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STACHYS AHMET-SAVRANII DOĞU AND BAĞCI (LAMIACEAE), A NEW SPECIES FROM SOUTH ANATOLIA, TURKEY

SÜLEYMAN DOĞU* AND YAVUZ BAĞCI[1]

Department of Animal and Plant Production, Meram Vocational School, Necmettin Erbakan University, Konya-42090, Turkey

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Abstract

Stachys ahmet-savranii Doğu & Bağcı sp. nov. (Lamiaceae) from the Niğde (C5 Niğde, Turkey) is described and illustrated. It exhibits general features of the section Infrarosularis. It is closely related to *Stachys citrina* Boiss. & Heldr. but differs by its slender and unbranched stem; leaves structure; floral leaves equalling or longer than verticillasters; verticillester with 8 - 12 flowered and corolla 10 - 18 mm; Bracteoles reaching nearly middle of calyx tube. Diagnostic morphological characters are discussed. The geographical distribution of the new species is mapped. Notes are also presented on its ecology, biogeography and conservation status.

Introduction

The family Lamiaceae is represented by about 220 genera and 4000 species on world. Although this family has the highest natural distribution in Turkey and in the Mediterranean region in the world, there are very few areas on earth where members of the Lamiaceae family, which can grow in almost all types of habits and altitudes, are not found. The Lamiaceae is represented by 46 genera, 577 species a total of 755 taxa in Turkey (246 subspecies and 23 hybrids) (Bhattacharjee 1974).

Stachys L. is one of the largest genera of the Lamiaceae in the world and contains approximately 370 species (435 taxa). It is a species that is distributed mainly in the temperate regions of the Mediterranean and Southwest Asia and secondarily in North America, South America and South Africa (Harley *et al.* 2004). *Stachys* species grows in mountains, forest areas, rocky places, limestone and other main rocks (Davis *et al.*1988).

Stachys species has medicinal properties and is therefore used by people to treat diseases. *Stachys annua* (L.) L. is used in the treatment of insomnia and menstrual irregularities, *S. sylvatica* L. as antispasmodic, diuretic, tonic and astringent, *S. officinalis* L. in the treatment of tonic, insomnia, headaches and cough, and *S. palustris* L. in treating external wounds (Steinmetz 1954, Garnier *et al.* 1961). Chemical studies conducted on *Stachys* species have revealed that they contain essential oils, fixed oils, iridoids, various phenolic acids, alkaloids, free oz and oligoglycosides as well as diterpenes and flavonoids (Kostos *et al.* 2001, Maleki *et al.* 2001, Mahliçli 2002, Rabbani *et al.* 2003, Meremeti *et al.* 2004).

The *Stachys* was revised by Bhattacharjee (1982) in the Flora of Turkey. According to his study, the genus is represented by 72 species belonging to 12 subsections, 15 sections and 2 subgenera in the flora of Turkey (Bhattacharjee 1982). Sections *Infrarosularis* Bhattacharjee, which is one of these 15 sections, involves 6 species and 7 taxa, all of which are endemic. Davis *et al.* (1988) reported in the 10th additional volume of Turkish Flora that the species of *Stachys choruhensis* Kit Tan & Sorger, *Stachys antalyaensis* Y. Ayaşligil & P. H. Davis, *Stachys*

*Author for correspondence: <suleymandogu@gmail.com>. [1]Department of Basic Pharmaceutical Science, Faculty of Pharmacy, Selçuk Universty, Kampus, 42250, Konya, Turkey.

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chasmosericea Ayaşligil & P. H. Davis and *Stachys tundjeliensis* Kit Tan & Sorger had been added to Turkish Flora. Since *S. choruhensis* is a taxon belonging to the *Infrarosularis* section, the number of species in the section rose to 7 and the number of taxa to 8. Since then, 3 new species belonging to *Infrarosularis* section have been identified in Turkey and therefore the number of taxa belonging to *Infrarosularis* section has risen to 11 (İlçim *et al.* 2008, Daşkın *et al.* 2009, Dinç and Doğu 2016).

With the addition of a new record for Turkey, namely "*Stachys megalodonta* Hausskn. & Bornm. ex P.H. Davis subsp. *megalodonta'*, and with publication of 19 new species, the number of species in Turkey has risen to 91 and the number of taxa to 118 and of these taxa, 56 are endemic to Turkey. These endemic taxa are generally distributed across the Mediterranean region (Duman 2000, Ekim *et al.* 2000, Dinç and Doğan 2006, İlçim *et al.* 2008, Daşkın *et al.* 2009, Akçiçek 2010, Yılmaz *et al.* 2010, Yıldırımlı 2010, Dirmenci *et al.* 2011, Güner and Akçiçek 2015, Akçiçek *et al.* 2016, Dinç and Doğu 2016,). The total number of taxa now reache 119 with the taxon of '*Stachys ahmet-savranii'*, which is identified in this study.

Materials and Methods

In July, 2017 during an expedition to the Middle Taurus Mountains as part of the project 'Natura 2000 and Biodiversity of Kayseri, some interesting *Stachys* specimens were collected. At a first glance the specimens looked like *Stachys citrina* complex. Further examination, however, has proved that the specimens are markedly different from both these species and belong to a new species. These interesting specimens were cross-checked with the relevant literature (Boissier 1879, Bhattacharjee 1974, 1982, Rechinger 1982, Davis *et al.* 1988, Cantino *et al.* 1992, Duman 2000, Harley *et al.* 2004, Akçiçek 2010, Dirmenci *et al.* 2011, Akçiçek *et al.* 2012, Salmaki *et al.* 2012, Satıl *et al.* 2012, Govaerts 2015 and Dinç and Doğu 2016).

Laboratory studies showed that the new species belongs to *Infrarosularis* sect. During this investigation, in order to examine more specimens, the main Turkish herbaria based in Ankara and Konya (ANK, GAZI, HUB, KNYA) were visited. The micromorphological properties of the nutlets of the *Stachys ahmet-savranii* were studied in electron microscope. For scanning electron microscopy (SEM), dry, mature nutlets were mounted directly on stubs, using single-side adhesive tape, coated with gold, and the photographs were taken with ZEISS EVO LS 10. The terminology for describing nutlet surface sculpturing mainly follows Stearn (1992).

Results and Discussion

Observations on fresh individulas and studies on the herbarium specimens showed that the specimens from Niğde were included in sect. *Infrarosularis* and readily distinguished from *Stachys citrina* complex and other members of the section.

Stachys ahmet-savranii Doğu & Bağcı **sp. nov**. (**Sect. Infrarosularis**) (**Figs 1-2**).

Type: TURKEY. C5 Niğde: Çamardı, Cimbar Valley, on rocky, 1900-2000 m, 25.07.2018, Y. Bağcı 4166, S. Doğu, and A. Savran (holotype: KNYA, isotype: ANK).

Slender, suffrutescent perennial with sterile basal rosettes. Flowering stems 5 - 18 (–25) cm long, unbranched, sparsely tomentose hairs, eglandular, with densely sessile glands. Basal leaves structure thin, fragile, broadly ovate to ellliptic - orbiculare, (1-)1 - 8 × 0.5 - 3 cm, crenate to crenulate, rarely serrate, apex obtuse, base cuneate to attenuate, sparsely tomentose; petiole 1 - 5.5 cm long. Cauline leaves 1 - 2 pairs, similar to basal, 1 - 3.5 × 0.5 - 1.5 cm, mostly entire, rarely crenulate, cuneate at base, shortly petiolate; petioles 0.5 - 1.0 cm long. Floral leaves elliptic,

sessile or subsessile with 1 - 3 mm long petiole, lamina about as large as and similar to cauline leaves, 1.6 - 3.3 × 0.6 - 0.8 cm, mostly entire, rarely crenulate, apex obtuse, base cuneate, equalling or longer than verticillasters. Verticillasters 1 - 2; 8 - 12-flowered, completely congested into dense and short spike. Bracteoles linear-lanceolate, 3 - 5 mm long, herbaceous, reaching nearly middle of calyx tube. Pedicels 1 - 2 mm long. Calyx regular, sub-campanulate, densely pilose, with sessile gland and stalky glands, mouth densely pilose hairy ring, 8 - 15 mm long with 6 - 10 mm long tube and 2 - 3 mm long teeth at flowering; 10 - 15 mm long with 8 - 12 mm long tube and 2 - 3 mm long teeth at fruiting; teeth subequal, erect, bluntly triangular to triangular lanceolate, herbaceus, pilose at tip. Corolla cream yellow; lips streaked and spotted with violate inside, pilose outside, minutely hairy inside, 10 - 18 mm long with 8 - 13 mm tube, 3 - 4 mm long upper lip and 4-6 mm long lower lip, tube minutely hairy upper half outside and glandular hairy, inside glabrous, annulate; Filaments exserted. hairy at lower half part. Stamens 4, exsered on the upper part of the corolla tube, exserted beyond the mouth of the tube; filaments 2 - 2.5 mm long, dilated and with a few swollen hairs below; anters ca. 1.0 mm long with parallel thecae. Style 3 - 4 mm long, bifid with equal 0.8 - 1 mm long branches. Ovary glabrous, 4-lobed; nutlets 2.5 - 3 × 1.5 - 2.1 mm, brownish, usually obovoid, the surface ornamentation is reticulate-papillate, without hairy.

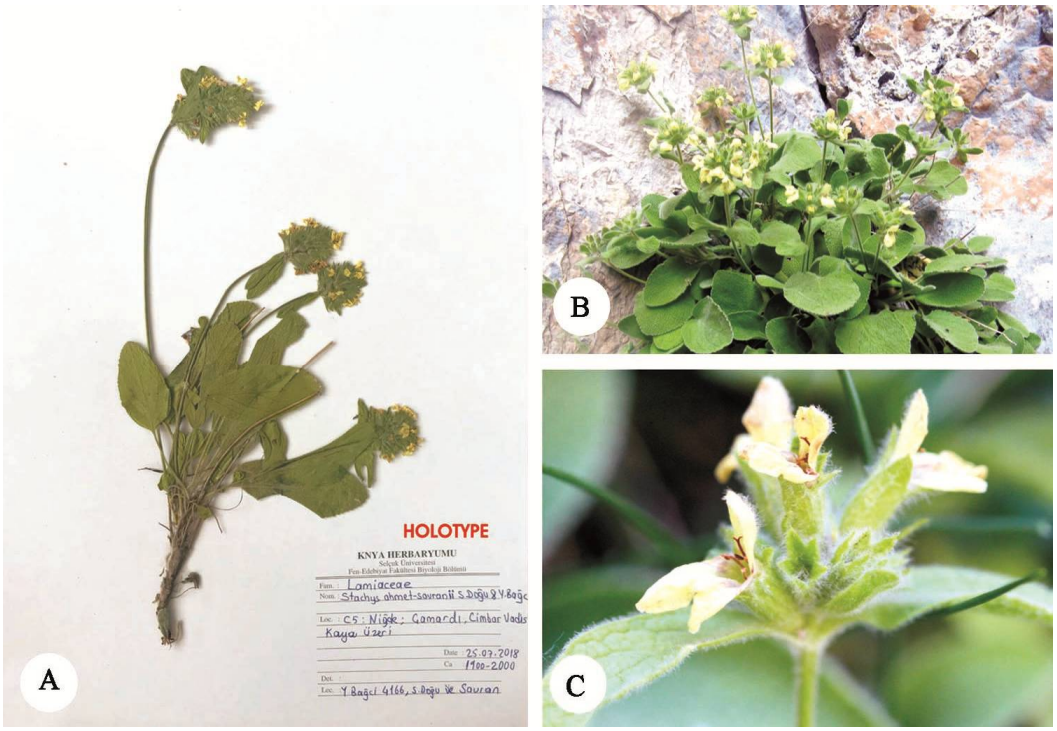

Fig. 1. *Stachys ahmet-savranii* (A) Holotype, (B) Habit and (C) Flower.

Nutlet Characteristics: In this study, the dorsal nutlet surface of *Stachys ahmet-savranii* were examined in detail using scanning electron microscopy. Nutlets of *S. ahmet-savranii* are brownish, usually obovat, 2.5 - 3 × 1.5 - 2.1 mm. The surface ornamentation is reticulate-papillate and without hairy Fig. 3.

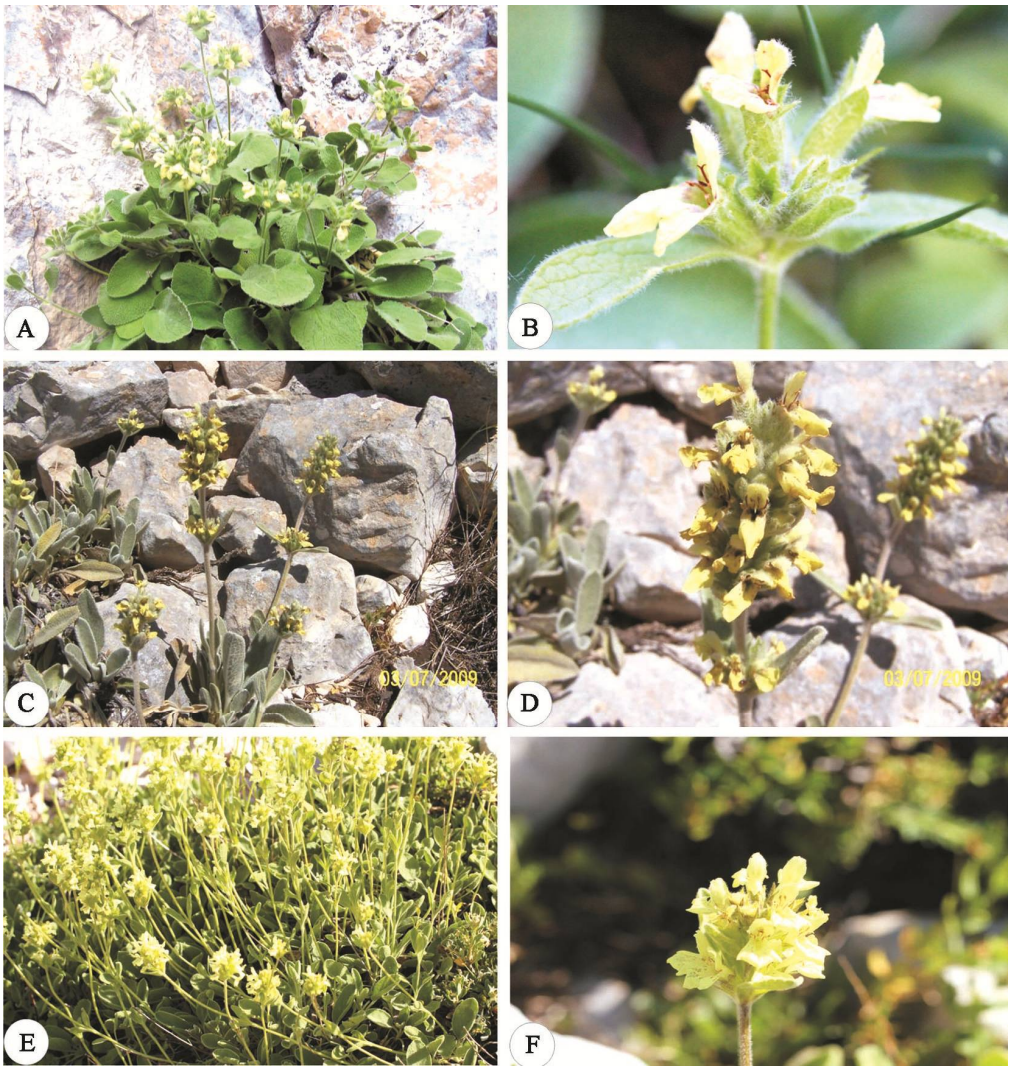

Fig. 2. Habits of *Stachys ahmet-savranii* and related species; *Stachys* sect. Infrarosularis taxa. (A-B): *Stachys ahmet-savranii*, (C-D) *S. citrina* subsp. *citrina* and (E-F) *S. citrina* subsp. *chamaesideritis*.

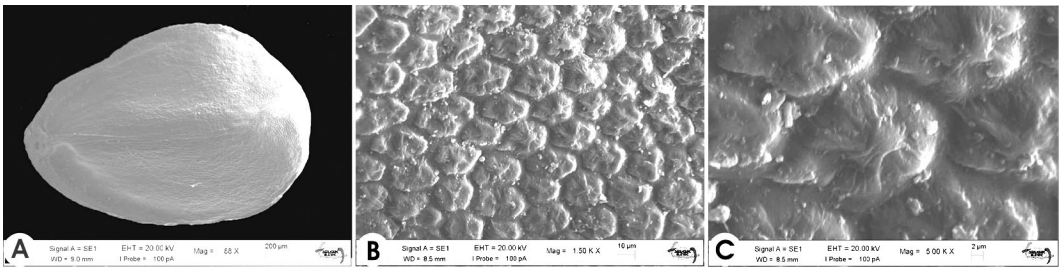

Fig. 3. SEM photographs of the nutlet *S. ahmet-savranii* (A) General view, (B-C) Detailed view.

The new species grows on rocks. It shares its habitat with some plants such as *Salvia multicaulis* Vahl., *Nepeta cilicica* Boiss. ex Benth., *Fibigia eriocarpa* DC Boiss., *Laserpitium petrophilum* Boiss. Et Heldr., *Sideritis libantica* Labill. subsp. *linearis* (Bentham) Bornm., *Hypericum crenulatum* Boiss., *Teucrium chamaedrys* L. subsp. c*hamaedrys, Silene odontopetale* Fenzl., *Salvia recognita* Fisch. et Mey., *Asphodelina prismatocarpa* J.Gay ex Boiss., *Cerasus prostrata* (Lab.) Ser., *Berberis crataegina* DC, *Scorzonera tomentosa* L., *Delphinium nydeggeri* Hub.-Mor., between 1600 and 2000 m altitude.

Flowering occurs betwen second half of June and first half of July. Fruiting occurs between end of July and Agust.

The specific epithet honours the late Prof. Dr. Ahmet SAVRAN from the Atatürk University, Department of Philology.

Stachys ahmet-savranii is an endemic species restricted to the South Anatolia, Niğde province, Çamardı district; Cimbar valley, on limenstone rocks, and is an Irano-Turanian element. It was found at only one locality and has a very limited distribution. No relevant data on the distribution and abundance of the taxon are available. It can be included in the Not Evaluated (NE) category of IUCN Red List Categories (IUCN 2017) as it lacks sufficient information to make a direct or indirect assessment of the extinction risk of its generation depending on the population and distribution.

Additionally examined specimens

Stachys rupestris Montbret and Aucher ex Benth. **C4 Mersin**: Silifke, Keşlitürkmenlili Köyü, kayalık yamaçlar, 400 m, 19.05.2011, M. Dinç 3358 and S. Doğu (KNYA). **C5 Mersin:** Işıktepe köyü, kayalık yamaçlar, 190 m, 10.06.2011, S. Doğu 2596 (KNYA). **C5 Mersin:** Aslanköy, Cocakdere, Şahinkayası mevkii, çam ormanı, orman açıklıkları, 1550 - 1600 m, 04.07.2003, M. Dinç 1944 and H. H. Doğan (KNYA). **C5 Mersin:** Çamlıyayla, Atdağı, kayalık yamaçlar, 1100-1200 m, 04.07.2010, S. Doğu 2463 (KNYA). **C5 Adana:** Pozantı, Şeker pınarı, kayalık yamaçlar, 850 m, 10.05.2011, S. Doğu 2584 (KNYA). **C5 Adana:** Pozantı, Akçatekir, Eski Akça köyü, kayalık yamaçlar, 1250 m, 10.05.2011, S. Doğu 2590 (KNYA). ***Stachys ketenoglui*** Kaynak, Daşkın and Yılmaz. **C4 Mersin**: Tarsus, Kurtçukuru Köyü civarı, kayalık yamaçlar, 560 m, 15.06.2011, M.Dinç 3404 and S. Doğu (KNYA). ***Stachys cataonica*** R. Bhattacharjee and Hub.-Mor. **B6 Malatya:** Akçadağ, Akçadağ-Darende arası 13. km, kayalık yamaçlar, 1400 m, 17.06.2011, M. Dinç 3431 and S. Doğu (KNYA). ***Stachys petrokosmos*** Rech. f. **C6 Hatay:** Yayladağ, Akra Dağ, Denizgören Köyü üstü, kayalık yamaçlar, 770 - 800 m, 16.06.2011, M. Dinç 3419 and S. Doğu (KNYA). ***Stachys amanica*** P.H. Davis. **C6 Osmaniye:** Gaziantep-Osmaniye yolu, Haruniye'ye 25 km kala, Dumanlıdağ civarı, kayalık yamaçlar, 550 m, 16.06.2011, M. Dinç 3424 and S. Doğu (KNYA). **C6 Osmaniye:** Eski Gaziantep-Osmaniye yolu, Haruniye'ye 25 km kala, Dumanlıdağ civarı, kayalık yamaçlar, 570 m, 12.05.2012, M. Dinç 3472 and S. Doğu (KNYA). ***Stachys marashica*** Ilçim, Cenet and Dadandı. **C6 Kahramanmaraş:** Andırın, Maraş-Andırın yolu, Kadirli yol ayrımına 5 km kala, kayalık yamaçlar, 850 m, 17.06.2011, M. Dinç 3427 and S. Doğu (KNYA). **C6 Kahramanmaraş:** Andırın, Maraş-Andırın yolu, Efil Ağzı mevkii, kayalık yamaçlar, 615 m, 17.06.2011, M. Dinç 3428 and S. Doğu (KNYA). ***S. pumila*** Banks and Sol. **C6 Hatay:** Antakya, St. Peter Kilisesi civarı, kayalık yamaçlar, 100 m, 08.07.2010, M. Dinç 3321 and S. Doğu (KNYA). **C6 Hatay:** Samandağ, Çöğürlü köyü civarı, kayalık yamaçlar, 50 m, 15.06.2011, M. Dinç 3408 and S. Doğu (KNYA). **C6 Hatay:** Samandağ, Çevlik civarı, kayalık yamaçlar, 50 m, 16.06.2011, M. Dinç 3417 and S. Doğu (KNYA). **C6 Hatay:** Samandağ, Gözene Köyü civarı, yol kenarı kayalık, 300 m, 04.07.2011, M. Dinç 3435 and S. Doğu (KNYA). ***Stachys citrina*** Boiss. and Heldr. ex Benth. subsp***. citrina.*** **C4 Konya:** Taşkent, Balcılar, Tülek Dağı,

2,000 m, 03.07.2009, M. Dinç¸ 3203 and S. Doğu (KNYA). ***Stachys citrina*** Boiss. and Heldr. ex Benth. subsp**.** ***chamaesideritis*** (Boiss. and Balansa) R. Bhattacharjee. **B6 Kayseri:** Aslantaş, Kayalık yamaçlar, 1900 m, 03.07.2008, Y. Bağcı 3810 and M. Dinç (KNYA). ***Stachys gaziantepensis*** M. Dinç & S. Doğu **C6 Gaziantep:** Şehitkamil, Yeşilce Köyü, Sof Dağı, Kayalık yamaçlar, 1060 m, 12.05.2012, M. Dinç 3467 & S. Doğu (KNYA). **C6 Gaziantep:** Büyük Araptar (Yeşilce) Köyü 1 km güneyi, mermer kayalık, 1200 - 1300 m, 24.06.1978, T. Ekim 3781 (ANK!); **C6 Gaziantep:** Büyük Araptar (Yeşilce) Köyünün 1 km güneyi, mermer kayalıklar, 1100 m, 03.08.2012, S. Doğu 2627 & M. Dinç (KNYA).

Diagnosis:

The Turkish endemic *S. ahmet-savranii* is closely related to *Stachys citrina complex*, however, the former differs from the later by having the following characters: **Stems** slender, sesil glands (not robust and sparsely sesil glands); **Basal leaves** structure thin, fragile; broadly ovate to elliptic-orbiculare, crenate to crenulate (not elliptic to ovate or oblong, cranulate to subentire; structure thick, not fragile); **Stem leaves** 1 - 2 pair (not 1 - 3 pair); **Floral leaves** elliptic, usually entire, rarely crenulate, equalling or longer than verticillasters, with 1 - 3 mm long petiole (not oblong spatulate to oblong, sometimes ovate, entire, shorter than verticillasters, subsesil); **Verticillaster** with 8 - 12 flowered and 1 - 2 verticillaster (not with 6 - 8 flowered and 1 - 3 verticillaster); **Bracteoles** is reaching nearly middle of calyx tube (not equalling calyx tube); **Corolla** 10 - 18 mm, creamy yellow (not 20 - 25 mm, lemon yellow) (Table 1).

Table 1. Comparison between the diagnostic characters of *Stachys ahmet-savranii* and those of the related species *Stachys citrina* Boiss. & Heldr. ssp. (complex).

	Stachys ahmet-savranii	*Stachys citrina complex*
Plant height	5 - 18 (-25) cm	11 - 35 cm
Stem	Slender, unbranched; with densely sesil glands	Robust, branched or unbranched; sparsely sesil glands
Basal leaves	broadly ovate to elliptic-orbiculare, crenate to crenulate, structure thin, fragile	Eliptic to ovate or oblong, crenulate to subentire, structure thick, not fragile
Basal leaves petiole	1 - 5.5 cm long	1.5 - 3.5 cm long
Cauline leaves	1 - 2 pair,	1 - 3 pair,
Floral leaves	Elliptic, usually entire, rarely crenulate, equalling or longer than verticillasters, with 1 - 3 mm long petiol	Oblong spatulate to oblong, sometimes ovate, entire, shorter than verticillasters, subsesil
Verticillaster	With 8 - 12 flowered and 1 - 2 verticillaster	With 6 - 8 flowered and 1 - 3 verticillaster
Bracteoles	Reaching nearly middle of calyx tube	Equalling calyx tube
Corolla	10 - 18 mm, creamy yellow	20 - 25 mm, lemon yellow
Nutlet shape	Obovoide	Triangular-ovate
Nutlet Ornementation	Reticulate-papillate	Reticulate

While *S. ahmet-savranii* nutlet shape obovoid, *S. citrina* ssp. *citrina* and *S. citrina* subsp. *chamaesideritis* are triangular-ovate. While nutlet surface ornemantation of the *S. ahmet-savranii* is reticulate-papillate, *S. citrina* subsp. *citrina* and *S. citrina* subsp. *chamaesideritis* nutlet surface ornemantation are reticulate (İçeli 2011).

Considering the morphological and micromorphological data mentioned above, this new taxon is clearly different from other close relative taxa (Table 1, Fig. 2).

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