

Sisymbrium volgense (BRASSICACEAE) IN THE FLORA OF ROMANIA

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Abstract. *Sisymbrium volgense* M. Bieb. ex E. Fourn., native from South-Western Russia, is reported in the flora of Romania. This species was found in the area of the Socola railway station, in the East of Iasi city (North-Eastern Romania). The description and general distribution of the species, as well as some data relating to its biology, ecology and phytosociology are given in the paper. An identification key for this species and other related taxa from the flora of Romania is provided.

Keywords: alien plant species, *Sisymbrium*, flora of Romania, identification key

INTRODUCTION

An increasing number of alien plants occur as naturalized populations in North-Eastern Romania. In the last years, some plant species, new for the flora of this country, were recorded in the surroundings of Iasi city, namely: *Euphorbia dentata* Michx. [22], *Grindelia squarrosa* (Pursh) Dunal [28], *Artemisia lancea* Vaniot, *A. lavandulaefolia* DC., and *A. argyi* H. Lév. et Vaniot [Sirbu & Oprea 2010, unpublished data]. To these, now we can add an other naturalized alien species, namely *Sisymbrium volgense* M. Bieb. ex E. Fourn. The genus *Sisymbrium* L. includes about 94 species, disjunctly distributed in the Old World (41 species) and the New World (53 species) [35]. Among these, a number of 19 species occur in Europe [1, 2] and only 8 species were recorded into the spontaneous flora of Romania, until now, all of them being indigenous [6, 21, 23]. According to DAISIE (2009) [8], a number of 16 alien species of *Sisymbrium* L. have been reported in various countries of Europe, so far. Of these, 3 species are from outside Europe, and 13 species are native in certain regions of the continent, but became alien outside their native range. Although *S. volgense* (native from South-Western Russia), is locally naturalized in many European countries [1, 2, 8], occurrence of this species has not been previously reported from Romania [6, 21, 23].

MATERIALS AND METHODS

The species was recorded during our recent field works on alien plants, in the historical province of Moldavia (Romania), in a research project funded by UEFISCSU Romania, contract No 1110 / 2009. The geographic coordinates were recorded using eTrex Legend HCx GPS system. Biological and ecological features of the species were noted on the field. Voucher specimens are deposited in the Herbarium of University of Agricultural Sciences and Veterinary

Medicine Iasi (IASI). The species was identified using both *Flora Europaea* [1, 2] and *Flora SSSR* [33]. The plant nomenclature follows Tutin et al. (1964-1980; 1993) [31, 32]. Casual, naturalized or invasive plants are understood according to Richardsdson et al. (2000) [26]. Phytosociological relevés were made according to the standard Central European phytosociological method [5].

RESULTS

A new alien species for the flora of Romania was found, namely *Sisymbrium volgense* M. Bieb. ex E. Fourn. *Rech. Fam. Crucif.* 97 (1865) (vernacular name: Russian mustard). We first found this species, as rosettes of leaves, in September 2009, at Socola - Iași shunting railway station (47°08'41.0" N, 27°37'05.1" E; altitude: 42 m). The following year, in May-June, the plant abundantly flourished and fructified in that place, making possible its identification.

S. volgense (Fig. 1-5) is a perennial herbaceous plant, rhizomatous (hemicryptophyte), 30-75 cm high, glaucescent, more or less glabrous or shortly pubescent on the stem toward the base. Basal and middle leaves lyrate-pinnate-lobate or pinnatifid with a few oblong-lanceolate lateral lobes at base, the terminal lobe large, broad-ovate, with irregularly callose teeth; the upper leaves ± entire, linear-lanceolate. Inflorescence lax paniculate. Flowers with sepals of 3.5-4 mm long, the two external ones with a callosity under the top; petals yellow, of 6-10 mm long. Siliqua glabrous, 25-40(-60) × 0.7-1.2 mm, tetragonous-cylindrical, somewhat flattened, with a style of about 0.5 mm long, valves with weak lateral veins. Seed elliptic, angular, yellowish brown, 1.2 × 0.75 mm.

The main morphological differences between *S. volgense* and the other *Sisymbrium* species in the flora of Romania are given in the following identification key:

- | | |
|--|---------------------------------|
| 1a. Siliqua of 10-20 mm, closely appressed to the axis of inflorescence | <i>S. officinale</i> (L.) Scop. |
| 1b. Siliqua of (10-) 15-100 mm, not closely appressed to the axis of inflorescence | 2 |
| 2a. Leaves ovate-lanceolate, entire or dentate | <i>S. strictissimum</i> L. |
| 2b. At least the lower leaves deeply lobed or divided | 3 |
| 3a. Petals ± as long as sepals. Anthers of 0.7 mm long. Young siliquae distinctly overtopping the upper flowers and buds | <i>S. irio</i> L. |
| 3b. Petals distinctly longer than sepals. Anthers of 1-3 mm. Young siliquae not overtopping the upper flowers and buds | 4 |

4a. Pedicel about as thick as the siliqua, usually at least of 0.7 mm in diameter at the base	5
4b. Pedicel thinner than the siliqua, to 0.5 mm in diameter at the base	6
5a. Uppermost leaves ± sessile, pinnatisect, with the terminal lobe linear. Sepals horizontal at flowering times, the external ones having horned tops	<i>S. altissimum</i> L.
5b. Uppermost leaves shortly petiolated, entire or lobate, the terminal lobe oblong or lanceolate. Sepals erect at flowering times, the external ones non horned	<i>S. orientale</i> L.
6a. Annual, usually densely hispid. Seeds 0.7-1 mm	<i>S. loeselii</i> Jusl.
6b. Biennial or perennial, glabrous or glabrescent (at least in the middle and upper parts). Seeds 1-1.5 mm	7
7a. Septum of the siliqua opaque, whitish or yellowish. Stem green, glabrous or with short upwardly curved hairs. Plant biennial (sometimes perennial).....	<i>S. austriacum</i> Jacq.
7b. Septum of the siliqua hialine. Stem ± glaucous, pubescent or hispid at base (with not curved hairs), glabrous above. Plants perennial	8
8a. Lower leaves triangular-hastate, with 1(-2) pairs of prominent lobes. Stem usually pubescent at base. Siliqua 1-1.2 mm in diameter	<i>S. volgense</i> M. Bieb. ex E. Fourn.
8b. Lower leaves deeply pinnatisect, with 2-4 pairs of prominent lobes. Stem usually hispid at the base. Siliqua 0.7-1 mm in diameter	<i>S. polymorphum</i> (Murray) Roth.



Figure 1. *Sisymbrium volgense* M. Bieb. ex E. Fourn. - general habitus.



Figure 2. *Sisymbrium volgense* M. Bieb. ex E. Fourn. - scanned specimen.



Figure 3. *Sisymbrium volgense* M. Bieb. ex E. Fourn. - inflorescence.



Figure 4. *Sisymbrium volgense* M. Bieb. ex E. Fourn. - young siliquae.

At Socola - Iași, *S. volgense* blooms in May (-June) and the fruits ripen in June (-July). Flowers are pollinated by insects (bees) (see Fig. 3). It grows in ruderal places, along the railway embankments, on shallow and skeletal soils, relatively dry during the vegetation seasons. The species occurs as viable populations that compete well with the native vegetation, forming, together with other ruderal plants, relatively dense phytocoenoses (Fig. 5), with coverage between 75-80%, stretched on surfaces of 6-8 m². These phytocoenoses dominated by *S. volgense*, can be related to the alliance *Dauco-Melilotion* Görs 1966, well-represented in the species list. The vegetation composition is presented in Table 1.

Table 1. Phytocoenoses with *Sisymbrium volgense*, at Socola-Iași (North-Eastern Romania).

Date	28 th of July, 2010	
	6	8
Surface (m ²)	75	80
Coverage (%)	23	27
No. of species	1	2
Relevés number		
Dauco-Melilotion & Onopordetalia acanthii		
<i>Sisymbrium volgense</i>	4	4
<i>Crepis foetida</i> subsp. <i>rheoadifolia</i>	+	+
<i>Daucus carota</i> subsp. <i>carota</i>	+	+
<i>Grindelia squarrosa</i>	+	+
<i>Melilotus alba</i>	+	.
<i>Verbascum speciosum</i>	+	+
<i>Artemisia absinthium</i>	+	+
<i>Echium vulgare</i>	.	+
<i>Melilotus officinalis</i>	.	+
Artemisietea vulgaris		
<i>Poa angustifolia</i>	1	2
<i>Erigeron annuus</i> subsp. <i>annuus</i>	+	+
<i>Elymus repens</i> ssp. <i>repens</i>	+	.
<i>Linaria vulgaris</i>	+	+
<i>Ballota nigra</i> subsp. <i>nigra</i>	.	+
Sisymbrietalia & Stellarietea mediae		
<i>Ambrosia artemisiifolia</i>	+	+
<i>Atriplex patula</i>	+	.
<i>Torilis arvensis</i>	+	+
<i>Lactuca serriola</i>	+	+
<i>Chenopodium album</i>	+	+
<i>Polygonum aviculare</i>	+	+
<i>Setaria viridis</i>	+	+
<i>Conyza canadensis</i>	.	+
Festuco-Brometea		
<i>Plantago lanceolata</i>	+	+
<i>Achillea collina</i>	+	+
<i>Centaurea biebersteinii</i> subsp. <i>biebersteinii</i>	+	+
<i>Cynodon dactylon</i>	.	+
<i>Gypsophila perfoliata</i>	.	+
<i>Potentilla recta</i>	.	+
Molinio-Arrhenatheretea		
<i>Arrhenatherum elatius</i> subsp. <i>elatius</i>	+	.
<i>Carex hirta</i>	+	.
<i>Dactylis glomerata</i>	.	+
<i>Taraxacum officinale</i>	.	+



Figure 5. Phytocoenosis with *Sisymbrium volgense*, at Socola-Iași railway station (North-Eastern Romania).

DISCUSSIONS

History of introduction. *S. volgense* is native to steppe regions from North of Kazakhstan, and South-West of Russia (Volga and Don rivers basins) [1, 2, 16, 33]. In Europe, the species is known, as an alien plant, at least since year 1887 (Germany) [16]. Today it is casual or locally naturalized in some European countries, as Britain, Czech Republik, Germany, Poland, Western, Central and Northern Russia [1, 2, 7, 11, 18, 27, 30], Denmark [17], Norway [9], Belgium [34], Ukraine [10, 19], Latvia [20], as well as in Russia - Far East [13].

In Romania, neither *Flora R. P. Române* (vol. 3) [21], nor other older or latest floras [3, 4, 6, 23, 25] contain any mention of *S. volgense*, so it is the first record of this species into the flora of the country. Probably it was accidentally introduced here by railway transport, from the former SSSR.

Biology and ecology. The morphological characters seen in the specimens examined by us fully correspond to those presented by *Flora Europaea* [1, 2], and *Flora SSSR* [33]. *S. volgense* is a herbaceous perennial (hemicryptophyte), diploid (2n = 14) [15], that reproduces both generatively, through seeds, and vegetatively, by adventitious shoots produced by roots [11]. As it has been seen, the plant blooms in May-June and the fruits ripen in June (-July). Flowers are pollinated by insects (bees). Rosettes of leaves can be seen both in autumn (September-October) and in spring (March-April).

According our observations, which are consistent to other authors [11, 18], *S. volgense* is a heliophyllous, xero-mesophyllous, mezotermophyllous and moderately nitrophyllous species. In the native area, it grows in steppe and as a weed, wherefrom it is dispersed by wind along the railways [33]. In other regions it also prefers disturbed habitats such as ruderal places, vacant lands, roadsides, train stations, railways [11, 14, 30]. Usually its spread is strongly correlated with human population density in some European cities (it is regarded as an urbanophile plant) [18].

Phytosociological data. According to our observations, plant communities where this species grows at Socola-Iași include many characteristic species to alliance *Dauco-Melilotion* Görs 1966. Species from *Sisymbrietalia officinalis* J. Tx. in Lohm. et al. 1962 are also well represented. In central Europe there were also described ruderal communities dominated by this species (*Sisymbrium volgense*-Gesellschaft), which were classified either in the order *Sisymbrietalia* J. Tx. in Lohm. et al. 1962 [24], or in the order *Onopordetalia acanthii* Br.-Bl. & Tüxen ex Klika & Hadač 1944, alliance *Dauco-Melilotion* Görs 1966 [12].

Impact. As shown, *S. volgense* competes well with other ruderal species, becoming dominant in the communities in which it was identified at Socola-Iași. We do not know its impact in other types of plant communities. Because the ability to sprout from the root, it is considered a dangerous weed in native habitat [33]. Jehlík (1998), cited by Soukup et al. (2004) [29]

considered this plant among other invasive species to be put into quarantine for the area of the Czech Republic.

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