 10 km from Kütahya towards Afyon, 1113 m a.s.l., 18 March 2005 *F. Candan 86035* (holotype ISTE). — PARATYPES: Turkey. B3 Isparta, Şarkikaraağaç, Kizildağ National Park, 1500 m (HUB 8145)!; C4 Karaman, Hadim, Bolay village, 1500–1800 m a.s.l. (HUB 35998)! with var. *chrysanthus* and var. *bicoloraceus*.

Corm 1.0–1.4 × 0.9–1.3 cm, leaves 0.6–1.1(1.2) mm width. Flowers 1–2, throat purplish, brownish or blue; perigon tube yellowish orange or purplish, brownish speckled or suffused on exterior. Tepals often yellowish orange, rarely yellow; outer tepals 0.25–0.45 × 1.70–2.10 cm, inner tepals 0.30–0.55 × 1.50–1.90 cm. Filaments yellow, yellowish orange, 3.6–5.0 mm; anthers wholly yellow, 7.5–8.6 mm. Seeds reddish brown, 1.4–2.2 × 3.0–4.4 mm; testa irregular aculeate. Pollen grains spiraperturate. Chromosome number 2n = 14.

***Crocus chrysanthus* subsp. *punctatus* F.
Candan & N. Özhatay, *subsp. nova* (Fig.
1M–P)**

TYPE: Turkey. B2 Kütahya, Uşak–Aslanapa road, near Gediz, left of the road, 1185 m a.s.l., 18 March 2005 *F. Candan 86041* (holotype ISTE). — Paratype: Turkey. B2 Kütahya, 10 km from Afyon to Kütahya, 950 m a.s.l. (AEF 17106!).

Corm 0.5–2.3 × 0.8–2.2 cm, leaves 0.6–1.2(1.5) mm wide. Flowers 1–4(5), throat and perigon tube creamy white or yellow. Tepals yellow, yellowish orange; outer tepals (0.4)0.5–1.1 × 1.8–3.2 cm, inner tepals, 0.4–1.1 × 1.5–3.0 cm. Filaments yellow, yellowish orange 3–9 mm; anthers yellow with greyish black basal lobes (6)7–11.9 mm. Seeds brown, reddish brown, 1.7–2.4 × (2.8)3–4.8(5.1) mm; testa regular aculeate. Pollen grains polyrugoidate. Chromosome numbers 2n = 12, 12 + 3B.

***Crocus chrysanthus* subsp. *kesercioglu*
F. Candan & N. Özhatay, *subsp. nova*
(Fig. 1Q–T)**

TYPE: Turkey. C3 Muğla, from Muğla to Göktepe, north part of the Günlüce village, 1300 m a.s.l., 10 March 2007 *F.*

Candan 86023 (holotype ISTE).

ETYMOLOGY: This subspecies is named after the celebrated Turkish botanist Professor Dr. Teoman Kesercioglu of Dokuz Eylül University in Turkey.

Corm 1.2–1.5 × 1.1–1.5 cm, leaves 0.7–1.0(1.1) mm wide. Flowers 1–2, throat and perigon tube yellow, yellowish orange; purplish, brownish or blue speckled or suffused on exterior. Outer tepal edges yellowish orange; purplish, brownish or blue speckled or suffused on exterior; 0.4–0.5 × 2.1–2.3 cm; inner tepal edges yellowish orange; sometimes pale purplish, brownish or blue speckled or suffused; 0.50–0.65 × 1.85–2.10 cm. Filaments yellowish orange, orange, 4.6–7.8 mm; anthers greyish black, black or rarely with yellowish spots, 8.0–10.4 mm. Seeds reddish brown, 1.5–2.4 × 3.2–4.5 mm; testa colliculate-aculeate. Pollen grains polycollipate. Chromosome number 2n = 16.

***Crocus chrysanthus* subsp. *sipyleus*
F. Candan & N. Özhatay, *subsp. nova* (Fig.
1U–X)**

TYPE: Turkey. B1 Manisa, Spil Mountain, horse place, 1250 m a.s.l., 6 March 2005 *F. Candan 86020* (holotype ISTE).

ETYMOLOGY: In reference to the type locality.

Corm 1.4–2.5 × 0.8–2.1 cm, leaves 0.8–1.2 mm width. Flowers 1–4(5), throat and perigon tube purplish, brownish or blue speckled, striped or rarely suffused on the exterior. Outer tepals yellowish orange; sometimes with 3–5 prominent lines or purplish, brownish or blue speckled, veined striate or rarely suffused on exterior; 0.4–0.8 × 1.8–3.2 cm; inner tepals generally pale purplish, brownish or blue veined striate or lined from base sometimes decreasingly to upper parts, 0.4–0.8 × 1.6–2.9 cm. Filaments yellow, yellowish orange, orange, 4.4–6.7 mm; anthers yellow with greyish black longitudinal lines, 9.8–14 mm. Capsule often purple-tinged. Seeds reddish brown, (1.5)1.7–2.2 × (2.0)3.0–4.9 mm; testa finely vesiculate. Pollen grains nonaperturate. Chromosome numbers 2n = 20, 20 + 2B.

Key to the subspecific taxa of *Crocus chrysanthus*

1. Anthers wholly yellow, pollen type spiraperturate; 2n = 8, 10, 14 2

1. Anthers not wholly yellow; $2n = 12, 16, 20$ 3
2. Throat and perigon tube creamy white or yellow; tepals yellow, sometimes yellowish orange; $2n = 8$
..... subsp. *chrysanthus* var. *chrysanthus*
2. Throat, perigon tube and tepals yellow, greyish, purplish, brownish or blue speckled, striped or suffused on exterior, $2n = 10$
..... subsp. *chrysanthus* var. *bicoloraceus*
2. Throat purplish, brownish or blue; perigon tube wholly yellowish orange or purplish, brownish speckled or suffused on exterior; tepals yellowish orange, rarely yellow; $2n = 14$ subsp. *chrysanthus* var. *atroviolaceus*
3. Anthers yellow with greyish black basal lobes; pollen polyrugoidate; $2n = 12, 12 + 3B$ subsp. *punctatus*
3. Anthers wholly greyish black, black or rarely with yellowish spots; pollen polycolpate; $2n = 16$
..... subsp. *kesercioğlu*
3. Anthers yellow with greyish black longitudinal lines; pollen nonaperturate; $2n = 20, 20 + 2B$... subsp. *sipyleus*

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Appendix. Distribution of *Crocus chrysanthus* in Turkey, based on that of the examined specimens.

A1 Edirne, between Keşan and Enez, 50 m a.s.l. (ISTE 23814); between Edirne and Lalapaşa (ISTE 60018); Lalapaşa, above Doğanca village, 120 m a.s.l. (ISTE 27272). **Kırklareli**, between Babaeski and Havsa, 70 m a.s.l. (ISTE 27256). **Tekirdağ**, Malkara, between Deveci village and Kadıköy, 750 m a.s.l. (HUB 6270). **A3 Bilecik**, 15 km from Bilecik towards Bozüyük (ISTE 31555). **B1 İzmir**, Tahtalı Mountain, 520 m a.s.l. (EGE 9934), 500 m a.s.l. (ISTE 21316); Yamanlar Mountain, 400–800 m a.s.l. (HUB, EGE 8208), 800 m a.s.l. (EGE 9932, 9933), 850 m a.s.l. (ISTE 21317, 10723); Kemalpaşa, Nif Mountain, near Ovacık, 1000 m a.s.l. (EGE 23492), 400–800 m a.s.l. (EGE 24093), 1000 m a.s.l. (ISTE 46158), 1500 m a.s.l. (ANK); Odemiş, Bozdağ, 1400 m a.s.l. (EGE 9940), 1450 m a.s.l. (EGE 9939), alpine zone, 1580 m a.s.l. (EGE 9941). **Manisa**, Manisa Mountain, 800 m a.s.l. (EGE 15099), alpine zone, 1350 m a.s.l. (EGE 9928, ISTE 21345). **Balikesir**, Ayvalık, Dolap island, 20 m a.s.l. (ISTE 71314); Alibey island (ISTE 73577); Ayvalık, around Tuz Lake, 20 m a.s.l. (ISTE 73645); Mitralyöz Bay, 5 m a.s.l. (ISTE 73577). **B2 Kütahya**, from Kütahya towards Eskişehir, 20 km (AEF, ISTE 21330); 15 km from Simav towards Emet, 1360 m a.s.l. (EGE 21234); Gölcük, 1450 m a.s.l. (EGE 24350); Murat Mountain, Kartal peak, Yörük plateau, alpine zone, 2150 m a.s.l. (EGE 33260). **B3 Kütahya**, 16 km from Kütahya towards Afyon, 1080 m a.s.l. (ISTE 23744). **Afyon**, around railway station, 1020 m a.s.l. (GAZI); Bayat, 1600 m a.s.l. (GAZI); Hidirlik Mountain (ISTE 21335); between Afyon and Sandıklı, 1200 m a.s.l. (ISTE 23746); Sultan Mountains, 1550 m a.s.l. (ISTE 34575), 1800 m a.s.l. (ISTE 34569). **Isparta**, Şarkikaraağaç, Kizildağ National Park, 1250–1300 m a.s.l. (HUB 35986); Şarkikaraağaç, Eskici plateau (EGE 8190). **Eskişehir**, Türkmen Mountain, 1300–1800 m a.s.l. (ANK 2382), 1450 m a.s.l. (ANK 2993), 1500 m a.s.l. (ISTE 48141); Mihaliççik, 1577 m a.s.l. (HUB). **Konya**, between Akşehir and Yalvaç, 1600 m a.s.l. (ISTE 34546); above Akşehir, 1670 m a.s.l. (ISTE 34531), 1850 m a.s.l. (ISTE 34534). **B6 Kahramanmaraş**, Göksun, Findik village, 1400–1700 m a.s.l. (HUB 35996). **C2 Muğla**, 15 km from Muğla towards Göktepe, 1600–1650 m a.s.l. (GAZI); 24 km from Muğla towards Kale, 1250 m a.s.l. (ISTE 1356; anthers are black). **Denizli**, Babadağ, 1800 m a.s.l. (EGE 34418); Honaz Mountain, 1200 m a.s.l. (ISTE 31317), 1300 m a.s.l. (ISTE 31311). **C3 Afyon**, Bayat, between Köroğlutepe and Yongalitepe, 1550 m a.s.l. (ANK 35); Bayat, between Yongalı hill and Kiğili hill, 1600 m a.s.l. (GAZI); Kumalar Mountain, 1650 m a.s.l. (ANK 14310); between Sandıklı and Akdağ, Kocayayla, 1500 m a.s.l. (EGE 26116). **Isparta**, Eğridir, 1700 m a.s.l. (EGE 37119); Eğridir, Boyalık place, 1200 m a.s.l. (EGE 37121); Eğridir, Yaka village, 1280–1650 m a.s.l. (ISTE 34266), 1580 m a.s.l. (ISTE 34645), 1600 m a.s.l. (ISTE 34661); Eğridir, between Gökdere and Kasnak, 1600 m a.s.l. (ISTE 34673); Barla Mountain, 1600 m a.s.l. (ANK 14309); Davraz mountain, 1700–1750 m a.s.l. (HUB 35999); between Senirkent and Kapıdağ, 1500 m a.s.l. (EGE 37120). **Antalya**, Akseki, 1450 m a.s.l. (AEF 19781); Akseki, Çimi village, 1750 m a.s.l. (HUB 3599); 15 km from Akseki towards Seydişehir, Gidefi mountain, 1500–1650 m a.s.l. (GAZI); Gündoğmuş, Kemalgaži plateau, 1300 m a.s.l. (AEF 19642); Gündoğmuş, Narağacı village, 1400–1700 m a.s.l. (AEF 14994); Senirkent, 1170 m a.s.l. (AEF 17417); Alanya, Derettürbenaz road, 1165 m a.s.l. (ISTE 8534). **Konya**, Beyşehir, Kurucuova, 1590–1740 (ANK 1052); 20 km to Akseki towards Beyşehir, 1000 m a.s.l. (AEF 17041); between Beyşehir and Akseki, Bakaran place, 1400 m a.s.l. (AEF 13431); Beyşehir, Kurucuova, Sütleğen, 1300–1400 m a.s.l. (AEF 13443); Beyşehir, Kurucuova, Suludere, 1500–2000 m a.s.l. (ISTE 34269); Beyşehir, near Yeşildağ, 1300 m a.s.l. (AEF 17043); between Seydişehir and Akseki, 1620 m a.s.l. (GAZI); Karacaören, 1460 m a.s.l. (HUB). **C4 Karaman**, Ermenek, Yelibel, moist places, 1750 m a.s.l. (ANK 1228); Özyurt mountain, 1200 m a.s.l. (HUB 35943); Seydişehir, 1550 m a.s.l. (ANK 1365); 9 km from Taşkent towards Ermenek, 1900 m a.s.l. (HUB 8159). **C5 Niğde**, around Ulukışla (ISTE 12456). **Adana**, Pozanti, above Bürücek plateau, 1600 m a.s.l. (HUB 35995); Pozanti, Kocaköy (ISTE 2390). Eskişehir, 20 km (AEF, ISTE 21330); 15 km from Simav towards Emet, 1360 m a.s.l. (EGE 21234); Gölcük, 1450 m a.s.l. (EGE 24350); Murat Mountain, Kartal peak, Yörük plateau, alpine zone, 2150 m a.s.l. (EGE 33260). **B3 Kütahya**, 16 km from Kütahya towards Afyon, 1080 m a.s.l. (ISTE 23744). **Afyon**, around railway station, 1020 m a.s.l. (GAZI); Bayat, 1600 m a.s.l. (GAZI); Hidirlik Mountain (ISTE 21335); between Afyon and Sandıklı, 1200 m a.s.l. (ISTE 23746); Sultan Mountains, 1550 m a.s.l. (ISTE 34575), 1800 m a.s.l. 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