

## Communication

# *Veronica peregrina* (Plantaginaceae), an alien species rediscovered in Lithuania

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### Abstract

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*Veronica peregrina* L. (Plantaginaceae) is a native species to North and South America and an alien to Europe. This species was first found in Lithuania in 1829, and no later records were made for almost two centuries. In May 2023, *Veronica peregrina* was rediscovered in Vilnius, Lithuania. Groups of plants and solitary individuals were scattered over ca. 1500 m<sup>2</sup>. A total of about 700 individuals were found. Observed plants belong to the type subspecies *Veronica peregrina* L. subsp. *peregrina*. It is presumed that seeds of *Veronica peregrina* could have been introduced with plants from nurseries. The spread of this species in anthropogenic habitats in Lithuania is quite likely. *Veronica peregrina* is currently considered a casual alien in Lithuania.

**Keywords:** annual species, nurseries, rare alien, seed contaminant, weeds.

## INTRODUCTION

The spread of alien species is continuous, and the number of alien plant species in the regional floras is increasing considerably (Fremstad & Elven, 1997). Some alien plants affect native plant communities and are a significant threat to ecosystems (Pyšek et al., 2020). Introducing new alien plant species is linked to the movement of ornamental plants and their accompanying weeds. When plants from distant regions are introduced into nurseries, the risk of introducing new alien plant species from one region to another also increases (Seebens et al., 2017). The number of alien plant species introduced to ornamental plantations in Lithuania is also growing significantly (Gudžinskas, 2017; Gudžinskas, Taura, 2020).

The introduction of alien weeds and plants into nurseries attracted the interest of researchers several decades ago (Fremstad & Elven, 1997; Reichard &

White, 2001; Hoste & Verloove, 2009). Currently, several species of the genus *Cardamine* L., *Cardamine occulta* Hornem. (Pliszko, 2020; Takács et al., 2020), *Cardamine graeca* L. (Verloove & Barendse, 2019), *Cardamine corymbosa* Hook. f. (Hoste et al., 2008) are spreading throughout Europe with plants distributed by nurseries. The same introduction pathway for *Veronica peregrina* has also been reported (Wolff & Krippel, 2022). For some plants, accidental introduction as a weed with ornamental plants is the main pathway. Through nurseries of ornamental plants, *Euphorbia* (Verloove & Barendse, 2019), *Oxalis* (Hoste, 2011) and other noxious weeds are spreading (Wolff & Krippel, 2022). Ornamental plants are usually distributed and planted over large areas in a short time frame, meaning that nursery weeds are widely dispersed together (Reichard & White, 2001). Furthermore, plants or their propagating material are being introduced into nurseries from various sources

and countries, increasing the diversity of introduced alien weeds (Hulme et al., 2018).

The genus *Veronica* (Plantaginaceae) in Lithuania is represented by 21 species, with three alien species: *Veronica filiformis* Sm., *Veronica peregrina* L. and *Veronica persica* Poir. (Natkevičaitė-Ivanauskienė, 1976). *Veronica filiformis* is a relatively frequent species that spread several decades ago and is usually found in lawns and moist grasslands. In contrast, *Veronica persica* is a widespread species that grows in arable fields (Gudžinskas, 1998).

*Veronica peregrina* L. is an annual, 5–25 cm tall plant, with erect, diffusely from the base branching stems. Leaves are 1–2.5 cm long, 3–5 mm wide, glabrous, and sessile. Flowers are inconspicuous, corolla white or pale blue. The seeds are elliptical, ca. 1 mm long (Walters & Webb, 1972). This species is native to North and South America, although it was originally described based on herbarium specimens collected in Europe (Thulin, 2023). This species is represented by two subspecies, *Veronica peregrina* subsp. *peregrina* and *Veronica peregrina* subsp. *xalapensis* (Humb., Boupl. & Kunth) Pennell. Stems and capsules of *Veronica peregrina* subsp. *peregrina* are glabrous, whereas stems and capsules of *Veronica peregrina* subsp. *xalapensis* with short glandular hairs (Pennell, 1921). The type subspecies, *Veronica peregrina* subsp. *peregrina*, occurs in various parts of Europe (Guzik & Paul, 2000), whereas *Veronica peregrina* subsp. *xalapensis* has been recorded only in Austria (Hohla et al., 2015) and Norway (Grøstad et al., 1999).

This article provides information on a new locality of *Veronica peregrina* recorded in Lithuania. Possible pathways of introduction for *Veronica peregrina* and similar alien species are discussed.

## MATERIALS AND METHODS

Collected plants of the genus *Veronica* L. were identified based on morphological features provided in identification keys (Walters & Webb, 1972; Natkevičaitė-Ivanauskienė, 1976). Subspecies of *Veronica peregrina* were identified following descriptions provided by Pennell (1921). The collected herbarium specimen of *Veronica peregrina* is deposited at the Herbarium of the Institute of Botany of the Nature Research Centre (BILAS).

The area where *Veronica peregrina* was found was carefully surveyed, and three isolated patches where this species was dominant were identified. The size of each patch was measured with a tape measure, and individuals of *Veronica peregrina* were carefully counted in each patch. Species accompanying *Veronica peregrina* were recorded in these patches. The whole area occupied by *Veronica peregrina* was measured from the Spatial Information Portal of Lithuania ([www.geoportal.lt](http://www.geoportal.lt)).

## RESULTS AND DISCUSSION

In May 2023, plants belonging to the genus *Veronica* were found growing at the sides of a parking lot in Vilnius, Verkiai Str. (54.71518° N, 25.29415° E). After examination, plants were identified as *Veronica peregrina* L. Observed plants were hairless; therefore, they belong to *Veronica peregrina* subsp. *peregrina*. Flowering individuals of *Veronica peregrina* were first recorded on 10 May 2023. Later, on 4 June 2023, the site was revisited and carefully surveyed again, and more individuals were found close to the plants recorded in May. At that time, individuals of *Veronica peregrina* were with ripe fruits, and some plants were starting to wilt. In total, three small patches of *Veronica peregrina* were discovered growing in tile spacings in the parking lot. The population was comprised of ca. 700 individuals. Three patches (5.7 m<sup>2</sup>, 7.5 m<sup>2</sup> and 9.6 m<sup>2</sup>) where *Veronica peregrina* was dominant were identified. Solitary individuals and smaller groups of *Veronica peregrina* plants were distributed over 1500 m<sup>2</sup>. Species diversity in patches where *Veronica peregrina* was recorded was similar. In these patches, mainly ruderal species prevailed: *Erigeron annuus* (L.) Desf., *Erigeron canadensis* L., *Cardamine occulta* Hornem., *Taraxacum officinale* F.H. Wigg. The individuals of *Veronica peregrina* were mostly growing in shady and somewhat humid places under *Spiraea* shrubs along north-facing borders.

The first record of *Veronica peregrina* in Lithuania was dated 9 June 1829. The specimen of *Veronica peregrina* is deposited at the Herbarium of Vilnius University (WI), but without a collector's name (*sine nomine*). Gorski (1830) reported this species in his work without specifying a particular location or collector. Therefore, it remains unclear whether the her-

barium specimen and the record mentioned by Gorski (1830) are related. Additional information on the herbarium label indicates this species was found outside the Botanical Garden in Vilnius [Za ogrodem Botanicznym]. At the beginning of the 19th century, the Botanical Garden was located in the current old town of Vilnius, Sereikiškės Park (Žilinskaitė, 2012a). Natkevičaitė-Ivanauskienė (1976) erroneously indicated that *Veronica peregrina* was found close to Vingis Park, where the Botanical Garden of Vilnius University was established only in 1919 (Žilinskaitė, 2012b). In surrounding countries, this species was recorded in Belarus (Dzhus & Treťiakov, 1999) and Poland (Guzik & Paul, 2000). In Estonia, this species was recorded only in 1839, whereas in Latvia, this species is not present (Kask et al., 1996).

The negative impact of *Veronica peregrina* on native plant species in surrounding countries was not reported; therefore, it is assumed that it does not possess invasiveness traits in Lithuania, either. In Europe, this species is usually found in wet or seasonally flooded habitats, along shores of waterbodies (Topić & Ilijanić, 2003; Bissels et al., 2005), although, recently, it is more common in anthropogenic habitats, e.g. gravel lanes, railroads (Guzik & Paul, 2000; Wolff & Krippel, 2022). *Veronica peregrina* occupies similar habitats in its primary range and occurs on moist soil such as banks of streams and lakes and in moist depressions. It also occurs in disturbed habitats such as lawns, wastelands, arable fields, and gardens (Baskin & Baskin, 1983). In several other European countries, this species was recorded in the vicinities of botanical gardens (Galera & Sudnik-Wójcikowska, 2010). It is supposed that seeds of *Veronica peregrina* could have been imported with plants for cultivation in botanical gardens. Similar spreading tendencies of *Veronica peregrina* are observed in other countries, where this species spreads with nursery plants. *Veronica peregrina* has recently spread in Hungary, mainly from the potted plants in nurseries and botanical gardens (Takács et al., 2020; Kovács et al., 2023). The same pathway of introduction has been observed in Germany and Luxembourg, where this species has spread in the surroundings of cemeteries (Hohla, 2006; Wolff & Krippel, 2022). In Norway, *Veronica peregrina* has been recorded in potted plants, spreading as a soil contaminant (Grøstad et al., 1999). It is worth men-

tioning that in Ukraine, another species of the genus *Veronica*, *Veronica cardiocarpa* Walp. has recently started to spread from the botanical garden (Konaikova & Peregrym, 2023).

The newly recorded site of *Veronica peregrina* in Vilnius is located about 120 meters from the outdoor plant marketplace at the edge of newly planted *Spiraea* shrubs. Therefore, imported potted plants might be the vector of *Veronica peregrina* propagules. *Cardamine occulta* growing with *Veronica peregrina* indicates that the import of ornamental plants might have been the main introduction pathway, as *Cardamine occulta* usually spreads through ornamental plantings (Pliszko, 2020).



Fig. 1. Flowering *Veronica peregrina* in Vilnius (10 May 2023). Photograph by L. Petrulaitis

The repeated occurrence of this species in Lithuania shows that the introduction of weeds is still an ongoing process, and a survey of nursery plants is required to ensure early response to newly detected alien plant species. It is unclear whether propagules or individuals of *Veronica peregrina* have been transferred from the local nursery or whether it is a source from abroad. As pointed out by several authors

(Grøstad et al., 1999; Guzik & Paul, 2000), *Veronica peregrina* is often neglected due to its small size and short-living nature, as this species is only present in May–July; afterwards, it disappears after fruit production. Considering the size of *Veronica peregrina* occupied area (1500 m<sup>2</sup>), this species might persist at this site. However, the probability of spreading to natural habitats is low, as this site is surrounded by urbanised areas. Nevertheless, the likelihood of new introductions of propagules of *Veronica peregrina* with plants imported into nurseries remains high. *Veronica peregrina* is currently considered a casual alien in Lithuania.

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