

## *Allium arszuzense* sp. nov. and *A. roseum* subsp. *gulekense* subsp. nov. from Turkey

Mehmet Koyuncu and İsmail Eker

*M. Koyuncu, Dept of Pharmaceutic Botany, Faculty of Pharmacy, Ankara Univ., Tandoğan, TR-06100 Ankara, Turkey. - İ. Eker (ekerismail@mynet.com), Dept of Biology, Faculty of Science and Literature, Abant İzzet Baysal Univ., Gökkyöy, TR-14280 Bolu, Turkey.*

A new species, *Allium arszuzense* Eker & Koyuncu sp. nov. and a new subspecies, *Allium roseum* L. subsp. *gulekense* Koyuncu & Eker subsp. nov. (Alliaceae) from Turkey are described. Diagnostic characters, descriptions, detailed illustrations, geographical distribution, conservation status, observations and taxonomic comments on the new taxa are provided. They are also compared with the closely related *A. ertugrului* Demirelma & Uysal and *A. roseum* L. subsp. *roseum*.

Anatolia is situated at the junction of three major phytogeographical regions: the Euro–Siberian, the Irano–Turanian and the Mediterranean region. In addition, it ranges in altitude from sea level to 4000–5000 m a.s.l., and varies geologically and topographically. In this region, Taurus and Amanus Mountains are important locations for endemic species. In spite of frequently performed studies in this area, new species in *Allium* L. are still being described.

*Allium* is represented by 260–750 species in the world and is distributed in the Mediterranean, Asia, Europe and North America (Stearn 1992, Rahn 1998). The genus was revised by Kollmann (1984) for the ‘Flora of Turkey and east Aegean Islands’ in which 141 species (161 taxa) were recognized. After this study, 29 new species have been described from Turkey in the last twenty years (Davis et al. 1988, Özhatay and Tzanoudakis 2000, Deniz and Sümbül 2004, Demirelma and Uysal 2007, Dural et al. 2009, Koçyiğit & Özhatay 2010, Özhatay et al. 2010). Thus, the total number of *Allium* species has increased to 170 (190 taxa).

In May 1982, Koyuncu collected interesting *Allium* specimens from the Taurus mountains (Gülelek/Adana). The specimens appeared closely related to *Allium roseum* L., differed from typical *A. roseum* by having white flowers, pale mauve anthers and a solitary larger leaf. At that time, Kollmann was working with the genus *Allium* for ‘Flora of Turkey’. The two authors discussed the taxonomic identity of these specimens. Initially, the specimens were thought to be a variant or subspecies of *A. roseum* from the Taurus mountains. Finally, the authors agreed that these specimens might be a subspecies of *A. roseum*. However, Kollmann added these specimens as a variant of *A. roseum* in ‘Flora of Turkey’ (1984). He also noted that typical *A. roseum*

specimens in the western coastal region and on east Aegean Islands have pink flowers and grow at lower altitudes (sea level–150 m a.s.l.). In contrast, specimens collected from the Taurus mountains have white or creamy white flowers, fewer leaves, broader perianth segments and grow in rocky moist places and in the shade of forest at higher altitudes (1500–2000 m a.s.l.).

In the following years, extensive material belonging to the genus *Allium* was examined by Koyuncu and Eker to solve the taxonomical position of typical *A. roseum* specimens and Taurus specimens collected from different localities. Although *A. roseum* includes different infraspecific taxa in the world (Marcucci and Tornadore 1997), in our detailed studies, some remarkable morphological differences such as flower and anther colour, leaf number, leaf sheathing position, and presence or absence of bulbils were detected between *A. roseum* and the Taurus specimens. Further, these taxa have an allopatric distribution in Turkey.

During fieldwork in the Amanus mountains in June 2008, other interesting *Allium* specimens were collected from Arsuz/Hatay by Eker. Both the Taurus and Amanus specimens were stored at AEF and AIBU. After checking the floras of Turkey and neighbouring regions such as Syria, Palastine, Iraq, Iran and Europe (Post and Dinsmore 1933, Wendelbo 1971, 1985, Stearn 1980, Kollmann 1984, Davis et al. 1988, Özhatay and Tzanoudakis 2000), and a comparison of similar specimens at the herbaria AEF, ANK, ISTE, ISTF, GAZI and AIBU, it was concluded that both specimens were closely related to *A. ertugrului* Demirelma & Uysal and *A. roseum* L., but with important morphological differences. Consequently, these specimens are here described as one new species and one new subspecies.

**Allium arsuzense** Eker & Koyuncu sp. nov. (Fig. 1, 3)

(sect. *Molium* G. Don ex W. Koch)

*Affinis* *A. ertugrulii* Demirelma & Uysal et *A. roseo* L., sed ab *ambabus foliis anguste linearibus (non late linearibus vel lineari-lanceolatis); perianthio cylindrico vel stellato (non campanulato), segmentibus 6–8 mm longis, laceolatis, acutis (non 7–15 mm nec oblongo-lanceolatis vel elliptico-obovatis et obtusis); pedicellis 5–10 mm (non (7)11–45 mm) longis, spatha pedicellis aequali vel longiore (non pedicellis brevioribus); ab antea spatha profunde 3–4-lobata (non modice 4–5-lobata), antheris luteis (non purpuratis); a postea perianthio segmentibus albis (non roseis) et bulbillis nullis differt.*

**Type:** Turkey. C6 Hatay: Amanus, Arsuz, above Aydını village, rocky and stony plains at higher altitudes in maquis,

1450 m a.s.l., 5 Jun 2008, Eker 2189 (holotype: AIBU, isotype: AEF).

Bulb ovoid, 1.5–2.0 cm in diameter, without bulblets; outer tunics crustaceous, greyish-brown, pitted; inner tunics membranous dirty white. Stem 35–60 cm, thin, cylindrical. Leaves 2(–3), narrowly-linear, 10–30 cm × 2–8 mm, glabrous, sometimes scabrid at margin, shorter than stem, sheathing the lower 1/5 of stem; leaf vagina generally dark red. Spathe 1-valved, deeply 3–4-lobed, membranous, pinkish-red, 10–15 mm long, equal to pedicels or longer, persistent. Umbel 2–4 cm in diameter, without bulbils, 10–40-flowered. Pedicels 5–10 mm long. Perigone cylindrical or stellate; segments white with slightly reddish midvein outside, 6–8 × 2–3 mm, lanceo-

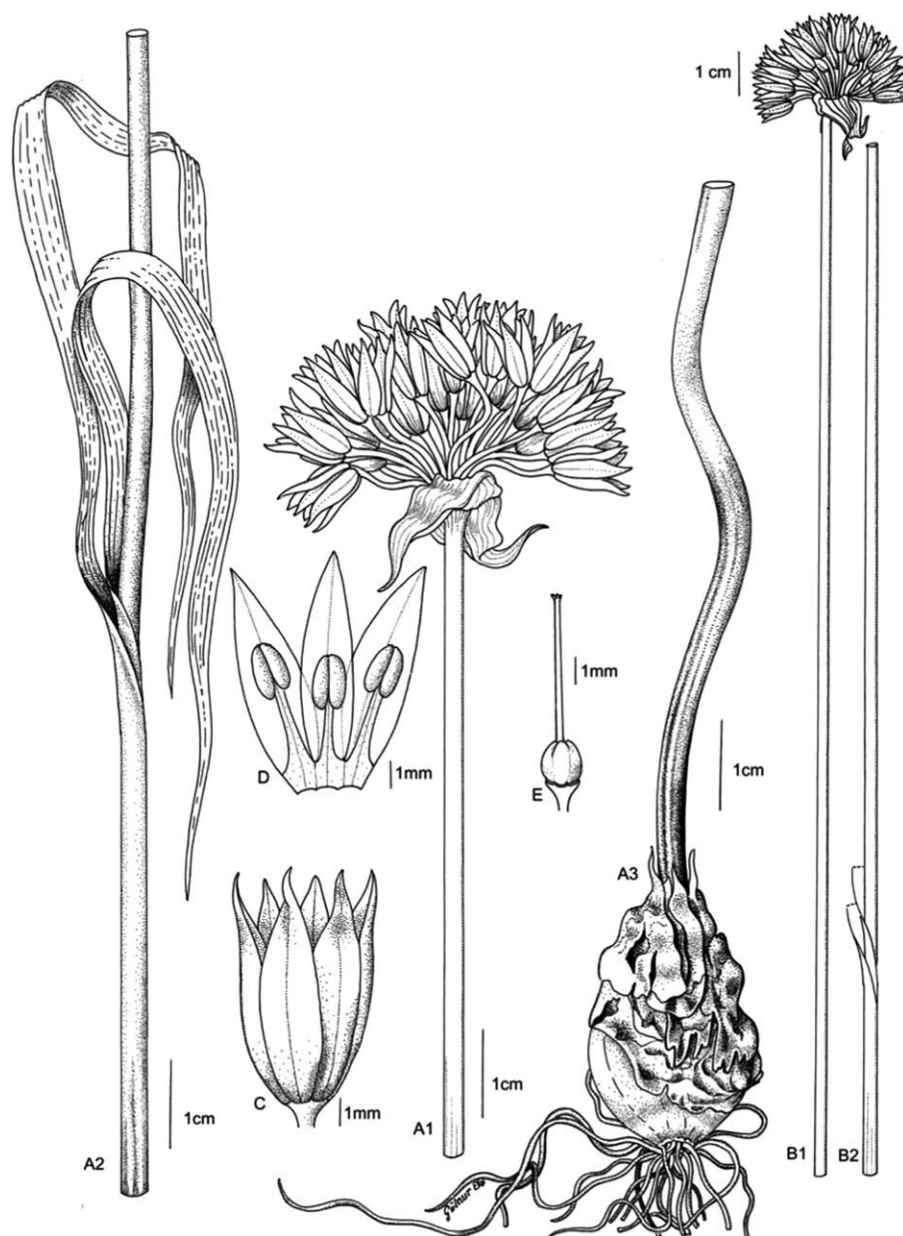


Figure 1. *Allium arsuzense* Eker & Koyuncu sp. nov. (holotype). (A<sub>1</sub>) inflorescence, (A<sub>2</sub>) stem and leaves, (A<sub>3</sub>) bulb, (B<sub>1</sub>, B<sub>2</sub>) habit, (C) perigone from the outside, (D) perigone opened up and stamens, (E) pistil.

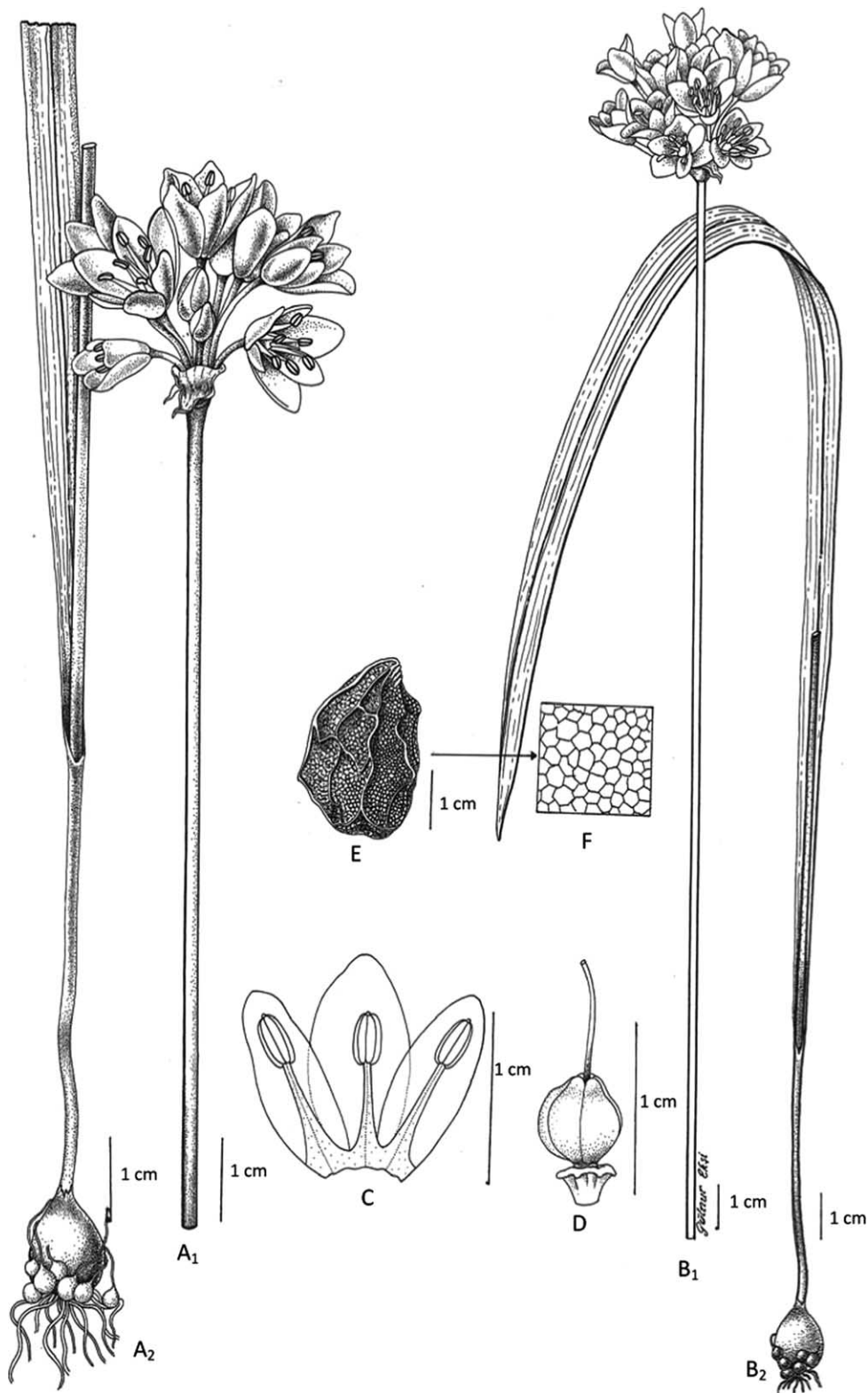


Figure 2. *Allium roseum* subsp. *gulekense* Koyuncu & Eker subsp. nov. (holotype). (A<sub>1</sub>) inflorescence, (A<sub>2</sub>) stem and leaf, (B<sub>1</sub>, B<sub>2</sub>) habit, (C) perigone opened up and stamens, (D) pistil, (E) seed, (F) seed surface.

late, acute. Stamens included; filaments 4–5 mm long, membranous-white,  $2/3 \times$  perianth segments; anthers and pollen yellow. Ovary ovoid-globose. Style equalling the stamens. Capsule ovoid-globose. Flowering and fruiting: Jun–Jul.

***Allium roseum* L. subsp. *gulekense* Koyuncu & Eker subsp. nov. (Fig. 2, 3)**  
 (sect. *Molium* G. Don ex W. Koch)  
*Affinis* *A. ertugrulii* Demirelma & Uysal et *A. roseo* L. subsp. *roseo*, sed ab antea filamentis brevibus perianthii  $3/4$  (non  $1/2$ )

*longis*, *bulbillis pluribus (non nullis)*, *spatha 2-3-lobata (non 4-5-lobata)*, *15-20 mm (non 7-13 mm) longa*; *a postea perianthii segmentibus candidis (non roseis nec albo roseis)*, *antheris pallido-malvinis (non luteis)*, *umbrella ebullillifera*, *folio solitario (non foliis 2-4)*, *vagina caulis basi 1/8 (non 1/5) amplectenti differt.*

**Type:** Turkey. C5 Mersin: Gülek, Taurus mountains, rocky moist places and shades of forest, 1500 m a.s.l., 15 May 1992, Koyuncu (AEF 18568) (holotype: AEF, isotype: AIBU).

Bulb globose, 1.0–1.5 cm in diameter, bulbilliferous; outer tunics crustaceous, minutely pitted. Stem 30–60 cm tall, cylindrical. Leaf 1, broadly linear-lanceolate, 30–60 cm × 15–25 mm, equal to stem, sheathing the lower 1/8 of the stem, finely denticulate at margin, acuminate. Spathe 1-valved, 2–3-lobed but not deeply divided, 15–20 mm long, shorter than pedicels, membranous, white, persistent. Umbel fastigiata, 3–7 cm in diameter, 10–30-flowered, without bulbils. Pedicels 15–40 mm long. Perigone campanulate; tepals 12–15 × 3–8 mm, white, without pink or mauve midvein, the inner segments elliptical, the

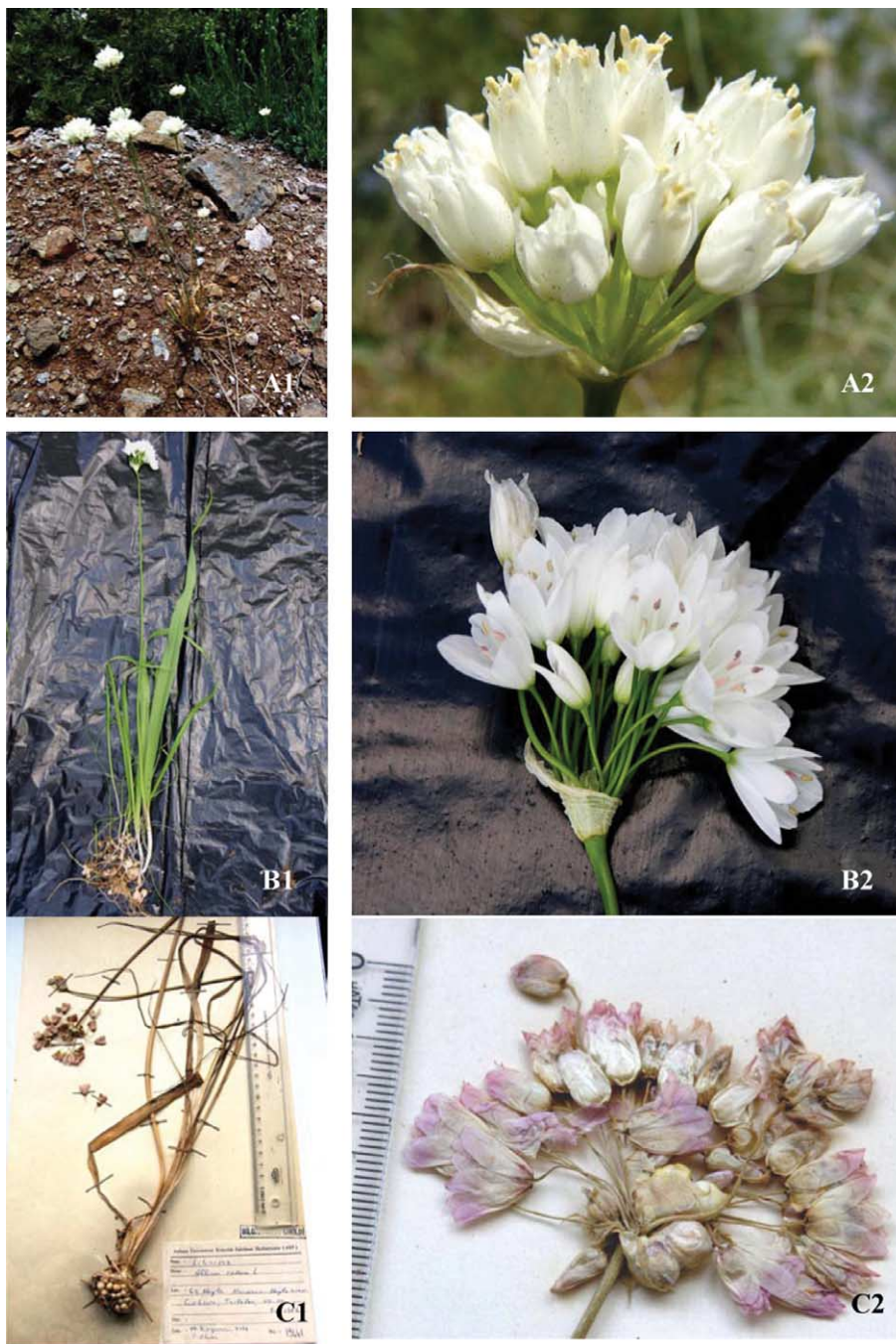


Figure 3. (A) *Allium arszuzense* sp. nov. (1) habit, (2) inflorescence. (B) *Allium roseum* subsp. *gulekense* subsp. nov. (1) habit, (2) inflorescence. (C) *Allium roseum* subsp. *roseum* (1) habit, (2) inflorescence.

outer segments broadly obovate, obtuse. Stamens included; filaments 5–8 mm long, white,  $3/4 \times$  perianth segments; anthers pale mauve and pollen light yellow. Ovary globose. Style equalling the stamens. Flowering and fruiting: May–Jun.

**Ecology and distribution**

*Allium arszuzense* is known from a single locality in south Anatolia and represents an east Mediterranean (mountain) element. It grows on rocky and stony plains at higher altitudes (1300–1500 m a.s.l.) in maquis. *Allium roseum* subsp. *gulekense* occurs in the Taurus mountains and represents an east Mediterranean element. It is frequent in open rocky places and forests at 1500–2200 m a.s.l.

**Conservation status**

At present, *Allium arszuzense* is exclusive to one locality, were it has a very limited distribution (Fig. 4). It is not so common in its natural habitat and we estimate that there are ca 1000 specimens present within an area of less than 100 km<sup>2</sup>. Thus, the species may be classified as ‘Critically Endangered’ (CR) (criterion B1a). *Allium roseum* subsp. *gulekense* is widely distributed although with relatively few known localities (Fig. 4). There is no extinction risk. Thus, the subspecies may be classified as ‘Least Concern’ (LC) (IUCN 2001).

**Taxonomic remarks**

*Allium arszuzense* sp. nov. resembles *A. ertugrulii* and *A. roseum* in the same section. However, it differs from them by having cylindrical or stellate perianth, smaller (6–8 × 2–3 mm), lanceolate and acute perianth segments, shorter pedicels (5–10 mm), spathe equal to pedicels or longer, and 2 (rarely 3) narrowly-linear leaves. In addition, it differs from *A. ertugrulii* by having deeply 3–4-lobed spathe and yellow anthers, and from *A. roseum* by white perianth segments and lacking bulbils and bulblets (Table 1).

*Allium roseum* subsp. *gulekense* subsp. nov. resembles *A. ertugrulii* and *A. roseum* subsp. *roseum* in the same section. However, it clearly differs from *A. ertugrulii* by having filaments  $3/4$  of perianth, numerous bulblets, and 2–3-lobed spathe, and from *A. roseum* subsp. *roseum* by having

pure white perianth segments, pale mauve anthers, umbel without bulbils, and a solitary leaf sheathing the lower  $1/8$  of stem.

**Key to closely related *Allium* species in Turkey (sect. *Molium* G. Don ex W. Koch)**

1. Bulb tunic not pitted . . . . . 5  
– Bulb tunic pitted. . . . . 2
2. Perigone campanulate, perianth segments obtuse, 7–15 mm long; spathe shorter than pedicels. . . . . 3  
– Perigone cylindrical or stellate, tepals acute, 6–8 mm; spathe equal to pedicels or longer . . . . . *A. arszuzense*
3. Tepals pink or white and without mauve midvein . . . 4  
– Tepals white with mauve midvein, perigone turning pink at end of anthesis . . . . . *A. cassium*
4. Filaments  $3/4$  of perigone; bulbiferous; spathe 2–4-lobed . . . . . *A. roseum*  
a. Tepals pink or whitish-pink; anthers yellow; leaves 2–4, 12–35 cm long, sheathing the lower  $1/5$  of stem . . . . . *A. roseum* subsp. *roseum*  
a. Tepals pure white; anthers pale mauve; leaf 1, 30–60 cm long, sheathing the lower  $1/8$  of stem . . . *A. roseum* subsp. *gulekense*  
– Filaments  $1/2$  of perigone; umbel not bulbiferous; spathe 4–5 lobed . . . . . *A. ertugrulii*

**Etymology**

The names of our new species and subspecies are derived from the names of their sites, i.e. Arsuz which is a district of Hatay province and Gülek which is a part of Taurus mountains.

**Additional specimens examined**

*Allium roseum* L. subsp. *gulekense* Koyuncu & Eker (paratypes): C5 Adana: Tekir plateau, under forest, rocky places, 1500 m a.s.l., Koyuncu (AEF 5394)! İçel: Arslanköy, Ballık Dağı, rocky places, 2200 m a.s.l., Koyuncu (AEF 6100)! Arslanköy, 2200 m a.s.l., T. Baytop (ISTE 39166)!

*A. roseum* L. subsp. *roseum*: A1 Balıkesir: Bandırma, 19 May 1976, Y. Akman (AEF 10011)! B1 İzmir: Çeşme, Ovacık village, Akarca mevkii, 50 m a.s.l., 27 Apr 1979, N.

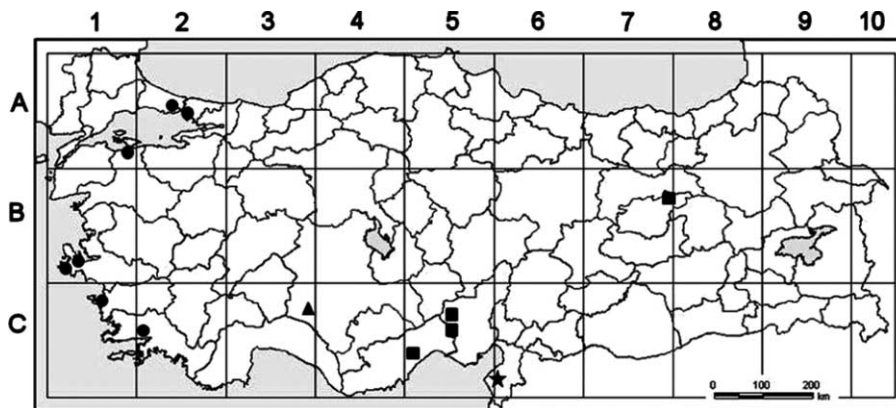


Figure 4. Geographic distribution of *Allium arszuzense* (★), *A. ertugrulii* (▲), *A. roseum* subsp. *roseum* (●), *A. roseum* subsp. *gulekense* (■) in Turkey.

Table 1. A comparison of selected characters used to distinguish between *Allium arszuzense* sp. nov., *A. ertugrulii*, *A. roseum* subsp. *gulekense* and *A. roseum* subsp. *roseum*.

Characters	<i>A. arszuzense</i>	<i>A. ertugrulii</i>	<i>A. roseum</i> subsp. <i>gulekense</i>	<i>A. roseum</i> subsp. <i>roseum</i>
Bulb	ovoid, without bulblets	ovoid-ellipsoid, without bulblets	globose, with numerous bulblets	ovoid or subglobose, with numerous bulblets
Leaves	2 (very rarely 3), narrowly-linear, 10–30 cm × 2–8 mm, shorter than stem, sheathing the lower 1/5 of stem	1 (very rarely 2), linear-lanceolate 15–30 cm × 1–10 mm, shorter than stem, sheathing the lower 1/5 of stem	1, broadly linear-lanceolate, 30–60 cm × 15–25 mm, equal to stem, sheathing the lower 1/8 of the stem	2–4, broadly-linear, 12–35 cm × 1–14 mm, shorter than stem, sheathing the lower 1/5 of stem
Spathe	deeply 3–4-lobed, equal to pedicels or longer, 10–15 mm	4–5-lobed but not deeply divided, shorter than pedicels, 7–13 mm	2–3-lobed, not deeply divided, shorter than pedicels, 15–20 mm	deeply 3–4-lobed, shorter than pedicels, up to 15 mm
Umbel	2–4 cm in diameter, without bulbils	1–4 cm in diameter, without bulbils	3–7 cm in diameter, without bulbils	up to 7 cm in diameter, with or without bulbils
Pedicels	5–10 mm	up to 25 mm	15–40 mm	7–45 mm
Perigone	cylindrical or stellate; white, lanceolate, 6–8 × 2–3 mm, acute	campanulate; white, oblong-lanceolate, 9–12 × 4–5 mm, obtuse	campanulate; pure white, inner tepals elliptical, outer tepals broadly obovate, 10–15 × 3–8 mm, obtuse	campanulate; pink or whitish-pink, inner tepals narrowly elliptical, outer tepals narrowly obovate, 7–12 × 3–5 mm, obtuse, often denticulate at apex
Filaments	2/3 of perigone	1/2 of perigone	3/4 of perigone	3/4 of perigone
Anthers	yellow	purple	pale mauve	yellow
Distribution and altitude	only one locality in the southern part of Amanus mountains	south Anatolia, 1350–1500 m a.s.l.	Taurus mountains, 1500–2200 m a.s.l.	western coastal regions, sea level–150 m a.s.l.

Tanker et al. 450 (AEF 6668)! C2 Muğla: between Marmaris-Muğla, Gökova, in fields, 50 m a.s.l., 1 May 1982, Koyuncu 5126 and T. Ekim (AEF 19441)! *ibid.*, 200 m a.s.l., 27 Apr 1989, Koyuncu (AEF 15047)!

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