

The Genus *Setaria* in Turkey

Türkiyede *Setaria* Cinsi

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The genus *Setaria* is represented on the world with more than a hundred of species (2,6). They are distributed through all continents, excepting the polar regions, and have their greatest concentration in the tropical regions (11).

In Turkey, it occurs 5 species of *Setaria* : *S. glauca* (L.) Beauv., *S. verticillata* (L.) Beauv., *S. viridis* (L.) Beauv., *S. ambigua* Guss. and *S. italica* (L.) Beauv.

The first four species are rather widespread in this country and are found in gardens, vineyards, on roadsides, fieldsides, railway lines. *S. italica*, on the contrary, has a restricted distribution. The specimens that we have seen date nearly 70 years ago and were collected by Aznavour (1) on both sides of Bosphorus. There are no recent specimens of *S. italica* collected from Turkey, except one which was taken in 1942 from an agricultural station's garden. *E. italica* is a grass cultivated in East and South Asia, in Africa, America and South of Europe, and as fodder grass and providing grains for human consumption and for breeding cage birds (3,8). As I have been informed from the commercial and agricultural centers, it is not actually cultivated in Turkey.

The present paper deals with the description of the genus *Setaria* in Turkey, gives a key for the identification of the 5 species that grow in this country. It is followed by the description of each species and the distribution according to the specimens that we have seen in the following herbaria: Herbarium of the Royal Botanic Garden at Edinburgh, Herbarium at the Royal Botanic Gardens at Kew, Herbier du Conservatoire Botanique de

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Genève, Herbarium of the Faculty of Sciences at Ankara, Herbarium of the Faculty of Pharmacy at Istanbul. The localities have been arranged according to the grid system introduced by P.H. Davis (5).

***Setaria* Beauv.**

P. Beauv. Ess. Agrost. 51 (1812)

Annual grasses. Culms erect or geniculated at the base, scabrid below the panicle, dark brown on the nodes. Leaf-blades flat. Sheaths glabrous or hairy. Ligule a fringe of short hairs. Panicles dense, cylindric, branches with bristles, alternate or verticillate. Bristles (sterile branchlets) persistent, scabrid, longer than the spikelets. Spikelets with short pedicels, elliptic, dorsally compressed, flat on the inner side, rounded on the back, falling entire and leaving a little cup at the top of the pedicel, or the fertile floret detaching alone and the glumes remaining on the panicle. Spikelets with two florets, the lower male or barren, the upper bisexual. Lower glume smaller than the spikelet, 3 - nerved. Upper glume as long as the spikelet or half the length of it, 5-7-nerved. Lemma of the lower floret as long as the spikelet, palea as large as the spikelet or smaller, the lateral margins being folded inside. Lemma and palea of the fertile upper floret equal in length, coriaceous, shiny, with involute margins, lemma rounded at back, involving the palea with its margins, palea flat, lemma and palea both transversely rugose or minutely punctulate, the lateral borders of the palea being very smooth. Stamens 3. Anthers 0.5-1 mm long. Grain oblong, flat on the ventral side, rounded on the back, obtus at the apex, tightly inclosed by the hardened lemma and palea, but free. Hilum at the base of the ventral surface, as a round or oblong, dark, small spot. Embryo seen on the dorsal side, longer than half of the grain. Starch granules simple, rounded or polyhedral with blunt angles, 3-8 μ in diameter, the hilum represented by a small radiated cleft.

Key to the species

1. Bristles retrorsely scabrid

2. *verticillata*

1. Bristles antorsely scabrid

2. Upper glume half the length of the spikelet. Lemma of the fertile floret transversely rugose. Palea of the lower floret as large as the spikelet *1. glauca*
2. Upper glume as long as the spikelet. Lemma of the fertile floret finely punctulate. Palea of the lower floret smaller than the spikelet
3. Panicle 4-7 mm wide, not lobulate. Spikelet falling entire
 4. Axis of the panicle scabrid and hairy, hairs tubercled at the base. Branches alternate, dense. *3. viridis.*
 4. Axis of the panicle antrorsely scabrid. Lower branches verticillate *4. ambigua*
3. Panicle 1-3 cm wide, lobulate. The fertile floret falling alone, the rest of the spikelet remaining on the inflorescence *5. italica*

1. *S. glauca* (L.) Beauv., Ess. Agröst. 51, 169, 178 (1812). Syn. *panicum glaucum* L., Sp. Pl. 56 (1753). Fig. 1,2 and 3.

Annual. Culm erect or geniculated at the base, simple or branched in the lower part, 10-50 cm high, subtomentose below the panicle, Leaf-blades flat, 4-8 mm wide, minutely scabrid on the upper surface and the margins, sometimes pilose towards its base. Sheaths glabrous. Ligule a dense fringe of short hairs. Panicle yellowish, 2-6 cm long, 4-8 mm wide (excluding the bristles), the axis subtomentose, branches dense, with one or two spikelets. Bristles yellowish, 5-8 mm long, antrorsely scabrid, 8-20 on a branch. Spikelets 3 mm long, pedicel short and subtomentose. Lower glume one third the length of the spikelet, 3-nerved, upper glume half the length of the spikelet, 5-nerved. Lemma of the lower floret 5-nerved, as long as the spikelet, palea elliptic, 2-keeled, as large as the lemma. Lemma and palea of the fertile floret transversely and coarsely rugose, the two lateral borders of the palea smooth. Anthers 1 mm long. Grain 2 mm long.

Cultivated land, gardens, edges of fields, plantations. From sea level to 1000 m. February-October.

A. 1 Edirne: near Pazarkule, edge of a field, 4.x.1966, A. Baytop ISTE 10404! A 2 (E) İstanbul: Hisarbeyli edge of a rice field, 17.x.1968, A. Baytop, ISTE 14613! Florya, 2.x.1968, A. Baytop, ISTE 14613! Florya, 2.x.1968,

A. Baytop, ISTE 14663! Şişli, Kâğıthane, Cendere, Bahçeköy, Büyükdere, Sarıyer, Zekeriyeköy, *Azn!* A 2 (A) İstanbul: Beykoz. Çubuklu Kurbağalıdere *Azn!* Göksu, Polonezköy, *Post!* A 3 Bolu: Gökaya, 31. viii. 1960, *A. and T. Baytop*. ISTE 6127! A 7 Trabzon: Görele, sea level, 2.viii.1966, *Davis* 47728! A 8 Rize, inside *Alnus* forest, 100-200 m, 21.viii.1952, *Davis* 20800! A 8 Erzu-

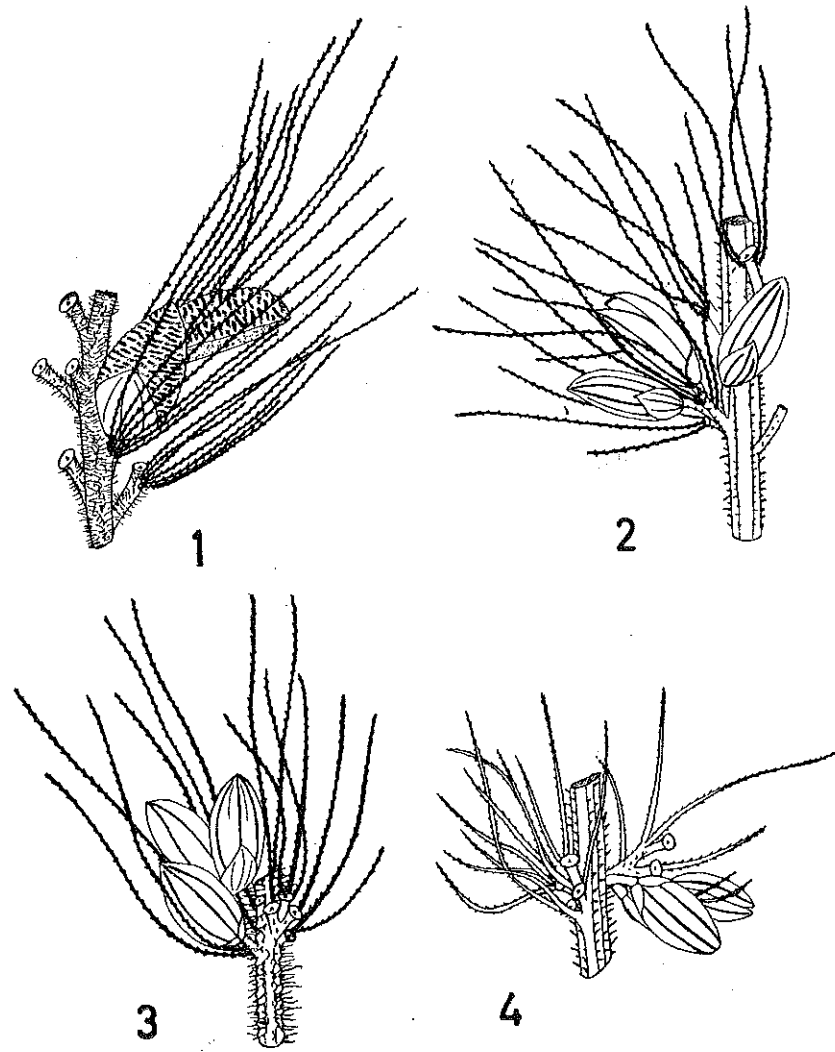


Fig. 1. Fragment of panicle: 1 *S. glauca*, 2 *S. verticillata*, 3 *S. viridis*, 4. *S. ambigua*. (x7).

rum: 5 km north of Tortum göl, cultivated land near little lake, 1000 m, 31.viii.1966, Davis 47639 A! Erzurum, Zorab 451 and 456! A 8/9 Çoruh: Murgul 500 m, 9.viii.1957, Davis 32202! C 3 Antalya: Alanya, under Citrus plantation, 25.ii.1966, A. and T. Baytop, ISTE 8546!; Antalya, 14.ix.1959, N. Zeybelc, ISTE 5760!; Alanya, cultivated ground, by stream, near the sea, summer 1967, Schultz 209!

S. glauca is well characterized by the following features: spikelets 3 mm long, upper glume half the length of the spikelet, palea of the lower floret as large as the spikelet, lemma and palea of the fertile floret transversely and coarsely rugose, axis of the panicle subtomentose.

The palea of the lower floret, which is as large as the spikelet in *S. glauca*, is represented in the other 4 species by a small membranous piece which is about the same size in all of them (Fig. 4).

2. *S. verticillata* (L.) Beauv., Ess. Agrost. 51, 171, 178 (1812).
Syn: *Panicum verticillatum* L., Sp. Pl. 82 (1782). Fig. 1,2 and 3.

Annual. Culm erect or geniculate at the base, simple or branched in the lower part, 20-80 cm high, scabrid below the panicle, Leaf-lades flat, 4-15 mm wide minutely scabrid on both surfaces and the margins, glabrous or regularly pilose. Ligule a dense fringe of short hairs. Panicle green or purplish, 4-10 cm high, 6-8 mm wide (excluding the bristles), axis scabrid, branches verticillate, with 2-6 spikelets. Bristles green or purplish, about 5 mm long, retrorsely scabrid, 10-16 bristles on a branch. Spikelets 2 mm long, pedicel short, scabrid. Glumes green or purplish, lower glume up to half of the spikelet, 3-nerved, upper glume as long as the spikelet, 5-7-nerved. Lemma of the lower floret 5-7-nerved, as long as the spikelet, palea membranous, small and narrow, with the margins plicate inside, half as long as the lemma, obtuse or 2-lobed at the apex. Lemma and palea of the fertile floret finely wrinkled with dots or short transversal lines, the two lateral borders of the palea smooth. Anther 0.8 mm long. Grain 1.6-1.8 mm long.

Cultivated land, fields, vineyards, orchards. From sea level to 800 m. June-October.

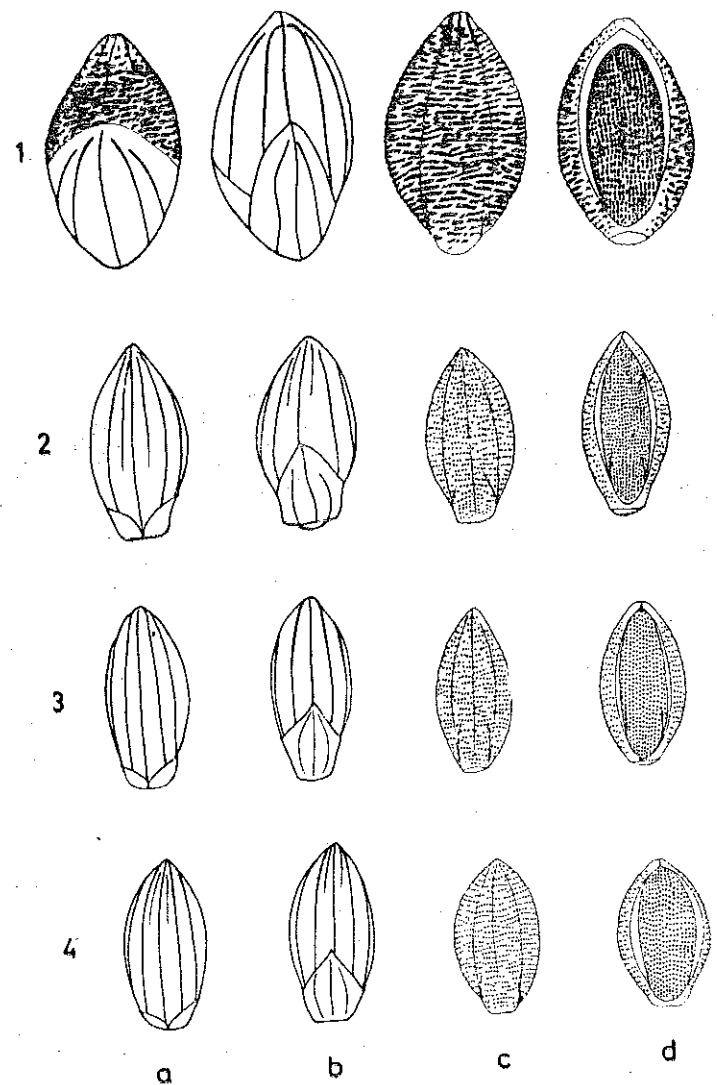


Fig. 2. Spikelet and fertile flower: 1 *S. glauca*, 2 *S. verticillata*, 3 *S. viridis*, 4 *S. ambigua*, a dorsal side of the spikelet with the upper glume, b ventral side of the spikelet with the lower glume and the lemma of the lower floret, c dorsal side of the fertile floret with its lemma, d ventral side of the fertile floret with its palea. (x 11).

A 2 (A) İstanbul: Beykoz - Akbaba, Kızıltoprak, Pendik - Tuzla, Pendik-Yakacık, *Aen!* A 2 Kocaeli: between Dil iskelesi and Yarımca, in vineyards, 30.x.1958, *T. Baytop*, ISTE 5778! A/B 4 Ankara, Hochschule, 6.vii.1932, *Kotte* 29! c 3 Antalya: Antalya, 14.x.1959, *N. Zeybek*, ISTE 5760 a! C 3/4 Antalya: Alanya, on the way to the Nursery, at the edge of orange gardens, 26.v.1966, *A. Baytop*, ISTE 9587! C 5 İçel: 5 km east of Mersin, 22.v.1959, *Hennipman and al.* 1326! C 5 Adana: Feke, Göksu gorge below Himmetli, 700 - 800 m, 9.viii.1952, *Davis* 19819! C 6 Hatay: İskenderun, Karaağaç, under datepalms, 1.vii.1944, *Kasaphgil* 84! C 6 Maraş: Maraş, 20.viii.1865, *Hausknecht!*

S. verticillata can be easily distinguished from the other species by its retrorsely scabrid bristles and its verticillate branches.

3. *S. viridis* (L.) Beauv., Ess. Agrost. 51, 178 (1812). Syn: *Panicum viride* L., Syst. Veg. ed. 10, 870 (1759). Fig. 1, 2, and 3.

Annual. Culm erect or geniculated at the base, simple or branched in the lower part, 10-50 cm high, scabrid below the panicle. Leaf-blades flat, 3-6 mm wide, minutely scabrid on both surfaces and the margins, margins sometimes wavy. Sheaths glabrous, the upper part of the lower sheaths often hairy, the margins, specially on the upper part, densely ciliate. Ligule a dense fringe of short hairs. Panicle green or yellowish, 2-6 cm long, 4-7 mm wide (excluding the bristles), axis scabrid and hairy, the hairs about 1 mm long, with a tubercle formed by the raised epidermis cells at the base, branches dense, alternate, with 2-6 spikelets. Bristles green, yellowish or purplish, straight or wavy, 4-8 mm long, antrorsely scabrid, 10-20 bristles on a branch. Spikelets 2 mm long, pedicel short, scabrid. Lower glume one third the length of the spikelet, 3-nerved, upper glume as long as the spikelet, 5-7-nerved. Lemma of the lower floret as long as the spikelet, 5-nerved, palea narrow, membranous, with the margins plicate inside, half the length of the lemma, obtuse or 2-lobed at the apex. Lemma and palea of the fertile floret finely wrinkled with dots and short transversal lines, the two lateral borders of the palea smooth. Anter 0.5 mm long. Grain 1.5 mm long.

Cultivated land, fields, gardens, vineyards, waste land, stony places railway lines, roadsides, riversides. From sea level to 2300 m. June-October.

A. 1 Tekirdağ: Kumbağ, vineyard, 8.x.1968, *A. Baytop*, ISTE 14704! 14 km east of Tekirdağ, on a isolated hill, 8.x.1968, *A. Baytop*, ISTE 14699! Silivri to Tekirdağ, 25 km after Silivri, 16.viii.1967, *A. and T. Baytop*, ISTE 11817! A 1 Kırklareli: between Büyükkarıştıran and Bedirköy, sunflower fields, 23.vii.1968, *A. Baytop*, ISTE 14475! A 2 (E) İstanbul: Büyükçekmece to Çatalca, 28.vii.1967, *A. Baytop*, ISTE 11569! Florya, 2.xi.1968, *A. Baytop*, 14664! Tarabya, *Azn!* Rumelihisar, Post! A 2 (A) İstanbul: Kanlıca, 31.viii.1963, *A. Baytop*, ISTE 7457! Çubuklu, Fenerbahçe, *Azn!* Railway station of Süreyya plâ-jı, 24.vi.1961, *A. Baytop*, ISTE 6742! Kartal, 26.vii.1960, *A. Baytop*, ISTE 5992! A 4 Zonguldak: South of Karabük, 250 - 300 m, gravel of river bed, 6.viii.1962, *Davis* 39044! Balıksık (near Yenice), 150 m, railway line, 22.vii.1962, *Davis* 37992! Bartın-Amasya 25.viii.1960, *Khan and al.* 793! A 5/6 Amasya: Kirazlıdere, 15.vi.1956, *M. Tanker*, ISTE 4505! Kirazlıdere, 17.vi.1956, *M. Tanker*, ISTE 4579! A 6 Ordu: 25.viii.1962, *Furse* 4149! A 8 Erzurum: 5 km North of Tortum gölü, 1000 m, cultivated land, 31.vii.1966, *Davis* 47639! Yusufeli Erzurum road, Tortum gölü, Northeast end, 1200 m, wayside, 9.vii.1960, *Stainton and Henderson* 6088! A/B 4 Ankara: Hochschule, 6.vii.1932, *Kotte* 29! Ankara, 9.vii.1942, *H Bağda*, ISTE 1102! B 1 İzmir: near Narlıdere 14.vi.1966, *A. Baytop*, ISTE 10054! B 2 Kütahya: between Inegöl and Tavşanlı, Erkek yolu, 1300 m, 30.viii.1959, *T. Baytop*, ISTE 5680! Yeşilköy, Tavşanlı, riverside, 31.viii.1959, *T. Baytop*, ISTE 5703! B 4 Konya: Yeltepe - Cihanbeyli vi.1942, *M. Başarman!* B 7 Tunceli: on the side of Frat river, 18.vii.1959, *M. Tanker*, ISTE 5569! and ISTE 5577! B 9 Bitlis: 2300 m, wet valley, 31.vii.1966, *Tong* 231! C 2 Antalya: Antalya, 10.ix.1959, *N. Zeybek*, ISTE 5759! on the way to Lara, 4.viii.1965, *N. and M. Tanker*, ISTE 8243! Elmalı to Finike road, streamside, 26.vii.1960 *Khan and al.*, 209! C 5 Adana: Feke, Göksu gorge below Himmetli, 700-800 m, 9.vii.1952, *Davis* 19327! C 6 Maraş: Süleymanlı, near stream, 4.vii.1964, *Davis!* C 9 Hakkâri: 12 km from Yüksekova, 2000 m, riverside scree, 4.ix.1967, *Duncan and Tait* 157!

The principal features that are characteristic for *S. viridis* are the presence on the scabrid panicle axis of hairs which have at their base a tubercle formed by the raised epidermis cells (Fig. 3 C), and the dense and not verticillate arrangement of the branches in the panicle.

4. *S. ambigua* Guss., Fl. Sic. Syn. 114 (1842). Syn. *S. decipiens* C. Schimper ex Nyman, Consp. Fl. Eur. 787 (1882) (7) — Fig. 1, 2 and 3.

Annual. Culm erect or geniculated at the base, simple or branched on the lower part, 10-60 cm high, scabrid below the panicle. Leaf-lades flat, 3-8 mm wide, minutely scabrid on both surfaces and the margins. Sheaths glabrous, the margins ciliate

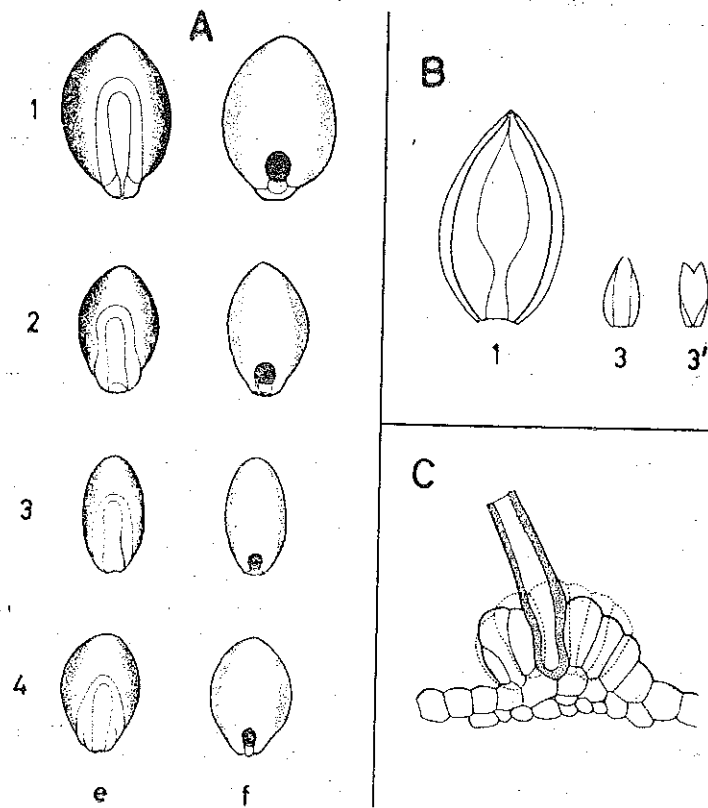


Fig. 3. A Grain: 1 *S. glauca*, 2 *S. verticillata*, 3 *S. viridis*, 4 *S. ambigua*, e dorsal side with the embryo, f ventral side with the hilum (x11). B Palea of the lower floret: 1 *S. glauca*, 3 and 3' *S. viridis* (11 x). C Tubercled base of a hair, from the panicle axis of *S. viridis* (x 245).

on the upper part. Ligule a dense fringe of hairs. Panicle green or purplish, 2-7 cm long, 4-7 mm wide (excluding the bristles), axis antorsely scabrid, branches with 2-5 spikelets, the lower ones verticillate. Bristles green or purplish, 3-5 mm long, antorsely scabrid, 4-10 on a branch. Spikelets 2 mm long, pedicel very short, scabrid. Glumes green or purplish. Lower glume half the length of the spikelet, 3-nerved, upper glume as long as the spikelet, 7-nerved. Lemma of the lower floret as long as the spikelet, 5-nerved, palea narrow, membranous, with the lateral margins

plicate inside, about half the length of the spikelet, entire or 2-lobed at the apex. Lemma and palea of the fertile floret wrinkled with dots or short transversal lines, the two lateral borders of the palea smooth. Anther 0.5 mm long. Grain 1-1.2 mm long.

Cultivated and waste land, railway lines. From sea level to 1000 m. June-October.

A 2 (E) İstanbul University garden, 20.ix.1958, A. Baytop, ISTE 5260! Küçükçekmece, railway line, 2.x.1968, A. Baytop, 14652! Pangaltı, Kanlıceviz, Yorgancı, Azn! Emirgân, Post! A 2 (A) İstanbul: Kanlıca, 31.viii.1963, A. Baytop, ISTE 7457! Suadiye, 14.vii.1964, A. Baytop, ISTE 7780! Railway station of Süreyya plâjı, 24.vi.1961, A. Baytop, ISTE 6741! B 8 Erzurum: Erzurum Zorab 442! and 455! C 3 Antalya: Antalya, 30 m, 23.vi.1935, Tengwall 30!

S. ambigua is very similar to *S. viridis*, but it differs from it in the verticillate lower branches of the panicle, in the antrorsely scabrid panicle axis and in the absence of tubercled hairs. On the other hand, the verticillate arrangement of the lower branches brings it close to *S. verticillata*. So, it has been considered sometimes as a variety of *S. verticillata* [*S. viridis* var. *ambigua* (Guss.) Coss. et Dur., Expl. Sc. Alg., 36 (1855)], sometimes as a variety of *S. verticillata* [*S. verticillata* var. *ambigua* (Guss.) Parl., Fl. Palerm. 36 (1845)], and later as an hybrid between the two (4, 9, 10). As the three morphologic characters mentioned above are present without any variations in the specimens we examined we accept *S. ambigua* Guss. as a distinct species.

5. *S. italica* (L.) Beauv., Ess. Agrost 51, 170, 178 (1812). Syn *Panicum italicum* L. Sp. Pl. 56 (1753).

Annual. Culm erect, 50-100 cm high, simple or branched in the lower part, very scabrid below the panicle. Leaf-blades flat, 6-20 mm wide, minutely scabrid on the upper surface and the margins. Sheaths glabrous, margins densely ciliate. Ligule a fringe of short hairs. Panicle very dense and lobulate, 3-30 cm long, 1-3 cm wide, axis and branches densely scabrid and hairy, hairs up to 2 mm long. Branches with numerous spikelets. Bristles up to 1 cm long, numerous and antrorsely scabrid. Spikelet 1.2-2 mm long, almost round, the upper floret only falling down at maturity, the rest of the spikelet remaining on the panicle. Lower glume half the length of the spikelet, 3-nerved, upper glume having about the

same length as the spikelet, 5-7-nerved. Lemma of the floret 5-nerved, as long as the spikelet, palea narrower and shorter, membranous, obtus at the apex. Lemma of the fertile floret with minute dots, palea with smooth lateral borders and slightly punctuate median part. Anther 0.8 mm long. Grain somewhat round, 1.5 mm long.

A 2 (E) İstanbul: Şişli, Kanlıceviz, *Asn!* A 2 (A) İstanbul: Çubuklu, Üsküdar - Bağlarbaşı, *Asn!* A 2 Bursa: Agricultural School of Bursa, viii. 1942, *Mete!*

S. italica is very different from the other species in having a larger and lobulate panicle, the upper floret only falling down at maturity and the rest of the spikelet remaining on the inflorescence.

SUMMARY

In Turkey, it occurs 5 species of *Setaria*. *S. glauca*, *verticillata*, *viridis* and *ambigua* are rather widespread. On the other hand, *S. italica*, according to the specimens, which are rather old, is collected from a restricted area. Although it is a grass cultivated in many countries for its grass and its grains, it is not actually cultivated in Turkey.

S. glauca is distinguished from the others by its larger spikelets, its transversely rugose lemma and palea, and the submentose panicle axis. The characteristic feature that identify *S. verticillata* is the retrorsely scabrid bristles. *S. viridis* and *ambigua* are very close; the former differs from the second mainly in the presence on the panicle axis of hairs tubercled at its base.

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ÖZET

Türkiyede 5 *Setaria* türünün yetiştiği tespit edildi. Bunlardan *S. glauca*, *verticillata*, *viridis*, *ambigua*, oldukça yaygındır. *S. italica*-nın yayılışı ise, oldukça eski olan örneklerle dayanmakta ve bunlara göre de dardır. Bu tür, gıda olarak kullanılan taneleri veya hayvan yemi olarak kullanılan yeşil kısımları için, birçok memleketlerde yetiştirilmekle beraber, memleketimizde halen ekilmemektedir.

S. glauca, spikulasının nispeten büyük olması, lemma ve paleanın enine kırışıklıklar taşıması, panikula ekseninin kısa ve sık tüylü olması ile diğerlerinden ayrılır. *S. verticillata*'yı tanıtan özellik, setalarındaki dikenciklerin setanın tabanına doğru yönelmiş olmasıdır. *S. viridis* ve *S. ambigua* ilk bakışta birbirine çok benzer. Bununla beraber, *S. viridis*, panikula ekseninde, tabanı şişkin örtü tüyler taşımasıyla *S. ambigua*'dan ayrılır.

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