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A new species of *Acantholimon* Boiss. (Plumbaginaceae) from Ankara, Turkey

MUSA DOĞAN[1]* and GALİP AKAYDIN[2]

[1]*Department of Biological Sciences, Middle East Technical University, 06531 Ankara, Turkey*
[2]*Department of Biology Education, Hacettepe University, 06532 Beytepe, Ankara, Turkey*

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Acantholimon anatolicum Dogan & Akaydın **sp. nov.** (Plumbaginaceae) is described and illustrated. The species grows on deep gypsum-rich sandy soil on eroded mountain slopes between Çayırhan and Nallıhan in Ankara. Diagnostic morphological characters that discern it from closely related species are discussed and its conservation status is indicated. A revised key to *Acantholimon* species with ± dense terminal spikes and excurrent scapes is given for the species found in Turkey. (c)The Linnean Society of London, *Botanical Journal of the Linnean Society*, 2002, **140**, 443–448.

ADDITIONAL KEYWORDS: Central Anatolia – conservation – distribution.

INTRODUCTION

The genus *Acantholimon* Boiss. comprises about 200 species throughout the world but mainly distributed in Euro-Asia and crossing into South America. Its centre of diversity lies in the east Mediterranean and Irano-Turanian phytogeographic regions. *Acantholimon* species are all perennial, densely or laxly pulvinate subshrubs forming thorn cushions. The genus has ecological and economic importance. Its ornamental importance with coloured long-lasting flowers is remarkable. A Turkish dessert is also made by means of boiling the roots (Baytop, 1994).

Boissier (1879) recognized 74 species of *Acantholimon* in his *Flora Orientalis*; some of these species were described from Turkey. Bokhari (1970, 1972a) carried out taxonomic studies on *Plumbaginaceae* in Turkey where he recognized six genera (*Acantholimon* Boiss., *Limoniopsis* Lincz., *Limonium* Miller, *Armeria* Willd., *Goniolimon* Boiss. and *Plumbago* L.) in this family, and described six new species (*A. confertiflorum*, *A. halophilum*, *A. reflexifolium*, *A.dianthifolium, A. hypochaerum* and *A. strigillosum*). Bokhari (1972b) also studied the stigma and pollen types in *Acantholimon* and *Limoniopsis*. The first revision of *Acantholimon* in Turkey was done by Bokhari & Edmondson (1982) for the *Flora of Turkey and the East Aegean Islands* in which they recognized 25. They indicated the possibility of finding further species either imperfectly known (two species) or doubtfully recorded (nine species).

A recent study conducted by Muvaffak (1997) concluded that there were nine species of *Acantholimon* in Ankara Province, *viz*: *A. venustum* Boiss., *A. halophilum* Bokhari, *A. acerosum* (Willd.) Boiss., *A. kotschyi* (Jaub. & Spach) Boiss., *A. confertiflorum* Bokhari, *A. glumaceum* (Jaub. & Spach) Boiss., *A. caesareum* Boiss. & Bal., *A. puberulum* Boiss. & Bal. and *A. ulicinum* (Willd. et Schultes) Boiss. In a recent numeric taxonomic study, a new infrageneric grouping in the genus was made on the basis of the species found in Ankara Province, and three subsections, namely *Caryophyllacea* Bunge (including *A. venustum* and *A. kotschyii*), *Halophiliacea* Muvaffak & Dogan (including *A. halophilum, A. acerosum, A. caesareum* and *A. confertiflorum*) and *Androsacea* Bunge (including *A. glumaceum, A. puberulum* and *A. ulicinum*) were recognized (Muvaffak, Doğan & Bilgin, 2001).

The extensive field surveys and the laboratory studies conducted on *Acantholimon* in Turkey by the authors revealed four additional new species, namely *A. avanosicum* Dogan & Akaydın (Doğan & Akaydın,

*Corresponding author. E-mail: doganm@metu.edu.tr

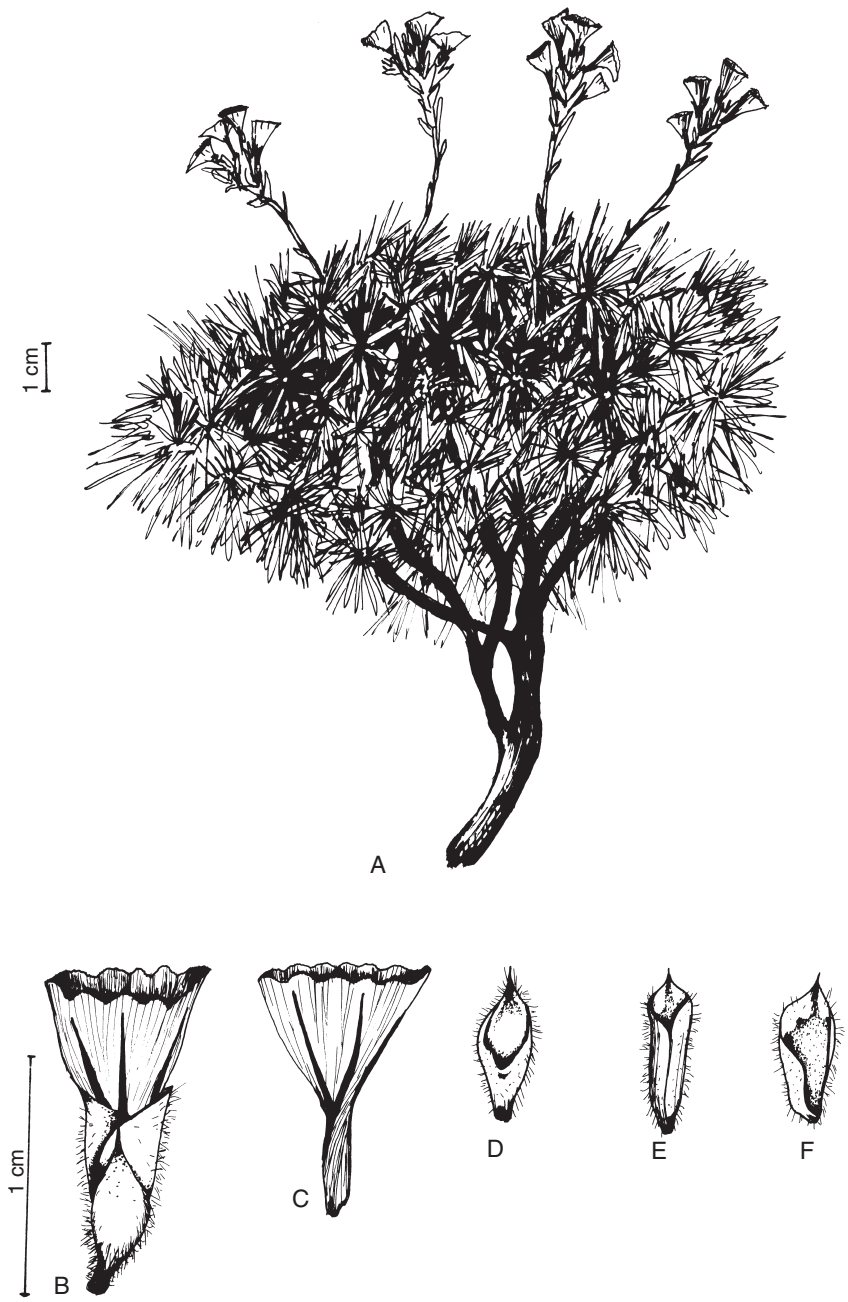

Figure 1. ***Acantholimon anatolicum*** **sp. nov.** (A) Habit; (B) spikelet; (C) calyx; (D) outer bracts; (E,F) inner bracts.

2002a), *A. karamanicum* Akaydın & Dogan (Akaydın & Doğan, 2002), *A. yildizelicum* Akaydın (Akaydın, 2002) and *A. birandii* Dogan & Akaydın (Doğan & Akaydın, 2002b).

METHODS

Since 2000, as a part of a revisional study on the genus *Acantholimon* in Turkey, the authors have carried out extensive field studies and collected a large number of specimens. These specimens were pressed carefully and dried using the standard techniques for laboratory analysis (Davis & Heywood, 1973). A local population of *Acantholimon*, which looked close to *A. strigillosum* Bokhari at first glance in the field, was collected from Kuşenneti between Çayırhan in Ankara (A3). The specimens were cross-checked with the keys provided by Bokhari & Edmondson (1982), and the *Acantholimon* accounts given in various floras, such as *Flora Orientalis* (Boissier, 1879), *Flora*

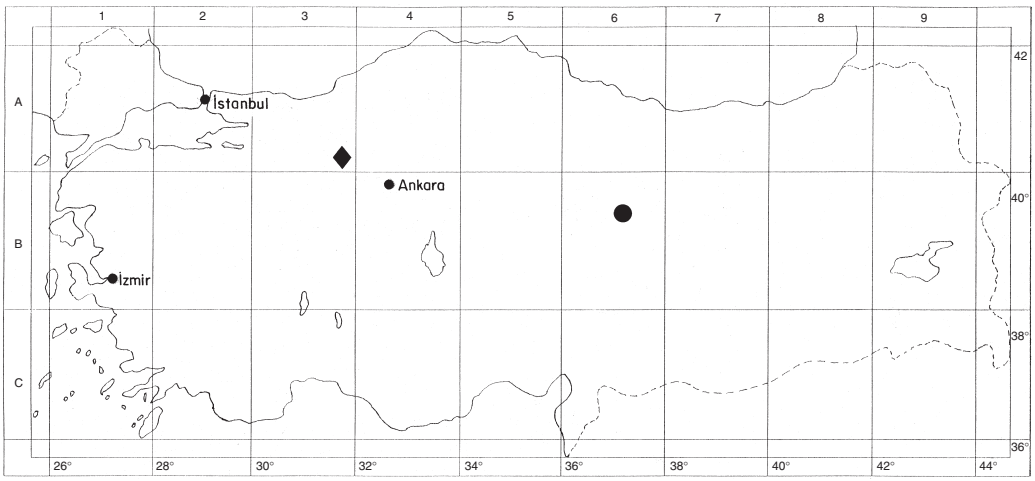

Figure 2. Distribution of (◆) ***Acantholimon anatolicum* sp. nov.** and (●) *A. strigillosum* in Turkey.

Iranica (Rechinger & Schiman-Czeika, 1974), *Flora Europaea* (Moore, 1972), *Flora of USSR* (Komarov, 1967), and *Flora of Syria, Palestine and Sinai* (Post, 1933).

The specimens were then compared with the duplicates of Davis' specimens obtained from Edinburgh (E) as a gift, cited in the *Flora of Turkey and the East Aegean Islands*. The Supplement (Davis *et al*., 1988) was also consulted. *Acantholimon* material either collected from the field in the past two years or kept at three Turkish herbaria in Ankara (ANK, GAZİ and HUB) was examined. Some specimens of *A. strigillosum* were also collected from the area around Hekimhan in Malatya (B6) in July and August 2001. The type specimens of E. Boissier cited in his *Flora Orientalis* were studied at the Boissier Herbarium in Jardine Botanic Garden, Geneva (G). The authorities are cited in accordance with *Authors of Plant Names* (Brummitt & Powell, 1992).

RESULTS

ACANTHOLIMON ANATOLICUM DOGAN & AKAYDIN **SP. NOV.** (FIGS 1, 2)

Holotype: Turkey A3 Ankara: Kuş Cenneti between Çayırhan and Nallıhan, deep gypsum-rich soil on mountain slopes, 500., 19.viii.2000,Doğan 2007, 2008, 2009 & Akaydın (holo ANK).

Diagnosis: Affinis *A. strigillosum* sed foliis brevioribus, 5-12 mm longis, margine minute ciliatis; caules e folia exserta, 4-5 foliati; scapo 5-8 cm longo; spicae 15-20 mm longae, 6-12 spiculis composita; bractea florali externa breviore (4-5 mm longo), ovato-acuminati vel mucronati; bracteolis internis aequilongibus, 7-7.5 mm longitudine, oblongo-lanceolati, cuspidati, hyalino marginata, dorso ciliato; calycibus 10-11 mm, infundibularibus; limbo 10-lobati, nervis limbi marginem attingentibus.

Description: Densely pulvinate glaucous shrublet. Leaves 5–12 × 0.5–1 mm, linear-triquetrous, glabrous, ciliate on margins. Scapes 5–8 cm excurrent, puberulent, with 2–3 spikes. Scales 4–5, shorter than internodes, puberulent. Spikes 15–20 mm, imbricate to terminal. Spikelets 6–12, 1-flowered, lower ones undeveloped. Bracts unequal, green; outer bracts 4–5 mm, ovate, pointed at apex, densely puberulent, narrowly hyaline on margins; inner bracts 7–7.5 mm (including aristate point *c*. 1 mm), oblong-lanceolate, obtuse, cuspidate, with narrowly hyaline on margins especially in upper half. Calyx infundibular, 10–11 mm, tube pilose; limb white, 10-lobed; veins expanded towards margins, not excurrent. Petals pink.

Phenology: Flowering August. Deep gypsum-rich sandy soil on dry mountain slopes.

Ecology: This new species grows on deep gypsum-rich sandy soil on open mountain slopes around Kuş Cenneti between Çayırhan and Nallıhan in Ankara (A3) with *Gypsophila venusta* Fenzl, *Gypsophila pilosa* Huds., *Astragalus microcephalus* Willd., various grasses of the Central Anatolian steppe.

Distribution: Central Anatolia (A3 Ankara). Endemic. Ir.-Tur. element.

Status: This new species is known only from the type locality between Çayırhan and Nallıhan, where it grows on dry mountain slopes on the left side of the

A REVISED KEY TO TURKISH *ACANTHOLIMON* SPECIES WITH ± DENSE TERMINAL SPIKES AND EXCURRENT SCAPES

1. Bracts strigillose; scapes 5–6 scaled; leaves strongly glaucous ..... *A. strigillosum*
1. Bracts glabrous or puberulous; scapes 1–5 scaled; leaves greenish or glaucous-green 2
2. Scapes simple, unbranched, always 1-spiked 3
3. Lower leaves strongly reflexed; inner bracts elliptic-lanceolate ..... *A. reflexifolium*
3′. Lower leaves not strongly reflexed; inner bracts oblong-spathulate to oblong-lanceolate ..... *A. caesareum*
2′. Scapes branched, 2 (–3) spiked 4
4. Densely pulvinate; leaves 8–20 mm 5
5. Inner bracts hyaline narrowly on margin; spikelets 11–12 mm; leaves 5–12 mm long ..... ***A. anatolicum***
5′. Inner bracts hyaline except for vein; spikelets 13–15 mm; leaves 15–30 mm long ..... *A. saxifragiforme*
4. Laxly to densely caespitose; leaves 15–30 mm 6
6. Lower leaves strongly reflexed; branches long, naked in lower parts ..... *A. glumaceum*
6′. Lower leaves spreading or slightly reflexed; branches short and leafy 7
7. Bracts not purple-tinged; calyx densely pilose on tube up to middle of limb. ..... *A. huetii*
7′. Bracts purple-tinged; calyx tube glabrous below, pilose above ..... *A. caesareum*

road facing to Kuş Cenneti. The additional field surveys carried out by the authors in July and August 2001 and 2002, showed that the species was a very local one and distributed in an area about 10 ha. The populations seem to be small and scattered on the mountain slopes where excessive grazing and erosion are threatening the species. Therefore, it should be graded as Critically Endangered (**CR**) category because of its local distribution and small population size (IUCN, 2001).

Etymology: This new species is named after Anatolia where it appears to be a very local and a distinct endemic species.

DISCUSSION

A. anatolicum is certainly related to *A. strigillosum* and both of the species could be placed in subsect. *Androsacea* in sect. *Staticopsis* on the basis of their monomorphic leaves, infundibular calyx, and having branched terminal spikes with densely congested spikelets.

In Table 1, *A. anatolicum* and *A. strigillosum* are compared on the basis of their vegetative organs (i.e. habits, leaves, scapes and scales), reproductive organs (i.e. spikes, spikelets, bracts and calyx) and habitat preferences.

Acantholium anatolicum has shorter (5–12 mm long) and glabrous leaves, but in *A. strigillosum* the leaves are longer (14–18 mm) and covered by strigillose hairs. *Acantholium anatolicum* has slightly shorter (5–8 cm) scapes with 4–5 scales and covered with puberulent hairs all over, but in *A. strigillosum* scapes are slightly longer (7–12 cm), with 5–6 scales and covered with strigillose hairs.

The type of inflorescence is a spike in both species, but they are densely branched and terminal, 15–20 mm long, having 6–12 spikelets and spikelets are imbricate, 12–13 mm long in *A. anatolicum*. In *A. strigillosum* the spikes are laxly branched, 15–30 mm long, having 2–6 spikelets which are widely spaced and 13–15 mm long.

Acantholium anatolicum appears to have a shorter outer bract (4–5 mm long) and inner bracts (7–7.5 mm long) than *A. strigillosum*, in which the outer bract is 6–6.5 mm and the inner bracts are 7–8 mm. In *A. anatolicum* the inner bracts (excluding aristate point) are as long as the calyx tube, which is shorter than the inner bracts of *A. strigillosum*.

The calyx is 10–11 mm and the calyx tube is longer than the limb in *A. anatolicum*, in which the limb is 7–8 mm in diameter, and the veins are brownish. In *A. strigillosum* the calyx is 11–12 mm, the calyx tube is of equal length to the limb, which is 5–6 mm in diameter and the veins are purple.

Acantholium anatolicum appears to be quite a distinct local endemic species growing on gypsum-rich sandy soils on dry mountain slopes in Central Anatolia. This new species was probably formed by means of sympatric speciation from a common ancestor, from which *A. strigillosum* also evolved.

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Table 1. A comparison of *Acantholimon anatolicum* and *A. strigillosum*

	A. anatolicum	*A. strigillosum*
Habit	Densely pulvinate, glaucous shrublet	Laxly pulvinate, strongly glaucous shrublet
Leaves	Linear-triquetrous, 5–12 ×0.5–1 mm, glabrous, ciliate on margins	Linear-triquetrous, 14–18 ×1–1.2 mm, margins scabrid, strigillose
Scapes	5–8 cm long, puberulent all over, densely branched, 2–3 spiked	7–12 cm long, strigillose, laxly branched, 2–3 spiked
Scale	4–5, shorter than internodes, puberulent all over	5–8, shorter than internodes, strigillose all over
Spike	2–3, 15–20 mm long, imbricate or terminal	2–3, 15–30 mm long, laxly distichous
Spikelets	6–12 in each spike, 1-flowered, 12–13 mm	2–6 in each spike, 1-flowered, 13–15 mm
Bracts	Unequal, puberulent all over	Unequal, strigillose all over
Outer bract	4–5 mm (including aristate point), ovate, narrowly hyaline on margin	6–6.5 mm, broadly triangular, acute, margins narrowly hyaline
Inner bracts	7–7.5 mm (including aristate point*c*. 1 mm), oblong-lanceolate, obtuse, cuspidate with narrowly hyaline margin	7–8 mm oblong-lanceolate, acute, long cuspidate, hyaline except for the dark brown vein
Calyx	10–11 mm, tube densely pilose; limb 10-lobed, white; veins 5- brownish, pilose, expanded towardsmargins, not excurrent	11–12 mm, tube densely pilose in middle region; tube equal to limb; limb obscurely 5-lobed; veins purple, narrowing towards margin, excurrent
Petals	Pink	Pink
Flowering time	8	8–9
Habitat	Deep sandy gypsum-rich soil	Eroded hills
Altitude	500 m	1100–1250 m
Phytogeography	Irano-Turanian element	Irano-Turanian element

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