

A new *Onosma* (Boraginaceae) species from southern Anatolia, Turkey

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Abstract: *Onosma aksoyii* Aytaç & Türkmen sp. nova (Sect. *Haplotricha* H.Riedl, Boraginaceae) is described and illustrated as a new species. It grows in a *Pinus nigra* forest on serpentine rocks in Southern Anatolia (Konya province). Diagnostic characters of related species are compared and discussed. The characteristic features of pollen, stomata structure, and hairs were studied using a scanning electron microscope. The distribution map of this new species is presented.

Key words: Boraginaceae, *Onosma*, endemic, Konya, Turkey

Türkiye'nin Güneybatı Anadolu bölgesinden yeni bir *Onosma* (Boraginaceae) türü

Özet: Konya'dan (Türkiye) serpantin anakayaçlardaki karaçam ormanı altında yetişen *Onosma aksoyii* Aytaç & Türkmen (Sect. *Haplotricha* H.Riedl, Boraginaceae) yeni bir tür olarak tanımlandı ve şekli verildi. Türün sistematik durumu tartışıldı. Ayrıca türe ait polen, stomata yapıları ve tüylenmesi taramalı elektron mikroskopunda incelendi. Yeni türün ülkemizdeki dağılım haritası verildi.

Anahtar sözcükler: Boraginaceae, *Onosma*, endemik, Konya, Türkiye

Introduction

Onosma L. (Boraginaceae) is an interesting genus and its systematics is rather difficult to study. Most of diagnostic features are based on hair characters, as haplotrichous or asterotrichous, and structure of the nutlets. Moreover, the calyx features show more variation at flowering and fruiting. This genus has 88 species and 7 imperfectly known and doubtful taxa in the *Flora of Turkey* (Riedl, 1978); 8 new taxa were

described by different authors (Davis et al., 1988; Güner, 2000; Aytaç & Mill, 2005; Binzet & Orcan, 2007). The latest new species of this genus from Turkey was described by Kandemir and Türkmen, *Onosma beyazoglui* (2010).

The location of Kızıldağ Mountain near the town of Çamlık (Konya province) is an interesting area of Turkey. It is a small serpentine area in a calcareous main location. In the last 10 years, 8 new taxa have

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been described in the same locality by different botanists: *Sideritis ozturkii* Aytaç & Aksoy (Aytaç & Aksoy, 2000), *Bornmuellera kiyakii* Aytaç & Aksoy (Aytaç & Aksoy, 2000), *Eryngium trisectum* Wörtz & Duman (Wörtz & Duman, 2004), *Rindera dumanii* Aytaç & Mill (Aytaç & Mill, 2005), *Noccea camlikense* Aytaç, Nordt & Parolly (Aytaç et al., 2006), *Centaurea kizildaghensis* Uzunhisarcıklı, Doğan & Duman (Uzunhisarcıklı et al., 2007), *Allium ertugrulii* Demirelma and Uysal (2007), and *Silene ozyurtii* Aksoy and Hamzaoglu (2009), and all listed species are here and others from Turkey are listed in Özhatay et al. (2009). Except for *N. camlikense*, all species are known only from their type localities.

Materials and methods

The materials were collected during flowering and fruiting times. The specimens were checked with the relevant literature, such as Riedl (1967, 1978), Davis et al. (1988), Güner (2000), Riedl et al. (2005), Feinbrun-Dothan (1978), and Ball (1972), and compared with the herbaria specimens in GAZI, ANK, HUB, and E.

Pollen samples were provided by herbarium materials for palynological studies. Pollen grains were first hydrated with 10% KOH for ca. 10 min., then rinsed with distilled water, and dried before mounting and coating with gold for scanning electron microscope (SEM) studies. The SEM micrographs were taken with a JEOL CXII microscope. The descriptive terminology of Faegri and Iversen (1992) was followed. The general pollen description was based on the SEM investigation.

The hairs and stomata of leaflets examined with the SEM were taken from the regions close to the end points of the dried plant leaf and mounted on SEM stubs with double-sided tape in a manner in which the upper surfaces could be examined. They were coated with gold using a Polaron SC 502 Sputter Coater and were examined with the JEOL JSM 6060 SEM operated at 15 kW in the Gazi University electron microscope unit.

Onosma aksoyii Aytaç & Türkmen **sp. nova** (Figures 1-4). Sect. *Onosma*, Subsect. *Haplotricha* (Boiss.) Gürke.



Figure 1. *Onosma aksoyii*: A- habitus, B- flowers, C- calyx.

Type: C3 Konya: Derebucak, Çamlık, Kızıldağ, 1350-1400 m, serpentine rocks, clearings in *Pinus nigra* forest, 16.vi. 2004, Aytaç 8715 (holotype: GAZI, isotypes: ANK, HUB).

Diagnosis: Affinis *O. cappadocico* (1970 **sphalm.** ‘*cappadocicum*’) sed bracteis 6-8 mm longis (non 15 mm); foliis 1.2-1.5 mm latis (non 2-3 mm) basalibus et caulibus, pedicellis 5-8 mm longis (non 2-3 mm); calycis dentibus appresso-setulosus (non patenti-setulosus); corollae lobis glabris (non sparse puberulis) differt.

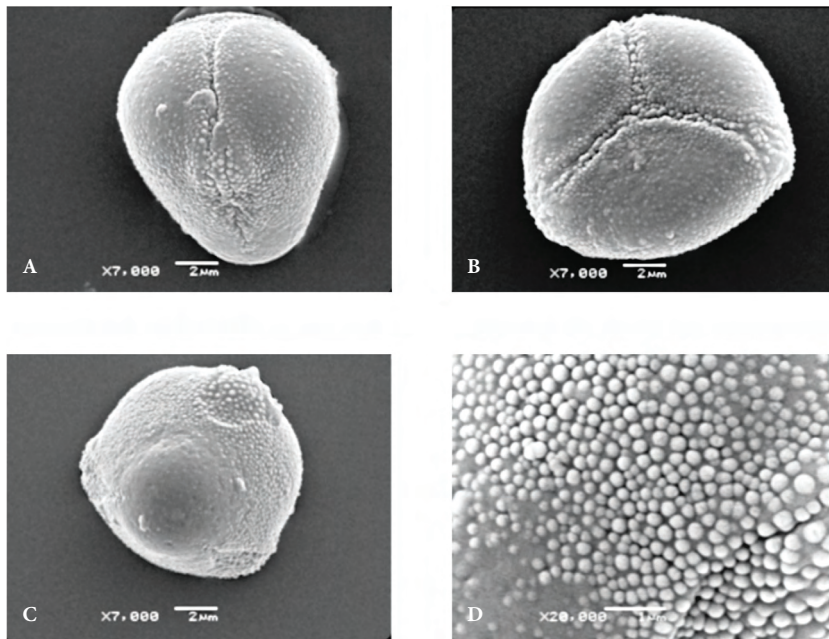


Figure 2. The pollen structure of *Onosma aksoyii*: A- equatorial view, B and C- polar view, D- verrucose ornamentation.

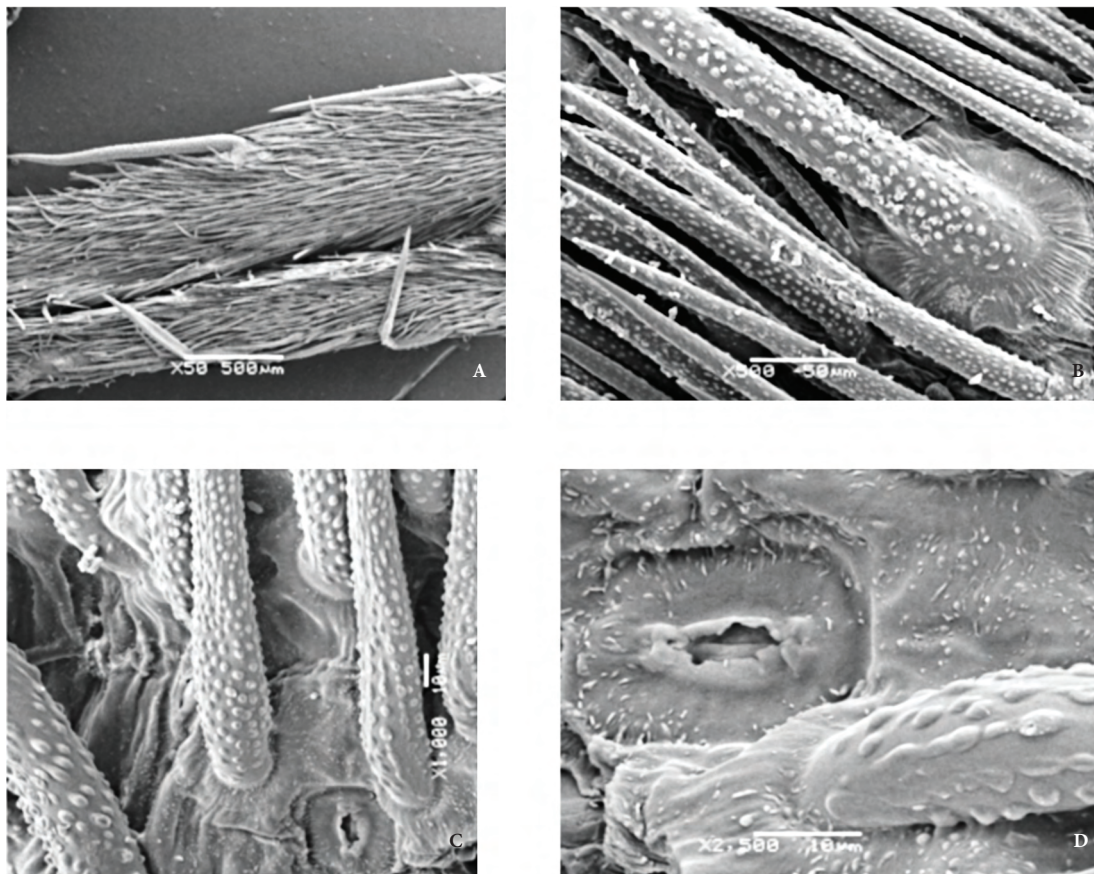


Figure 3. A, B and C- simple indumentums and setae of *Onosma aksoyii*; D- xeromorphic helloborus type stomata.

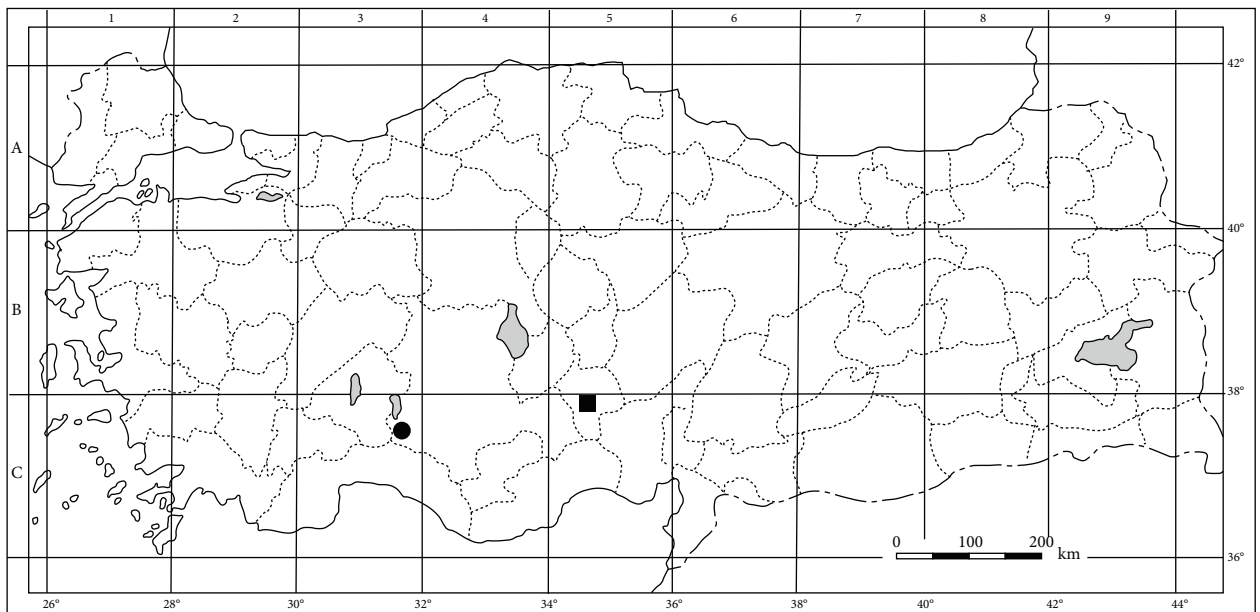


Figure 4. Distribution map of *Onosma aksoyii* (●) and *O. cappadocica* (■) in Turkey.

Perennial herb. Stems numerous, 5-15 cm tall, ascending, simple to branched in the flowering part; brownish later greenish and leafy; with antrorse bristles arising from small white and glabrous tubercles, adpressed silvery and simple hairy. Leaves crowded at base. Basal and lower cauline leaves 18-50 × 1.2-1.5 mm, oblanceolate to spatulate; with strongly revolute margins, acute; covered with densely adpressed setae with glabrous tubercles (haplotrichous). Middle and upper cauline leaves similar, but smaller. Inflorescence with 3-10 flowers with scorpioid cymes. Bracts linear-lanceolate to narrowly linear, as long as or longer than pedicels and indumentum similar to leaves. Pedicels 5-8 mm. Calyx 7-10 mm in flower, 10-14 mm in fruit with linear-lanceolate lobes, acute. Corolla yellow, 12-16 mm, cylindrical, slightly lobed; lobes acuminate and revolute; annulus glabrous. Stamens 5, as long as or shorter than corolla. Anthers linear, with a sterile apex and bilobed at the base; lobes longer than wide, 4-5 mm, as long as filaments. Filaments inserted below the middle of the corolla tubes. Style 15-17 mm, 1-2 mm; longer than the corolla. Stigma very small and distinctly bilobed. Nutlets 5 × 2 mm, ovoid-pyramidal with an obtuse beak, smooth and chestnut-brown.

Fl. 5-6, *Fr.* 6-7.

All pollen grains are anisopolarate, tricolporate, and prolate. The operculate, aperture membrane has verrucose ornamentation, equatorial ornamentation verrucate and psilate at pole (Figure 2). The stomata usually arranged under the surface of leaves and have a xeromorphic and helloborus type, with tuberculate and glabrous cells (Figure 3).

It became clear that the specimens were quite different from all known Turkish species. The indumentum is typically hispid, with patent setae arising from glabrous tubercles. Setae and simple indumentum are tuberculate (Figure 3).

A map is provided in Figure 4 that shows the distribution of both *O. cappadocica* Siehe ex H.Riedl and *O. aksoyii* based on the localities in which the specimens were collected.

Through the morphological and palynological studies and a comparison with the close species' specimens (*O. cappadocica*), this species is proposed as new to science. It is distinguished by ascending, brownish when young later greenish and silvery gray stem, leaves narrower (1.2-1.5 mm wide, not 2-3 mm); pedicels and bracts are longer; the calyx covered with

Table. Differences between *Onosma aksoyii* and *O. cappadocica*.

	<i>O. aksoyii</i>	<i>O. cappadocica</i>
Stem	ascending and brownish	erect and whitish-gray
Indumentum	adpressed silvery hairy	densely puberulous
Leaves lamina	1.2-1.5 mm wide	2-3 mm wide
Bracts	6-8 mm	15 mm
Pedicele	5-8 mm	2-3 mm
Calyx lobes	adpressed-setose	patent setose
Corolla lobes	glabrous	sparsely pubescent above

adpressed setose, not patent-setose hairs. The most diagnostic characteristic is having glabrous corolla lobes, not pubescent. The comparison characteristics are shown in the Table.

It is endemic to Turkey and grows in Eastern Mediterranean and Irano-Turanian areas. It is known from the type locality with 3 collections.

Distribution and ecology: *Onosma aksoyii* is distributed in south Anatolia (Konya) and grows on serpentine rocks, between 1350 and 1650 m in *Pinus nigra* Arn. subsp. *nigra* var. *caramanica* (Rehder) Loudon forest. This area is an ecotone between Mediterranean and Irano-Turanian regions, and so it is hard to say of which region it is an element. The new species grows with *Sideritis ozturkii*, *Bornmuellera kiyakii*, *Rindera dumanii*, *Eryngium trisectum*, *Noccea camlikensis*, *Centaurea kizildahensis*, and *Viola kizildaghensis*, all of which are endemics and described recently.

Recommended IUCN threat category listing: It is known from one locality (criterion B2 a), with an estimated area of occupancy is less than 10 km² (criterion B2). The population is unhealthy with less than 100 individuals (criterion C). Therefore, it should be classified as "Critically Endangered (CR)" based on the criteria of the IUCN Red List Categories (IUCN 2001).

Etymology: This species is named in honour of Dr. Ahmet Aksoy, who is one of the collectors of the new species and a botanist at the Biology Department, Faculty of Science, Erciyes University, Turkey.

Specimens examined: Paratypes: C3 Konya: Derebucak, Çamlık, Kızıldağ, 1450-1600 m, serpentine rocks, clearings in *Pinus nigra* forest, 29.vi.1998, Aytaç 7833 (in flowers) (GAZI); *ibid.*, 25.v.2007, Hamzaoğlu 4536, Aksoy & Budak (GAZI, ANK, E, HUB, YILDIRIMLI, Bozok Univ. Herbarium).

Onosma cappadocica: C5 Adana: Masmutli Dagh (Ala Dağ): 1800 m, vii.1907, Siehe 107 (iso. E); Adana: Karsanti, Akinek, 1550 m, Yurdakulol 45 (ANK).

The total number of *Onosma* species at 96, with the recently added new species.

The name of genus *Onosma* is feminine gender, according to Stern (Stearn, 1993, Peruzzi et al., 2008), and so the epithet *cappadocicum* changed to *cappadocica*.

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