

Grindelia squarrosa: a new alien species for the Bulgarian flora

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Abstract. *Grindelia squarrosa* (Asteraceae) is reported as a new alien species to the Bulgarian flora. It is native to North America and has been recorded in the floristic regions of the Black Sea Coast (Northern), Northeast Bulgaria and Sofia Region. The species should be considered naturalized in the Bulgarian flora. The recorded localities and some notes about the habitats and populations of the taxon are presented.

Key words: alien plants, Asteraceae, Bulgaria, *Grindelia*, naturalized plants, vascular plants

Introduction

Recent studies of the alien species in the Bulgarian flora have resulted in the discovery of numerous new taxa for the country (e.g. Tzonev 2007; Jehlík & Scholz 2009; Petrova & Vladimirov 2009, 2012; Vladimirov 2009; Vladimirov & Petrova 2009a, b; Zieliński & al. 2012). Particular attention has been paid to the alien flora along railways and roads, especially in close proximity to border passes and international ports. This paper reports one more species, *Grindelia squarrosa*, which was discovered along railways in East Bulgaria and near Sofia.

Material and methods

Plant material was collected by the authors along railway tracks. Morphological characters were taken from the gathered material and were compared with data from literature (Hansen 1976; Strother & Wetter 2006). Taxonomy of all other species mentioned in the text follows Delipavlov & Cheshmedzhiev (2003). All collected herbarium specimens are deposited in the

Herbarium (SOM) of the Institute of Biodiversity and Ecosystem Research.

Results and discussion

Grindelia squarrosa (Pursh) Dunal, Mém. Mus. Hist. Nat. 5: 50 (1819) (Figs. 1, 2).

Biennial to perennial plant, 10–50(100) cm tall. Stems erect, often branched in the upper part, glabrous. Cauline leaves 2–7 cm, oblong, oblanceolate to spatulate, about 2–5 times as long as wide, ±amplexicaul, resinous-punctate, serrate-crenate, glabrous. Capitula few to numerous, in corymbiform arrays. Involucre hemispheric, 6–11 × 8–20 mm. Phyllaries in 5–6 series, 3–8 × 0.5–1 mm, with cylindrical, square-deflexed apex, strongly resinous. Ligules usually numerous, 7–15 mm, yellow. Inner florets yellow. Achenes 2–4 mm, oblong, stramineous to brown. Pappus of 2–3(8) straight awns, 3–5 mm, usually finely serrate, readily falling.

Flowering July to October, fruiting August to October.



Fig. 1. *Grindelia squarrosa* – whole plant (photo V. Vladimirov).

Grindelia squarrosa belongs to *Asteraceae* and is native of North America. It has been introduced to many European countries, mostly in East Europe. On the Balkan Peninsula it has been reported only from Romania (Greuter 2006–2009; Sîrbu & Oprea 2008). The species is included in the ‘List of worst invasive alien species threatening biodiversity in Europe’ (Larsson & al. 2007), since in some countries, e.g. the Ukraine and Moldova, it is reported as an invasive alien species threatening native biodiversity (Mosyakin 2006; Sîrbu & Oprea 2008).

Examined specimens for comparison: **W:** sub *G. squarrosa* – s.n., North America, Saskatchewan, 1857–8, coll. *E. Bourgeau*; s.n., Californien, Ebened. Sacramento, 1872–73, coll. *H. Wawra* (Raise d. Prinz. Phil. u. Aug. v S.-Coburg um die Welt 1872–73, no. 32); 2003-08964, Russische Federation, St. Saratow, Eisenbahnstation Saratow – 3, Alte Eisenbahngleise, 29.08.2002, coll. *A. Suchorukow & M. Beresutzki*; 2009-117773, USA, Vtah, Promonfory, 1973, leg. *R. Albert*; 2009-19758, Canada, Manitoba, Seton Wayside Park, 11 km W of Sidney on Trans Canada Hwy., 49°54'50"N, 99°14'W, in dry sandy soil by roadside, 30.08.1985, coll. *D. Punter* 8502; 1960-16488, Canada,



Fig. 2. *Grindelia squarrosa*: **A** – involucre; **B** – flower head from above (photos V. Vladimirov).

British Columbia, Chilcotin suspension bridge on the road from Williams Lake to Riske Creek, 22.07.1056, coll. J.A. Calder & al.; 1962-10584, USA, South Dakota, Fall River County, Black Hills, 16.08.1956, coll. C.P. Paise; 1958-20523, USA, Illinois, Peoria County, 16.08.1947, coll. V.H. Chase.

Distribution in Bulgaria: Black Sea Coast (North-ern): along the railroad tracks at Razdelna Shunting-Yard Station, Varna district, 43.16748°N, 27.63644°E, 5–10 m alt., 27.08.2009, coll. V. Vladimirov & A.S. Petrova & 02.10.2009, coll. V. Vladimirov & A.S. Petrova; Ferryboat Complex W of Beloslav town, Varna district, 43.18137°N, 27.66762°E, ca. 10 m alt., 02.10.2009, coll. V. Vladimirov, A.S. Petrova & I. Yankov; **North-east Bulgaria:** Ruse, along railways at Ruse-Razpreditelna Railway Station, 43.85686°N, 26.00180°E, ca. 60 m, 14.09.2010, coll. V. Vladimirov & A.S. Petrova; **Sofia Region:** railway station at Kazichene, 42.65112°N, 23.47495°E, ca. 550 m, 27.08.2010, coll. V. Vladimirov & D. Hadzhieva.

About three hundred flowering specimens were recorded at the Razdelna Station locality, at a linear distance of ca. 650 m. Other species that grew in close proximity were: *Amaranthus albus*, *Ambrosia artemisiifolia*, *Artemisia absinthioides*, *Centaurea diffusa*, *Cephalaria transylvanica*, *Chondrilla juncea*, *Cichorium intybus*, *Clematis vitalba*, *Crepis foetida*, *Echium vulgare*, *Erigeron canadensis*, *Euphorbia davidii*, *Galium humifusum*, *Gypsophila trichotoma* – an endangered species in Bulgaria (Petrova 2009), *Lactuca saligna*, *Linaria genistifolia*, *Melilotus officinalis*, *Petrorhagia prolifera*, *Portulaca oleracea*. In the locality at the Ferryboat Complex, which is close to the Razdelna Railway Station, numerous spots and groups of plants were recorded with hundreds of individuals, at a distance of ca. 2 km. In the locality in Kazichne, about a thousand flowering specimens were observed at a linear distance of ca. 1 km, whereas the locality in Ruse comprised about 200 flowering specimens. Plants grew in groups of few to several scores of individuals. The composition of the flora was similar to that in the first mentioned locality.

The plant is naturalized in the Bulgarian flora, with variously sized populations, consisting of a few dozens to a few hundred individuals. According to the EUNIS classification, the habitats where the species was recorded belong to: **J4.1.** Disused road, rail and other constructed hard-surfaced areas; and **J4.3.** Rail networks (Hill & al. 2004; EEA 2012).

Most likely the species was introduced independently in the three floristic regions, since the localities are rather far away from each other, and no direct trains run between them. In the localities at the Beloslav Ferryboat Complex and Razdelna Station, the species may have been introduced from the Ukraine, with commodities transported across the Black Sea. A similar distribution pattern in Bulgaria shows *Euphorbia davidii* Subils which was recently discovered along the same railroads (Vladimirov & Petrova 2009b), connecting the Ferryboat Complex with the national railway network of Bulgaria. Both species have been reported as alien and even invasive in the Ukrainian flora (Mosyakin 2006; Geltman 2012). In the locality in Ruse, the species was probably introduced along the railway transport corridor from Romania.

A relatively easily distinguished species from all other representatives of *Asteraceae* in Bulgaria by the sticky, resinous leaves and resinous involucre bracts with strongly squarrose-deflexed apex.

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