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***Solanum elaeagnifolium* (*Solanaceae*), a new alien species for the Bulgarian flora**

Abstract

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Solanum elaeagnifolium (*Solanaceae*) is reported as a new alien species to the Bulgarian flora. It is native to Central America – Mexico and USA, and has been introduced and naturalized in 4 continents. The species was recorded in Valley of River Struma floristic region in Bulgaria, along the road from Sandanski to Petrich town. Inferring from its current occurrence in the country it can be said the taxon had been recently introduced, and is likely to naturalize and spread further due to its invasive traits and suitable environmental conditions in the region. The article presents brief morphological description of the species based on the material collected in the field, and discussion of its habitat preferences and invasiveness.

Key words: xenophytes, invasive species, Silver-leaved nightshade.

Introduction

Vascular plant diversity in Bulgaria is relatively well known. Nevertheless, survey in some poorly studied habitats – disturbed sites, railroads, roadsides, riparian habitats, etc., continues to provide floristic novelties. At least six alien species have been reported as new to the Bulgarian flora only in the past two years, e.g. *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) and *Oenothera glazioviana* (Kalníková & Palpurina 2015). Knowledge of the alien flora of the neighbouring countries as well as of the main pathways for introduction of alien species in a country may help identify suitable sites for regular monitoring and early detection of new introductions. In Bulgaria, such sites are, e.g., the main international roads near the borders. Regular monitoring of the roadside flora along the road connecting Bulgaria and Greece near river Struma gave chance to early detect a new non-native species for Bulgaria – *Solanum elaeagnifolium* Cav. The latter was known to occur widely in Northern Greece, close to the Bulgarian border.

The aim of this article is to report the occurrence of the alien species *Solanum elaeagnifolium* in Bulgaria.

Material and methods

Plant material was collected in the field. Herbarium specimens were deposited in the herbarium of the Institute of Biodiversity and Ecosystem Research of Sofia (SOM). Morphological characters were noted from the gathered herbarium material and compared with the data from literature (Hawkes & Edmonds 1968; Brunel 2011). Data about the habitat and population of the species are based on personal observations in the field. Information about the invasiveness of the species is based on relevant literature sources as well as on field observations in Northern Greece by one of the authors (VV).

Results and discussion

Solanum elaeagnifolium Cav., Icon. Descr. 3: 22 (1795) – Fig. 1.

Herbaceous perennial or a small shrub with an extensive root system. Stems 60–80 cm tall, erect, branched in the upper part, with dense stellate hairs and numerous 1.5–3.5 mm long prickles. Leaves numerous, 2.5–10 × 0.8–2.5 cm, oblong-lanceolate to linear-lanceolate, subacute at apex, rounded to shortly cuneate at base, entire, on both sides silver-tomentose with dense stellate hairs, with 5–20 mm long petiole. Flowers few to many, grouped in 1–5-flowered terminal cymes; pedicels 15–20 mm, prickled. Calyx 5–8 mm, deflexed in fruit, calyx-lobes 3–6 mm, broadly lanceolate. Corolla 20–30 mm in diameter, star-like to somewhat pentagonal, purple; anthers yellow. Fruit a berry, globose, ca. 0.7–1.2 cm in diameter, dry, yellow to orange in maturity; seeds numerous – ca. 40–60 in each fruit, suborbicular, 2–2.5 mm in diameter, flattened. Flowering VII–X, fruiting IX–XI. Poisonous plant.

The genus *Solanum* L. is represented in the Bulgarian flora by 8 wild-growing species (Andreev 1989; Cheshmedzhiev 2011). *Solanum elaeagnifolium* is easily distinguished by the other *Solanum* species recorded in the country by the combination of the following characters: silver-tomentose plant with dense stellate hairs, prickled stem, entire leaves, purple flowers and yellow fruits. Other species with indumentum of stellate hairs and prickled stems are *S. cornutum* Lam. and *S. sodomaeum* L., both alien to the Bulgarian flora, however, the former has yellow flowers, whereas the latter is much bigger and the leaves are deeply pinnatisect.

Distribution in Bulgaria. – Valley of River Struma floristic region, by the road from Sandanski to Petrich towns, right roadside, disturbed site often used for car stops, ca. 95 m alt., 41.49422°N, 23.26927°E, 01.09.2015, with flowers, V. Vladimirov, S. Bancheva & M. Delcheva s. n. (SOM); loc. *ibid.*, 13.11.2015, with fruits, V. Vladimirov (SOM). A dense group of plants occupying an area of ca. 10 m² (Fig. 2). So far only this locality has been found in Bulgaria. However, considering the wide distribution of the species

in Northern Greece, potential areas for invasion are other parts in Valley of River Struma floristic region as well as Valley of River Mesta. Both regions are characterised by high influence of the Mediterranean climate and offer suitable environmental conditions for invasion of the species.

Distribution worldwide. — *Solanum elaeagnifolium* is native to Central America – North-East Mexico and South-West USA (EPPO 2007; Brunel 2011). Unintentionally introduced as a contaminant of commodities to five continents – Africa, Asia, Australia, Europe, South America (Brunel 2011). In Europe the species occurs in the Mediterranean parts. In the Balkans it has been recorded in Croatia, Cyprus, Greece, R. Macedonia, Montenegro and Serbia (EPPO 2007; Valdés 2012).

Habitat preferences. — In Bulgaria the species invaded a man-made habitat – disturbed site and a wasteland area by a road; the site is often used as a car-stopping place. According to EUNIS classification the habitat belongs to ‘J4.2 Road networks’. In other countries the species occurs in ‘cultivated land, orchards, managed grasslands and associated man-made habitats, natural grasslands, riverbanks, canalsides, rail/roadsides and wastelands’ (Brunel 2011).

Invasiveness and impacts. — *Solanum elaeagnifolium* is considered one of the worst invasive alien plants worldwide (Brunel 2011). Several traits facilitate its spread and establishment. The species has an extensive root system, any fragment of which may reproduce a new plant. Alongside with the very well developed vegetative propagation, seed reproduction occurs too. Plants form numerous many-seeded fruits, which can float with running water; fruits usually remain on the plants during winter and can be dispersed by wind. Important transport agents are vehicles and agricultural machinery or *Solanum*-seeds can be transported as contaminants in agricultural products (EPPO 2007; Brunel 2011). It is not known how the plant was introduced in Bulgaria. Judging from its current occurrence, most likely agent was a vehicle – seeds were either attached to a vehicle coming from Greece (most likely) or they were introduced as a contaminant in crop-seeds transported by a vehicle along this road. The exact time of introduction is not known either. Bearing in mind the present distribution of the species in the country and the fact, that this road has been regularly monitored for alien plants, it can be inferred that the species was introduced less than 5 years ago. Most likely the present group of plants was formed by vegetative propagation of one or a few initial plants. Search in other similar habitats in the adjacent areas did not result in discovery of other *Solanum*-plants. Numerous negative impacts have been reported for the species in the invaded areas, e.g. competing with native plants, including for pollinators, weed in agricultural crops significantly reducing the crop yield, facilitators of the distribution of other pests, such as Colorado beetle, etc. (e.g. EPPO 2007; Tscheulin et al. 2009; Brunel 2011). Negative impact is much stronger in agricultural fields than in natural or semi-natural environments.

Following the terminology of Richardson & al. (2000), it is somewhat difficult to classify *Solanum elaeagnifolium*, since the species was introduced very recently. However, considering its environmental requirements and reproductive traits it is very likely that the species will naturalize and spread further if no eradication measures are taken.

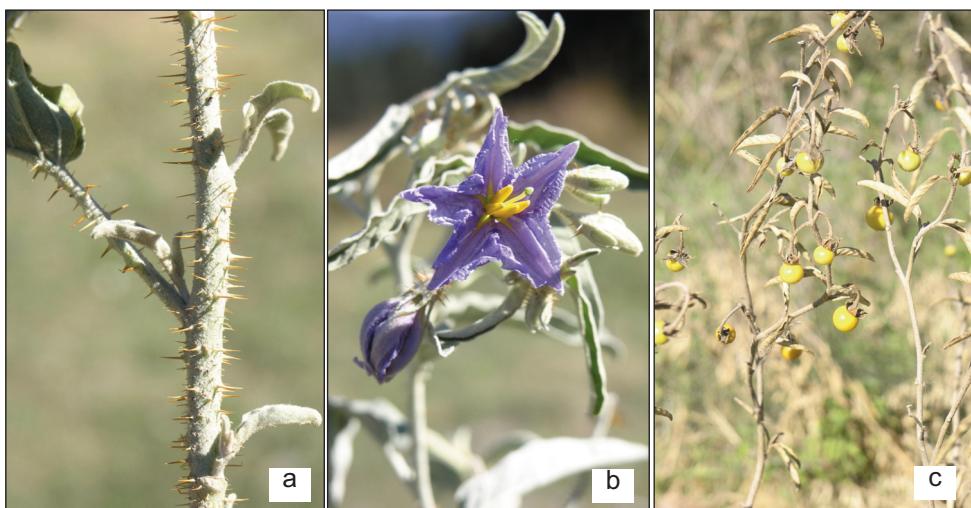


Fig. 1. *Solanum elaeagnifolium*: a) stem with prickles; b) flower; c) fruits.



Fig. 2. *Solanum elaeagnifolium* in Bulgaria, along the road from Sandanski to Petrich towns.

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