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The genus *Gladiolus* (Iridaceae) in southern Transcaucasia

Abstract

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The S Transcaucasian representatives of the genus *Gladiolus* are revised. Nine species and two additional subspecies are recognised. Their morphological features are illustrated, their distribution, ecology and relationships are discussed. A key for their identification as well as some distribution maps are provided.

Introduction

Southern Transcaucasia, here defined to include the arid and subarid regions of Armenia and Nakhichevan, is characterised by a rich and peculiar flora with a great number of neo-endemics. The marked complexity of relief and climate, extreme altitudinal differences (from 450 m to 4095 m above sea level), influences of widely different floristic provinces, frequent volcanic activity, and other factors, may be invoked to explain the floristic richness and high species diversity of this relatively small territory. Here speciation can be studied in many genera, including two of the Iridaceae: *Gladiolus* L. and *Iris* L.

The taxonomy of *Gladiolus* is complex in a general way. Status and delimitation of many of its species are uncertain or confused. Many important features are lost by drying, so that the observation of live plants in the field is of prime importance for a good understanding of the variation and delimitation of taxa.

Our morphological analysis of Caucasian *Gladiolus* species in comparison with several European, Anatolian, and Iranian relatives allowed a better characterisation of the previously known ones as well as the description of four taxa new to science.

Material and Methods

The present revision is based on the study of a vast majority of Armenian herbarium specimens of *Gladiolus* kept at G, G-BOIS, ERE, LE, P, TBI, and TGM, as well as on the observation of natural populations in the field, during numerous expeditions throughout Armenia and Nakhichevan.

Morphology

A thorough morphological examination of different organs of Caucasian *Gladiolus* species, and of their close relatives from other areas, shows a large variability in the structure of the following features, traditionally considered as diagnostic within the genus.

Corms (Fig. 1). – Corms are symmetric or slightly asymmetric, ovoid or subglobose, enclosed by several tunic layers; the tunic is deep brown, brownish, grey or pinkish, papery to coriaceous, fragmenting into coarse or thin fibres, or reticulately fibrous.

Leaves (Fig. 2). – There are two to many cauline leaves which are synanthous, flat or

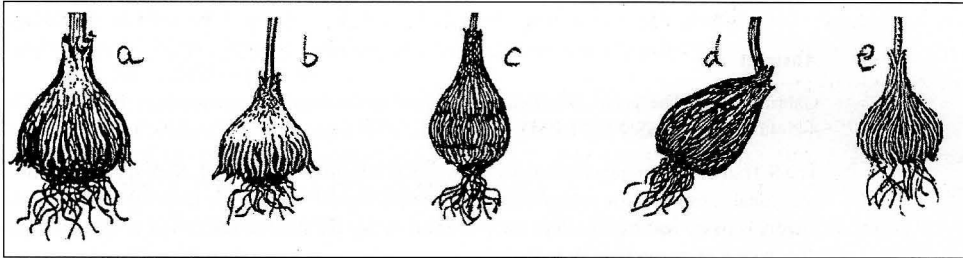


Fig. 1. Corms of *Gladiolus caucasicus* (a), *G. kotschyanus* (b), *G. halophilus* (c), *G. atroviolaceus* (d), and *G. szovitsii* (e).

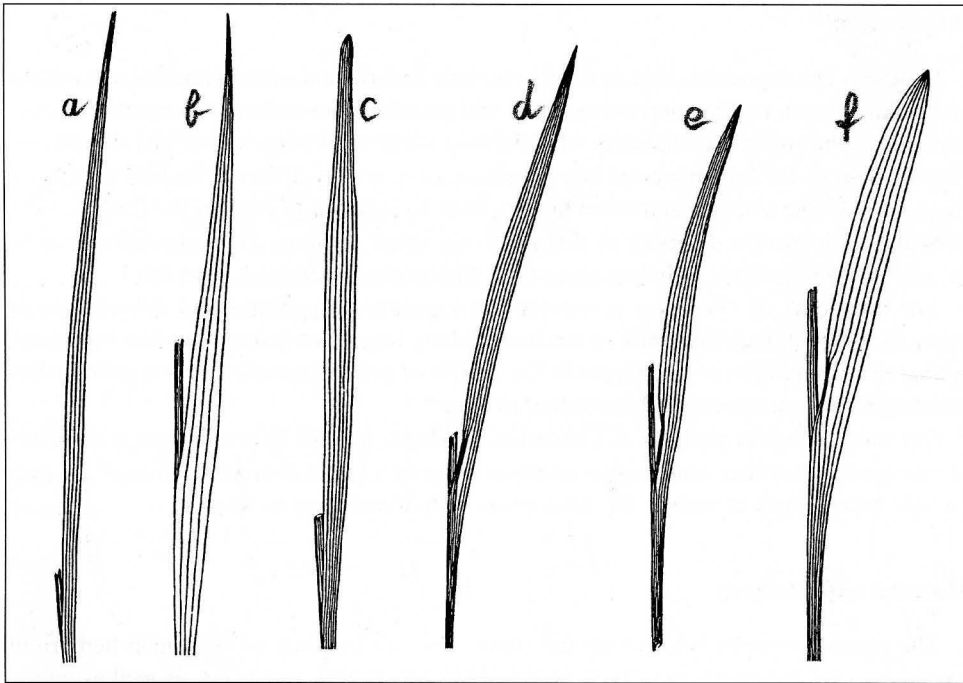


Fig. 2. Cauline leaves of *Gladiolus atroviolaceus* (a), *G. italicus* (b), *G. menitskyi* (c), *G. tenuis* (d), *G. dzhavakheticus* (e), and *G. kotschyanus* (f).

ensiform, linear to lanceolate, straight, vaginate, smooth or finely papillose, green, greenish-purple or glaucous; the venation is parallel or upwardly diverging, and the veins may be weak, slightly thickened, or thick.

Inflorescence and flowers (Fig. 3). — The spike is usually either secund (all flowers turned to one side) or more rarely distichous. The flowers are laxly or densely arranged, zygomorphic or, very rarely, almost actinomorphic, mostly purple, rose-purple to blackish violet-purple. The tepals are more or less unequal, united below in a somewhat curved tube, the lower three are often much narrower than the upper, clawed and united for a short distance at the base, usually with contrasting rhomboid or narrowly elliptical markings functioning as a nectar guide. The filaments are filiform, inserted inside the mouth of the perianth tube; the anthers are unilateral, dehiscing longitudinally. The ovoid to oblong ovary is crowned by a filiform style divided into 3 simple branches which are apically expanded either gradually or abruptly.

Capsules and seeds (Fig. 4). — The capsule is many seeded, trivalvate, loculicidal, oblong, cylindrical, ovoid, obovoid, or globose, more or less 3-lobed above, tuberculate. The seeds are flattened, discoid, triquetrous, pyriform, globose, or angled, winged or wingless.

Besides the traditional diagnostic features used for the delimitation of taxa, the follow-

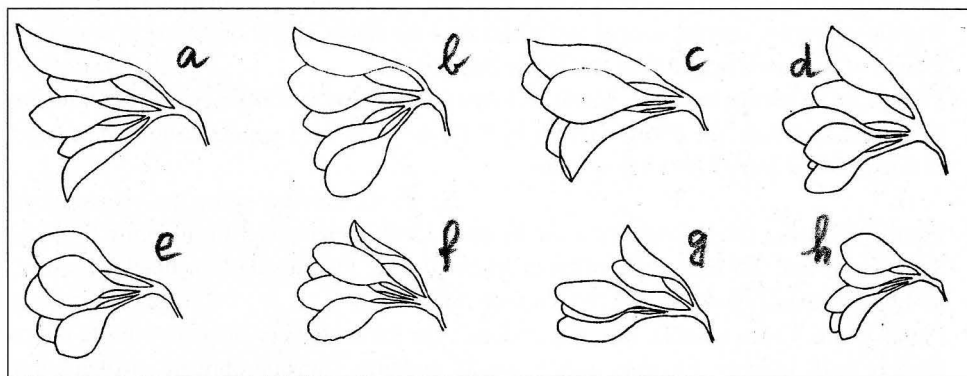


Fig. 3. Flowers in side view of *Gladiolus italicus* (a), *G. kotschyanus* (b), *G. caucasicus* (c), *G. atroviolaceus* (d), *G. dzhavakheticus* (e), *G. menitskyi* (f), *G. szovitsii* (g), and *G. tenuis* (h).

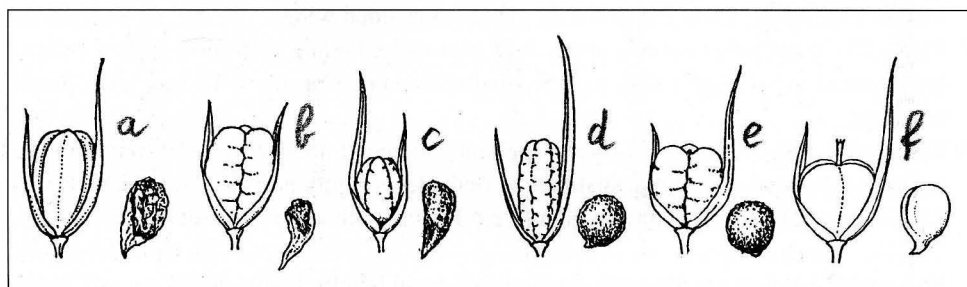


Fig. 4. Capsules with bracts (left) and seeds (right, not to scale) of *Gladiolus caucasicus* (a), *G. kotschyanus* (b), *G. tenuis* (c), *G. atroviolaceus* (d), *G. italicus* (e), and *G. dzhavakheticus* (f).

ing characters, best studied in the field, proved to be important: details of the structure and colour of the corm; the leaf arrangement along the stems; the colour of flowers and their arrangement in the inflorescence; the relative position of the perianth lobes; the shape and colour of the nectar guide blotches on the lower lobes (usually pale, with or without a darker, purple border); the capsule shape; etc.

Key

1. Flowers almost actinomorphic, widely open, erect, dark purple, drying violet 1. *G. dzhavakheticus*
 – Flowers zygomorphic, not widely open, not erect, variously coloured 2.
2. Inflorescence lax, slightly flexuous, secund or distichous. All flowers pink 3.
 – Inflorescence dense, usually not flexuous, secund or, if distichous, flowers crowded apically. flowers purple to violet, the upper ones rarely whitish 5.
3. Inflorescence secund, with 2-3(-4) flowers. Seeds globose 8a. *G. szovitsii* subsp. *szovitsii*
 – Inflorescence distichous, with 6-10(-17) flowers. Seeds angular-globose 4.
4. Leaves 4-5(-6), lamina 8-17 mm wide . Flowers 4-5.5 cm long, upper median segment slightly upwardly curved, longer and wider than the upper lateral ones; lower segments almost of the same length than the upper lateral ones 6. *G. italicus*
 – Leaves 2-(3), lamina narrowly linear, 2-3 mm wide. Flowers 2.5-3.5 cm long, segments rhomboid-spatulate, the 3 lower longer by 5-10 mm than the 3 upper, abruptly narrowed at the base and joined into a long claw 8b. *G. szovitsii* subsp. *pseudopersicus*
5. Plants glaucous. Corm large, to 3 cm in diam. with a coarsely fibrous tunic. Leaves 3 narrow linear, 3-8 mm wide, often exceeding spike. Flowers dark or blackish violet, nodding. Capsule elongate, 15-20 mm long, tuberculate 7. *G. atroviolaceus*
 – Plants green. Corm smaller, to 2 cm in diam., the tunic leathery or papery in its lower third or half, lacerate. Flowers purple, hardly nodding. Capsule obovate or ovate, not noticeably tuberculate 6.
6. Plants 80-120 cm tall. Leaves long, 2-2.5 cm wide, lamina with rather thick, equidistant veins. Spike dense, with 5-8 large, dark purple flowers. Capsule 10-15 mm long. Seeds oval or cuneiform, some flat and with a wide, one-sided wing 2. *G. caucasicus*
 – Plants 25-70 cm tall. Leaves shorter, 3-15 mm wide; lamina with more or less irregularly spaced veins. Spike with 1-4(-5) smaller flowers. Capsule 6-12 mm long. Seeds wingless 7.
7. Spike with 1-2(-3) flowers. Lower 3 perianth segments longer by 8-10 mm than the upper 3, narrowed, very long, spatulate or obovate, abruptly narrowed into claw. Plants 25-40 cm tall. Corm 6-10 mm in diam. Leaf lamina with almost parallel veins 5. *G. hajastanicus*
 – Spike with 4-8 flowers. Perianth segments of equal length. Plants 40-80 cm tall. Veins of leaf lamina either parallel or irregularly spaced and diverging above their junction with the sheath veins 8.

- 8. Corm 15-20 cm in diam. Leaf lamina 15 mm wide, shortly acuminate, with thick, irregularly spaced and diverging above their junction with the sheath veins. Spike dense, flowers crowded apically, secund or (in subsp. *distichus*) distichous. Perianth 4-4.5 cm long, purplish-pink but whitish in the upper flowers, with wide elliptic segments all of the same length. Capsule 12-14 mm long 4. *G. kotschyanus*
- Corm 6-10(-15) mm in diam. Leaf lamina 3-10 mm wide, gradually acuminate, with thin parallel veins. Spike always secund. Perianth 2.5-3.5 cm long, segments not so shaped and coloured 9.
- 9. Perianth 3-3.5 cm long, lilac, drying pale; upper median segment widely elliptic, shortly attenuate at the base, shorter by 3-5 mm than all the others which are spatulate, long attenuate at the base; margins irregularly erose-crispate 9. *G. menitskyi*
- Perianth 2.5-3.5 cm long, purple, drying violet; lower lateral segments slightly shorter than the others, narrow, pale light-blue, sometimes whitish, with a pale, narrowly rhomboid, purple-margined spot. Margins flat. 3. *G. tenuis*

1. *Gladiolus dzhavakheticus* Eristavi in Zametki Sist. Geogr. Rast. 34: 38. 1977. – Holotype: [Georgia] “Džavahetia in viciniis lacus Tabatzhuri, prope pagum Ziteli-sagdari, 20 Jul 1976, M. Eristavi (TBI!).

Distribution. – Endemic in S Georgia and NW Armenia (Fig. 5).

Note. – The rather primitive and taxonomically isolated *Gladiolus dzhavakheticus* with its peculiar, beautiful, widely open, almost actinomorphic flowers was so far known as a local endemic from just two localities in Georgia. Recently it has been found in many different



Fig. 5. The total known distribution of *Gladiolus dzhavakheticus* (dots), *G. szovitsii* subsp. *szovitsii* (lozenges), *G. szovitsii* subsp. *pseudopersicus* (half dots), and *G. menitskyi* (triangles).

places in northern Armenia. The locus classicus of this Transcaucasian endemic thus lies at the northern edge of its area of distribution.

2. *Gladiolus caucasicus* Herb. in Edwards's Bot. Reg. 27, Misc.: 65. 1842. – Fig. 6d.

Distribution. – W and E Caucasus, C, SW and S Transcaucasia; N Armenia (Aparan, Sevan).

Note. – Related to the European *Gladiolus communis* L., with which it was confused by some authors (Boissier 1882, Grossgejm 1928, 1940, Černjakovskaja 1935, etc.), but from which it is easily distinguished by its larger size (80-120 cm not 50-80 cm tall), cataphylls with greenish-white rather than reddish-green veins, and its 5-8 dark violet, large flowers (4.5-6 cm long), when *G. communis* has 10-20 pink, 3-4 cm long flowers.

3. *Gladiolus tenuis* M. Bieb., Fl. Taur.-Cauc. 1: 29. 1808. – Type: In graminosis Caucasi subalpini (LE-Bieb!).

Distribution. – Endemic in the Caucasus; N & C Armenia.

Note. – Easily distinguished from *Gladiolus imbricatus* L., in which it was sometimes included (Boissier 1882, Grossgejm 1928, 1940, Černjakovskaja 1935, etc.), by its wingless seeds and flowers in which the two lower lateral segments are smaller than the others, narrow, pale light-blue or sometimes whitish, each with a pale, narrowly rhomboid blotch bordered with purple.

4. *Gladiolus kotschyanus* Boiss., Diagn. Pl. Orient. 13: 15. 1854 = *G. imbricatus* L. var. *kotschyanus* (Boiss.) Boiss., Fl. Orient. 5: 141. 1882. – Holotype: "In Mesopotamia inter Suereck et Diarbekir", 1843, *Kotschy 163*. (G-BOIS!; isotype: K!).
= *Gladiolus subbiflorus* Boiss. in Tchihatcheff, Asie Min., Bot. 2: 579. 1860.

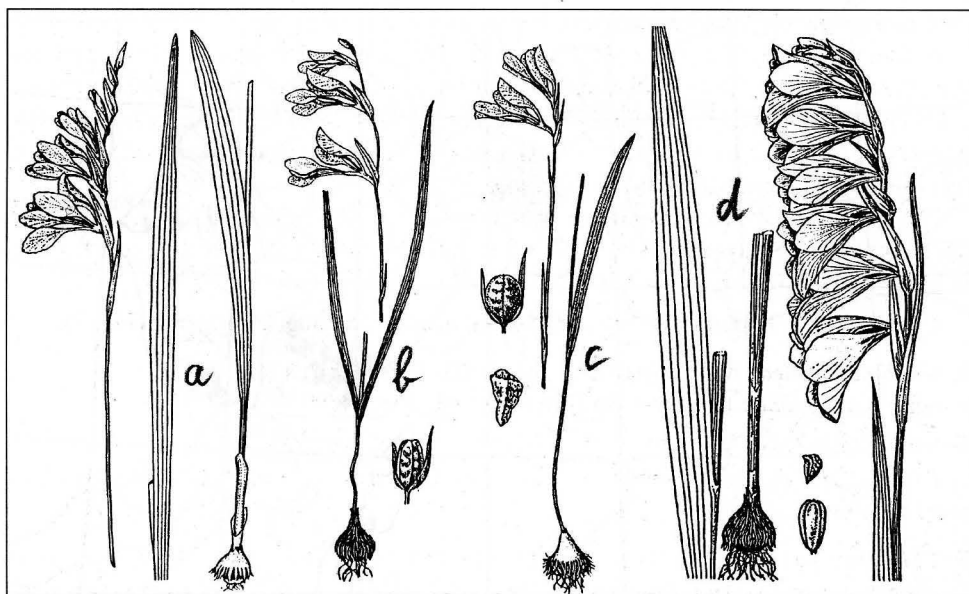


Fig. 6. *Gladiolus menitskyi*, habit (a); *G. szovitsii* subsp. *szovitsii*, habit and capsule (b); *G. hajastanicus*, habit, capsule, and seed (c); and *G. caucasicus*, habit, capsule, and seed (d).

a. *Gladiolus kotschyanus* subsp. *kotschyanus*

Distribution. – Transcaucasia, Anatolia, NE Iraq, NW Iran; N, C, and S Armenia.

b. *Gladiolus kotschyanus* subsp. *distichus* Gabrielian, subsp. *nova* – Holotypus:
[Armenia] “Sevan distr. in vicinitate pag. Lhašen, m. Bugda, altiherbetum subalpinum,”
2300 m, 8 Aug 1967, *Gabrielian* (ERE; isotypi: ERE).

Cormus parvus, rotundus, 8-12 mm in diam. Tunicae papyraceae ad medium laceratae. Folia sensim angustata, nervatione subparallela. Flores distichi, superiores conferti. Perigonii lacinae laterales adaxiales distincte gibbosae.

Distribution. – Endemic to Armenia: Aragac, Sevan, Vajoc Dzor, Zangezur.

5. *Gladiolus hajastanicus* Gabrielian, sp. *nova* – Holotypus: [Armenia] Darelegis, angustiae Alajasenses, in vicinitate pagi Hermon (Kavusuk), inter saxa,” alt. 1800-2000 m, 18 Jun 1957, *Gabrielian* (ERE; isotypus: ERE).

Planta 25-40 cm alta. Cormus 6-10 mm in diam., squamis tenuibus, per dimidium inferius laceratis. Cataphyllum singulum, albido-purpureum. Caulis rectus, tenuis, 1-2(-3) mm in diam. Folia plerumque 1-2(-3), duo superiora saepe valde reducta, 4-6(-8) mm lata, tenuia, pallide viridia, in dimidia parte superiore saepe purpurea, subparallele nervosa vel nervis binis approximatis percursa. Inflorescentia 1-2(-4) flora, secunda. Perianthium purpureum, tubo brevi subrecto, laciniis 3 superioribus romboideo-ellipticis, sensim angustatis, apice acuminatis; media brevissime gibbosa, 3 cm longa; lateralibus 3.5 cm longis, laciniis 3 inferioribus in tertia parte superiore oblongo-rhomboideis, in unguem tenuem sensim angustatis, apice acuminatis, 4.5 cm longis. Filamenta 12-15 mm longa, anthera 8-11 mm longa, apice valde inflexa. Stigmatis lobi clavatum dilatati, 3.5 mm longi. Capsula 6-10 mm longa, obovata, apice obtusa. – Fig. 6c.

A *Gladiolo kotschyano*, cui admodum proximus, plantae totius et cormi minutia; squamis chartaceis; foliorum forma, colore, dimensionibus et nervatione; inflorescentia valde depauperata (1-2(3) flora, nec 4-7 flora); necnon perianthii laciniis inferioribus valde protractis differt. Ob formam perianthii *G. szovitsii* similis, sed squamis cormi chartaceis (nec fibrosis) aliisque notis bene distinguitur.

Habitat in regionibus media et superiore montium, 1800-2900 m supra maris aequor, inter saxa, in declivibus herbosis, in curvisilva quercina subalpina, in pratis postsilvaticis, in locis humidis herbosis.

Distribution. – Endemic to Armenia: Sevan, Erevan, Darelegis, Zangezur (Fig. 7).

6. *Gladiolus italicus* Mill., Gard. Dict., ed. 8: *Gladiolus* N° 2. 1768.

= *Gladiolus segetum* Ker-Gawl. in Bot. Mag.: tab. 719. 1804.

= *Gladiolus tenuiflorus* K. Koch in Linnaea 21: 636. 1848.

Distribution. – Caucasus, Mediterranean region, Asia Minor, Iraq, S Central Asia; N, C, and SE Armenia.

7. *Gladiolus atroviolaceus* Boiss., Diagn. Pl. Orient. 13: 14. 1854. – Syntypes: “Inter segetes prope urbem Teheran,” 17 Apr 1843, *Kotschy* 28; “Persia circa Ispahan”, *Aucher-Eloy* 5352 (G-BOIS!, G!, K!, LE!).

= *Gladiolus alepicus* Boiss., Diagn. Pl. Orient. 13: 13. 1854.

- = *Gladiolus armeniacus* Hausskn. ex J. N. Gerard in Gard. & Forest 5: 318. 1892.
 = *Gladiolus sintenisii* Baker, Handb. Irid.: 202. 1892.

Distribution. – Caucasus (S Transcaucasia, Karabagh, Talysh); E Mediterranean region, Anatolia, Syria, Lebanon, Israel, Iraq, Iran, Turkmenia (Kopetdagh); C and SE Armenia.

Note. – A very polymorphic species.

8. *Gladiolus szovitsii* Grossh. in Beih. Bot. Centralbl. 44(2): 206. 1927. – Holotype: [Armenia] “Distr. Zangezur, inter Meghri et Karcevan”, 30 May 1923, A. Grossgejm (ERE!; isotype: LE!).

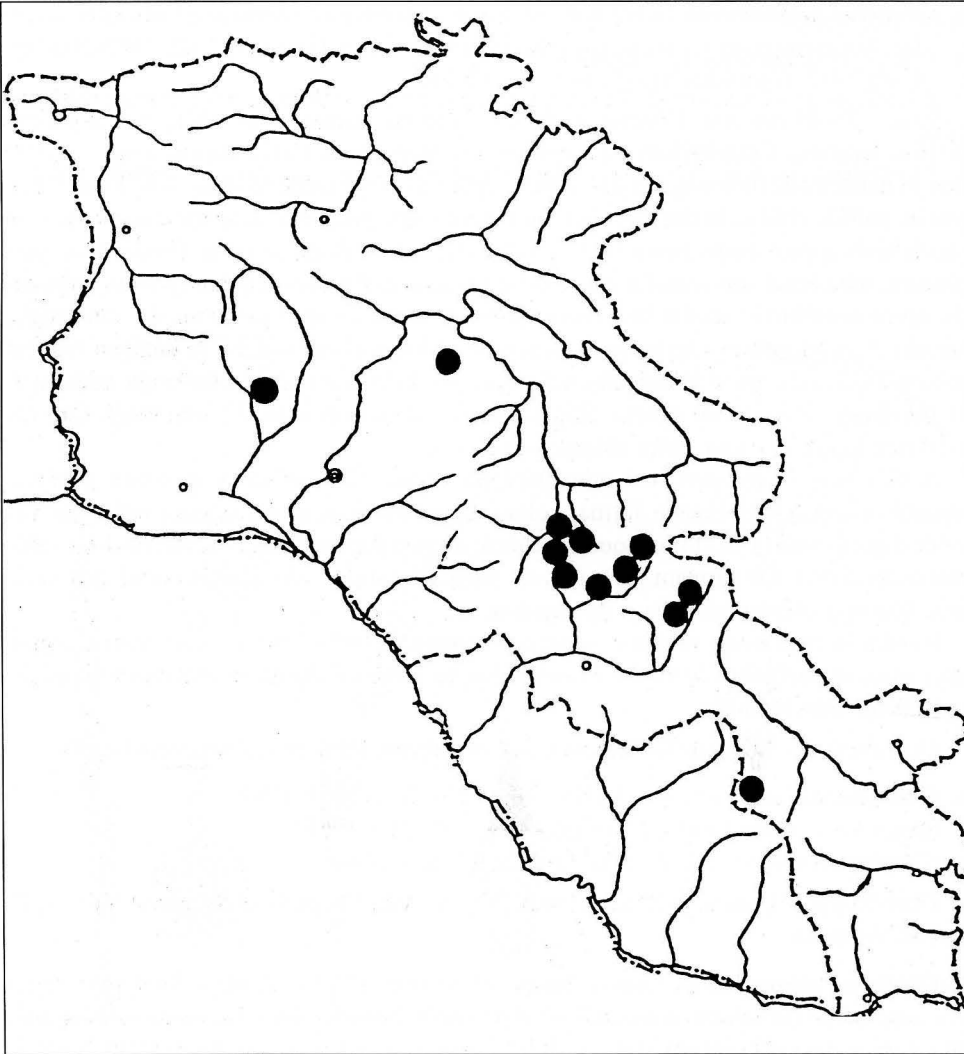


Fig. 7. The total known distribution of *Gladiolus hajastanicus*.

Note. – The Transcaucasian endemic *Gladiolus szovitsii* was soon unjustifiably included in *G. halophilus* Boiss. & Heldr. by many taxonomists (Cernjakovskaja 1935, Grossgejm 1940, 1949, Wendelbo & Mathew 1975, Eristavi 1983, etc.). Revision of the holotype and other material in several herbaria as well as field work in Meghri (the locus classicus of *G. szovitsii*) revealed that two clearly different species are involved. They can be separated by the following distinctive features (Fig. 8): the corms of *G. szovitsii* are smaller, ovate, not so coarsely fibrous as *G. halophilus*, light brown rather than dark greyish brown; the leaves are herbaceous, erect, with thin veins (not leathery, rigid, swordlike, and with thick veins); the perianth is distinctly bilabiate (not funnel-shaped); the tepals are rhombic-spatulate (not obovate); the lower lateral lobes are much longer than the upper middle one (not shorter); the seeds are globose-angular, unwinged (not flat, ellipsoid and with wide wings).

a. *Gladiolus szovitsii* subsp. *szovitsii* – Fig. 6b.

Distribution. – Caucasus (S Transcaucasia, Zangelan), NW Iran; SW Armenia (Meghri) (Fig. 5).

b. *Gladiolus szovitsii* subsp. *pseudopersicus* Ogan. & Gabrielian, **subsp. nova** –

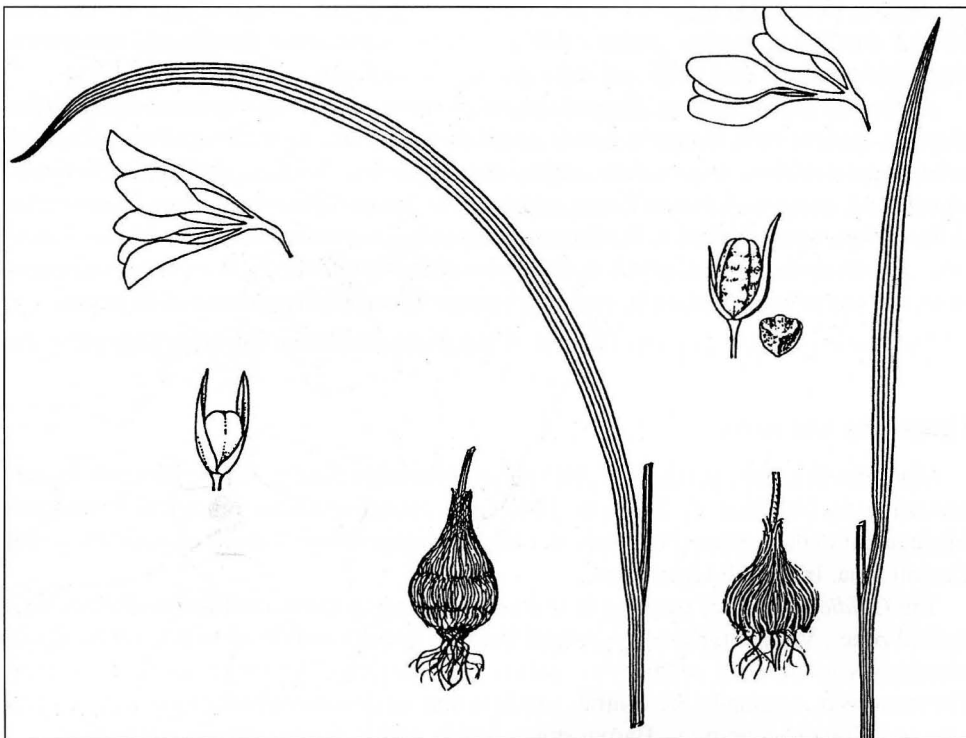


Fig. 8. A comparison between corm, stem leaf, perigon in side view, and capsule with bracts, of *Gladiolus halophilus* (left) and *G. szovitsii* subsp. *szovitsii* (right).

Holotype: [Armenia] "Meghri distr. in faucibus Švanidzor", 29 Jul 1945, *Ahverdov* (ERE!).

Folia spicas florum plerumque non exendentia, inter nervos setulosa; bracteae cum rachide glabrae. Flores 5-9 (nec 2-4), distichi.

Distribution. – Armenia (Meghri), N Iran (Fig. 5).

9. *Gladiolus menitskyi* Gabrielian, **sp. nova** – Holotypus: [Transcaucasus] "distr. Lerikensis, in valle fluminis ad pagum Amburdare, in prato graminoso inundato, 11 Jun 1979, *Popova & Menitskyi II* (ERE!; isotypi: LE!).

Planta 70-80 cm alta. Cormus 6-8 mm longus, 6-10 mm in diam., late ovoideus, tunicis brunneis, integris, in tertia parte inferiore laceratis. Cataphylla bina, primum 2.4 cm, alterum 6-8 cm longum, amba haud arcte contigua, albido-violascentia. Caulis rectus glaber. Folia 2.4-10 mm lata, sensim acutata, viridia, nervis binis parallelis aequalibus tertio obsoleto; lamina valde reducta inflorescentia brevior. Inflorescentia ambitu triangularis, 5-12 cm longa, 4-8 flora, secunda, flexuosa, laxiuscula, anthesi succedanea. Spatha florum inferiorum 2-3 cm longa, valde acuminata, superiorum 1.5-2 cm longa, ovoideo-elliptica, breviter acuminata, margine paleacea, viridulo-violacea. Perigonium 3-3.5(-4) cm longum, lilacinum, in sicco pallescens, tubo subrecto; lobo medio superiore late elliptico, apice breviter attenuato; lobis caeteris 3-5 mm brevioribus, subaequilongis et subaequalibus, spathulatis, in unguem longe attenuatis, margine irregulariter erosulo-crispatis. Filamenta 10-12 mm longa, glabra, anthera 8-9 mm longa, connectivo prominente acuminata. Stigmati rami ad 3 mm longi, calvatim dilatati. Floret Junio. – Fig. 6a.

A *Gladiolo kotschyano* cui aliquanto affinis cormo minore, foliis vaginantibus binis (nec singulo), caulinis binis elongatis, nervis parallelis aequicrassis (nec remotis inaequicrassis), inflorescentia uniflora flexuosa laxa, anthesi succedanea (nec 3-4 flora, conferta, anthesi sub-simultanea); perigonii lorum forma, imprimis lobi medii superioris forma ac magnitudine differt. A speciebus reliquis in Transcaucasia australi et regionibus contiguis Persiae vigentibus (*G. atrovioleaceo*, *G. szovitsii*, et *G. persico* Boiss.) cormi tunicis dissimillimis (integris in tertia parte inferiore tantum laceratis nec omnino fibrosis) aliisque notis distinguitur.

Distribution. – Transcaucasia (Talysch), N Iran (E Azerbaidzhan: Kiyamaki Dagh) (Fig. 5).

Geography and ecology

Gladiolus is a large genus of c. 250 species, centred in Southern Africa (c. 163 species according to Goldblatt & Manning 1989) and extending through tropical Africa and Madagascar to the Arabian Peninsula, the Mediterranean region, Caucasus, Asia Minor and Central Asia, Iran, and Afghanistan.

The *Gladiolus* species growing in southern Transcaucasia are confined to discrete altitudinal zones. Various types of vegetation from sagebrush semi-desert to carpet-like alpine meadows can be seen within this rather small region. The major part of southern Transcaucasia, especially the central, southern and south-eastern part of the region, presents arid climatic conditions. Barren stony, sandy, rocky, clayey, gypsaceous or gravelled slopes with a sparse vegetation of greyish-pubescent plants appear to the eye, from a distance, as a lifeless desert. However, it is just here that many useful and ornamental wild

plants grow, among them the local endemic or subendemic *Gladiolus atroviolaceus*, *G. szovitsii* subsp. *szovitsii* and subsp. *pseudopersicus*, and the widespread *G. italicus*. They grow in the lowland or on the foothills, at low to medium altitude, between 450 and 1400 m above sea level. They will thrive in sagebrush semi-desert with *Artemisia fragrans* Willd., in deciduous bush formations (shiblyak with *Paliurus spina-christi* (L.) Mill.), juniper (*Juniperus polycarpus* K. Koch) or oak (*Quercus macranthera* Fisch & C. A. Mey. ex Hohen., *Q. araxina* (Trautv.) Grossh.) woodlands, in fields, on mounds or stony slopes, mainly in the central and southern part of the region.

In the medium and upper mountain zones, at altitudes between 1500 and 2500 m, in mountain steppe, steppe-meadows, turf, swampy sites, as well as field margins, the species composition of the *Gladiolus* flora begins to change. *Gladiolus dzhavakheticus*, *G. caucasicus*, *G. tenuis*, mainly distributed in the northern part of southern Transcaucasia, are characteristic species here.

Gladiolus kotschyanus (subsp. *kotschyanus* and subsp. *distichus*) climb much higher and may reach altitudes of 2700-2900 m. *G. kotschyanus* subsp. *kotschyanus* is fairly widespread in places with excess moisture or swampy sites, in subalpine meadows, hayfields, and moist pastures along riversides and around springs. This taxon occurs almost throughout the high-mountain regions of southern Transcaucasia, but avoids the Ararat valley. *G. kotschyanus* subsp. *distichus* is a rarer plant, limited to the subalpine tall herbaceous vegetation of the Aragac massif and the mountain ridges of Gegham and Zangezur.

The Armenian endemic *Gladiolus hajastanicus* grows among rocks, on grassy slopes, in turf or meadows in clearings, in subalpine oak woodlands, on mount Aragac, in the central part of southern Transcaucasia, and on the mountain ridge of Zangezur.

The last species, *Gladiolus menitskyi*, occurs in wet grassy meadows in the Talysh (eastern Transcaucasia) and in N Iran, just on the border to Transcaucasia, on the mountain ridge of Karadagh (Kiyamaki Preserve). It can also be found in the region of Meghri and, in Nakhichevan, in the Ordubad region.

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