

Allium efeae (Amaryllidaceae), a new species from northwest Anatolia, Turkey

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Abstract: *Allium efeae* Özhatay & İ.Genç is described as a new species from northwest Anatolia. The distribution area of this species is restricted to Kırıbrıcık (Bolu) and Beypazarı (Ankara). It resembles *Allium lycaonicum* Siehe, but differs in tepal shape and color, leaf length, and filament shape. A table comparing the diagnostic morphological characters of the new species and *A. lycaonicum* is provided. The diagnostic morphological characters, distribution, conservation status, and color photographs of the new species as well as its chromosome number ($2n = 24$) are presented.

Key words: *Allium*, *Melanocrommyum*, new species, chromosome number, Turkey

1. Introduction

The genus *Allium* L. comprises more than 850 species (Keusgen et al., 2011), making it one of the largest monocotyledonous genera; it is a variable group that is spread widely across the holarctic region from the dry subtropics to the boreal zone. *Allium* subg. *Melanocrommyum* (Webb & Berthel.) Rouy comprises about 169 accepted taxa (Fritsch, 2012).

In Turkey, the subgenus is represented by 33 taxa in the sections *Acanthoprason* Wendelbo (2 taxa), *Melanocrommyum* Webb & Berthel. (30 taxa), and *Kaloprason* K.Koch (1 taxon) (Kollmann, 1984; Davis et al., 1988; Özhatay and Tzanoudakis, 2000; Eker and Koyuncu, 2011; Behçet et al., 2012; Behçet and Rüstemoğlu, 2012; Genç et al., 2012; Deniz et al., 2013; Genç and Özhatay, 2013; Özhatay and Genç, 2013).

Seven of these 33 taxa are distributed in central and western Anatolia. These species are *Allium nigrum* L., *A. cyrilli* Ten. (3 subspecies), *A. elmaliense* Deniz & Sümbül, *A. orientale* Boiss., and *A. lycaonicum* Siehe. The remaining species are distributed in eastern Anatolia.

During the revision of the sect. *Melanocrommyum* in Turkey, we studied some herbarium specimens collected from around Bolu. They were determined as *A. lycaonicum* but are not similar to the holotype of *A. lycaonicum* and do not match the original description of *A. lycaonicum*. Such specimens were investigated in their natural habitats, and bulbs were collected and planted in the research garden.

Further investigations of these specimens resulted in the detection of a new species.

2. Materials and methods

The materials were collected between Bolu and Ankara in 2009. Voucher specimens are deposited in the ISTE herbarium. They were compared with allied taxa deposited in the herbaria AEF, BM, E, ISTE, and K. For chromosome counts, root tips were collected from 3 planted bulbs collected from 1 locality. Root tips were pretreated with ABN (α -monobromonaphthalene) at 4 °C overnight, and fixed in Carnoy's solution. They were stained using the standard Feulgen technique and squash preparations were prepared. Slides were made permanent by the liquid CO₂ method. Photographs were taken with an Olympus BH2 photomicroscope. Chromosome counts were based on 15 metaphase plates. For SEM, selected material was directly mounted onto aluminum stubs with double-sided adhesive tape for observation with a JEOL Neoscope 5000 scanning electron microscope.

3. Results

Allium efeae Özhatay & İ.Genç sp. nov. (Figures 1–4).

Type: Turkey, A3 Bolu: Bolu-Kırıbrıcık, 34 km from Bolu, 1500 m, 08.06.1984, N. & E.Özhatay s.n. (holotype: ISTE 54188, isotype: AEF).

Diagnosis: *Allium efeae* is related to *A. lycaonicum*, but differs by tepals, elliptic-lanceolate, longer and wider, bright pink (not linear and wine red), and filaments gradually narrowed (not abruptly).

Description: Bulbs ovoid, 1–3 cm in diameter; outer tunics disintegrating, grayish or light brown, bulblets numerous. Scape 20–60 cm long, cylindrical. Leaves 2–6,

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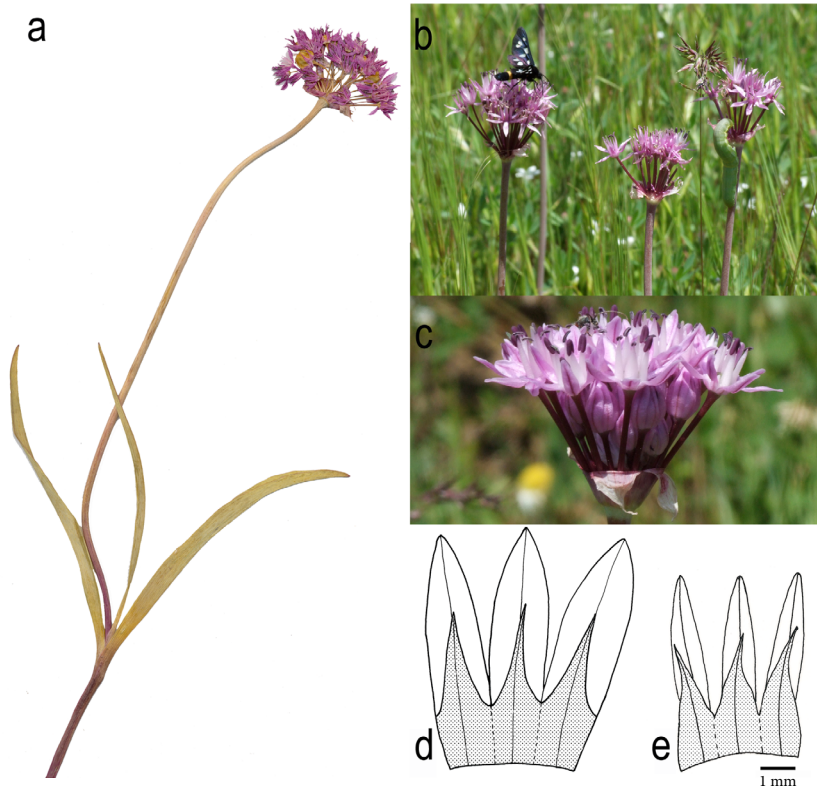


Figure 1. *Allium efeae*: a- habit (ISTE 91507), b and c- inflorescence; d- tepals and filaments. *A. lycaonicum*: e- tepals and filaments.

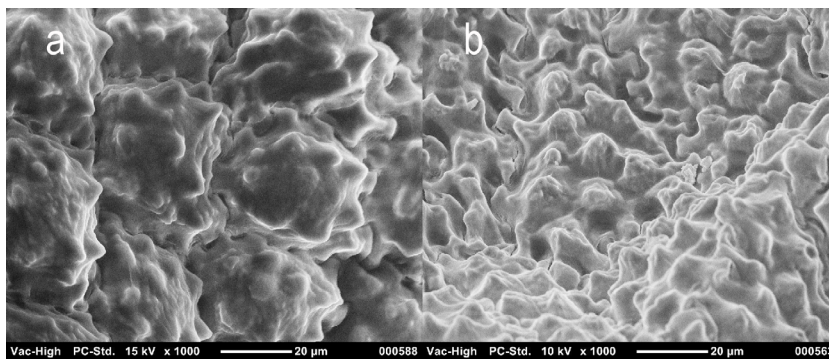


Figure 2. Seed epidermal cells of the testa: sculpture of the periclinal walls and undulation of the anticlinal walls. a- *Allium efeae*, b- *A. lycaonicum*.

broadly linear, 5–20 mm wide, usually longer than 1/2 of scape, glaucous, margin irregularly serrate or smooth. Spathe split in 2–3 triangular parts. Inflorescence fastigiate-semiglobose, 2–6 cm in diameter (Figure 1). Pedicels 3 × tepals, almost equal, slightly carmine flushed. Perigon stellate, curving inwards in fruit, elliptic-lanceolate, with a subobtuse-subacute tip, 6–7(–8) mm long and 2–2.5(–3) mm wide, bright pink with purple or green median vein. Filaments 3/4 as long as the tepals, fleshy, basally united for nearly 1–2 mm, triangular at base, gradually narrowed

above, pinkish white. Anthers purple. Ovary green, globose with 6 furrows. Capsule ovoid, 4–5 mm in diameter. Seeds black, reniform.

The seed testa cells of *A. efeae* have prominent verrucae and U-like undulations with moderate wavelength. This structure is similar to that of other species of *Allium* subgen. *Melanocrommyum*. Flowering in May–June, fruiting in June–July. $2n = 24$

Distribution: *Allium efeae* is endemic to northwest Anatolia.

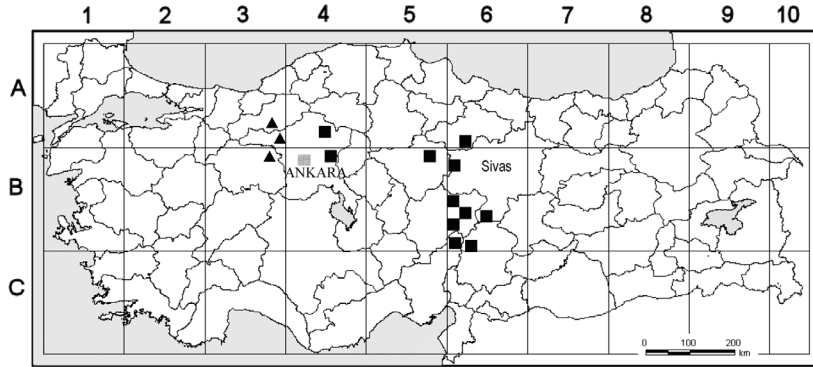


Figure 3. Distribution of *Allium efeae* (▲) and *A. lycanicum* (■)

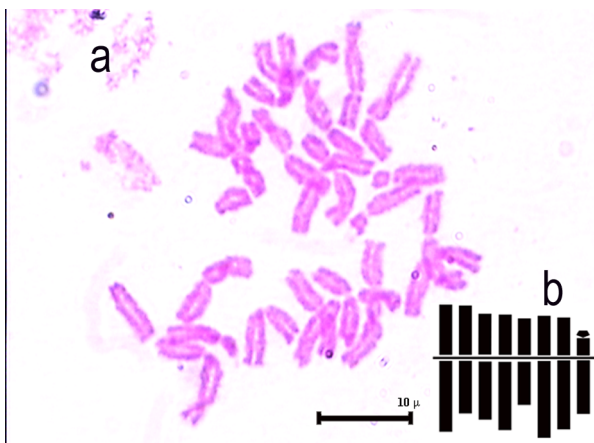


Figure 4. *Allium efeae*: a- metaphase chromosomes, b- idiogram. Scale bar = 10 μm.

Habitat: Open forest meadows.

Conservation status: It is known from 5 localities and from an area of less than 5000 km² (B1a). The new species is growing in open forest meadows of planted forests. Therefore we expect a continuing decline in extent of occurrence, area of occupancy, quality of habitat, number of locations and subpopulations, and number of mature individuals [B1b(i, ii, iii, iv, v)]. Under these conditions, the new species should be classified as “endangered” (EN) according to IUCN criteria [B1ab(i, ii, iii, iv, v)] (IUCN, 2012)

Additionally examined species (paratypes):

Allium efeae: A3 Ankara: Gerede-Kızılcahamam, 36 km to Kızılcahamam, 1350 m, 05.06.1984 *N. & E. Özhatay s.n.* (ISTE 54079). Bolu: Bolu-Kibriscık, 37 km from Bolu, above Kargan timber yard, 1450 m, 20.05.1983, *N. & E. Özhatay s.n.* (ISTE 50533). *ibid.* 26.07.1983, *N. & E. Özhatay s.n.* (ISTE 51853). Bolu-Kibriscık, 34 km from Bolu, 1500 m, 08.06.1984, *N. & E. Özhatay s.n.* (ISTE

54188). Bolu-Kibriscık, 32 km from Bolu, stony areas at the roadsides, 1400 m, 04.06.1993, *N. & E. Özhatay s.n.* (ISTE 65087). Seben-Bolu, open forest meadows, 1418 m, 24.05.2008, *G.Ecevit Genç & İ.Genç* 1274 (ISTE 91507). *ibid.* 01.06.2009, *İ.Genç* 1374 (ISTE 91586). Bolu-Kibriscık, 33 km to Bolu, stony areas, 1427 m, 24.05.2008, *G.Ecevit Genç & İ.Genç* 1278 (ISTE 91509). *ibid.* 01.06.2009, *İ.Genç* 1376 (ISTE 91588).

Etymology: The new species is named in honor of the Turkish botanist Prof Dr Asuman Efe, who tragically passed away in a traffic accident in 2010.

Karyology: The triploid karyotype of *Allium efeae* ($2n = 24$) is very similar to that of other species of sect. *Melanocrommyum* (Genç et al., 2013). Chromosomes 1–5 are metacentric, 6–8 are submetacentric; chromosome 8 usually has satellites on the short arms of 1 or 2 chromosomes (Figure 4). Polyploidy has occasionally been seen in previous studies on the subgenus *Melanocrommyum*, but often a tetraploid chromosome number is reported (Özhatay, 1990; Ohri et al., 1998; Genç et al., 2013). Previously, a triploid karyotype was found in only one study on the subgenus *Melanocrommyum*. Tzanoudakis (1999) reported triploid and tetraploid karyotypes for *A. orientale*.

4. Discussion

The new species is morphologically close to *Allium lycanicum*; therefore some samples of the new species were incorrectly determined as *A. lycanicum* in the past.

Detailed investigations have shown that *A. efeae* can be distinguished by the bright pink (not purplish pink) and widely elliptic-lanceolate (not narrowly linear-elliptic) tepals, filaments gradually (not abruptly) narrowed above (Figure 1) and narrower than the base of tepals (not wider), and by leaves as long as 1/2 of scape or longer (not 1/3–1/2 of scape) (Table).

Table. Diagnostic characters of *Allium efeae* and *A. lycaonicum*.

Characters	<i>Allium efeae</i>	<i>Allium lycaonicum</i>
Tunics	disintegrating	papery
Tepals	elliptic-lanceolate, after anthesis curving back 6–7(–8) × 2–2.5(–3) mm, purplish pink with dark pink or green midvein, subobtusate-subacute.	linear, after anthesis curving inwards 4–6 × 0.8–1(–1.5) mm, dark pink to wine red-purplish with prominent blackish purple midvein, acute.
Filaments	4–5.5 mm, whitish pink, gradually narrowed above	4–5 mm, reddish purple, color lightens toward the bottom end, abruptly narrowed above
Seed surface	Periclinal walls distinctly convex, verrucae and anticlinal walls U-like undulations with moderate wavelength	Periclinal walls slightly convex, prominent verrucae and anticlinal walls U- to Ω-like undulations with moderate wavelength
Chromosomes (2n)	24	16

The micromorphology of the testa of members of subgenus *Melanocrommyum* is characterized by convex periclinal walls with several large verrucate sculptures, combined with S- to Ω-like undulated anticlinal walls (Fritsch et al., 2006; Celep et al., 2012).

The table compares diagnostic morphological characters of the new species with those of *A. lycaonicum*.

References

- Behçet L, Kaval İ, Rüstemoğlu M (2012). Three new records for Turkey: *Allium giganteum* (Liliaceae) *Grammosciadium scabridum* and *Ferulago angulata* subsp. *carduchorum* (Apiaceae). *Turk J Bot* 36: 637–643.
- Behçet L, Rüstemoğlu M (2012). *Allium shirnakiense*, sect. *Melanocrommyum* (Liliaceae), a new species from South-eastern Turkey. *Turk J Bot* 36: 450–454.
- Celep F, Koyuncu M, Fritsch RM, Kahraman A, Dogan M (2012). Taxonomic importance of seed morphology in *Allium* (Amaryllidaceae). *Syst Bot* 37: 893–912.
- Davis PH, Kit Tan, Mill RR (eds.) (1988). *Flora of Turkey and the East Aegean Islands*, Vol. 10. Edinburgh, UK: Edinburgh University Press, pp. 221–223.
- Deniz İG, Genç İ, İnce A, Aykurt C, Elmasulu S, Sümbül H, Sönmez S, Çıtak S (2013). Taxonomic data supporting differences between *Allium elmaliense* and *Allium cyrilli*. *Biologia* 68: 373–383.
- Eker İ, Koyuncu M (2011). *Allium olivieri* Boiss. (Alliaceae), a new taxon to Turkey, with contributions to its taxonomy. *Acta Soc Bot Pol* 80: 275–277.
- Fritsch RM (2012). Illustrated key to the sections and subsections and brief general circumscription of *Allium* subg. *Melanocrommyum*. *Phyton* (Horn, Austria) 52: 1–37.
- Fritsch RM, Kruse J, Adler K, Rutten T (2006). Testa sculptures in *Allium* L. subg. *Melanocrommyum* (Webb & Berth.) Rouy (Alliaceae). *Feddes Repertorium* 117: 250–263.
- Genç İ, Özhatay N, Koyuncu M (2012). *Allium purpureoviride* sp. nov. (Alliaceae) from east Anatolia, Turkey. *Nord J Bot* 30: 333–336.
- Genç İ, Özhatay FN (2013). *Allium serpentinum* and *A. kandemirii* (Alliaceae), two new species from East Anatolia, Turkey. *Ann Bot Fenn* 50: 50–54.
- IUCN (2012). IUCN Red List Categories and Criteria: Version 3.1. Second edition. IUCN, Gland, Switzerland and Cambridge, UK.
- Keusgen M, Kusterer J, Fritsch RM (2011). *Allium* species from Middle and Southwest Asia are a rich source for Marasmin. *J Agr Food Chem* 59: 8289–8297.
- Kollmann F (1984). *Allium* L. In: Davis PH (ed.), *Flora of Turkey and the East Aegean Islands*, Vol. 8. Edinburgh, UK: Edinburgh University Press, pp. 98–211.
- Ohri D, Fritsch RM, Hanelt P (1998). Evolution of genome size in *Allium* (Alliaceae). *Plant Syst Evol* 210: 57–86.
- Özhatay N (1990). The genus *Allium* in European Turkey and around Istanbul. *Ann Mus Goulandris* 8: 115–128.
- Özhatay N, Tzanoudakis D (2000). *Allium* L. In: Güner A, Özhatay N, Ekim T, Başer KHC (eds.) *Flora of Turkey and the East Aegean Islands*, Suppl. 2. Edinburgh, UK: Edinburgh University Press, pp. 224–232.
- Özhatay FN, Genç İ (2013). *Allium cyrilli* complex (sect. *Melanocrommyum*) in Turkey. *Turk J Bot* 37: 39–45.
- Tzanoudakis D (1999). The genus *Allium* in Cyprus: a preliminary cytotaxonomical study. *Bocconea* 11: 105–115.