

Oenothera laciniata Hill (Onagraceae), A New Alien Species to the Bulgarian Flora

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Abstract: A new alien species, *Oenothera laciniata* (Onagraceae), is reported for the first time for the Bulgarian flora from the Black Sea Coast floristic region. It was found in the inland sand dunes habitats by both authors independently, respectively in 2014 and 2016. The article provides a brief morphological description of the species, comments on the distinguishing characters, data about phenology, distribution and populations.

Key words: Bulgarian alien flora, Evening-primroses, *Oenothera laciniata*

Introduction

The genus *Oenothera* L. is of American origin. Many species of the genus are with beautiful flowers and are grown as ornamentals; others are used in traditional and official medicine or for essential oil production (BROWN 2011, SINGH et al. 2012). This, together with the easiness of propagation through tiny seeds, which are produced abundantly, help the distribution of many species outside their native range. Many are registered as aliens in different parts of the world. More than 80 species are found in Europe (ROSTANSKI et al. 2010).

The genus has specificities in the breeding mechanisms, which result in variable population structures over space and time. The taxonomy of the genus is complex and difficult (ROSTANSKI & VERLOOVE 2015) and some representatives of the genus are likely neglected in particular floras.

In Bulgaria, only five species have been reported: *O. biennis* L., *O. parviflora* L. (GANCHEV 1979), *O. bulgarica* Delip. (DELIPAVLOV 1998), *O. stricta* Ledeb. ex Link. (VELCHEV & VASSILEV 2002), and *O. glazioviana* Micheli (KALNÍKOVÁ & PALPURINA 2015).

Here we report one more species from the Black Sea Coast floristic region.

Materials and Methods

Plant materials were collected by the authors during field studies by A. Petrova and during plant photographing by Zh. Barzov. The identification was done firstly through Internet sources, then confirmed with relevant keys (RAVEN 1968, ROSTANSKI 1982, ROSTANSKI et al. 2010, BROWN 2011). The species has a large recent range and is a variable one, so the short morphological description was based on the collected samples and the data from literature sources (ROSTANSKI 1982, MAHKLOUF 2016) with some comments. The data about populations were based on the visual observations. The taxonomy of the other species mentioned in the text followed mainly DELIPAVLOV & CHESHMEDZHIEV (2011).

Results and Discussion

Onagraceae

Oenothera laciniata Hill, Hort. Kew. 172/4 (1768) (Fig. 1)

Synonyms: *O. sinuata* L., Mant. Alt. 228 (1771); *Raimannia laciniata* (Hill) Rose, Contr. U.S. Natl. Herb. 8(4): 331 (1905).

Annual to perennial (observed as annual in

Bulgaria). Stems branched or not, (5) 15-40 (60) cm, usually with spreading hairs and some glandular ones on the inflorescence. Leaves oblong-lanceolate to lanceolate, sinuate-pinnatifid or dentate, almost entire in small individuals, 2-6 × 0.3-1.5 cm; the lower petiolate; the upper sessile, hairy, mostly with simple hairs and some glandular ones. Flowers axillary, tetrameric; hypanthium cylindrical, narrow, 15-25 mm long; sepals green, 5-10 (15) mm with acute apices 1-2 mm, hairy, strongly reflexed at anthesis; petals yellow, turn orange-red after anthesis, 5-10 (18) mm, rounded. Stamens eight, adnate, style equalling or exceeding stamens; stigma lobes four, spreading, 2-4 mm. Flowers vespertine, open near sunset, close at about midday on the next day. Ovary inferior, four-celled. Capsule oblong-fusiform to subcylindrical, usually somewhat arcuate, divaricate and enlarged upwards at mature time, 15-35 × 3-4 mm, sessile or with short pedicel. Seeds numerous, brown, more or less ellipsoid, app. 1 mm.

Oenothera laciniata belongs to the subgenus *Raimannia* (Rose) Munz (Amer. Jour. Bot., 22: 645, 1935). The native distribution lies in North America, USA: from Maine to Texas and South Dakota (USDA, NRCS. 2017). In its native range, *O. laciniata* is found usually in sandy habitats: sand prairies, sandy fields and meadows, disturbed sandy or limestone gravelly areas along railroads, roadsides and waste areas (HILTY 2002-2016). It is naturalised in many parts of North and South America, Asia, Australia, and Africa, where it is found also mainly in sandy habitats, usually with open disturbed vegetation (JIARUI et al. 2007, MAHKLOUF 2016, ALA 2017).

In Europe, RAVEN (1968) summarised that this species was recorded from several countries but does not seem to be naturalised. Similar is the more recent conclusion of RAUS (2006). Among the countries where it is or was found are: Great Britain – ephemeral before 1928 (ROSTANSKI 1982); France – rare, ephemeral (JAUSEIN 1995); Austria – not established (ESSL & RABITSCH 2002); Italy – casual (CELESTI-GRAPPOW et al. 2009); Ukraine – ephemero-phyte (YAVORSKA 2009); Greece – casual (ARIANOUTSOU et al. 2010); Spain – occasional (MARTÍNEZ FLORES 2012); Belgium – only ephemeral before 1950 (ROSTANSKI & VERLOOVE 2015), etc.

Distribution in Bulgaria: Black Sea Coast (*Northern*): the periphery of the Central Group Pobiti Kamani natural landmark, sandy terrain, NH 58, N 43.22590°, E 27.70918°, 105 m a.s.l., 13.07.2014, leg. A. Petrova (SOM 173286 & 173387); NW of Strashimirovo Village, Varna District, sandy slopes near the graveyard, NH 58, N 43.20025°, E

27.72331°, 60 m a.s.l., 25.07.2016, leg. Zh. Barzov (SOM 172898) and 20.08.2016, observed by Zh. Barzov & A. Petrova; NW of Strashimirovo Village, Varna District, sandy slopes, NH 58, N 43.20261°, E 27.72505°, 50 m a.s.l. 21.07.2016, leg. Zh. Barzov (SOM 172896 & 172897).

Habitat and population data for Bulgaria: The observed populations were found in the area with inland sand dunes W of Varna City in which the groups of the natural phenomenon Pobiti Kamani (= Standing Stones) are scattered. Sands are Tertiary, silicate, and the flora of the area includes many relict and rare species. The habitat type E1.9B Standing stone inland dunes (according to the EUNIS classification) is evaluated as Endangered (PETROVA 2015).

The population at the periphery of the Central Group Pobiti Kamani was developed at a glade in a sparse plantation of *Robinia pseudoacacia* L. The terrain is almost flat, vegetation coverage app. 70%, dominated by *Festuca arenicola* (Prodán) SÓO (Fig. 2). The population numbered about 70 individuals on an area of app. 60 m².

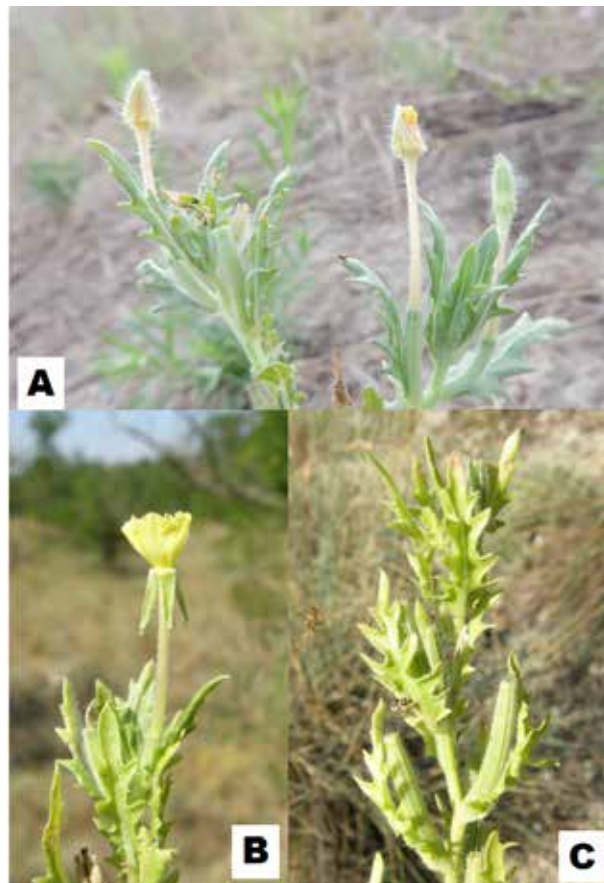


Fig. 1. *Oenothera laciniata* Hill. **A.** An individual with buds in different stages of development; **B.** An open flower; **C.** Fruits. Photos: **A** – Zh. Barzov, 21.07.2016; **B** & **C** – A. Petrova, 13.07.2014



Fig. 2. The habitat in the periphery of the Central Group Pobiti Kamani natural landmark. Photo: A. Petrova, 13.07. 2014

The population near the graveyard of Strashimirovo Village was developed on the S and SW facing slopes. Here the vegetation cover was more uneven, 30-50%. Beside *Festuca arenicola*, *Allysum borzaeanum* Nyár and *Centaurea* sp. were common and abundant. The number of individuals was more than 200 on an area of app. 1000 m².

The third population was among sparse woody vegetation of *Robinia pseudoacacia* and *Ailanthus altissima* (Mill.) Swingle. The most common of the native species were *Festuca arenicola* and *Allysum borzaeanum*. *Lepidotrichum uechtritizianum* (Bornm.) Velen., a psammophyte species endemic to the western Black Sea Coast, was also found there. The number of individuals was about 150 on an area of app. 300 m².

The common species for all sites were *Anchusa velenovskyi* (Guşul.) Stoj., *Chondrilla juncea* L., *Conyza canadensis* (L.) Cronquist, *Daucus guttatus* Sm., *Herniaria hirsuta* L., *Petrorhagia prolifera* (L.) P.W. Ball et Heywood, *Plantago scabra* Moench., *Senecio vernalis* Waldst. et Kit., *Verbascum purpureum* (Janka) Hub.-Mor., *Erodium cicutarium* (L.) L'Her, and *Xeranthemum annuum* L. Registered also were: *Sedum urvillei* DC. – at the first site; *Cynodon dactylon* (L.) Pers., *Erysimum quadrangulum* (L'Her.) Desf. – at the second site; *Silene supina* M. Bieb. – at the second and third sites; *Bombicylaena erecta* (L.) Smoljan, *Brassica* sp., *Carex ligERICA* J. Gay, *Dichanthium ischaemum*

(L.) Roberty, *Silene frivaldzkyana* Hampe – at the third site.

Phenology in Bulgaria: Data are limited so far. Flowering: VI-VII, fruiting: VII-VIII.

Conclusions

Our results support the conclusion of PETROVA et al. (2012) that the Black Sea Coast region is among the most vulnerable to intentional or unintentional introductions of alien plants in Bulgaria. Considerations about the pathway of introduction are only speculative in this case. The fact that the species has at least three populations at about 3 km distance apart supposed that most likely unintentional introduction took place years ago. There is a local ferryboat that cross the lake nearby Strashimirovo Village; the International Sea Port Varna West is also not far. The Central Group Pobiti Kamani natural landmark is a popular touristic place, but *O. laciniata* was found at the periphery area, difficult to access. Only hunters used to pass there rarely. There is small scale sheep grazing in the area, in the spring and late autumn, recently only around Strashimirovo Village.

Further observations are needed on the distribution and the behaviour of the species in Bulgaria.

We want to point out that the area with inland sand dunes, of which the outcrops of standing stones

are most remarkable and are declared as protected natural landmarks, Natura 2000 site (BG0000132) and Important Plant Area (BGIPA087) is very vulnerable to invasion by alien plants. The opinion of the first author is that the most dangerous are *Robinia pseudoacacia*, *Pinus pinaster* Aithon, *Ailanthus altissima* (those intentionally planted decades ago) and *Opuntia*

humifusa (Raf.) Raf. (at the area south of Beloslav Lake). During the last decade *Conyza sumatrensis* (Retz.) E. Walker has been spreading rapidly.

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