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## A new species from Türkiye: *Bolanthus sertavulus* (Caryophyllaceae)

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## Türkiye'den yeni bir tür: *Bolanthus sertavulus* (Caryophyllaceae)

**Abstract:** During a field study, performed within the scope of an ongoing revision study on *Bolanthus* (Ser.) Rchb. genus, aiming to contribute to the 'Illustrated Flora of Türkiye', some specimens resembling *B. cherleroides* (Bornm.) Barkoudah were collected from Sertavul Pass (Mut-Mersin). Detailed investigations on the specimen revealed that some distinct differences exist between *B. cherleroides* and newly collected specimens. As a result of a carefull comparison with the closest taxon, it was decided that it is new for science, and named as *Bolanthus sertavulus*. It grows at altitudes between 1100-1500 meters, on steppe and rocks. It is flowering in May to June. Cushions 5-10 cm diameter, stems erect, 1-2 cm long, densely upright, and with long glandular hairs; shorter and thicker from *B. cherleroides*, internodes invisible. Leaves shorter and harder. Calyx surrounded by leaves, rarely visible. Petals protruding from the calyx, pink, with 3 prominent veins. It is known only from type collection, a Mediterranean element, and endemic to Türkiye. A description of the new species, comparison with the closest taxon, photographs and drawings related to its morphology are presented.

**Key words:** *Bolanthus sertavulus*, endemic, new species, revision, taxonomy

**Özet:** 'Resimli Türkiye Florası'na katkı sağlamak amacıyla, *Bolanthus* (Ser.) Rchb. cinsinin revizyonu konu alan bir çalışma kapsamında gerçekleştirilen bir arazi çalışması esnasında, Sertavul geçidi (Mut-Mersin)'nden *B. cherleroides* (Bornm.) Barkoudah türüne benzeyen bazı örnekler toplanmıştır. Örnekler üzerinde gerçekleştirilen detaylı çalışma, yeni toplanan örnekler ile *B. cherleroides* örnekleri arasında belirgin bazı farklılıkların olduğunu ortaya koymuştur. En yakın takson ile dikkatli bir karşılaştırma sonucunda, örneklerin bilim dünyası için yeni olduğuna karar verilmiş ve *Bolanthus sertavulus* olarak isimlendirilmiştir. Bu bitki 1100-1500 metre rakımda, step ve kayalık yerlerde yetişir. Mayıs-Haziran aylarında çiçek açar. Yastıklar 5-10 cm çapında, gövdeleri dik, sık, dik, 1-2 cm boyunda, uzun salgılı tüylere kaplı *B. cherleroides*'e göre daha kısa ve kalındır. Boğumalar arası görünmez. Yaprakları daha kısa ve sert, yapraklarla örtülü nadiren görülebilin kaliks. Petalleri kalıksten dışarı çıkmış, pembe ve 3 belirgin damarlıdır. Sadece tip lokalitesinden bilinen tür, Akdeniz elementidir ve Türkiye için endemiktir. Yeni türün betimlemesi, en yakın taksonla karşılaştırması, morfolojisine ilişkin fotoğraf ve çizimleri verilmiştir.

**Anahtar Kelimeler:** *Bolanthus sertavulus*, endemik, yeni tür, revizyon, taksonomi

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### 1. Introduction

Although family Caryophyllaceae, comprising around 100 genera and 2500 species, is mainly distributed in Northern Hemisphere, the gene center is estimated to be Mediterranean Region (Lawrence, 1951; WFO, 2023). According to our field observations; two differentiation centers have been determined for the genus *Bolanthus* (Ser.) Rchb. within Lakes Region (in Türkiye): First one is the Sultan Mountains (within the boundaries of Isparta, Afyonkarahisar and Konya provinces) and continuation of this mountain, volcanic lands of Bozkır, Hadım, Ermenek districts. The other one is Köpekbeli, around Salda Lake (in Burdur) and Sandras Mountain (in Muğla), serpentine beds. For this reason, distribution area and biodiversity centers of the genus are mainly in Lake Region of Türkiye.

Distribution area of the genus *Bolanthus* (known as Havalotu in Turkish) is Mediterranean countries. There are about 20 species distributed in the region (Türkiye, Greece, Syria, Lebanon and Palestine) (Barkoudah, 1962; Huber-Morath 1967; Phitos, 1997; Koç and Hamzaoglu 2015). Of these, 11 species currently exist in Türkiye and all of them are endemics. Newly defined species are generally known

from type gatherings, 6 in Flora of Europe, one Flora of Palestine (Zohary, 1966; WFO, 2023).

The first revision of the genus for Türkiye was made by Artur Huber-Morath (Huber-Morath, 1967a,b). In this revision, 5 species and 2 varieties were described and recorded for Turkish flora. During the preparation of first supplement volume of the 'Flora of Turkey and the East Aegean Islands', another species, *B. stenopetalus* Hartvig & Strid was added (Davis et al., 1988). Later on, *B. huber-morathii* C.Simon, *B. mevlanaea* Aytaç, *B. turcicus* Koç & Hamzaoglu and *B. azizsancari* M.Koç & E.Hamzaoglu were presented, and the number of species in Türkiye increased to 11. In recent publications, existing Turkish *Bolanthus* taxa were revised and an identification key was prepared (Aytaç and Duman, 2004; Özhatay et al., 2009; Koç and Hamzaoglu, 2015).

Totally 25 members of the genus currently exist in the countries (Syria, Lebanon, Palestine, Greece and Türkiye) localized at Mediterranean coasts. The genus is represented by 8 taxa in European flora, and 6 taxa in Syria, Palestine and Lebanon. All of the taxa distributed in Europe are also known from Greece and East Aegean Islands (Yıldızbaş

**Table 1.** Existing *Bolanthus* taxa of Türkiye

Taxon name	Turkish Name
1a <i>B. frankenoides</i> (Boiss.) Barkoudah var. <i>frankenoides</i>	Tüylü hashavalotu
1b <i>B. frankenoides</i> (Boiss.) Barkoudah var. <i>fasciculatus</i> (Boiss. & Heldr.) Barkoudah	Tüysüz hashavalotu
2 <i>B. spergulifolius</i> (Jaub. & Spach) Hub.-Mor.	Yoz havalotu
3 <i>B. stenopetalus</i> Hartwig & Strid	Özge havalotu
4 <i>B. turcicus</i> Koç & Hamzaoglu	---
5 <i>B. sandrasicus</i> Hamzaoglu & Koç	Sandras havalotu
6 <i>B. thymoides</i> Hub.-Mor.	Çorak havalotu
7 <i>B. cherlerioides</i> (Bornm.) Barkoudah	Konya havalotu
8 <i>B. aziz-sancarii</i> Koç & Hamzaoglu	Azizsancar havalotu
9 <i>B. mevlanaea</i> Aytaç	Akseki havalotu
10 <i>B. minuartioides</i> (Jaub. & Spach) Hub.-Mor.	Kaya havalotu
11 <i>B. huber-morathii</i> C.Simon	Bursa havalotu

and Koç, 2018). Twelve of these 26 taxa are distributed only in Türkiye and all of them are endemic to the country.

Existing *Bolanthus* taxa of Türkiye are listed in Table 1 together with their Turkish names (Aytaç and Duman, 2004; Barkoudah and Akeroyd, 1993; Koç and Hamzaoglu, 2015; Koç et al., 2019; Yıldızbaş and Koç, 2018).

In this study, a new *Bolanthus* species is presented. It was determined within the scope of an ongoing revision study, aiming to contribute to the ‘Illustrated Flora of Türkiye’ and to solve the problems of small but taxonomically difficult genus *Bolanthus*.

## 2. Materials and Method

Specimens related to the newly reported *Bolanthus* species were collected in June from Sertavul pass within the boundaries of Mut district of Mersin province, in Türkiye. Photographs related morphology were taken in the herbarium from dry specimens. A stereomicroscope is used for detailed examinations. The determined characteristics of the specimens were compared with Barkoudah (1962), Davis (1967). The herbarium specimens of GAZI, KNYA and especially of GUL which is the richest one in terms *Bolanthus* specimens were also evaluated. The distinguishing features of the specimen are compared, in tabular form, with the closest taxon, *B. cherlerioides*. Diagnosis, description and drawings of holotype specimen were prepared. Based on the investigated specimens, an updated description was also prepared for *B. cherlerioides*. Current identification key for Turkish *Bolanthus* (Davis, 1967; Koç et al., 2019) were also updated considering the newly identified species and the updates.

## 3. Results

### 3.1. Taxonomic treatment

*Bolanthus sertavulus* Özçelik sp. nov. (Figs. 1,2, Table 2)

Affinis *Bolanthus cherlerioides* sed partes eius supra humum dense, erectae, pilis longis glandulosis obsita; corpore breviore et crassiore (1-2 cm); foliis brevioribus et durioribus; minora cervicalia magnitudine (5-10 cm) distinguuntur.

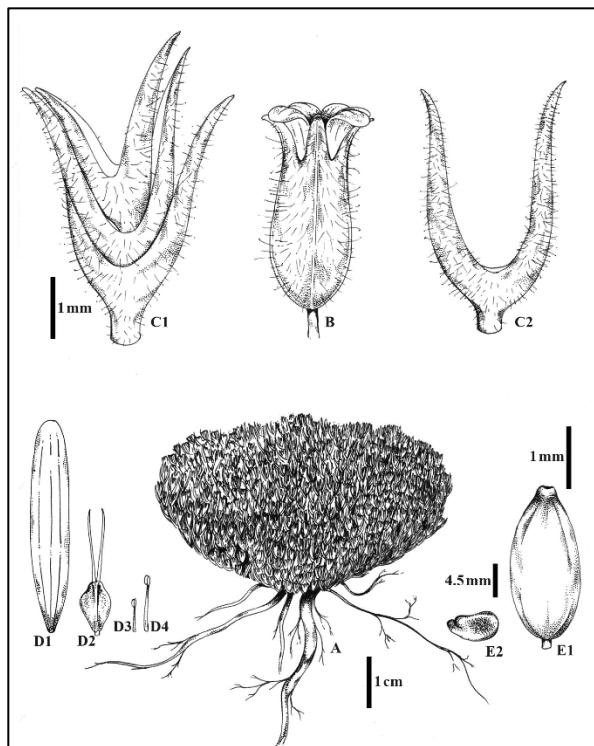
**Type:** İçel (Mersin), Mut, Sertavul pass, steppe and rocks, 1100-1500 m, 26.06.2000, Özçelik 8462. Endemic. Holo: GUL, Iso: GUL, VANF, KNYA.

**Diagnosis:** Allied to *B. cherlerioides*. But its cushions 5-10 cm, densely upright, and with long glandular hairs; stems erect, 1-2 cm long, shorter and thicker, internodes invisible; leaves shorter and harder; calyx surrounded by leaves, rarely visible; petals protruding from the calyx, pink, with 3 prominent veins (Table 2).

**Description:** Glandular perennials herbs. Roots soft, thin, long; young (thin) roots pilose hairy, bright colored. Above-ground parts (3-) 5-10 (-15) cm in diameter, cushion forming, middle of which is like a dome, forming a pillow. Stems short, up to 1 cm tall, clearly shorter than leaves, very branched at base, covered with old and/or dead stem remnants and clumps at base. Internodes very short, slightly visible; stem, leaf, bract and calyx covered with dense long glandular hairs. Leaves in bunches, cylindrical, pointed at ends, 1-veined, up to 4 x 1 mm, often glandular hairy, gradually enlarging with a membranous structure towards base. First leaves oblong-linear, shorter and less hairy than the later leaves. Flowers sessile, usually 1 per fascicle.



**Figure 1.** Holotype (a), isotype (b,c) specimens, and leaves, bracts, calyx and stamens of *Bolanthus sertavulus* Özçelik (in Hb. GUL)



**Figure 2.** Drawings of holotype specimen of *Bolanthus sertavulus*. A- habit, B-flower, C1- leaves and bracts, C2- bracts, D1- petal, D2- pistil, D3,D4- stamens, E1- capsule, E2- seed (GUL Hb., Özçelik 8462) (drawings by G.Aytepe)

Bracts leaf-shaped, smaller. Calyx 5, tubulate, veins prominent, membranous between,  $4 \times 1.5\text{-}2$  mm, often erect long glandular hairs; teeth pinkish, linear, pointed tips. Fruity calyx swollen in the middle. Petals 5, pale pink, with

3 prominent veins, long linear,  $4\text{-}5 \times 1.5\text{-}2$  mm, a little longer than calyx, flush with leaves. Stamens 10, anthers not protruding from calyx, slightly short. Styles 2. Ovary with 8-20 ovules. Fruit capsule, oblong-ovoid, opens with 4 teeth. Seeds tuberculous.

**Etymology:** This new taxon was detected from Mersin, Sertavul Pass. For this reason, it was named after the place (Sertavul) where it was gathered.

**Conservation Status:** The habitat of the specimen posses more than 100 square kilometers. But considering the area of occupancy (only one locality) and probable heavy grazing in the area, the IUCN category of the *B. sertavulus* is suggested as Critically Endangered (CR).

**Economic Value:** No economic use as yet. It can be a ground cover in rock gardens. However, as an endemic, it contributes to biodiversity of Türkiye.

**Geography:** İçel (Mersin), Mut, Sertavul Pass, steppe and rocks, 1100-1500 m, 26.06.2000, Özçelik 8462. According to Davis (1967), *B. cherlerioides* is also distributed in İçel, Sertavul Pass (Mut, İçel), 29 km south of Karaman, 1610 m, Hub.-Mor. 17098. Since this distribution is thought to belong to *B. sertavulus*, *B. cherlerioides* was redefined in the light of the herbarium specimens given below, and the diagnostic features of it were also stated.

**Investigated herbaria specimens for *B. cherlerioides*:**  
**Isparta-Konya:** Özçelik 7957, 7958, 9161, 9231, 9708, 9229, 9230; 9239, 9233; 9223, 9225, 9228, 8863, 8864, 9227, 9228, 9226, 9224, 9232b! in GUL Herbarium.  
**Konya:** 9340 (in GAZI!); Özçelik 7264 (GAZI!); H. Ocakverdi 238/804 (KNYA 1213!). **Antalya-Adana:** 805 (KNYA14502!); **Afyonkarahisar:** GAZI 35677!.



Fig. 2. Samples of *Bolanthus cherleriooides* in natural habitat (a), and from GUL Hb.(b), Isparta: Özçelik 9708.

**Table 2.** A comparison of *Bolanthus cherleroides* and *B. sertavulus* (new species).

Characters	<i>B. cherleroides</i>	<i>B. sertavulus</i>
<b>Plant cushion</b>	(5-)10-15 (-20) cm diameter	5-10 cm diameter
<b>Stems</b>	Young stems 2-3(-8) cm, longer than leaves, internodes visible. Old stems and their remains are black.	Stems 0-1(-2) cm tall, shorter than leaves, internodes very short, invisible. There is no old stems and their remains not black.
<b>Leaves</b>	Leaves linear-subulate, 5-9 mm long	Leaves cylindrical, up to 4 mm long
<b>Calyx</b>	Calyx easily visible, 4-6 mm, short sparsely glandular hairs, rarely glabrous. Calyx teeth linear-subulate to linear-lanceolate, green or pink.	Calyx surrounded by leaves and brackets, rarely visible, up to 4 mm, often erect, with glandular hairs. Calyx teeth linear, with pointed tips, pinkish.
<b>Corolla</b>	Petals linear-lanceolate, white, rarely pale pink, not prominent veins	Petals linear, pale pink, with 3 prominent veins.
<b>Indumentum</b>	Leaves and bracts glabrous or sparsely hairy; stems glandular hairy.	Stems, leaves, bracts and calyx covered with dense, long glandular hairs.
<b>Habitat and geography</b>	Konya, Afyonkarahisar partly to Antalya and Adana provinces, 1600-1900 m altitudes at steppe and subalpinic meadows on slopes.	İçel (Mersin), Mut, Sertavul pass. It grows on steppe and rocks, 1100-1500 m.

### 3.2. Updated diagnostic characters and description of *B. cherleroides*

**Diagnostic characters:** Plant clusters are dense, pillow-shaped; pillows clearly compact (like a dome in the middle), clusters (5-)10-15 (-20) cm in diameter; young stems unbranched, compact, innumerable, upright and short, (1-) 2-3 (-10) cm tall. Internodes visible (0-) 1 (-2) mm; lower part herbaceous or woody. Leaves imbricate, linear-subulate, one-veined, 3-9 mm, base enlarged, cross section approximately circular. Inflorescence dichasium, 1-3(-6). Calyx teeth linear-lanceolate to subulate; petals white or pink, petals 3-pronged with purple veins; central flower sessile.

### An updated identification key for Turkish *Bolanthus* taxa

1. Petals entirely white, not purple veins
  2. Plants prostrate or decumbent; flowers (5-)10–25 in dense subsessile clusters; calyx 4,0-5,0 mm long ..... *B. minuartioides*
  2. Plants ascending or erect; flowers 1–3 in pedicellate clusters; calyx 5,5-7,0 mm long ..... *B. aziz-sancarii*
1. Petals entirely purple or white with purple veins
  3. Stems glabrous or puberulent hairy; leaves setaceous, glabrous; bracts 1,5 times as long as calyx
    4. Plants prostrate; internodes 5–15 mm long; flowers pedicellate ..... *B. huber-morathii*
    4. Plants ascending or erect; internodes 1–3 mm long; flowers sessile ..... *B. mevlanaea*
  3. Stems glandular-hairy; leaves linear to linear-setaceous, glandular hairy; bracts 1–1,2 times longer than calyx
    5. Cushions compact; leaves falcate; inflorescence 1–3-flowered; calyx teeth 2–2,5 mm long
      6. Cushion diameter (5-)10-15 (-20) cm; stems 2-3(-5) cm long, thin, visible; leaves and bracts glabrous or sparsely glandular hairy ..... *B. cherleroides*
      6. Cushion diameter 5-10 cm; stems 1-2 cm long, partly thick, invisible, leaves and bracts densely glandular hairy ..... *B. sertavulus*
    5. Cushions lax or prostrate, leaves not falcate; inflorescence 4–15-flowered; calyx teeth 0,5–1,5 mm long
      7. Plants ascending or erect; internodes upto 5 mm long; flowers sessile; petals linear-oblong
        8. Stems (2-) 3-5 cm, internodes 1-2 (-4) mm, bracts as long as calyx; calyx 4-5 mm; petals linear oblong, truncate ..... *B. thymoides*
        8. Stems 1(-2) cm, internodes 0-1(-2) mm; bracts shorter calyx; calyx 2,5–4,0 mm; petals oblanceolate ..... *B. sandrasicus*
      7. Plants prostrate; internodes 5–15 mm long; flowers pedicellate; petals narrowly oblanceolate
        9. Leaves linear-oblanceolate; calyx 3–3,5 mm; inflorescence with lax clusters
          10. Leaves long-ciliate hairy; calyx non-viscid, ovary 8–10-ovulate ..... *B. stenopetalus*
          10. leaves not long-ciliate (pubescent to glabrescent); calyx viscid, ovary 20-ovulate ..... *B. frankenioides*
            11. Plants ± fasciculate, loosely tufted, prostrate, decumbent; leaves linear-subulated, glabrous; stems puberulent; pedicels 0-2,0 mm ..... var. *fasciculatus*
            11. Plants not tufted; leaves partially flattened linear, loosely glandular pubescent; stems glandular pubescent or not, pedicels (0-) 2-4 mm ..... var. *frankenioides*
        9. Leaves subulate-setaceous or linear; calyx 3,5–5,5 mm; inflorescence with compact clusters
          12. Leaves linear, 3-nerved; calyx 3,5–4,5 mm long; petals 3,3–4,5 mm, usually as long as calyx ..... *B. turcicus*
          12. Leaves subulate-setaceous, 1-nerved; calyx 4,5–5,5 mm long; petals 6–7 mm, 1,5 times longer than calyx ..... *B. spergulifolius*

**Description:** Cushion-shaped perennial herbs with many-branched and woody rhizomes; cushion compact, 5-15(-20) cm diameter. Young stems much branched; with a mixture of short eglandular and longer glandular hairs. The stems 1-3(-8) cm, longer than leaves. Internodes 1-2 mm, visible, covered by densely imbricated leaves. Old stems and their remains are black. Leaves rather weak, small, (3-)5-7(-9) x 0,2-0,4 mm; linear-subulate, often falcate, densely fasciculate; with ±numerous long spreading glandular and with scarce short eglandular hairs or not. Bracts leaf-like, adpressed to the calyx, enlarged and membranous-margined at base; as long as or longer than flowers. Inflorescence terminal, 1-3(-6) flowered; flowers short

pedicellate, only the central flower sessile. Calyx tubular, easily visible, 4-6 mm, with 5 projecting ribs, short sparsely glandular hairs, rarely glabrous. Calyx teeth linear-subulate to linear-lanceolate, 2-2.5 mm, often spreading, green or pink. Petals pure white or rarely bright pink with purple veins; linear-subulate, cylindrical, cuneate, obtuse to truncate, about as long as calyx. Ovary 8-ovulate. Capsule unknown. It is a very distinctive species.

**Distribution and Habitat:** Endemic to Türkiye. Grows in Konya, Afyonkarahisar partly to Antalya and Adana provinces. Sultan Mountains (north of the pass) and its surroundings, 1600-1900 m, at steppe and subalpinic meadows on sloping slopes and piles of stones. Fl: 6-7. Fr. 7-8. It is an East Medit. element.

#### 4. Discussion

*Bolanthus* species are taxonomically difficult to study. Perhaps the most difficult species of the genus is *B. sertavulus*. Because the plant is short, flowers small, stuck between the leaves. According to our field observations; in the Lakes region, *Bolanthus* genus becomes more diverse and the population size becomes larger. Most of new

species are described from this region. While there were 5 species recorded in the book titled ‘Flora of Turkey..’ (Davis, 1967), today species number of *Bolanthus* in Türkiye has increased to 12. If the ecological characteristics of the Lakes Region, especially its rock diversity and climate, are examined well, the biology of *Bolanthus* genus will be better understood. These ecological features can also be used as distinguishing features in the revision of the genus

#### Conflict of Interest

Author has declared no conflict of interest.

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