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First record of the alien *Diplachne fascicularis* (*Poaceae*) in Bulgaria

Abstract

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Diplachne fascicularis (*Poaceae*), a taxon native to North and South America, is reported for the first time as an alien species for the flora of Bulgaria and of the Balkan Peninsula. It was recorded in rice fields in Central Bulgaria, in the Thracian Lowland floristic region. Brief morphological description is provided based on the material collected from the Bulgarian localities. This species grows in damp to wet places at the margins of rice fields and is already rather abundant. Distinguishing characters from the morphologically most similar native species (*Cleistogenes serotina* and *C. bulgarica*) have been highlighted. The invasiveness and spreading potential of the species have been discussed based on personal observations and data from the literature.

Key words: *Diplachne fusca* s.l., *Gramineae*, *Leptochloa*, rice fields, weeds, xenophytes.

Introduction

During the past decade the alien species of vascular plants in the Bulgarian flora received particular attention in floristic studies. Poorly studied regions and habitats of Bulgaria, e.g. roadsides, railroads, harbour areas, river banks, urban areas, were explored and this resulted in the discovery of numerous floristic novelties: *Ambrosia trifida* (Stoyanov & al. 2014), *Clematis tibetana* (Vladimirov & al. 2014a), *Epilobium adenocaulon* (Kalníková & Palpurina 2015), *Euphorbia prostrata* (Vladimirov & al. 2014b), *Lepidium virginicum* (Stoyanov & Vladimirov 2015), *Oenothera glazioviana* (Kalníková & Palpurina 2015), *Solanum elaeagnifolium* (Vladimirov & al. 2015) are among the most significant examples.

The aim of this article is to report for the first time the occurrence of *Diplachne fascicularis* (*Poaceae*) in Bulgaria.

Material and methods

Plant material was collected in rice-fields in Southern Bulgaria. Herbarium specimens were deposited in the herbarium (SOM) of the Institute of Biodiversity and Ecosystem Research. Morphological characters were noted from the gathered herbarium specimens

and compared with the data from relevant literature (Snow 2003; Stace 2010). Data about the habitat and populations of the species are based on personal observations.

Results and discussion

Diplachne fascicularis (Lam.) P. Beauv., Ess. Agrostogr.: 81, 160, pl. 16, f. 9. 1812 [syn. *Festuca fascicularis* Lam., *Leptochloa fascicularis* (Lam.) A. Gray, *Leptochloa fusca* subsp. *fascicularis* (Lam.) N. Snow, *Diplachne fusca* subsp. *fascicularis* (Lam.) P. M. Peterson & N. Snow] (Figs. 1-2).

Annual. Stems 70–100 cm, somewhat compressed, usually branched, erecto-patent to suberect, with hollow internodes. Sheaths scabrid to subglabrous; ligules 2–8 mm, membranous, becoming lacerate at maturity; leaf blades 15–45 × 0.3–0.8 cm, scabrid, the uppermost exceeding the panicle. Panicle partly enclosed in the uppermost leaf sheath, 10–60 cm long, with 10–25 branches; branches 4–12 cm long, erecto-patent to suberect. Spikelets sessile (peduncle 0.4–0.6 mm), 6–11 mm long, 5–11-flowered; lower glume ca. 2–2.5 mm, lanceolate, upper glume ca. 4 mm, elliptic; lemmas lanceolate, 3-veined, with silky hairs at base and along the margin in the lower half, bifid at apex, with 0.5–2.5 mm long apical awn arising from the notch, midrib keeled, usually scabrid.



Fig. 1. *Diplachne fascicularis* – habitus.



Fig. 2. *Diplachne fascicularis* – panicle.

Flowering August – September, fruiting October – November.

The taxonomic position of *D. fascicularis* is not resolved yet. Here, specific rank has been accepted for consistency with the Euro+Med treatment (Valdés & Scholz 2009). However, other taxonomic sources as well as recent molecular studies suggest the subspecific rank may be more appropriate – *Diplachne fusca* subsp. *fascicularis* (Peterson & al. 2015; Verloove 2016) or *Leptochloa fusca* subsp. *fascicularis* (Snow 1998, 2003).

In the Bulgarian flora, the species is morphologically close to *Cleistogenes serotina* (L.) Keng and *C. bulgarica* (Bornm.) Keng. *Diplachne fascicularis* differs from both species of *Cleistogenes* by the annual biological behavior (*C. serotina* and *C. bulgarica* are both herbaceous caespitose perennials), membranous ligule becoming lacerate at maturity (ligule a ciliate rim in the other two species), much longer panicle – 10–60 cm (usually 4–10 cm long in both species of *Cleistogenes*), spikelets of 5–11 florets (of 2–5 florets in the other two species) (cf. Kožuharov 1963; Tutin 1980). Also the habitat preferences of the species are very different – *C. bulgarica* and *C. serotina* grow in dry stony grasslands, whereas *Diplachne fascicularis* is a weed in rice-fields.

Distribution in Bulgaria: – Thracian Lowland floristic region (Fig. 3): ca. 2.5 km North of Tsalapitsa village, margin of a rice field along the road to Saedinenie town, 190 m a. s. l., 42.209332° N, 24.562244° E, 12 Oct 2016, *V. Vladimirov & M. Delcheva* (SOM 173164, 173165); ca. 3 km North of Tsalapitsa village, margin of a rice field along the road to Saedinenie town, 194 m a. s. l., 42.214107° N, 24.559780° E, 11 Nov 2016, *V. Vladimirov & M. Delcheva* (SOM 173166); *loc. ibid.*, 195 m a. s. l., 42.223843° N, 24.555600° E, 11 Nov 2016, *V. Vladimirov & M. Delcheva* (SOM); ca. 3.5 km W-SW of Saedinenie town along the road to Pishtigovo village, margin of a rice field, 208 m a. s. l., 42.252014° N, 24.501905° E, 11 Nov 2016, *V. Vladimirov & M. Delcheva* (SOM).

Distribution worldwide: – Native to parts of North and South America: from Southern British Columbia and Ontario in the USA to Argentina. Introduced to Asia and Europe (<http://emonocot.org/taxon/urn:kew.org:wcs:taxon:474908>). In Europe, reported as an alien in Spain and Portugal (Valdés & Scholz 2009; Osca 2013; Valdés 2015) and Italy (Romani & Tabacchi 2000; Celesti-Grapow & al. 2009, 2010). Recently introduced to Turkey, where it adapted to rice fields and became an important weed in many regions of the country (Altop & al. 2015). A rare casual in Belgium, first recorded as a wool alien (Verloove 2016), and in the Czech Republic (Kubát & al. 2002; Pyšek & al. 2012). Apparently, this is the first report of the species for the Balkan Peninsula.

Habitats and spreading potential: – In Bulgaria the species has been recorded only in and at the margins of rice fields. The species is already rather abundant at the margins of the rice fields, producing a large amount of seeds which fall down on the ground. Personal observation on the management practices of rice fields suggest that seeds of all species growing there are transported by the running water, and especially by the machineries used for land cultivation – large amounts of mud containing all fallen seeds of the weedy species stick to the tyres of the machines and are transported all around. It is perhaps only a matter of time that seeds of *D. fascicularis* are moved to the irrigation channels and other suitable



Fig. 3. Distribution map of *Diplachne fascicularis* in Bulgaria.

wet habitats nearby. An increase of the presence of *D. fascicularis* in rice fields over the past few years was reported for the region of Valencia, Spain (Osca 2013). Seed trade is pointed as the main pathway for the introduction and spread of the species in Spain (Del Monte & Cortés 2000) and Italy (Romani & Tabacchi 2000).

Diplachne fascicularis is an important weed in cereal crops, especially rice fields, regarded in Southern Europe as a species with a maximum spreading potential and maximum score for weediness, moderately easy to control (Weber & Gut 2005).

Other alien species around the rice fields were observed too, e.g. *Erigeron canadensis* L., *E. sumatrensis* Retz. (very abundant), *E. bonariensis* L., *Bidens frondosus* L., *Xanthium italicum* Moretti.

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