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Gladiolus osmaniyensis (Iridaceae), a new species from South Anatolia, Turkey

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Abstract: A new species, *Gladiolus osmaniyensis* Sağıroğlu (Iridaceae), is described and illustrated from South Anatolia, Turkey. *G. osmaniyensis* is morphologically close to *G. attilae* and *G. atroviolaceus*. The ecology and phenology of the new species as well as its etymology, conservation status, and diagnostic morphological features are discussed. In addition, the seed surfaces of the *G. osmaniyensis*, *G. attilae*, and *G. atroviolaceus* are examined by SEM. The geographical distribution of the new species and the morphologically related species are mapped as well.

Key words: New species, endemic, *Gladiolus*, Iridaceae, Turkey

1. Introduction

Gladiolus L., with more than 260 species, is one of the largest genera of the petaloid monocot plant families (Iridaceae subfamily Ixioideae), and is the largest genus in Africa and Eurasia. Large as *Gladiolus* is in tropical Africa, the genus is substantially eclipsed in southern Africa, where there are estimated to be at least 150 species. There are just 8 species of this genus in Madagascar and probably no more than 10 in all of North Africa, southern Europe, Turkey, and the Middle East, excluding southern Arabia (Goldblatt, 1996).

In Turkey, revision of *Gladiolus* was done by Kit Tan and Edmonson (1984). They recognized 9 species in the *Flora of Turkey*, 4 of which are endemic. Since then a new species has been added to the *Flora of Turkey* by Kit Tan et al. (2006).

Turkey is one of the world's richest countries in terms of monocotyledons. Day by day, new species belonging to monocots are also added to the *Flora of Turkey* (Uzunhisarcıklı et al., 2013). During fieldwork in June 2005, an interesting specimen was collected by the authors from Yayladağı (Hatay) and Yarpuz (Osmaniye), located in the Amanous Mountains.

During a subsequent visit, the adequate specimens of the new species were collected during the flowering and fruiting time from Hatay Province. After a close examination of the account of *Gladiolus* in *Flora of Turkey*, it was clear that the specimens were quite different from all *Gladiolus* species. The new species is very similar to *Gladiolus attilae* Kit Tan, B.Mathew & A.Baytop and *G. atroviolaceus* Boiss., but differs from them by having upper and lower median segments of perianth apically cuspidate, length of filaments (18–24 mm), anther length (15–18 mm), and turbinate to rounded and winged seeds. The new species were also cross-checked with accounts of *Gladiolus* from some floras, such as *Flora Iranica* (Wendelbo & Mathew, 1975), *Flora of Syria, Palestine and Sinai* (Post & Dinsmore, 1933), *Flora of the U.S.S.R.* (Chernyakovskaya, 1968), *Flora of Cyprus* (Meikle, 1985), and compared with specimens in GAZI, ANK, and HUB herbaria.

For seeds, morphometrical data of cleaned and mature seeds were obtained using a stereomicroscope with a micrometer. Seed length and width were measured on 15 seeds at the widest point. Mature seeds were mounted using double-sided tape on scanning electron microscope (SEM) stubs and coated with gold in a Polaron SC502 sputter coater. They were examined with a JEOL JSM 840A SEM at 5 kV at Gazi University.

The authors of plant names are given in accordance with Brummitt and Powell (1992).

2. Results

Gladiolus osmaniyensis Sağıroğlu **sp. nova** (Figure 1).

Type: Turkey, C6 Osmaniye: between Yarpuz and Yağlıpınar, 1250–1300 m, under mixed forest, shady slopes, 11.06.2005, *M.Sağıroğlu* 2556 & *G.Akgül* (holotype: GAZI, isotype: HUB).

Diagnoses: *Gladiolus osmaniyensis* is related to *G. attilae* and *G. atroviolaceous*. It mainly differs from

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Figure 1. *Gladiolus osmaniyensis* (Photo, Holotype).

Gladiolus attilae because it has long filaments 18–24 mm (not 10–12 mm), anthers 15–18 mm (not 8–10 mm), apically of upper and lower median segments cuspidate (not rounded), wingless seeds (not winged) and differs from *Gladiolus atroviolaceous* because of having long filaments (not 9–15 mm) and anthers (not 10–15 mm), apically of lower median segments cuspidate (not acute-rounded).

Description: Glabrous perennial. Corm symmetrical, subglobose, 2 cm diam., enclosed by several layers of brownish, finely reticulate fibrous tunics. Stem 60–75 cm, erect, as measured from ground level, 4–5 mm diam. at base. Leaves 5–6, the lower not reaching the base of the spike. Lowest leaf reduced to a subterranean sheathing cataphyll 15–24 cm long; the blades linear, 0.7–10 mm wide, venation parallel; cauline leaves 2–3, linear-lanceolate, 2.5–6 cm long. Spike 5–7(–9) flowered, lightly flexuose; bracts green, 20–50 mm long, the inner approximately two-thirds as long as the outer. Perianth zygomorphic, pinkish-purple flowers each subtended by a valved spathe; valves glaucous-green, unequal, upper 2–2.5 cm, lower 4–5 cm long. Hypanthial tube infundibular, posterior 10–15 mm, anterior 12–18 mm; perianth segments 6 (2 median and 4 lateral), unequal; upper median segment flared, pinkish-purple 30–35 mm with spathulate, apically cuspidate, 10–12 mm broad limb and 15–20 mm long claw; lower median segment 28–32 mm with spathulate, 8–11 mm broad limb and 9–12 mm claw, apically cuspidate; upper lateral segments longer and narrower than upper median, 22–28 mm long with 12–15 mm broad claw, apically acute; lower lateral segments spathulate, 28–33 mm, apically acute. Filaments 18–24 mm adnate to perianth tube, filiform, yellowish, anthers shorter than filaments, 15–18 mm. Style filiform, included; stigma 4–6 mm × 1–1.25 mm cleft at apex into 3 ± equal, dilated-spathulate branches with decurrent stigmatic surfaces. Ovary 3 locular. Capsule loculicidal, ovoid, 7–10 × 4–6 mm. Seeds turbinate to rounded, 2–3 × 1.7–2 mm, dark brown, not winged. The ornamentation is colliculate-rugulate.

Seed morphology: Seeds are dark brown, turbinate to rounded, not winged, 2–3 × 1.7–2 mm. Epidermal cells are more or less isodiametric, colliculate-rugulate, not winged, periclinal cell wall is flat or slightly convex.

Ecology and phenology: Flowering in May–June, fruiting in July. *Gladiolus osmaniyensis* is currently known only from Yarpuz, Osmaniye, and Yayladağı (Hatay) restricted to the Amanous mountain range. According to Zohary (1973), because of climatological peculiarities (e.g., sizeable rain fall, some occurring during summer months, and high atmospheric humidity in some parts of this mountain system), and probably also because of its floristic past, the Amanous system occupies a special place in the flora of the East Mediterranean province. Isolated high mountain areas also have species of limited ranges. Thus the highlands of Osmaniye and its surrounding areas have endemic plant species. This new species grows in calcareous rocky places at 650–1300 m near *Ostrya carpinifolia, Rosa canina, Crateagus monogyna, Quercus cerris, Q. coccifera*, *Calicotome villosa, Rhus coriaria*, *Jasminum fruticans, Styrax officinalis*, *Fraxinus ornus*, *Centaurea amanicola, Phlomis longifolia* var. *longifolia, Stachys pumila*, *Laserpitium glaucum*, and *Ferulago autumnalis*. Flowering time is May and early June. Fruiting time is in July.

Etymology: The specific epithet is derived from the locality of the type specimen, Osmaniye Province.

Distribution: *Gladiolus osmaniyensis* is found only in 2 populations in Yarpuz (Osmaniye) and Yayladağ (Hatay) (Souht Anatolia); however, *G. attilae* is found in only one locality from East Anatolia around Elazığ (B7) provinces (Figure 2).

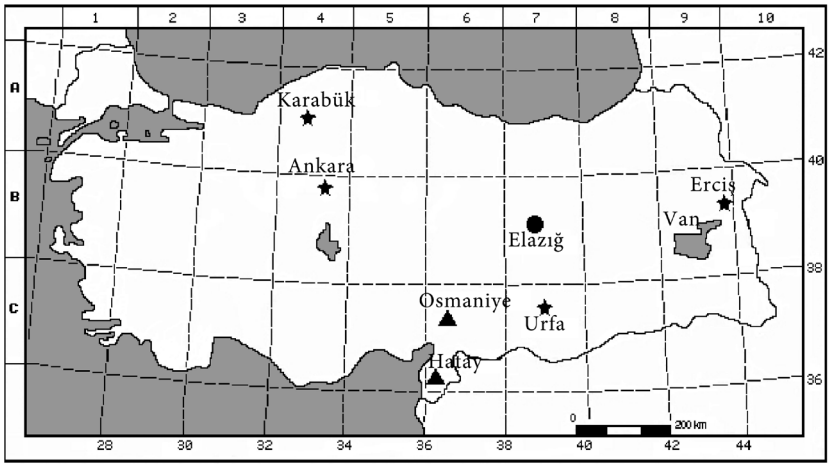

Figure 2. Distribution map of *Gladiolus osmaniyensis* (▲), *G. attilae* (●), and *G. atraviolaceus* (✶).

Conservation status: Because this species is known to be from 2 locations, it is considered "Endangered" (criterion B1 a). It could also be categorized as "Critally Endangered" (criterion B2) for its known "area of occupancy", which is not more than 1 km^2, and population size estimated to fewer than 100 mature individuals (criterion C). We conclude that *Gladiolus osmaniyensis* must be classified as "Critically Endangered (CR)" based on its "area of occupancy", although it is known to be from 2 locations (IUCN, 2010).

Additional specimens examined. *Gladiolus osmaniyensis* (paratypes): Turkey. C6 Hatay: between Hatay and Yayladağ, 650 m, 31 km from Hatay, 650 m, 01.06.2002, *M.Sağıroğlu* 1929 (GAZI); C6 Osmaniye; between Yarpuz and Yağlıpınar, 1300 m, under mixed forest, 10.06.2008, *M.Sağıroğlu* 2718 (KNYA), - *Gladiolus attilae*: Turkey, B7 Elazığ; Elazığ–Tunceli road, 10 km before Kovancılar, 500 m from Keban dam, c. 1000 m, 22 June 1991, *A.Baytop* (62995 holotype:ISTE); ibid., 3 July 1991, *A.Baytop* (ISTE 63009). - *G. atroviolaceus*: Turkey. A4 Kırıkkale: between Sulakyurt and Akkuzulu, 1100 m, 17.6.1990, *A.Dönmez* 2000 (HUB); Ankara: Polatlı, Kavuncu bridge, 130 km, 720 m, 11.5.1956, *H.Birand* 3 (ANK); Karabük:Yenice, Tirköy Bakraz region, 200 m, 25.5.1985, *M.Demirörs* 1503 (ANK); B7 Adıyaman: Gölbaşı, Yukarıçöplü village, 1000 m, 18.4.2001, *A.Dönmez* 8576 (HUB); B9 Bitlis: Tatvan, between Reşadiye and Pelli, 1700 m, 17.7.1972, meadow, *H.Peşmen* 3036 (HUB); B9 Van, between Erciş and Adilcevaz 44 km, steppe, 1750 m, 03.06.1993, *Y.Altan* 4790 (GAZI); Van: Edremit, Yeniköy, steppe, c. 1800 m, 06.06.1993, *Y.Altan* 5167 (GAZI); C7 Şanlıurfa: Ceylanpınar-Saraçtepe, 530 m, 05.05.1995, *Z.Aytaç* & *N.Adıgüzel* 2347 (GAZI); Şalıurfa: Viranşehir, Ceylanpınar, Gökçayır (Telhamut), 470 m, 19.4.1980, *A.Güner* 2264 (HUB).

3. Discussion

Gladiolus is a genus for which many of the diagnostic characters are based on floral characteristics (perianth and androecium) (Tan & Edmondson, 1984). *Gladiolus osmaniyensis* has also a lot of distinctive characters in the perianth (Figures 3 and 4), seeds, habitat, and ecology. It is a very distinct species, with no allies in Turkey, Iran, or Syria due to its long anthers and filaments, big upper and lower median segments of perianth, capsule, and seed shapes.

Gladiolus osmaniyensis is closest to *G. attilae* and *G. atroviolaceus*, which is distributed in South Anatolia near Yarpuz (B5 Osmaniye) and only known from the 2 localities. It differs from *G. attilae* in many characteristics

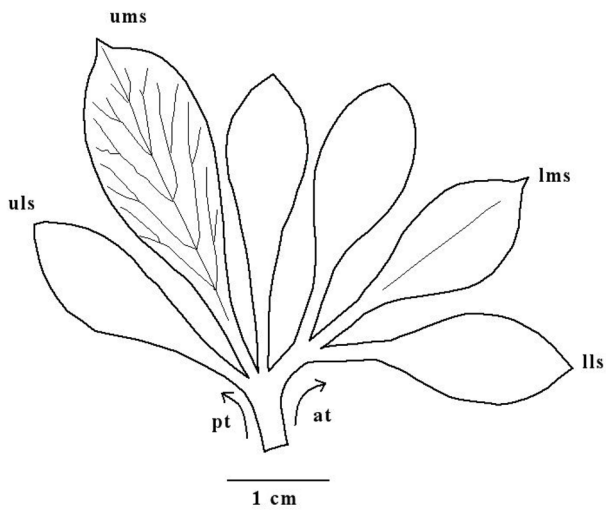

Figure 3. *Gladiolus osmaniyensis* perianth dissected: ums = upper median segment, uls = upper lateral segment, lms = lower median segment, lls = lower lateral segment, at = anterior of perianth tube, pt = posterior of perianth tube.

Figure 4. Flowers of *Gladiolus osmaniyensis.*

such as upper and lower median of perianth apically, length of filaments and anthers, shape, and wings of seeds (Table). *G. osmaniyensis* differs from *G. atroviolaceous* by its number of leaves, size of median and lower median segments, apically of upper and lower median segments, and size of filaments and anthers. Comparative characters are summarized in the Table.

The seeds of *G. osmaniyensis* are brown, turbinate. Epidermal cells are more or less isodiametric, periclinal cell wall is undulate or convex. Seeds of *G. attilae* reddish-brown, ellipsoid-triquetrous. Epidermal cells not longer, periclinal cell walls are spherical and overlap. Seeds of *G. atroviolaceus* are brown, ovoid. Epidermal cells irregular, periclinal cell walls are clearly winged (Figure 5).

Key to the species *Gladiolus osmaniyensis*, *G. attlae*, and *G. atroviolaceus*

1. Upper median and lower median segment apically acute-rounded, filaments 9–15 mm anthers 8–15 mm
   2. Flowers violet-purple, capsules oblong, 15–20 × 8–12 mm, seeds ovoid, 2.5–3 × 2 mm, wingless .... **G. atroviolaceous**
   2. Flowers pinkish-purple, capsule ellipsoid, 10–13 × 7–10 mm, seeds elipsoid-triquetrous, 3.4–4 × 2 mm, winged ..... **G. attilae**
1. Upper median and lower median segments apically cuspidate, filaments 18–24 mm, anthers 15–18 mm .... **G. osmaniyensis**

The Amanous mountain range is a botanically interesting area occupying an intersection between the Mediterranean phytogeographical region and the Anatolian Diagonal. The concept of the Diagonal was first proposed by P. H. Davis, who defined it as an oblique belt running from the Northeast to the Anti-Taurus, where it divides into 2 directions, with one branch to the Amanous

Table. Comparison of the diagnostic characters of *Gladiolus osmaniyensis*, *G. attilae*, and *G. atroviolaceus.*

Characters	*G. osmaniyensis*	*G. attilae*	*G. atroviolaceous*
Leaves	5–6	4 (–6)	3
Upper spathe	2–2.5 cm	1.5–2 cm	1.5–2.5 cm
Lower spathe	4–5 cm	2–4 cm	3–4.5 cm
Hypanthial tube posterior	10–14 mm	7–10 mm	1.3 cm
Hypanthial tube anterior	12–18 mm	9–12 mm	1.1 cm
Upper median segments of perianth	30–35 mm	22–25 mm	20–27 cm
Apically	cuspidate	rounded	acute-rounded
Lower median segments of perianth	28–32 mm	17–20 mm	20–22 cm
Apically	cuspidate	rounded	acute-rounded
Upper lateral segments of perianth	25–32 mm	20–22 mm	23–25 cm
Lower lateral segments of perianth	22–28 mm	17–20 mm	18–27 cm
Capsules	ovoid,	ellipsoid,	oblong,
	7 –10 × 4–6 mm	10–13 × 7–10 mm	15–20 × 8–12 mm
Filaments	18–24 mm	10–12 mm	9–15 mm
Anthers	15–18 mm	8–10 mm	10–15 mm
Seeds	turbinate to rounded,	ellipsoid-triquetrous,	ovoid,
	2–3 x 1.7–2 mm,	3.4–4 x 2 mm,	2–3 × 2 mm,
	wingless	winged	wingless

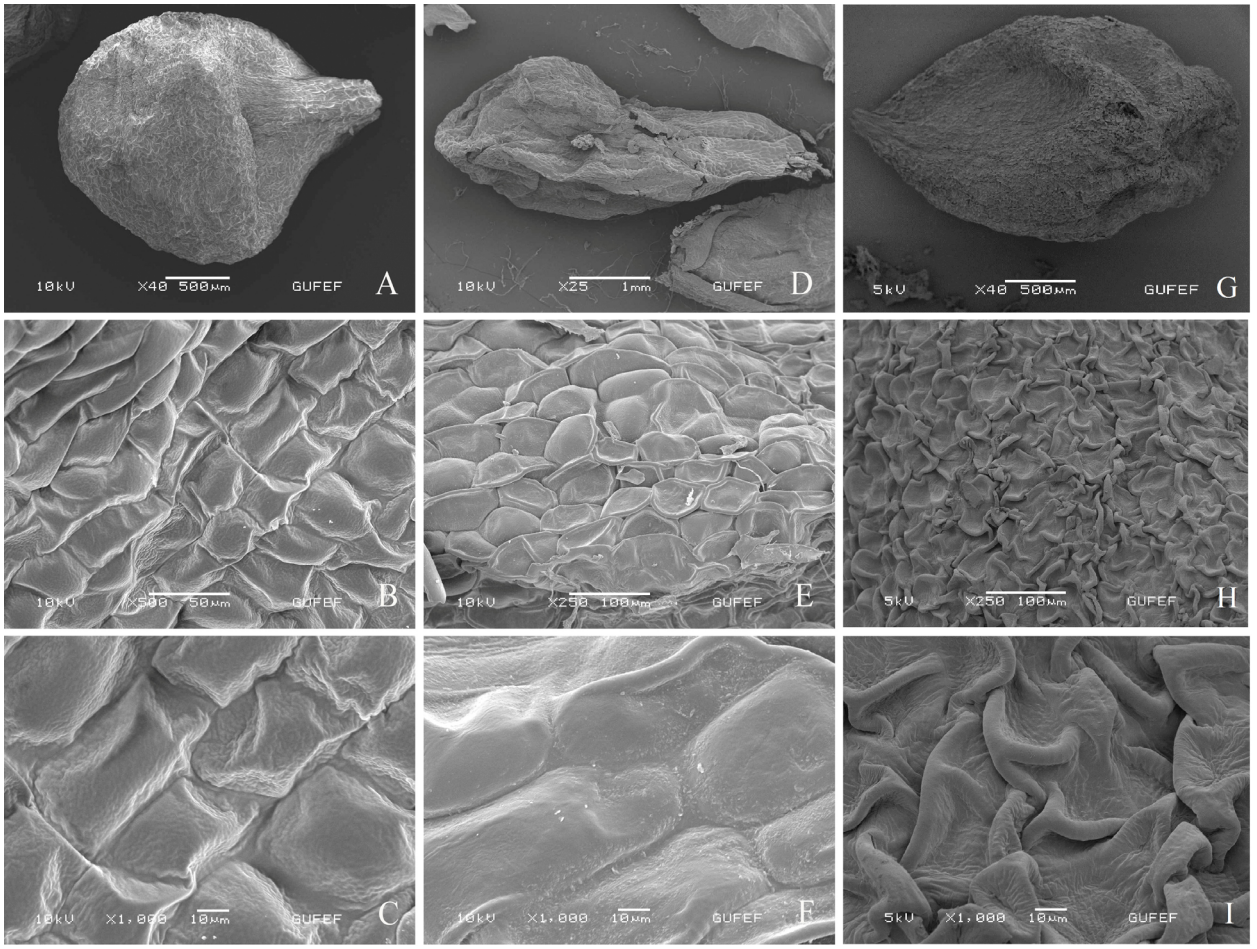

Figure 5. SEM micrographs of the seeds. A, B, and C- *Gladiolus osmaniyensis*; D, E, and F- *G. attilae*; G, H, and I- *G. atraviolaceus*.

Mountain, the other to the Cilician Taurus (Davis, 1971). One explanation for the present richness is neoendemism and distribution patterns of the plants related to the Diagonal (Ekim et al., 2000). According to Zohary (1973), because of climatological peculiarities (e.g., sizeable rain fall, some occurring during summer months, and high atmospheric humidity in some parts of this mountain system), and probably also because of its floristic past, the Amanous system occupies a special place in the flora of the East Mediterranean region. Isolated high mountain areas also have species of limited ranges. Thus the highlands of Osmaniye and its surroundings have endemic species of plants. In recent times several taxa have been introduced to the scientific world originating from Osmaniye and its surroundings located in the Amanous. Recently several new species have been described from this region, including *Scorzonera yıldırımlii* A.Duran & Hamzaoğlu (Duran and Hamzaoğlu, 2004), *Prangos turcica* A.Duran, M.Sağıroğlu & H.Duman (Duran et al., 2005), *Origanum* × *adanense* Baser & Duman (Duman et al., 1998), *Silene doganii* A.Duran & Y.Menemen (Duran and Menemen, 2003), *Hesperis hamzaoglui* A.Duran (Duran, 2008), *Cicer floribundum* var. *amanicola* M.Öztürk & A.Duran (Öztürk et al., 2011), *Verbascum ergin-hamzaoglui* Karavel. (Karavelioğulları et al., 2011), and *Scorzonera zorkunensis* Coskuncelebi & S.Makbul (Coşkunçelebi et al., 2012).

The study area needs to be legally protected with protection of the small populations and vegetation. In addition, the species should be cultivated in botanical gardens (ex-situ conservation).

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