

Giant Foxtail (*Setaria faberi*, Poaceae): a new alien species in the flora of Bosnia and Herzegovina

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Abstract. Giant Foxtail *Setaria faberi* R.A.W. Herrm. is originally native to E Asia and was introduced to some parts of the European Continent. It has been recorded for the first time in Bosnia and Herzegovina. The paper presents a short morphological description and photographs of the new alien species for Bosnia and Herzegovina, as well as distribution of the taxon.

Key words: alien, Bosnia, distribution, morphology, naturalization, plant

Introduction

The genus *Setaria* P. Beauv. belongs to the tribe Paniceae, subfamily Panicoideae and family Poaceae. There are 115–160 species worldwide occurring in tropical, subtropical and temperate regions. A total of 66 species and five varieties are present in the Old World (Morrone & al. 2014). Within the genus *Setaria*, 14 species have been recognized in Europe (Ryves & al. 1996, Valdés & Scholz 2009, Verloove 2016), among which five are present in Bosnia and Herzegovina: *S. pumila* (Poir.) Roem. & Schult., *S. verticillata* (L.) P. Beauv., *S. verticilliformis* Dumort, *S. viridis* (L.) P. Beauv., and *S. italica* (L.) P. Beauv. (Beck-Mannagetta 1903, Maslo 2016). *S. faberi* R. A. W. Herrm. has been reported in Europe as introduced in Austria, Azerbaijan, Belgium, Czech Republic, Denmark, Finland, France, Georgia, Germany, Great Britain, Hungary, Italy, Netherlands, Norway, Poland, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, and Ukraine (Karlsson 1987, Costea 1996, Dirkse & al. 2001, Schou 2009, Valdés & Scholz 2009, Oprea & al. 2012, Mesterházy & Király 2013, Verloove 2016). Recently, it was found in Croatia, in Istria near Poreč (Rottensteiner 2016).

Material and methods

The autumn floristic survey in 2017 in the area of Central Bosnia resulted in a new record for the alien flora of Bosnia and Herzegovina: *Setaria faberi* R.A.W. Herrm. Digital photographs and GPS coordinates were taken in the field. Identification of the specimens was done according to Fairbrothers (1959), Pohl (1962), Romiger (1962), Karlsson (1987), Amigo & al. (1991), Dirkse & al. (2001), and Verloove (2016). Nomenclature follows the Euro-Med checklist (Euro+Med 2006). The collected plant specimen was deposited in the herbarium (SARA, 51807). For herbarium abbreviations, see Holmgren & al. (1990).

Results and discussion

Setaria faberi R. A. W. Herrm., Beitr. Biol. Pflanzen 10: 51. 1910., (synonym: *Setaria macrocarpa* Luchnik 1937).

Morphologically, *S. viridis* is the most similar species (in Europe) to *S. faberi*, although the evolution is not so clear. According to Layton & Kellogg (2014), *S. faberi* and *S. viridis* are indeed distinct species morpho-

logically, cytologically and ecologically. On the basis of the phylogenetic and cytogenetic data from several studies, the same authors have concluded that *S. viridis* had crossed with an unknown close relative to produce the tetraploid *S. faberi*.

To separate these two species, we offer an adjusted key according to Karlsson (1987) and Morrone & al. (2014).

- 1 Leaf blades softly long hairy adaxially. Spikelets 2.6–3.2 mm long, each spikelet with (1) 3–6 bristles below. Upper glume $2/3$ – $3/4$ is the length of the spikelet. Panicle nodding from near the base at maturity, main axis covered with long hairs. *S. faberi*
- 2 Leaf blades glabrous on both surfaces. Spikelets 2–2.5 mm long, each spikelet with 1–3 (5) bristles below. Upper glume the same length as the spikelet. Panicle erect, rarely slightly nodding, main axis hirsute or tomentose *S. viridis*

Setaria faberi R. A. W. Herrm., (Fig. 1). Plants are caespitose annually. Stem erect, 50–200 cm tall, glabrous, nodes glabrous. Ligule is a ring of stiff, white

hairs 1–3 mm long. Leaf blades are flat, 0.5–20 mm wide and 7–35 cm long, usually with soft straight hairs on the upper surface. Panicle is cylindrical, densely flowered, spicate, usually drooping from near the base, 3–17 cm long, 1–3 cm wide. Panicle axis is densely villose, with long whitish hairs. Spikelets are 2.6–3.2 mm long, ellipsoid, planocovex, acute, pale, glabrous, subtended by one to six bristles each, about 10 mm long. Lower glumes are 1.2–1.8 mm long and acute, three-nerved; upper glume 1.8–2.2 mm long, obtuse, five-nerved, covering about $3/4$ of the fertile lemma. Lower sterile lemma 2.7–3 mm long, as long as the spikelet, membranous, 5–7-nerved, lower palea reduced, 1.4–1.6 mm long, narrowly lanceolate, hyaline. Lower floret absent; upper antherium 2.3–2.6 mm long, ellipsoid, plano-convex, apiculate, indurate, pale, transversely rugose, papillose. Caryopsis 1.8–2 mm long, ellipsoid. Chromosome counts are $2n=36$ (Nurse & al. 2009, Morrone & al. 2014).

Giant Foxtail is originally native to China, but was accidentally introduced to Europe as a contaminant in cereals from its secondary distribution range in the North America (Verloove 2016). The first finding of this species for Bosnia and Herzegovina came from Central Bosnia, at the beginning of October 2017, in the vicinity of Dolina village near Zavidovići (44°28'24.16"N; 18°09'33.10"E; elevation 205 m.). In the area, it grows on track ballast along the railway Sarajevo – Doboj, about 4 km northwards of the town of Zavidovići. This robust grass has become quite abundant in the area, and was found growing with *Ambrosia artemisiifolia* L., *Chenopodium album* L., *Echinochloa crus-galli* (L.) P.Beauv., *Equisetum telmateia* Ehrh., *Erigeron canadensis* L., *Euphorbia nutans* Lag., *Hibiscus trionum* L., *Panicum capillare* L., *Rumex obtusifolius* L., *Sedum sarmentosum* Bunge, *Setaria pumila* (Poir.) Roem. & Schult, and *Setaria viridis* (L.) P. Beauv. About twenty specimens were recorded along the railway, at a linear distance of about 2 km.

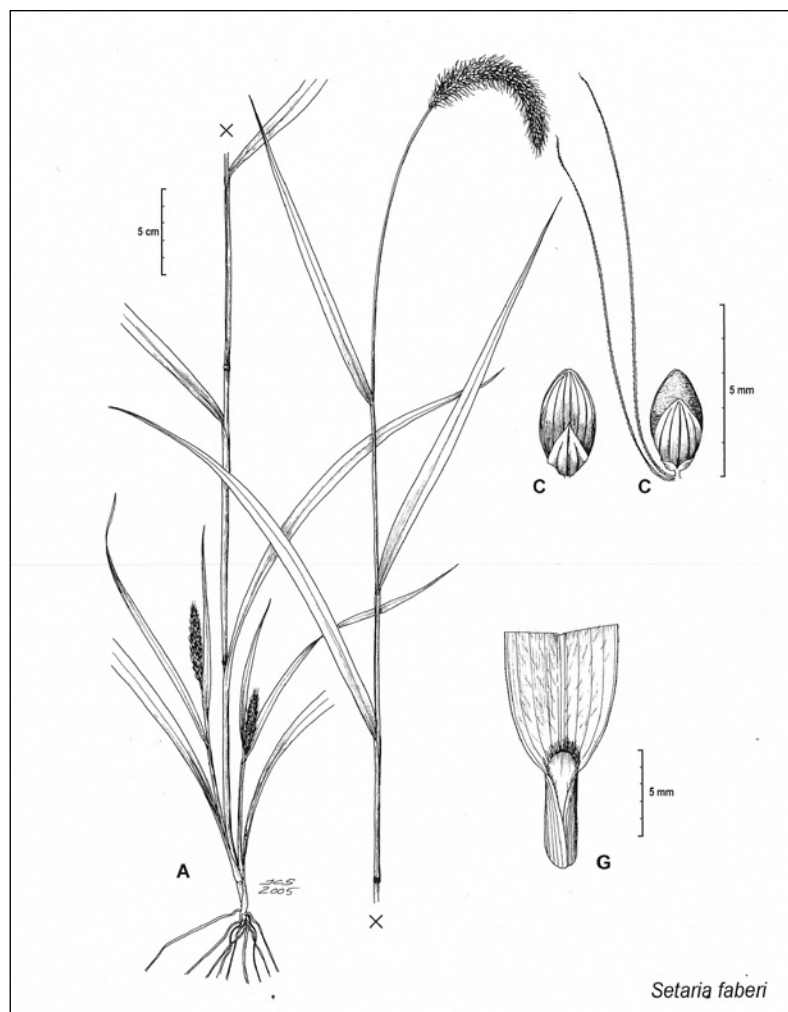


Fig. 1. *Setaria faberi* R. A. W. Herrm. A. habitus; C. spikelets; G. leaf sheath with lower part of leaf blade. (Drawing is from the book *Danmarks Græser*, by Jens Christian Schou, with the author's permission.)

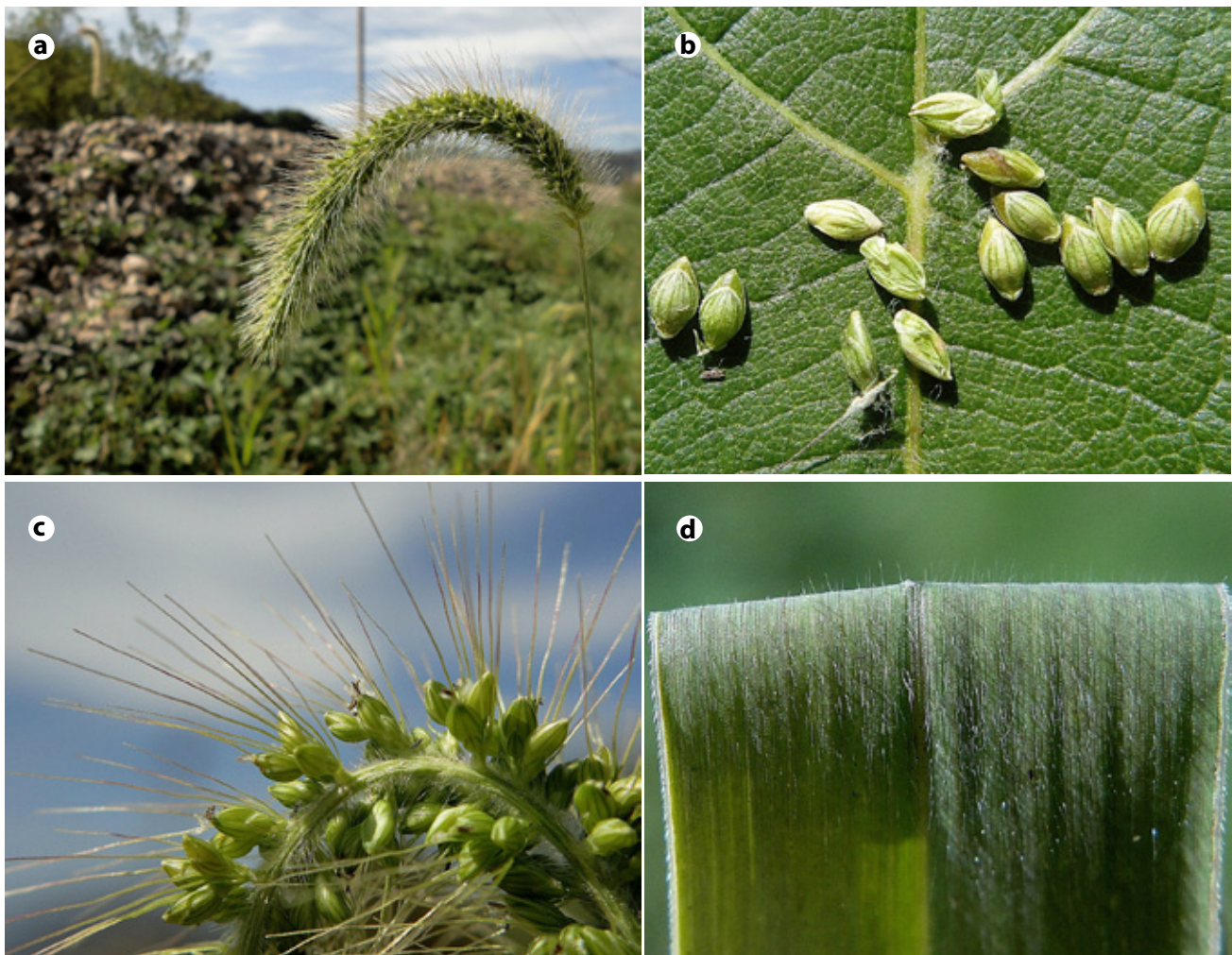


Fig. 2. *Setaria faberi* in the vicinity of Dolina village near Zavidovići. **a.** inflorescence; **b.** spikelets; **c.** densely villose panicle axis; **d.** upper surface of leaf blade (Photographs by Šemso Šarić, 5th October 2017).

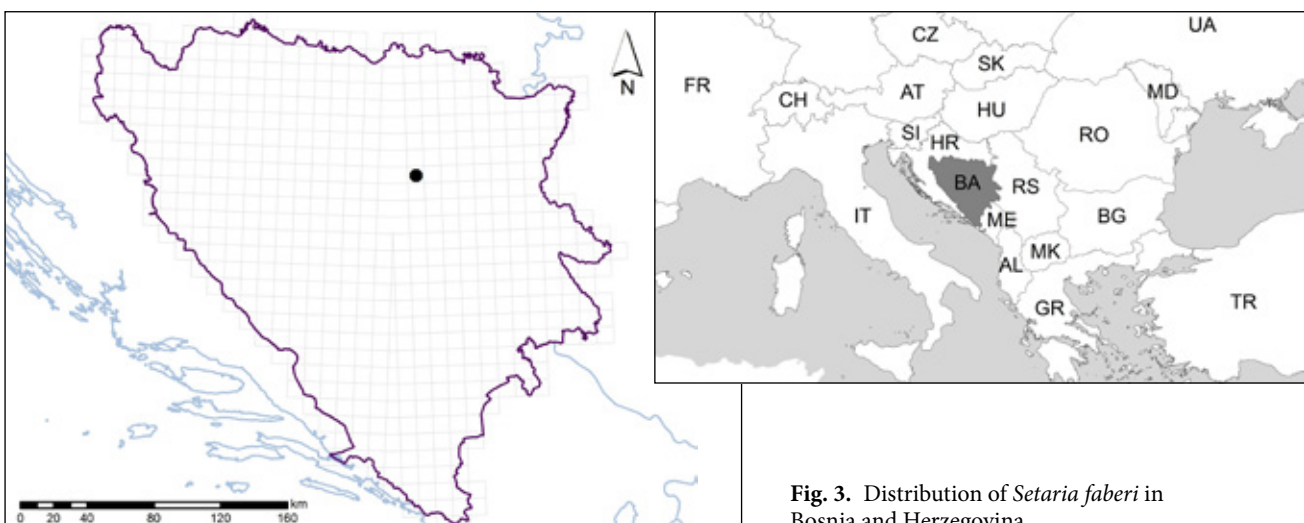


Fig. 3. Distribution of *Setaria faberi* in Bosnia and Herzegovina.

This species flowers and bears fruit from August to December. Adult plants may produce over 2000 seeds per panicle. Seeds can be dispersed by farm machin-

ery, water courses and by birds. Giant Foxtail has become a nuisance in cultivated fields in North America, such as maize and soybeans (Rominger 1962, Nurse

& al. 2009). The species is also recorded as a pernicious weed in maize fields in some countries of Europe (Dirkse & al 2001, Gregor 2006, Melzer 1984, 2005, Mesterházy & Király 2013, Verloove 2016).

The mode of introduction in the flora of Bosnia and Herzegovina is not certain. Possibly, it happened accidentally. The potential invasive characteristics of the species should be monitored in the coming years. Probably, it already occurs in the country more widely than the new records indicate, but most likely is overlooked by collectors because of its similarity to other *Setaria* taxa, and especially *S. viridis*.

Confusion between the two species in the field is often due to immature *S. faberi* specimens being compared with fully mature plants of *S. viridis*. Several characters can reliably separate the species. *S. viridis* has always glabrous leaf blades, whereas those of *S. faberi* are always softly long hairy adaxially. The relatively large gap between the apices of the upper glume and lower lemma, compared with the very small or nonexistent gap of *S. viridis*, also separates reliably the two species. *S. faberi* is also much more sensitive to shortage of water (Layton & Kellogg 2014).

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