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Sporobolus turcicus (sect. *Crypsis, Poaceae*), a new species from Türkiye

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Sporobolus turcicus (sect. *Crypsis, Poaceae*), Türkiye'den yeni bir tür

Abstract: Some interesting *Sporobolus* (Poaceae) specimens were collected from Eskil, Aksaray, that have narrow inflorescence, long lower glume and caryopsis. In the careful examination made, the specimens resemble *Sporobolus schoenoides* and *S. borszczowii* belonging to the section *Crypsis* (subsect. *Crypsis*), but it was determined that it is different from them due to especially some generative characters. These specimens after compared with the closest taxa, it was decided that, it is a new species for science world and was named *Sporobolus turcicus*. Specimens of the new species grows at altitudes between about 910-920 meters in the dried salt marsh. The size and shape of some organs such as leaf blades (0.6-1.2 mm broad, puberulent to long-pilose inner surface, glabrous outer surface), lower glume (3.2-4.1 mm long), lemma (awn 0.6-0.8 mm long) and caryopsis (ellipsoid, 1.5-2.1 mm long), allow to recognize *Sporobolus turcicus* from its closest taxa. Here, the description of the new species, comparison with the similar taxa, informative photographs, and some ecological preferences have been given.

Key words: Aksaray, new species, *Sporobolus*, taxonomy, Türkiye

Özet: Aksaray, Eskil'den çiçek durumu dar, alt gluması ve karyopsisi uzun bazı ilginç *Sporobolus* (Poaceae) örnekleri toplandı. Yapılan detaylı inceleme sonucunda örneklerin *Crypsis* seksiyonuna (alt seksiyon *Crypsis*) ait *Sporobolus schoenoides* ve *S. borszczowii*'ye benzediği, ancak özellikle bazı generatif karakterler nedeniyle farklı olduğu belirlendi. Bu örneklerin yakın taksonlarla karşılaştırılması sonucunda bilim dünyası için yeni bir tür olduğuna karar verildi ve *Sporobolus turcicus* olarak adlandırıldı. Yeni türün örnekleri kurumuş tuzlu bataklıkta yaklaşık 910-920 metre rakımlarda yetişir. Yaprak ayaları (0,6-1,2 mm genişliğinde, iç yüzey havlı-uzun tüylü, dış yüzey tüysüz), alt gluma (3,2-4,1 mm uzunluğunda), lemma (kılçık 0,6-0,8 mm uzunluğunda) ve karyopsis (elipsoid, 1,5-2,1 mm uzunluğunda) gibi bazı organların boyutu ve şekli, *Sporobolus turcicus*'un en yakın taksonlardan ayrılmasını sağlar. Burada yeni türün tanımı, benzer taksonlarla karşılaştırılması, bilgilendirici fotoğrafları ve bazı ekolojik tercihlerine yer verilmiştir.

Anahtar Kelimeler: Aksaray, *Sporobolus*, taksonomi, Türkiye, yeni tür

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1. Introduction

Poaceae Barnhart is one of the largest families in the world, with 830 genera and 12369 species that are considered valid (WFO, 2023a). According to the latest data, the family is represented with 147 genera and 556 species in Türkiye (Cabi and Doğan, 2012; Cabi et al., 2013; 2015a; 2015b; 2018; Doğan et al., 2015; Cabi and Soreng, 2016; Terzioğlu and Özkan, 2020; Behçet and Yapar, 2021; Aykurt et al., 2022). *Sporobolus* R.Br. s.l. contains about 230 species and is a common genus worldwide (WFO, 2023b). *Sporobolus* is represented by 8 taxa connected to 3 sections in Türkiye (Tan, 1985; Byfield and Pearman, 2000; Cabi and Doğan, 2012; Peterson et al., 2014). None of these species are endemic to Türkiye. Species of the genus mostly prefer edges of terrestrial and coastal salty lakes, marshes or sandy places as habitats (Tan, 1985).

Some interesting *Sporobolus* specimens were collected during the investigation of salt marshes around Tuz Lake (Türkiye, Aksaray, Eskil) in 2018. Due to its spikelets with one floret, annual and rachilla disarticulating below glumes, the specimens were first identified as the genus *Crypsis* Aiton according to "*Flora of Turkey and the East Aegean Islands*" (Davis, 1985). Specimens of the plants with flowers, which has adapted to the edge of salt marshes, were collected around the mid of August. As a result of the investigations carried out on specimens, and the consideration of the most recent revision studies and the Flora of Turkey and the East Aegean Islands, Flora Europaea, Flora USSR, Flora Iranica, Flora of Iraq, and Flora of Syria, Palestine and Sinai, it was decided that the specimens belong to a new species between *Sporobolus schoenoides* (L.) P.M.Peterson and *S. borszczowii* (Regel) P.M.Peterson (sect. *Crypsis* (Aiton) P.M.Peterson, subsect. *Crypsis* (Aiton) P.M.Peterson) (Post, 1933; Rozhevits and Shishkin, 1963; Bor, 1968; 1970; Tutin, 1980; Tan, 1985; Raus and Scholz, 2004; Peterson et al., 2014).

2. Materials and Method

Specimens belonging to the new species were collected in August from the dried salt marshes near Tuz Lake, in Eskil District of Aksaray Province (Central Anatolia, Türkiye). The related literature (Post, 1933; Rozhevits and Shishkin, 1963; Bor, 1968; 1970; Tutin, 1980; Tan, 1985; Raus and Scholz, 2004; Peterson et al., 2014), the high-resolution photographs in the Conservatoire et Jardin Botaniques de la Ville de Genève (G), Royal Botanic Garden Edinburgh (E), Naturhistorisches Museum Wien (W), and Muséum National d'Histoire Naturelle Paris (P) herbaria were utilized in the identification and evaluation of the specimens (Thiers, 2023). A Leica EZ4 stereo microscope, a Samsung A33 5G mobile telephone, and the Canon

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EOS60D were used in the examination of the specimens and the taking of photographs, whereas a ruler with a sensitivity of 0.5 mm was used in the measurements.

3. Results

***Sporobolus turcicus* Hamzaoğlu, sp. nova** (Figure 1)

Type. Türkiye. **Aksaray**: Eskil, from Eskil to Tuz Lake, NE of Eskil, road of "Ali Emminin Çardağı", 38°26'56"N - 33°27'09"E, 915 m a.s.l., dried salt marsh, 18 August 2018, *Hamzaoğlu 7519* (**holotype** GAZI!, **isotypes** GAZI!, ANK!, HUB!).

Diagnosis. *Sporobolus turcicus* is related to *S. schoenoides* and *S. borszczowii*. It differs from *S. schoenoides*, mainly by leaf sheaths sparsely pilose hairs between nerves (not glabrous), leaf blades linear-acuminate, 0.6–1.2 mm broad, puberulent to long-pilose inner surface, glabrous outer surface (not acuminate, 2–7 mm broad, glabrous inner surface, villous or sparsely pilose outer surface), lower glume 3.2–4.1 mm long (not 2.2–3 mm long), lemma awn 0.6–0.8 mm long, not ciliate on margin (not unawned), caryopsis ellipsoid, 1.5–2.1 mm long (not oblong-ellipsoid, 1–1.2 mm long). Also, it differs from *S. borszczowii*, mainly by culms erect to ascending (not procumbent to geniculately ascending), leaf blades linear-acuminate, 0.6–1.2 mm broad, puberulent to long-pilose inner surface, glabrous outer surface (not acuminate, 1–3(–5) mm broad, puberulent to long-pilose on both surfaces), inflorescence 4–5 mm broad (not 7–8 mm broad), lemma margin glabrous (not ciliate), caryopsis ellipsoid, 1.5–2.1 mm long (not ovoid, 1–1.5 mm long).

Description. Annual grass. Culms few from base, erect or ascending, 3–6 cm long. Leaves glaucous-green. Sheaths markedly ribbed on outer surface, not scabrid on nerves, sparsely pilose hairs between nerves, with membranaceous, and usually ciliate margins, usually not inflated, conspicuously shorter than internodes, upper 1(–2) usually with reduced blades and bract-like. Ligule a fringe of hairs. Leaf blades distinctly demarcated from sheath, linear-acuminate, involute, 7–25 × 0.6–1.2 mm, conspicuously ribbed on both surfaces, scabrid on margins, puberulent to long-pilose inner surface, glabrous outer surface. Inflorescence a narrowly ovoid or ellipsoid spiciform panicle usually of 10–17 fertile and 1–2 sterile spikelets, 8–15 × 4–5 mm. Rachis glabrous. Spikelets 3–4 mm long including acumens, wedge-shaped, compressed, lower with short- and other one long-pedicellate. Glumes subequal, 3.2–4.1 × 0.7–1.3 mm, 1-nerved, glabrous, scabrid on upper part of keel, narrowly to broadly lanceolate, with membranaceous margin, narrowing into a cuspidate 0.9–1.5 mm acumen, ciliate on upper part either on both margins or at least on one margin. Lemma 3–4 × 0.8–1.1 mm, with membranaceous, margin, 1-nerved, glabrous, scabrid on upper part of keel, narrowing into a cuspidate 0.6–0.8 mm acumen, not ciliate on margin. Palea completely membranaceous,, 4-lobed at apex, 2.3–3.1 × 0.9–1.2 mm, 2-nerved, plicate along nerves. Caryopsis dark brown, ellipsoid, slightly compressed, 1.5–2.1 × 0.9–1.2 mm.

Etymology. The name of the new species was inspired by the name of the country where it was grown and discovered.

Proposed vernacular name. Türk Bakakotu (in Turkish), Turkish Pricklegrass (in English).

Flowering time. July to August.

Figure 1. Habit and flower parts of *Sporobolus turcicus*. A – habit, B – leaves sheaths and hairiness, C – fertile spikelet, D – lemma and palea, E – caryopsis (Scale bars. A: 10 mm; B: 3 mm; C, D and E: 1 mm).

Distribution and habitat. Specimens of *Sporobolus turcicus* were collected from the surroundings of Tuz Lake (Eskil, Aksaray). It is estimated that the species grows in dried salt marsh of northeast of Eskil, approximately between 910 and 920 m a.s.l. The species is also likely to grow in such as Seyfe Lake (Kırşehir Province), Sultansazlığı (Kayseri Province), which are located in the central part of Turkey, but there is no data on this yet. Consequently, at present, the species is an endemic of Türkiye and when the area of distribution is considered, it is an element of the Irano-Turanian phytogeographic region.

IUCN Conservation assessment. According to the existing data, *Sporobolus turcicus* is a species only known from the type locality. Approximately 1.500 individuals were counted in the type locality. The species grows in the dried salt marshes at northeast of Eskil District (Aksaray Province). Since the area where the species grows is a marsh, there are no settlements and agricultural areas in its immediate vicinity. On the other hand, as it is the only pasture area in the vicinity, it is subject to intense grazing by livestock. When the areas where the species could be grown are considered, it is estimated that *Sporobolus turcicus* showed a distribution on an area approximately 3000 km^2. When the existing or envisaged threats are evaluated together, the species being known from only one addresses at present (area of life less than 100 km^2) and the breadth of the area of distribution calculated (less than 3000 km^2), it was decided that it would be suitable to propose the Endangered [EN, B1abiii and B2abii] classification for the extinction risk of the species (IUCN Standards and Petitions Committee, 2019).

Additional specimens examined

Sporobolus schoenoides. **Türkiye**. [Kahramanmaraş]: Maras, Süleymanlı, nr. stream, 04.08.1964, *L.Williams s.n.* (E, E00357226!); prope Smyrnam [İzmir], 22.10.1867, *J.Ball s.n.* (E, E00357226!); prov. Diyarbakır: Diyarbakır-Bitlis, c. 70 km from Diyarbakır, c. 750 m a.s.l., gravel banks in dry river bed, 10.08.1956, *McNeill 508* (E, E00357228!); Elazığ: zwischen Elazığ und Pertek, Südufer des Murat nehri, 500 m östlich der Straßenbrücke über den Fluß, 900 m a.s.l., 21.07.1973, *F.Holtz 00.749b* (E, E00357230!); Hakkari, Yüksekova, 1950 m a.s.l., on path, 07.09.1967, *D.Duncan & S.Tait 218* (E, E00357232!); Çanakkale: Umurbey, Umurbey Çayı, gravel, almost dry riverbed, 22.07.1981, *A.Kurtto 3228* (E, E00357234!). **Greece.** Iles Ioniennes, 0 m a.s.l., 1837, *H.Margot s.n.* (G, G00799112!). **Iran**. Khorasan: Gulestan forest, 1000 m a.s.l., by stream, ground very wet, 24.08.1967, *D.Walton 212* (E, E00357249!); Kazvin: 20 km south of Gazvin (Kazvin), 30.06.1969, J.Andersen & I.Petersen 130 (E, E00357260!); Lorestan: left bank of Kashgan Rud, above Pol-i-Khallor, 60 km W. of Khorramabad, 11.07.1966, J.Archibald 2660 (E, E00357252!). **Iraq**. Baghdad: Tigris Bank, 14.12.1954, *R.Haines s.n.* (E, E00357254!); Amara: cultivated ground by Tigris above Amara, 05.11.1917, *W.Evans s.n.* (E, E00357244!); Ninawa: Sersank, 09.08.1959, *R.Haines 1588* (E, E00357251!).

Sporobolus borszczowii. **Türkiye**. [İzmir]: Station de Boudja, près de Smyrne, vers 150 mètres d'alt. 31.08.1866, *B.Balansa 1541* [as *Crypsis ambigua*], (P, P02520104!; P02904427!; P02904428!; P02904429!; P02520103!; P02520105!; P02520106!; K, K000907264!; K000907266; W, W0027063!; W18890048400!).

4. Discussions

The first comprehensive information in Türkiye about the genus *Sporobolus* (as *Sporobolus* and *Crypsis*), was included in Volume 9 of the work titled Flora of Turkey and the East Aegean Islands (Tan, 1985). Accordingly, *Sporobolus schoenoides* and *S. borszczowii* (incl. all subspecies) are two of the 6 species of the genus known from Türkiye. The validity of these species were also accepted in the later revision studies of the genus *Sporobolus* (Peterson et al., 2014). These species are very similar to each other in habit because their culms erect, ascending or procumbent, leaves linear or linear-acuminate and ligule hairy, inflorescence narrowly ovoid or oblong, spikelets 3–5 mm long and strongly laterally compressed, glumes membranaceous or hyaline; palea 2-nerved and caryopses 1–2.1 mm long. On the other hand, these species differ from each other especially by the dimension of their some vegetative and generative characters (Table 1). According to the latest data, 8 species (incl. *S. turcicus*) of the genus *Sporobolus* grow in Türkiye (Table 2; Tan, 1985; Byfield and Pearman, 2000).

Sporobolus schoenoides and *S. borszczowii* differ slightly from each other with leaf hairiness, lower glume length, and the presence of awn in lemma. However, the differences between *Sporobolus turcicus* and these two species are much more obvious. Current descriptions and the examination of herbaria specimens revealed that *Sporobolus turcicus*, especially for the flowers characters, is different from *S. schoenoides*. For example, the lower

Table 1. Comparison of diagnostic characters of *Sporobolus turcicus* and related species

Diagnostic characters	*S. turcicus*	*S. schoenoides*	*S. borszczowii*
Culms	erect or ascending	procumbent or ascending	procumbent to geniculately ascending
Leaf sheaths	sparsely pilose hairs between nerves	glabrous	glabrous or sparsely pilose
Leaf blades	linear-acuminate, 0.6–1.2 mm broad, puberulent to long-pilose inner surface, glabrous outer surface	acuminate, 2–7 mm broad, glabrous inner surface, villous or sparsely pilose outer surface	acuminate, 1–3(–5) mm broad, puberulent to long-pilose on both surfaces
Inflorescence	4–5 mm broad	4–12 mm broad	7–8 mm broad
Spikelets	3–4 mm long	3–4 mm long	4–5 mm long
Lower glume	3.2–4.1 mm long	2.2–3 mm long	(3–)3.5–4.3 mm long
Lemma	awn 0.6–0.8 mm long, not ciliate on margin	unawned	awn 0.5–1.2 mm long, ciliate on margin
Caryopsis	ellipsoid, 1.5–2.1 mm long	oblong-ellipsoid, 1–1.2 mm long	ovoid, 1–1.5 mm long

Table 2. Taxonomic summary of the genus *Sporobolus* in Türkiye.

Species	According to Peterson et al. (2014)	According to "Flora of Turkey and the East Aegean Islands" (Tan, 1985; Byfield & Pearman, 2000)
	Section *Sporobolus* R.Br.	**Genus *Sporobolus* R.Br.**
1	*Sporobolus fertilis* (Steud.) Clayton	*Sporobolus fertilis* (Steud.) Clayton
	Section *Virginicae* Veldkamp	Genus *Sporobolus* R.Br.
2	*Sporobolus virginicus* (L.) Kunth	*Sporobolus virginicus* (L.) Kunth
	Section *Crypsis* (Aiton) P.M.Peterson	Genus *Crypsis* Aiton
	Subsection *Crypsis* (Aiton) P.M.Peterson	Genus *Crypsis* Aiton
3	*Sporobolus aculeatus* (L.) P.M.Peterson	*Crypsis aculeata* (L.) Aiton
4	*Sporobolus alopecuroides* (Piller & Mitterp.) P.M.Peterson	*Crypsis alopecuroides* (Piller & Mitterp.) Schrader
5a	*Sporobolus borszczowii* Regel subsp. *borszczowii*	*Crypsis acuminata* Trin. subsp. *borszczowii* (Regel) Kit Tan
5b	*Sporobolus borszczowii* Regel subsp. *acuminatus* (Trin.) P.M. Peterson	*Crypsis acuminata* Trin. subsp. *acuminata*
5c	*Sporobolus borszczowii* Regel subsp. *ambiguus* (Boiss. & Balansa ex Boiss.) P.M.Peterson	*Crypsis acuminata* Trin. subsp. *ambigua* (Boiss. & Balansa ex Boiss.) Kit Tan
6	*Sporobolus factorovskyi* (Eig) P.M.Peterson	*Crypsis faktorovskyi* Eig
7	*Sporobolus schoenoides* (L.) P.M.Peterson	*Crypsis schoenoides* (L.) Lam.
8	*Sporobolus turcicus* Hamzaoğlu	In this article.

glume is 3.2–4.1 mm long (not 2.2−3 mm), lemma is awned (not awned), and caryopsis is 1.5–2.1 mm long (not 1−1.2 mm). The new species also has similaries with *S. borszczowii*. But the inflorescence is 4−5 mm broad (not 7−8 mm), lemma is not ciliate on margin (ciliate on margin), caryopsis is ellipsoid and 1.5–2.1 mm long (ovoid and 1–1.5 mm long) (Table 1, Figure 1).

The works titled "A molecular phylogeny and new subgeneric classification of *Sporobolus* (*Poaceae: Chloridoideae: Sporobolinae*)" prepared by Peterson et al. (2014), is a broad-scope study which includes all the species of the genus *Sporobolus*, and includes a total of 177 species belonging to the genus. The moment the *Sporobolus turcicus* was collected for the first time, the most interesting aspects were the narrow leaves, inflorescences, and large caryopsis size. These are still more striking characters differentiating *S. turcicus* from *S. schoenoides* and *S. borszczowii* specimens (Table 1, Figure 1).

Conflict of Interest

Author has declared no conflict of interest.

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