A new alien species of *Symphyotrichum* (*Asteraceae*) to the Bulgarian flora

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Abstract. The article reports for the first time the occurrence of *Symphyotrichum novae-angliae* (*Asteraceae*) as an alien plant in the Bulgarian flora. The species has been recorded in three sites in W Bulgaria, in the Znepole floristic region, near Bukorovtsi and Kalenovets villages. The species is native to Central and Eastern North America. It is cultivated as an ornamental plant in many parts of the World, including in Bulgaria. The most likely pathway of introduction is 'escape from cultivation'. The recorded population is still a relatively small, with several dozens of specimens of a different age. The species reproduces both by seeds and vegetatively. Genome size of 1C = 1.42 pg has been estimated in a plant from the Bulgarian accession which confirms earlier reports from the native range of the taxon. The distribution, phenology and the habitat preferences of the species are presented. Field studies suggest that the species can be considered a naturalised alien in the Bulgarian flora but further monitoring is needed to assess the invasive potential of the taxon.

Key words: alien plants, Bulgaria, *Compositae*, genome size, new plant records, ornamental plants

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Introduction

The genus *Symphyotrichum* Nees (*Asteraceae*) comprises about 90 (Brouillet & al. 2006) to 100 (POWO 2024) species including some hybrids. The native distribution range of the genus covers North America, South America and Temperate Asia (Brouillet & al. 2006). So far, three species of *Symphyotrichum* have been reported for Bulgaria as naturalised aliens – *S. novi-belgii* (L.) G.L. Nesom, *S.* ×*salignum* (Willd.) G.L. Nesom and *S. squamatum* (Spreng.) G.L. Nesom (Kuzmanov 2012; Stoyanov & al. 2022). *Symphyotrichum novae-angliae* (L.) G.L. Nesom has been reported as an ornamental species cultivated outdoor in parks and private gardens.

The aim of the present article is to report for the first time for Bulgaria naturalised occurrences of *S. novae-angliae* and to provide some data about its populations and habitats.

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Material and methods

Plant material – herbarium specimens and live plants, have been collected from the field, from the recorded naturalised localities of the species. Herbarium material was deposited in the Herbarium of the Institute of Biodiversity and Ecosystem Research (SOM) (herbarium acronym after Thiers 2024+). Morphological characters were noted mainly from the material collected from the Bulgarian localities and compared with relevant literature (e.g. Merxmüller 1976; Chmielewski & Semple 2003; Brouillet & al. 2006). Data about the distribution, habitats and population size in Bulgaria are provided on the base of the author's personal observations.

The genome size of *S. novae-angliae* from a Bulgarian accession was measured by CyFlow SL Green flow cytometer (PARTEC, Germany), equipped with a green (532 nm) solid-state laser. Fresh leaves from plants collected from the field and cultivated in a greenhouse were used. *Pisum sativum* 'Kleine Rheinländerin' (1C = 4.38 pg, Greilhuber & al. 2007) was applied as an internal standard. The plant material was treated with the extraction and staining kit 'CyStain® PI Absolute P' (SYSMEX) following the protocol prescribed by the manufacturer. The samples were then measured at a rate of 10–20 nuclei per second, with a total of 5 000 nuclei per run. Three replicates were done for each sample and only measurements with CV below 3% were taken into account.

Results and discussion

Symphyotrichum novae-angliae (L.) G.L. Nesom, Phytologia, 77: 287, 1995 (Fig. 1)

Basionym: *Aster novae-angliae* L., Sp. Pl. 2: 875, 1753.

Herbaceous cespitose perennial, 40–120 cm. Stems one to many, often somewhat arcuate at base and arising from short rhizomes (Fig. 2), erect, branched in the synflorescence, with moderate eglandular and short stalked glandular hairs in the lower part, with dense eglandular and short stalked glandular hairs above and especially in the synflorescence. Leaves oblanceolate to oblong-lanceolate, usually entire; basal withering by anthesis; middle cauline leaves oblong to oblanceolate, 50–100 × 5–15 mm, auriculate at base, acute at apex, with moderate eglandular and sparse glandular hairs; upper leaves similar but gradually becoming smaller, acute to obtuse at apex, short-hairy and stipitate-glandular. Synflorescence more or less corymbose, leafy. Peduncles 0.5–4 cm, densely short-hairy and stipitate-glandular. Involucres more or less hemispheric, 6–10 mm in diameter. Involucral bracts in 3–4 rows, linear-lanceolate, subequal, the outer acute, more or less spreading, the inner aristate, all densely glandular-hairy and with sparse short eglandular hairs. Ray florets *ca.* 10 mm long, usually deep purple to violet, rarely pink. Disc florets with yellow corolla becoming purple. Achenes brownish, oblong or obconic, *ca.* 2 mm long, densely sericeous, with *ca.* 5–6 mm long pappus.

Flowering August – October. Fruiting September – November.

The species is easily recognized from the other *Symphyotrichum* species in Bulgaria, all alien, by its perennial biological type, densely short-hairy stem, and densely glandular branches of synflorescence, peduncles and phyllaries.

General distribution. *Symphyotrichum novae-angliae* is native to Central and Eastern North America. The species is widely cultivated as an ornamental plant and escaped to natural habitats in many parts of the World. It has been reported as an alien species for most of Europe (excluding northernmost parts), West to Central Asia (to Kazakhstan to the East), parts of East Asia (East Russia: Sakhalin, Sikhote Alin, Khabarovsk) and some parts of North America outside its native range (Brouillet & al. 2006; POWO 2024). In the Balkan Peninsula, the species has been reported as a naturalised alien for Bosnia and Herzegovina (Maslo & Šarić 2017) and Serbia (Lakušić & Jovanović 2012), as a casual alien for Greece (Simoglou & Kan 2022), and as an alien with unknown status for Slovenia (Greuter 2006+). From the neighbouring to Bulgaria countries, it has been reported for Romania as well (Sîrbu & al. 2011).

Fig. 1. Flowering stem of *Symphyotrichum novae-angliae*, Bukorovtsi village, Bulgaria, 21.09.2024 (photo V. Vladimirov).

Fig. 2. Short rhizome with base of stem and visible vegetative buds, 07.11.2024 (photo V. Vladimirov).

Distribution in Bulgaria. Bulgaria, Znepole Region: **1.** Right of the road from Godech town to Bukorovtsti village, some 50 m before the village, 620–630 m a.s.l., 42.99259 N, 22.97341 E, 07.11.2024, *V. Vladimirov* (obs.); **2.** Bukorovtsi village, grasslands on both sides of the road, *ca.* 630 m a.s.l., a rectangular polygon of about 50 m long between the points 42.99200 N, 22.97123 E and 42.99201 N, 22.97055 E, 07.11.2024, coll. *V. Vladimirov* (SOM); **3.** Kalenovets village, damp grassland left of the road to Dragoman town, *ca.* 630 m a.s.l., 42.98820 N, 22.95822 E, 07.11.2024, coll. *V. Vladimirov* (SOM).

Habitat and population. In its native distribution range, the species grows in open, moist to wet places, fields, prairies, meadows, marshy grounds, shrubby swamps, fens, shores, thickets, moist edges of woods, roadsides, railroad rights-of-way, somewhat weedy (Brouillet & al. 2006).

In Bulgaria, *S. novae-angliae* was recorded in open places on roadsides, margins of meadows and shrub thickets, roadside ditches, grassy places along streets and fences in rural areas. In the locality No. 1 reported above only one plant was recorded with *ca.* 40 flowering and fruiting stems. In fact, possibly the same plant was first observed by myself in this place 15 years ago, on 13.08.2009, when *ca.* 20-25 flowering stems were counted on the plant. Apparently, the same individual survived for many years, with a gradual increase of the number of the flowering stems. In 2024, the following accompanying species were recorded: *Agrimonia eupatoria*, *Agrostis capillaris*, *Crepis pulchra*, *Daucus carota*, *Dipsacus laciniatus*, *Elymus repens*, *Festuca* sp., *Fragaria viridis*, *Lotus corniculatus*, *Mentha longifolia*, *Plantago lanceolata*, *Poa pratensis*, *Potentilla reptans*, and *Rumex acetosa*.

Fig. 3. *Symphyotrichum novae-angliae*, Bukorovtsi village, Bulgaria, 21.09.2024 (photo V. Vladimirov).

In locality No. 2 some 35–40 specimens were observed scattered along both sides of the road for about 40–50 m (Fig. 3). Purple-flowering plants prevailed, although a few specimens with pink ligulate florets were observed too. The plants were of different age – some with just 1–2 flowering stems, apparently young, and some older specimens with 20–50 flowering stems. Accompanying species were *Clematis vitalba*, *Euonymus europaeus*, *Ligustrum vulgare*, *Prunus spinosa*, *Rosa* sp., *Agrimonium eupatoria*, *Agrostis* sp., *Allium vineale*, *Arrhenatherum elatius*, *Cichorium intybus*, *Cirsium vulgare*, *Daucus carota*, *Dipsacus laciniatus*, *Echium vulgare*, *Elymus repens*, *Jacobaea erucifolia*, *Mentha longifolia*, *Poa pratensis*, *Potentilla reptans*, etc. The cover of shrub-vegetation was *ca.* 20% and herbaceous vegetation covered some 70% of the area.

In the third reported locality, only a single plant with *ca.* 60 flowering and fruiting stems was recorded.

Genome size. A search of the Kew Plant DNA C-values database for the genus *Symphyotrichum* shows that a total of 14 species has been included (Leitch & al. 2019). The values range from 1C = 0.86 pg to 1C = 3.50 pg, with a mean of 1C = 1.60 pg. The published genome size for *S. novae-angliae* is 1C = 1.40 pg (Bai & al. 2012). The value obtained from a plant from the Bulgarian accession (locality No. 2) is 1C = 1.42 pg (Fig. 4) which closely matches the report from the previous study.

Alien and invasive status. The species has been cultivated for many years as an ornamental plant in private gardens in many villages in Bulgaria. Field observations, especially in the second reported locality, show that the plants are of different age – from young, with small size and single stems, to quite old plants, which reach larger size and have 40–60 flowering and fruiting stems. The plants are scattered throughout the territory and are most likely the result of seed propa-

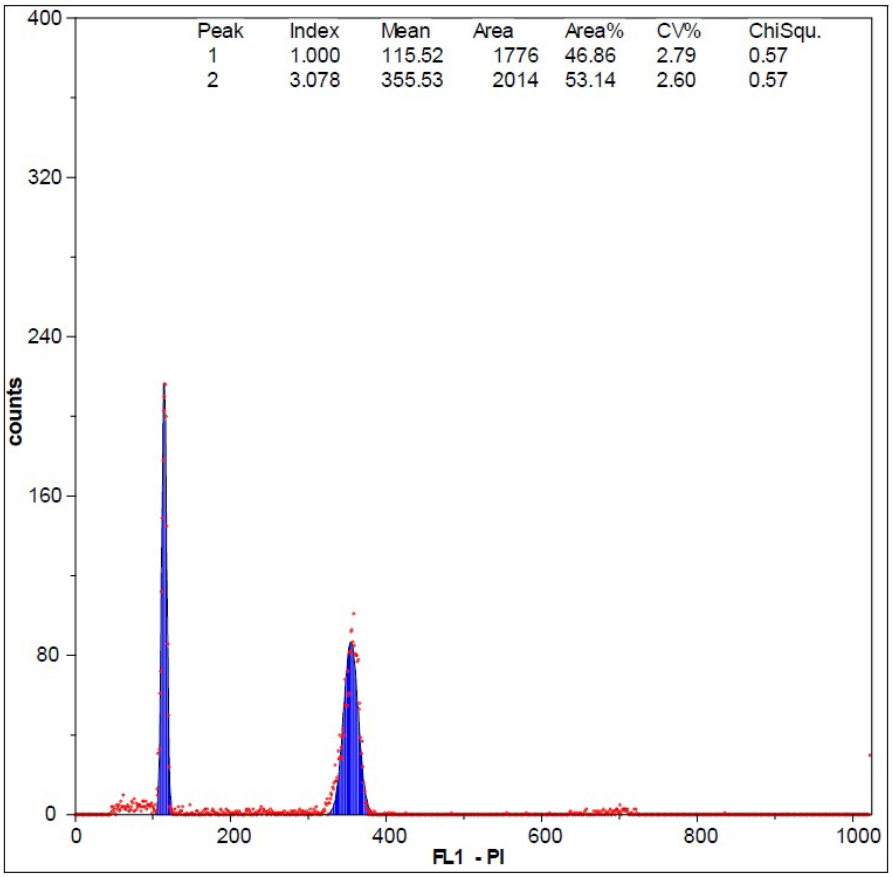

Fig. 4. Flow cytometry histogram of relative DNA content in the leaves of *Symphyotrichum novae-angliae* (left peak) using *Pisum sativum* 'Kleine Rheinlaenderin' (1C = 4.38 pg) as an internal standard (right peak).

gation. The observations show that the species can be considered naturalised, especially in the second locality, although still on a rather small and local scale. The most likely pathway of introduction is "escape from cultivation" and in particular through the disposal of viable fragments of the plants with garden waste into natural habitats. The species can reproduce both by seed and vegetatively. Without human intervention, however, vegetative propagation occurs over very short distances and is a slow process. In contrast, seed propagation can lead to a faster dispersal of the species. To confirm that plants can reproduce by seed in Bulgaria, a garden experiment was conducted. A single stem was taken in 2009 from the plant recorded in locality No. 1 and cultivated outdoors in an experimental garden for about 10 years. The aim was to check whether the seeds were able to mature and produce seedlings. As a result of the care, especially regular watering, the plant grew quickly and had abundant flowering and fruiting every year. Despite the rather late flowering and fruiting of the species, the warm autumns and the lack of snow and low temperatures at the beginning of winters over the last decade were a good prerequisite for seed ripening. The stems were not cut until early spring to allow the seeds to fall. It was found that every year during the spring-summer period several new seedlings emerged, which grew rapidly and some of them had the opportunity to flower in the second year. This shows that the species has the potential for seed propagation in the climatic conditions of Bulgaria.

As a result of the study, it can be inferred that the species is naturalised in the above reported localities in the Bulgarian flora. However, the observations are still insufficient to assess whether it has an invasive character. The high temperatures and prolonged droughts in recent years rather suggest that the species will not show an invasive behaviour, but longer-term monitoring is needed to assess this.

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