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Anthemis ekicii (Asteraceae), a new species from Turkey

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Abstract: *Anthemis ekicii* (Asteraceae) is described and illustrated as a new species from Tuz Lake in Aksaray Province in Central Anatolia. The new species belongs to the section *Anthemis*, and it is closely related to *A. pauciloba* var. *pauciloba*, from which it differs in stem, leaves, and capitulum features. Diagnostic characters, description, detailed illustrations, ecology, IUCN conservation status, and pollen and seed morphology are presented in this study.

Key words: Anthemideae, Compositae, endemic, taxonomy, Tuz Lake

1. Introduction

Anthemis L. (Asteraceae) is one of the largest genus of the tribe Anthemideae which consists of nearly 175 species worldwide. It is distributed widely across Europe, South-West Asia, North and East Africa (Oberprieler et al., 2007). South-West Asia is one of the genetics centres of the genus *Anthemis* (Oberprieler, 1998). According to the "Flora of Turkey" it has been divided into three sections (Grierson and Yavin, 1975). These are *Anthemis*, *Maruta* (Cass.) Gris, and *Cota* (J.Gay) Rupr. The sect. *Anthemis* is separated from the other sections by oblong or oblanceolate paleae and ± angular or squarish achenes. Moreover, the capitula and leaf shapes have diagnostic characters for separating the sections. It includes 52 taxa (27 species, 3 subspecies, and 22 varieties) in Turkey (Grierson and Yavin, 1975). *A.* sect. *Maruta*, which is represented by 6 species in Turkey (Yavin, 1970), is separated from sect. *Anthemis* by the linear-lanceolate or subulate paleae and by sharp point terete achenes. *A.* sect. *Cota* includes 22 taxa (15 species, 1 subspecies, and 6 varieties) and 1 doubtfully recorded taxon in Turkey. More recently, generic and infrageneric changes in *Anthemis* (s.l.) were carried out and *A.* sect. *Cota* was raised to a genus level (Oberprieler, 2001; Greuter et al., 2003; Oberprieler et al., 2007; Lo Presti et al., 2010). After the publication of the 5th volume of the Flora of Turkey (Grierson and Yavin, 1975), three taxa (1 species, 2 varieties) of *Anthemis* were described from Turkey (Duman, 2000; Güner, 2000; Hamzaoğlu et al., 2011). Currently, this genus includes 58 taxa (35 species, 12 subspecies and 11 varieties), 24 of which are endemic to Turkey, indicating an endemism rate of 48% (Özbek, 2012).

Endemic plants are usually distributed in particular ecological conditions and exclusive habitats. The unique and distinctive vegetation consists of wide halophilous marshes, halophilous and slightly salty meadows, and dry *Artemisia-Camphorosma* steppe growing in Tuz Lake basin. Therefore, this area has numerous endemic species, such as *Allium scabrifolium* Boiss., *Ferula halophila* Peşmen, *Hypericum salsugineum* N.Robson & Hub.-Mor., *Onosma halophila* Boiss. & Heldr., *Kalidium wagenitzii* (Aellen) Freitag & G.Kadereit (Adıgüzel et al., 2005). In recent years, twelve new species have been described around Tuz Lake basin (Vural et al., 2012).

According to pollen and achene morphology of the tribe Anthemideae, two types of exine ornamentation exist: spines and without spines types (Stix, 1960). Benedí i Gonzáles (1987) stated that perennial *Anthemis* species have larger pollen grains than the annuals. Also the exine sculpturing is another important character in the Anthemideae. The pollen morphological characters of the genus *Anthemis* in North Africa were studied by Oberprieler (1998) and variations were found in the dimensions of pollens between the species. Dauti et al. (2014) examined the palynological features of 8 species of the genus *Anthemis* in Albania, stating that the pollen grains of the species they studied are very similar to each other. We recently investigated the pollen morphology of 22 Turkish *Cota* taxa via light and scanning electron microscopes (SEM) (Özbek et al., 2016), emphasizing that the sizes of pollen grains and exine patterns proved to be important traits for the discrimination of those species. Schultz (1860) recommended a subdivision into

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six subtribes based mainly on carpological features in his revision on the tribe Anthemideae. Bhar and Mukherjee (2004) examined the achene macro- and micromorphology of 7 species in the genus *Anthemis* and four genera of the tribe Anthemideae (*Achillea* L., *Leucanthemum* Mill., *Matricaria* L., and *Tanacetum* L.), highlighting that these features have taxonomic importance in the systematic studies. The achene morphology of 11 species of *Anthemis* and its related four genera distributed in Iran were investigated by Chehregani and Mahanfar (2007). Achene micromorphological characters are significant and could be useful for identifying the species and genera. Abid and Qaiser (2009) studied the morphological properties of achenes of 44 species from 15 genera in the tribe Anthemideae growing in Pakistan and Kashmir region. They reported that achene micromorphological characteristics are useful in species and genus delimitation. In addition, we studied the achene morphology of the genus *Cota* in Turkey and reported that the size, the surface pattern, and the color of achene have a diagnostic value for separating the taxa (Özbek et al., 2018).

In June 2008, some unusual *Anthemis* specimens were collected near Eskil (South of Tuz Lake) in Aksaray, which differed from all Turkish species known so far. The detailed studies and observations revealed this species' distinctness from the known taxa, and it is described here as a new species to science sect. *Anthemis*.

2. Material and methods

The plant material was collected by the authors between 2008 and 2018 from Turkey. These specimens were checked with relevant literature (Fedorov, 1961; Täckholm, 1974; Grierson and Yavin, 1975; Fernandez, 1976; Feinbrun-Dothan, 1978; Pignatti, 1982; Meikle, 1985; Iranshahr, 1986; Shishkin, 1995) and compared with herbarium material preserved in GAZI, ANK, EGE and HUB (acronyms according to Thiers 2020+)[1]. In addition, pollen and achene morphology of the new species and of *A. pauciloba* Boiss. var. *pauciloba* were comparatively investigated. Author of plant names are written according to International Plant Names Index (IPNI)[2]. Davis' grid system was used for preparing the distribution map of the species (Davis, 1965).

Pollen samples obtained from the herbarium materials were prepared for light microscopy according to Wodehouse's technique (Wodehouse, 1935). Prepared pollen slides were investigated and measured under the Leica DM1000 light microscope (Leica Microsystems GmbH, Wetzlar, Germany). Measurements were performed on at least 30 pollen grains per specimen for each morphological character. The achenes were first investigated using a Leica EZ4D stereoscopic microscope. In order to determine their average sizes, at least 20 mature achenes were measured. For SEM studies, pollen grains taken from the herbarium samples and mature achenes were transferred onto stubs and then coated with gold, investigated and photographed with a JEOL JSM 6060 SEM. The pollen terminology was adopted from Faegri and Iversen (1992), Punt et al. (2007), Punt and Hoen (2009), and Özbek et al. (2016). The classification of pollen shape follows Erdtman's system (Erdtman, 1969), based partly on the P/E ratio. The terminologies of Barthlott (1981), Abid and Qaiser (2009), and Özbek et al. (2018) were followed for achene morphology. The conservation status was evaluated according to the IUCN (2017).

3. Results

Anthemis ekicii Özbek, H.Duman & Aytaç **sp. nov.** (Figures 1–2)

Type: Turkey, B4 Aksaray: Eskil, 3–4 km East of Eskil, semihalophytic steppe, 926 m, 06.06.2008, *H.Duman* 9745 et al. (Holotype: GAZI!, isotypes: ANK!, HUB!, GAZI!). **Paratype**: ibid., 05.07.2018, *Ekici* 5886 & *Özbek* (GAZI!).

3.1. Diagnosis

Anthemis ekicii is similar to *A. pauciloba* var. *pauciloba*, but it is easily distinguished from *A. pauciloba* var. *pauciloba* by its fleshy leaves (not fleshy, thin), basal leaves oblanceolate (not linear-oblanceolate to linear-obovate), stem glabrous (not adpressed greyish-silvery or yellowish sericeous), phyllaries glabrous (not sparsely to densely lanate-tomentose), and involucrum 5–10 mm diam. (not 10–15 mm diam.).

3.2. Description

Perennial herb, woody at base. Stems ascending-erect to erect, simple or branched from base, 4–15 cm long, glabrous, foliate below, completely leafless above, 1–headed. Leaves fleshy; petiole up to 15 mm long; basal leaves simple, oblanceolate, shallowly dentate or entire, glabrous; lamina 10–25 × 2–4 mm; lower cauline leaves similar to basal leaves but sessile; middle cauline leaves a few, decreasing in size, sometimes absent, sessile, linear-lanceolate, 3–8 × 0.5–1 mm. Capitula homogamous and discoid; peduncle not becoming thickened. Involucre hemispherical, 5–10 mm diam.; phyllaries 4–seriate, imbricate, margins and at apex white scarious, ovate-lanceolate, glabrous; outer phyllaries 2–4 × 1–2 mm; median phyllaries 3–5 × 2 mm and innermost 3–5 × 2

[1] Thiers B (2020). Index Herbariorum: A global directory of public herbaria and associated staff [online]. Website http://sweetgum.nybg.org/science/ih/ [accessed 08 September 2020].

[2] IPNI (2020). International Plant Names Index [online]. Website http://www.ipni.org [accessed 10 September 2020].

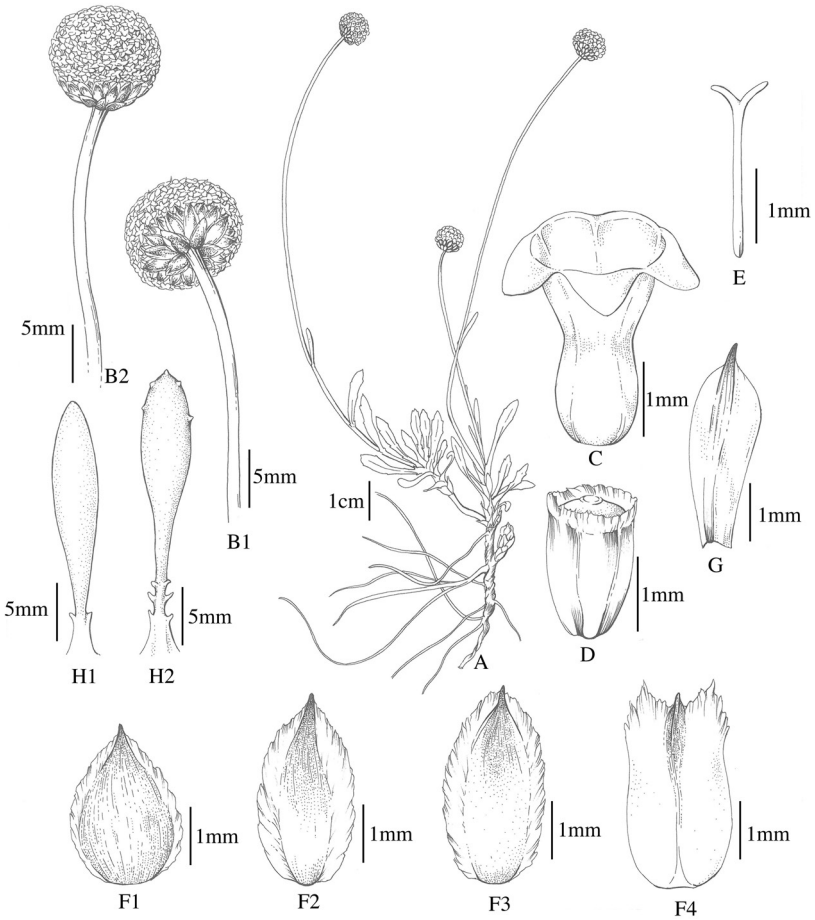

Figure 1. *Anthemis ekicii.* A- habit; B1 and B2- capitulum; C- disc flowers; D- achene; E- style; F1- outer phyllaries; F2 and F3-median phyllaries; F4- inner phyllaries; G- paleae; H1 and H2- basal leaves.

mm. Receptacle conical, paleaceous; paleae 3–4 × c. 1.5 mm, oblanceolate, navicular, acuminate. Ray flowers absent. Disc flowers tubular, yellow, hermaphrodite, 3–3.5 × 1 mm, 5–lobed; tube slightly thickened at base. Style bifurcate, 2–2.5 mm long. Achenes obpyramidal, angular, slightly curved, 1.75–2 mm long, whitish or straw-coloured, obscurely ribbed; corona absent to 0.1–0.2 mm long, unilateral, entire or crenulate.

3.3. Pollen morphology

The pollen grains of *Anthemis ekicii* and *A. pauciloba* var. *pauciloba* are radially symmetrical, isopolar, and trizonocolporate. Their pollen shape is oblate-spheroidal. The pollens of the studied taxa is very similar to one another. However, the pollen size shows differences between the two taxa. The pollen size of *A. ekicii* is P: 30.22 ± 1.36 µm, E: 32.75 ± 1.61 µm and P: 24.45 ± 1.32 µm, E: 26.18 ± 1.38 µm in *A. pauciloba* var. *pauciloba*. The outline of the pollens is elliptic in equatorial view and triangular in polar view in both taxa. The colpus is long, margins distinct, regular and ends acute. The shape of porus is circular or lalongate. The aperture membrane exhibits more granulate sculpture. Exine ornamentation is echinate and microreticulate-perforate is between the spines in both taxa (Figure 3). Detailed pollen morphological characters of examined two taxa are given in Table 1.

3.4. Achene morphology

The achenes are obpyramidal with narrowed base and truncate apex, angular, obscurely ribbed, slightly curved both in *Anthemis ekicii* and *A. pauciloba* var. *pauciloba*. They are whitish to straw-colored in *A. ekicii* and the close relative taxa. The achene size of *A. ekicii* is 1.75–2 × 0.65–1.34 mm, while it is (1.5–) 2.5–3 × 0.25–0.5 mm in *A. pauciloba* var. *pauciloba*. The corona is ± absent or minutely, 0.1–0.2 mm long, unilateral, entire or crenulate in *A. ekicii* and also 0.3–0.5 mm long, unilateral, entire or crenulate in *A. pauciloba* var. *pauciloba*. The ornamentation of achene surface is the same as reticulate-striate-ruminate in the two taxa. Epidermal cells are rectangular with conspicuous to inconspicuous, straight anticlinal walls showing a reticulate appearance and conspicuous, flat, concave or rarely convex, both transversal and longitudinal striped and also ruminate periclinal walls (Figure 4).

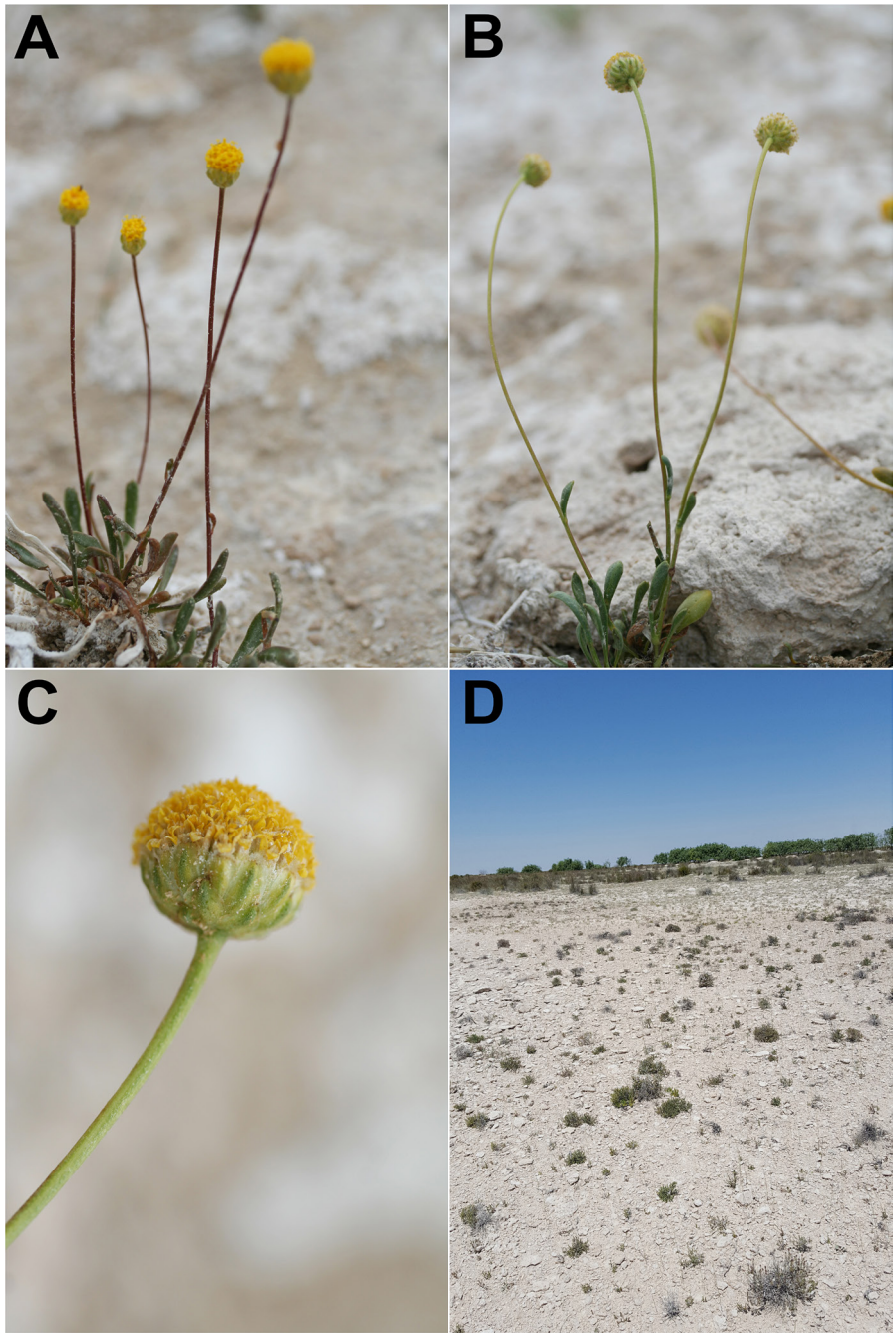

Figure 2. *Anthemis ekicii.* A,B- Habit, C- Capitulum, D- Habitat. (photos from H. Duman).

3.5. Etymology

The name of the species is given on behalf of the botanist Dr. Murat Ekici, who gave many contributions to plant taxonomy.

3.6. Distribution and ecology

Anthemis ekicii is growing in semihalophytic steppe. It is endemic to Central Anatolia and can be considered as a Irano-Turanian element (Figure 5). The species grows together with *Puccinellia bulbosa* Grossh. subsp. *caesarea* Kit Tan, *Centaurea tuzgoluensis* Aytaç & H.Duman, *Gladiolus halophilus* Boiss. & Heldr., *Silene salsuginea* Hub.-Mor., *Iberis halophila* Vural & H.Duman, *Frankenia salsuginea* Adıgüzel & Aytaç, *Scorzonera hieraciifolia* Hayek, *Taraxacum mirabile* Wagenitz, *Senecio salsugineus* H.Duman & Vural, *Thymus sipyleus* Boiss., and *Inula aucheriana* DC. at altitudes between 900 and 950 m. Flowering time: May to June; fruiting time: June to July.

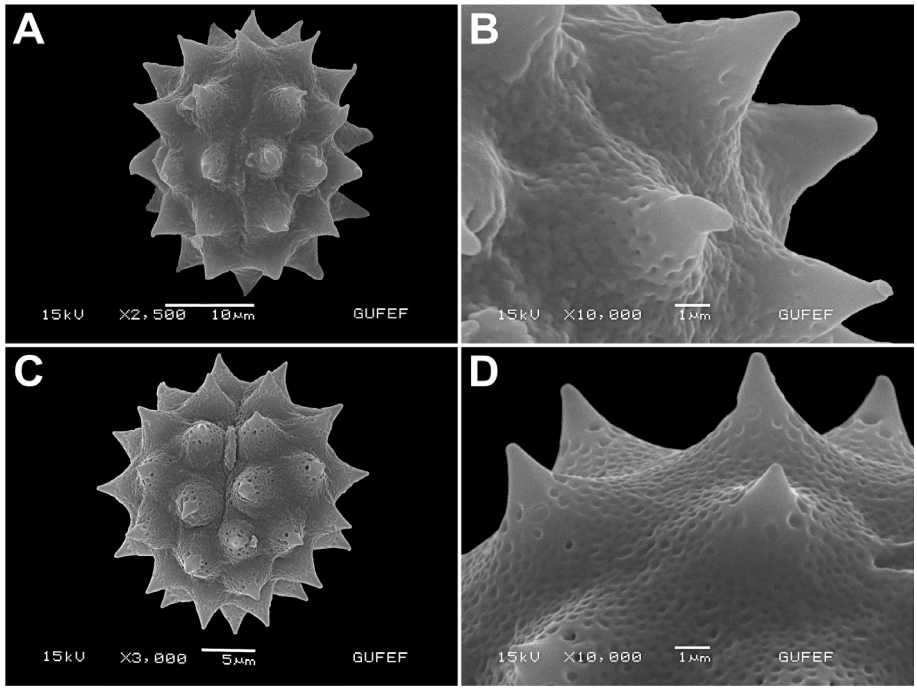

Figure 3. SEM micrographs of pollen grains of *Anthemis ekicii* (A, B) and *A. pauciloba* var. *pauciloba* (C, D). A, C. General aspect, B, D. Exine ornamentation.

Table 1. Pollen morphological data of *A. ekicii* and *A. pauciloba* var. *pauciloba* ((values in µm; minimum, maximum, mean ± standard deviation).

Species/ Characters		*A. ekicii*	*A. pauciloba* var. *pauciloba*
Polar axes	Min.	26.16	22.08
	Max.	32.64	26.88
	Mean	30.22 ± 1.36	24.45 ± 1.32
Equatorial axes	Min.	28.83	22.08
	Max.	35.52	28.8
	Mean	32.75 ± 1.61	26.18 ± 1.38
Pollen shape		oblate-spheroidal	oblate-spheroidal
Aperture type		trizonocolporate	trizonocolporate
Ornamentation	General	echinate	echinate
	Interspinal	microreticulate-perforate	microreticulate-perforate
Colpus (Cl)	Colpus length (Clg)	18.18 ± 1.5	15.85 ± 1.08
	Colpus width (Clt)	4.88 ± 0.66	4.29 ± 0.43
Pore (Pl)	Pore length (Plg)	7.71 ± 0.88	7.06 ± 0.8
	Pore width (Plt)	7.8 ± 0.66	6.93 ± 0.51
Exine thickness		3.6 ± 0.37	3.07 ± 0.35
Intine thickness		0.73 ± 0.14	0.72 ± 0.13
Spine length		4.17 ± 0.34	3.44 ± 0.39
Spine width		6.4 ± 0.68	5.63 ± 0.4
Amb		33.02 ± 2.27	27.44 ± 1.72

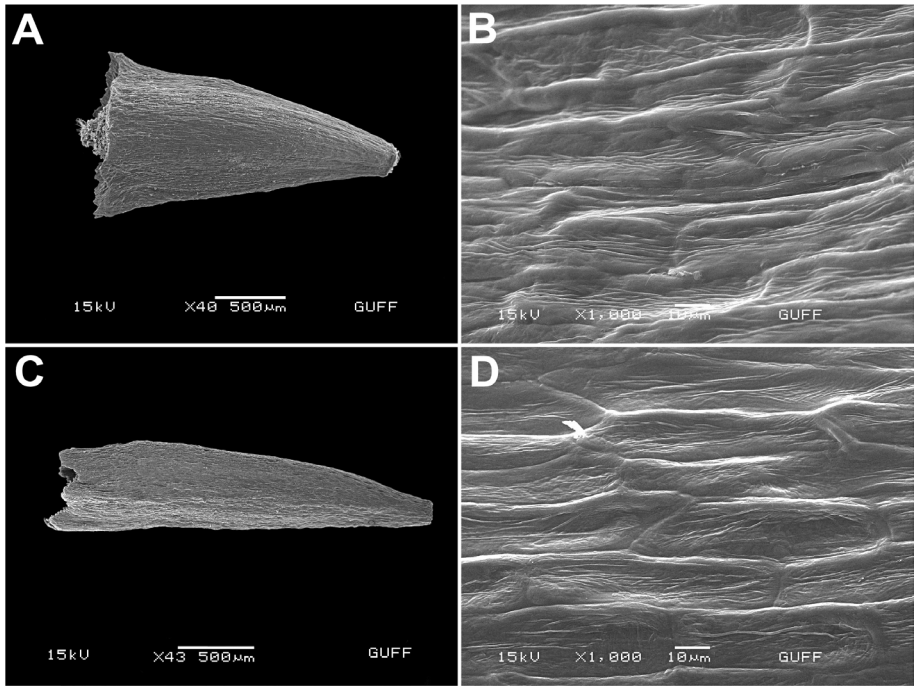

Figure 4. SEM micrographs of achenes of *Anthemis ekicii* (A, B) and *A. pauciloba* var. *pauciloba* (C, D). A, C. General aspect, B, D. Surface ornamentation.

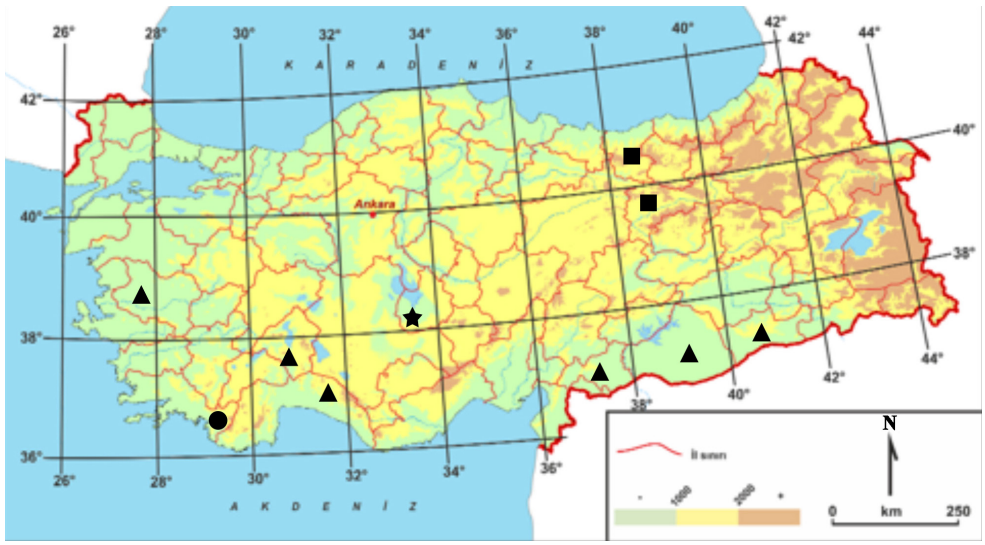

Figure 5. Distribution map of *Anthemis ekicii* (★), *A. pauciloba* var. *pauciloba* (▲), *A. anthemiformis* (▪) and *A. cuneata* (●).

3.7. Conservation status

Anthemis ekicii is known from one location. The area of occupancy (AOO) and extent of occurrence (EOO) of *A. ekicii* were calculated as less than 4 km^2, in which about 100 individuals were estimated to occur. The main threats observed were expansion of agricultural areas and overgrazing. According to the criterion B1ab(i,ii,iii,v)+B2ab(i,ii,iii,v) of the IUCN (2017), the new species was evaluated as critically endangered (CR).

3.8. Proposed Turkish name for the new species

This new species was called "Tuz gölü papatyası" in Turkish, according to the guidelines of Menemen et al (2013).

4. Discussion and conclusion

Anthemis is a morphologically complex and difficult genus. As stated in Flora of Turkey, it is evidently an actively evolving genus in great need of further critical

work (Grierson and Yavin, 1975). Capitula features are extremely important in distinguishing the species, such as: the presence or absence of ray flowers and, if any, its color, the shape of the phyllaries, the shape of the paleae and the achene properties. Moreover, leaf morphology is often used in discrimination of many species. In general, pinnatisect leaves are observed in this genus. However, in Turkey, the leaves in only 4 species are simple, shallowly dentate, serrate or shallowly pinnate or deeply pinnatilobate. These species are: *Anthemis anthemiformis* (Freyn & Sint.) Grierson, *A. cuneata* Hub.-Mor & Reese, *A. pauciloba* var. *pauciloba*, and *A. ekicii*. *A. anthemiformis* easily differs from other species by its radiate capitula and black-margined phyllaries. While *A. cuneata* has discoid capitula, *A. pauciloba* has discoid (var. *pauciloba*) and radiate capitula [var. *microstephana* (Eig) Grierson, var. *sieheana* (Eig) Grierson, var. *alba* Hamzaoğlu & Budak)].

Anthemis ekicii is similar to *A. pauciloba var. pauciloba,* but it differs from *A. pauciloba var. pauciloba* in its leaves, involucre, and indumentum characters (Table 2). *Anthemis ekicii* grows in a peculiar habitat such as semihalophytic steppe together with many halopytic endemic species. Due to the special habitat in which it grows, its unusual morphological characters make this species different from other species.

Dauti et al. (2014) reported that the palynotaxonomical properties of *Anthemis* specimens are quiet similar within themselves. In agreement with them, the pollen grains of the new species and the close related taxa are rather similar to each other generally in relation to the aperture type (trizonocolporate) and general (echinate) and also interspinal area (microreticulate-perforate) ornamentation. Little differences in the measurements of palynological character have been observed. Oberprieler (1998) detected that the size of pollens in *Anthemis* species shows differences between the species. Similarly, in our study, variations in pollen grains of the studied taxa have been found especially in pollen size. The size of pollen grains in *A. ekicii* (P: 30.22 ± 1.36 µm, E: 32.75 ± 1.61 µm) is bigger than the *A. pauciloba* var. *pauciloba* pollens (P: 24.45 ± 1.32 µm, E: 26.18 ± 1.38 µm). The members of the family Asteraceae have generally prolate and spheroidal shaped pollen grains and are not more than slightly oblate pollens (Stix, 1960). The pollens were found to be uniformly spiny

Table 2. Diagnostic morphological characters of *Anthemis ekicii* and closely related species.

Characters	*A. ekicii*	*A. pauciloba* var. *pauciloba*	*A. cuneata*	*A. anthemiformis*
Stem	simple or branched from base, 4–15 cm long; glabrous	simple or branched near base, 15–(30–45) cm long; adpressed greyish-silvery or yellowish sericeous	unbranched, 15–25 cm long; adpressed yellowish sericeous	simple or branched near base, 12–15 cm long; adpressed-tomentose
Leaves	fleshy	not fleshy	not fleshy	not fleshy
Basal leaves	oblanceolate, margin entire to shallowly dentate	linear-oblanceolate to linear-obovate, margin entire to slightly or deeply pinnatilobate with 3 or 7 pairs of lateral lobes	obovate-cuneate, margin serrate	ovate to obovate, margin dentate or slightly pinnatilobate
Capitulum	discoid	discoid	discoid	radiate
Involucre	5–10 mm diam.	10–15 mm diam.	10–13 mm diam.	10–15 mm diam.
Phyllaries	pale-margined; glabrous	pale-margined; sparsely to densely lanate-tomentose	pale-margined; densely tomentose	blackish-margined; subglabrous or sparsely pilose
Paleae	oblanceolate, navicular	oblanceolate	narrowly lanceolate to lanceolate	lanceolate
Achenes	1.75–2 mm long	1.5–(2–3) mm long	1.5 mm long	2.5–3 mm long
Habitat	semihalophytic steppe	on limestone screes and ledges, marly banks and disturbed steppe	*Pinus brutia* woods on limestone	Rocky slopes and alpine pasture

and spheroidal in all investigated *Anthemis* specimens from North Africa by Oberprieler (1998). The findings of this study are congruent with these studies. The shape of pollens in two taxa is observed as oblate-spheroidal. Dauti et al. (2014) observed circular pores in eight *Anthemis* species. In the present study, the pores are both circular and lalongate in shape.

The achenes, in *A. ekicii* and *A. pauciloba* var. *pauciloba* are similar to each other, they are obpyramidal with narrowed base and truncate apex, angular, obscurely ribbed, slightly curved, and whitish or straw-colored in both taxa. Coşkunçelebi et al. (2016) and Özbek et al. (2018) found the variations in achene size among the taxa they studied and stated that achene length is a helpful character for systematics of the taxa. Our findings are consistent with them, in that the differences in achene length have been observed in two taxa. The achenes in *A. pauciloba* var. *pauciloba* are longer and narrower (1.5-) 2.5–3 × 0.25–0.5 mm as compared to *A. ekicii* (1.75–2 × 0.65–1.34 mm). The achene surface in the Anthemideae is characterized by the presence of myxogenous cells by Bremer (1994) and Källersjö (1986). Contrary to them, Bhar and Mukherjee (2004) have not observed these cells as we did in our study. No significant differences on the achene surfaces have been found between the two taxa. The achenes shows reticulate-striate-ruminate ornamentation in these specimens.

In conclusion, the morphological, palynological and achene macro- micromorphological findings regarding *A. ekicii* and the closely allied species have revealed that *A. ekicii* is a new species, distinct from the other relative *Anthemis* species. With these results, the numbers of taxa and endemic taxa in Turkish *Anthemis* have increased to 59 and 25, respectively.

4.1. Identification key to *Anthemis ekicii* and related taxa*

1. Leaves simple, entire, shallowly dentate, serrate, slightly or deeply pinnatilobate **2**

2. Capitula radiate; phyllaries black-margined .... ***A. anthemiformis***

2+ Capitula discoid; phyllaries pale-margined **3**

3. Plant glabrous; leaves fleshy; involucre 5–10 mm diam ..... ***A. ekicii***

3+ Plant adpressed greyish-silvery or yellowish tomentose; leaves not fleshy; involucre 10–15 mm diam .. **4**

4. Stems simple or branched near base; basal leaves linear-oblanceolate to linear-obovate, with 3 or 7 pairs of lateral lobes ..... ***A. pauciloba* var. *pauciloba***

4+ Stems unbranched; basal leaves obovate-cuneate, serrate ..... ***A. cuneata***

1+ Leaves deeply pinnatisect or more often 2-pinnatisect ..... **(Other *Anthemis* species)***

The identification key was adapted from Grierson and Yavin (1975).

Acknowledgments

The authors are grateful to the curators of ANK, E, EGE, GAZI, and HUB for access to *Anthemis* materials for this study. Also, we would like to thank Fatma Şen for the illustration.

Additional specimens examined

***Anthemis pauciloba* var. *pauciloba*: Turkey, B1 Manisa**: Kırkağaç Mt., *Pinus brutia* and *P. nigra* forest, 950 m, 25.07.1966, *Peşmen* 430 (EGE!); **C3 Isparta**: Eğirdir, Yaka village, around Çamova, limestone rocky valley, 1900-1980 m, 02.07.1974, *Peşmen* 1598 & *Güner* (HUB!); **C3 Antalya**: Akseki, between Güzelsu and Serebil, clearings of macchie, 1100 m, 01.06.1996, *A.Duran* 3822 (GAZI!); between Akseki and Geyran pasture, S. of Kocaoluk, stony places, 1300-1400 m, 09.06.1995, *A.Duran* 2555 (GAZI!); **C6 Gaziantep**: 11 km later from Gaziantep, steppe, ca. 780 m, 20.05.1956, *Birand* 56 (ANK!); Gaziantep-Narlı, ca. 760 m, 24.05.1934, *Balls* 1152 & *Boilay* (ANK!); **C7 Şanlıurfa**: Şanlıurfa-Hilvan, 32 km from Şanlıurfa, steppe, 700 m, 18.05.1956, *P.H.Davis* 28216 & *Hedge* (ANK!); **C8 Mardin**: Mardin castle, rocky limestone N. slopes, 1200 m, 20.05.1957, *P.H.Davis* 28349 & *Hedge* (ANK!).

***Anthemis anthemiformis*: Turkey, A7 Giresun**: Balaban Dağları (Kılınç Tepe) above Tamdere, rocky slopes, 2700 m, 07.08.1952, *P.H.Davis* 20583 & *R.Çetik* (photo E!, ANK!); **B7 Erzincan:** Köhnem Mt, roadside 2533 m, 02.08.2008, *A.Kandemir* 10069 (photo E!).

***Anthemis cuneata*: Turkey, C2 Muğla**: Fethiye, 51 km from Fethiye to Çavdır, under *Pinus brutia* forest, 1085 m, 19.05.2007, *U.Özbek* 2284 & *M.E.Uzunhisarcıklı* (GAZI!); Lycien. Vilayet Muğla, Fethiye-Dirmil, *Pinus brutia*-Gehölz auf Kalkmergel, 51 km nördl. Fethiye, 1000 m, 08.06.1938, *Huber-Morath* 5663 (photo iso E!).

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