



Research Article

## *Allium decumbens*, unusual a new species of sect. *Allium* (Amaryllidaceae) from east Anatolia, Türkiye

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Received: July 18, 2024

Accepted: July 23, 2024

Online Published: July 23, 2024



**Abstract:** *Allium decumbens* Balos & Sonay is described as a new species from Elazığ Province, Eastern Türkiye. It is an endemic serpentine species that grows on the slopes at an altitude of 2160–2300 m above sea level on the Hazarbaba Mountain in the Sivrice district of Elazığ Province. Based on morphological features, it belongs in *Allium* subgen. *Allium* sect. *Allium*. *Allium decumbens* is quite different from other species in the section with some of its features. It is morphologically similar to *A. murat-sonayii* Balos, Sonay & C.Çeçen. However, it clearly differs from *A. murat-sonayii* by its leaf structure, tunic type, larger bulb, short and decumbent stem, number and shape of leaves, different sheath structure, longer pedicels, umbel structure with radial symmetry, and smooth inner and outer tepals. Herein, the morphology of *A. decumbens*, a comprehensive description, detailed photographs, habitat and ecological characteristics, and IUCN conservation assessment are provided.

### Citation:

Balos, M. M., & Sonay, V. (2024).

*Allium decumbens*, unusual a new

species of sect. *Allium*

(Amaryllidaceae) from east

Anatolia, Türkiye. International

Journal of Nature and Life

Sciences, 8 (2), 78-87.

**Keywords:** Elazığ, Hazarbaba Mountain, New species, Taxonomy, Turkey, Sivrice.

### 1. Introduction

The genus *Allium* is one of the largest genera of petaloid monocotyledons. It is widespread in the northern hemisphere and is represented by approximately more than 1078 species (POWO, 2024). The plants in the genus are characterized by bulbs enclosed in membranous tunics, terminal umbel, free or almost free 1-veined tepals (except *A. siculum*), often a sub-gynobasic style, and loculicidal capsule with 1 or 2 seeds per loculus (species of subgen. *Melanocrommyum* have more than 2 seeds per loculus) (Kollmann, 1984; Friesen et al., 2006). It was divided into 15 subgenus and 72 sections by Friesen (2006) based on molecular, morphological, anatomical and cytological data, although some of the subgenus may not be monophyletic (Li et al., 2010).

The first comprehensive study on the genus *Allium* in Türkiye was made by Kollman (1984). 141 species were reported in this study. Over the past 40 years, new *Allium* species have been discovered. According to the volume "Resimli Türkiye Florası 3b - Illustrated Flora of Türkiye 3b" (Koyuncu et al., 2023), in which the *Allium* genus has been revised, 225 *Allium* species are included in the Flora of Türkiye. With the new species described in the last two years (Koçyiğit et al., 2023a; Eker, 2023; 2024; Fırat, 2024; Koçyiğit et al., 2024; Yıldırım et al., 2024), the number of *Allium* species in Türkiye has reached 231 (about half of which are endemic), and this genus is the geophyte with the highest number of taxa in Türkiye. The number of *Allium* in Turkey has reached 231. This makes Türkiye an important center of *Allium* diversity in SW Asia (Balos and Geçit, 2023a; Koyuncu



et al., 2023). *Allium* is represented in Greece with more than 100 species (Trigas and Bareka, 2020; Ioannidis and Tzanoudakis, 2022), in Iran with more than 155 species (Dolatyari et al., 2020), in Lebanon-Syria with more than 68 species and in Iraq with more than 44 species (POWO, 2023). Sect. *Allium* is the richest species among the *Allium* genus in Türkiye with 71 species (Koyuncu et al., 2023; Eker, 2024). With the new species in this study, the number of *Allium* sect. species increased to 72.

Eastern and South-eastern Türkiye region is a less studied region in terms of *Allium* genus. In recent years, new *Allium* species have been discovered from Türkiye (Ekşi and Yıldırım, 2019; Yıldırım, 2019; Karakuş and Mutlu, 2019; Ekşi and Duman, 2020; Koçyiğit and Kaya, 2020; Armağan, 2021a; 2021b; Balos et al., 2021, Balos, 2022a; 2022b; 2022c; Balos et al., 2022, Özdöl et al., 2022; Balos et al., 2023, Koçyiğit et al., 2023a; Eker, 2023; 2024; Fırat, 2024; Koçyiğit et al., 2024; Sonay et al., 2024; Yıldırım et al., 2024). Many new endemic species have been described in Elazığ (Türkiye) in the last two years (Balos et al., 2022; Balos et al., 2023b; Keskin et al., 2023; Sonay et al., 2023; 2024. This shows that the region is rich in plant diversity.

During field trips in Elazığ Province (Eastern Türkiye) in July 2024, the first authors gathered some peculiar *Allium* specimens. As a result of detailed morphological studies carried out on the species, it was decided that the plant was a new species.

## 2. Materials and Methods

The specimens were collected from Mt. Hazarbaba, Elazığ, Türkiye during field studies. The collected specimens were dried and stored in the HARRAN (Harran University Herbarium). For the identification of the collected specimens, the literature on *Allium* was reviewed and we consulted Flora of Turkey and the East Aegean Islands (Kollmann, 1984; Özhatay and Tzanoudakis, 2000; Koyuncu et al., 2023) and Floras of the neighboring regions including Iran, Iraq, Syria and Palestine were also consulted (Boissier, 1882; Feinbrun, 1948; Wendelbo, 1971, 1985). Mathew (1996) and also published in recent years are publications on sect. *Allium*. More than 30 specimens of *A. decumbens* were examined for morphological description. Qualitative and quantitative morphological characters diagnostic at the species level in *Allium* were examined with a stereo-binocular microscope both fresh and dried materials. The threat category assessment of the new species was made according to IUCN criteria (IUCN 2022) and the GeoCAT software (GeoCAT 2024).

## 3. Results and Discussion

***Allium decumbens* Balos & Sonay *sp. nov.*** (Figure 1–3)

**Type:** Türkiye. Elazığ: Sivrice region, Mt. Hazarbaba, serpentine area, 2200–2347 m. a.s.l., 15 July 2024, M. Balos 5668 (holotype and isotype HARRAN!).

**Paratypes:** Türkiye, Elazığ: Sivrice region, Mt. Hazarbaba, serpentine area, 2200–2347 m. a.s.l., 7 July 2024, M. Balos 5657 (HARRAN!)

Bulb ovoid, 1.5–4 cm length × 1.2–2.5 cm wide; outer tunics membranous, grey, brown, falling quickly; inner tunics membranous, white; no bulblet. Scape 10–17 cm length, 2–2.2 mm wide, decumbent, zigzag or s-shaped. Leaves 2, hollow, 7-sided, keeled, and horn shaped, only edges scabrid; lower leaf are wider, 6.5–12 cm length, 0.2–0.4 cm wide, pointed at the tip, up to 1/3 of the trunk, mostly s-like curved, sometimes exceed the umbel; upper leaf are thinner and shorter, pointed, mostly uncurved, 3.5–5.5 cm length, 0.2–0.3 cm wide. Leaf sheath, 7-sided, keeled, up to 1/3–9/10 of stem, sometimes below the umbel, vagina membranous. Umbel generally globose or subglobose, 2.5–4.5 cm diameter, sparse, 20–100 flowered. Spathe 1-valved, c. 4 cm, caducous, broad at the base, narrowing suddenly towards the apex. Pedicels glabrous, almost equal, up to 1–3 × perigone (0.5–1.5 cm length), upper part is clavate; Bracteoles united around the outer pedicels, upper part is swollen. Perigon 4–5.25 × 3–3.1 mm, ovoid, ovoid-lanceolate, conical, slightly curved back at tip; tepals greenish, smooth, edges and base white, middle parts light green, not tough, midrib unclear, edges are thin, the middle is meaty and juicy; outer tepals 3.75–5 mm length × 2.25–2.75 mm, smooth, ovate or ovate-lanceolate, acute to obtuse at apex, cymbiform; inner tepals 4–5.25 × 2–2.75 mm, smooth, ovate or orbicular-ovate, obtuse at apex. Stamens exerted, leans outwards; filaments white, glabrous at base; outer filament simple, subulate, 2.75–6.25 × 0.5 mm; inner filament tricuspidate 3–6.25 × 1.1–1.5 mm; median cusps 1–2.25 mm, shorter lateral cusps; basal lamina 3.5–4 mm length. Anthers 1.5–1.75 mm length, 0.75 mm wide, creamy yellow, slightly verrucous. Pistil 4–6 mm length; style 2–3.75 mm length, exceeds the perigon; ovary 2.25–3 × 1.75–2 mm, ovate-pyriform shaped, papillose, 3 carpel and trilocular, each loculus bearing 2 seed.

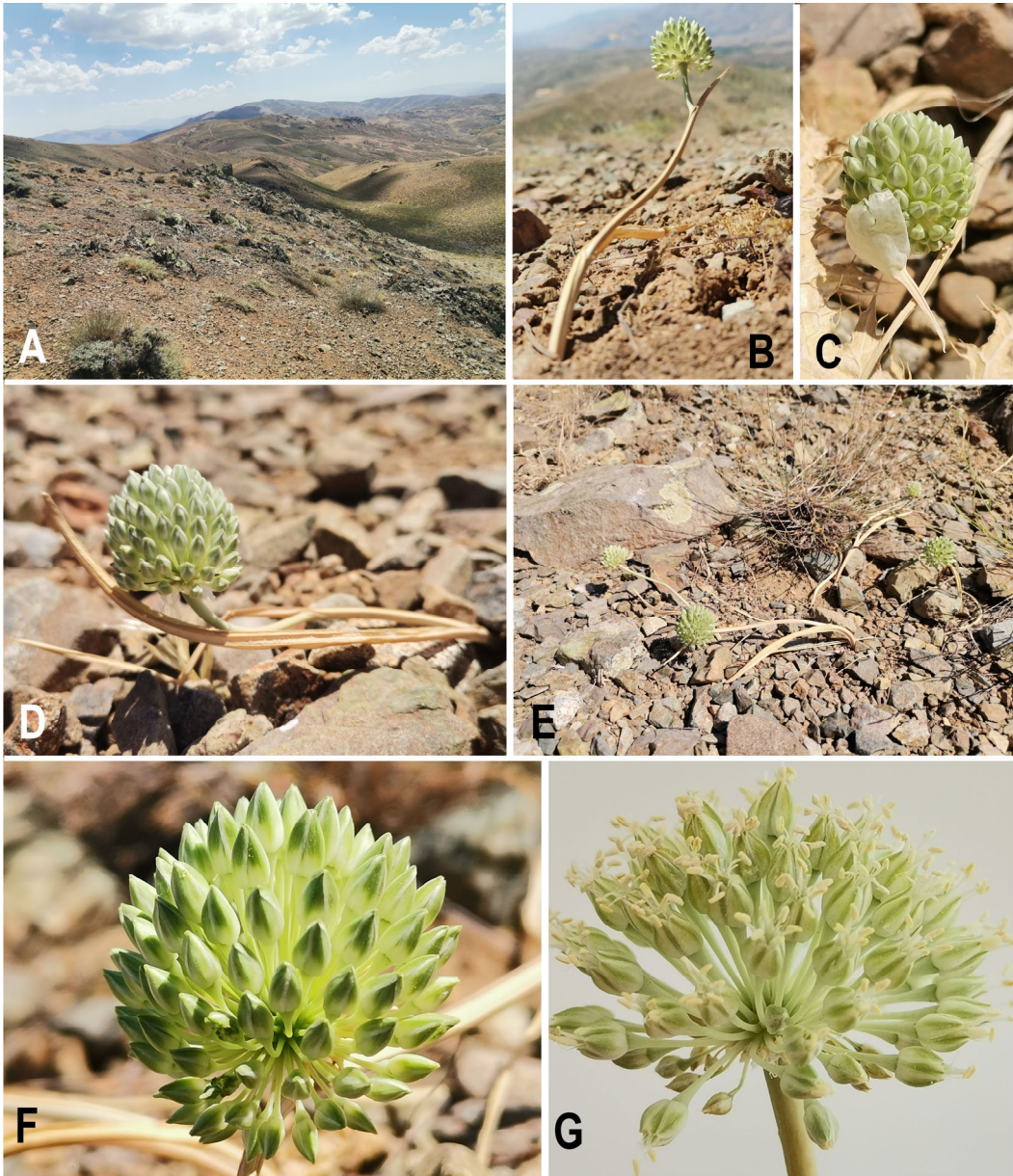
*Etymology:* The species takes its name from its horizontal-ascending (decumbens) growth. The proposed Turkish name is “yatik soğan”, according to the guidelines of Menemen et al.,(2016, 2019).

*Distribution and habitat:* *Allium decumbens* is a local endemic restricted to Mt. Hazarbaba in Elazığ province, Eastern Anatolia. It is an serpentine endemic that grows on the slopes at an altitude of 2160–2300 m above sea level (Figure 1). It is an element of Irano–Turanian phytogeographical region (Davis, 1971). Species growing nearby are *Allium anacoleum*, *Allium saricanense*, *Allium tankeriorum*, *Allium trachycoleum*, *Acantholimon acerosum*, *Aethionema speciosum*, *Allium saricanense*, *Astragalus gummifer*, *Astragalus kurdicus*, *Bungea trifida*, *Campanula stricta* var. *stricta*, *Carduus nutans*, *Centaurea consanguinea*, *Glaucium acutidentatum*, *Gundelia dersim*, *Hypericum scabrum*, *Marrubium astracanicum*, *Papaver armeniacum*, *Paronychia kurdica*, *Polygonum setosum*, *Prangos pabularia*, *Rosularia sempervivum* subsp. *persica*, *Salvia multicaulis*, *Scorzonera cana*, *Stachys lavandulifolia*.

*Phenology:* Flowering and fruiting from July.

*Conservation status:* The extent of occupancy (EEO) and the area of occupancy (AOO) of the new species were evaluated with GeoCAT (2024) to be 1197 km<sup>2</sup> (CR) and 12000 km<sup>2</sup> (EN), respectively. About 300–350 individuals were estimated to occur in Mt. Hazarbaba. There is a serious grazing effect on the population, which may lead to a reduction in the number of individuals in the near future. Therefore, due to its restricted population, one number of locality, and estimated decrease in the area of occupancy, habitat quality and number of mature individuals, the species may be classified as “Critically Endangered” (CR) (criteria B2ab [i, ii, v]) (IUCN, 2022).

*Taxonomic Relationships:* *Allium decumbens* is morphologically similar to *A. murat-sonayii* in terms of its umbel structure and tepal colors. However, it clearly differs from *A. murat-sonayii* by having e.g., leaf structure; tunic type, larger bulb, absence of bulblet; short and decumbens stem; number and shape of leaves; different sheath structure; different shape and size of the umbrella; longer pedicels; smaller flowers and reproductive organs; different shape tepals; smooth inner and outer tepals; and differs from *A. murat-sonayii*. These differences indicate the specimens to represent indeed a new species. The differences between the new species and *A. murat-sonayii* are summarized in Table 1 and Figure 3.



**Figure 1.** *Allium decumbens* (from the holotype); **A:** Habitat of *A. decumbens*, **B–C–D–E:** Habit at the type locality, **F:** Umbel before flowering, **G:** Umbel in flowering period (photographed by M. Balos).





**Figure 2.** *Allium decumbens* (from holotype); **A:** Habit, **B:** Bulb, **C:** transition from leaf sheath to lamina, **D:** Leaf sheathing. **E:** Bracteoles and apex of lower leaves, **F–G:** Perigone, **H:** Outer surface of open perigone with stamens, **I:** Inner surface of open perigone, **J:** Outer-inner-outer tepal, **K–L:** Ovary, **M–N:** Cross-section of lower and upper part ovary, **O:** Anther, **P:** Lower part of lower leaf, **Q:** Cross-section of leaf, **R:** upper half of the lower leaf, **S:** Leaf sheathing, **T:** Cross-section Leaf sheathing, **U:** Cross-section of scape (photographed by M. Balos).



**Figure 3.** Comparison of some different morphological parts of *Allium decumbens* and *Allium murat-sonayii* with photographs. *A. decumbens* (from holotype); **A:** Habit, **B–C:** Umbel, **D:** Perigone, **E:** Ovary, **F:** Outer and inner tepal, **G:** Cross-section of leaf, *A. murat-sonayii*, **H:** Habit, **I–J:** Umbel, **K:** Perigone, **L:** Ovary, **M:** Outer and inner tepal, **N:** Cross-section of leaf.

**Table 1.** Distinguishing characters between *Allium murat-sonayii*.

Characters	<i>Allium decumbens</i> sp. nova	<i>Allium murat-sonayii</i> (data from Balos et al., 2023b)
Bulb	1.5–4 cm × 1.2–2.5 cm	1.2–3.5 × 0.7–2.5 cm
Outer tunic	membranous, grey, brown, falling quickly	dark brownish, papyraceous, persistent
Bulblets	absent	6–8.5 mm, light purple
Scape	10–17 cm long, decumbent, zigzag or s-shaped	14–27 cm long, straight or flexuous below
Leaves	hollow, 7-sided, keeled, and horn shaped, only edges scabrid, 6.5–12 cm length, 2–4 mm wide	canaliculate, smooth, 5–17 cm length, 1.5–1.75 mm
Leaf sheathing	7-sided, keeled, up to 1/3–9/10 of stem, sometimes below the umbel	up to 1/2 of stem or below, glabrous, lowest leaf rarely circinnate; sheaths ± ribbed
Umbel	generally globose or subglobose, 2.5–4.5 cm diameter, sparse	subglobose, 1–3.5 cm long, many-flowered, dense
Pedicele	glabrous, almost equal, 0.5–1.5 cm length	1.5–5.5 mm long, unequal, glabrous, upper part is swollen
Perigon	4–5.25 × 3–3.1 mm, ovoid, ovoid-lanceolate, urceolate; tepals greenish, smooth, edges and base white, middle parts light green, not tough, midrib unclear, edges are thin, the middle is meaty and juicy	2.75–3 × 1.75–2.25 mm, oblong-campanulate; tepals, emerald green in primarily, later creamy at the base, greenish in the middle, slightly purplish on top and margins, midrib is not prominent
Outer tepals length × wide (mm)	3.75–5 mm × 2.25–2.75 mm, smooth, ovate or ovate-lanceolate, acute to obtuse at apex, cymbiform	2–3 × 1–1.2 mm, oblong or ovate-lanceolate, obtuse, scabrid in upper part, mainly along keel and margins
Inner tepals length × wide (mm)	4–5.25 × 2–2.75 mm, smooth, ovate or orbicular-ovate, obtuse at apex	2–3 × 1.25–2.4 mm, ovate-lanceolate, obtuse, curved inward, margins scabrid
Outer filament length	2.75–6.25 mm	1.5–3 × 0.5 mm
Inner filament length	3–6.25 × 1.1–1.5 mm; median cusps 1–2.25 mm	3–4.25 × 0.75 mm; median cusps 1.5–2 mm long
Anthers	1.5–1.75 mm length, 0.75 mm wide, creamy yellow	ca. 1 × 0.6 mm, dirty yellow
Ovary shape	2.25–3 × 1.75–2 mm, ovate-pyriform-shaped,	2 × 1.25 mm, ovate

**Conflicts of Interests**

Authors declare that there is no conflict of interests

**Financial Disclosure**

Author declare no financial support.

**Statement contribution of the authors**

This study's experimentation, analysis and writing, etc. all steps were made by the authors.

**Acknowledgements:** We would like to thank Ahmet Karakaya for his support in the field studies from time to time.



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