

## Communication

# The first record of alien species *Knautia macedonica* (Caprifoliaceae) in Ukraine

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Received: 30 August 2025. Accepted: 16 September 2025. Published online: 30 September 2025.

## Abstract

Koniakin S., Leshcheniuk O., 2025: The first record of alien species *Knautia macedonica* (Caprifoliaceae) in Ukraine. – Botanica, 31(3): 109–114. <https://doi.org/10.35513/Botlit.2025.3.3>

*Knautia macedonica* Griseb. is a herbaceous perennial plant native to Southeastern Europe. It is introduced in Ukraine as an ornamental species. In 2023, we first recorded a stand of this alien species outside of its primary cultivation on the territory of the archaeological monument of national importance, Khotiv Hillfort (Kyiv Region). *Knautia macedonica* forms a self-sustaining population. It is confined to grassy and synanthropic habitats. According to the time of introduction, *Knautia macedonica* is considered a neophyte, and according to the method of introduction, it should be classified as an ergasiophyte. The seeds of this species are commercially available, and the plant is used for ornamental purposes; therefore, it may continue to spread in natural and transformed habitats in Ukraine and other European countries. Thus, further monitoring of this species is required.

**Keywords:** alien species, meadow-steppe ecosystems, neophytes, Ukraine.

## INTRODUCTION

Recently, there has been an increase in attention to the risk of alien species spreading beyond their original habitats in natural ecosystems. This phenomenon poses a significant threat to biodiversity conservation (Heger, 2016). A rapid increase in the number of alien species and areas affected by invasions is expected in the future due to climate change (Wan et al., 2016; Puchałka et al., 2023). Introduced plant species, most of which are ornamental, often escape cultivation and become naturalised. They can achieve varying degrees of naturalisation and form self-reproducing populations within 10–15 years (Pyšek et al., 2022; Iamónico & Nicoletta, 2024). Therefore, it is essential to study the spread of alien escapee species, as they may nat-

uralise and acquire the status of potentially invasive species in the future, causing undesirable ecological and socio-economic consequences (Haubrock et al., 2021; Pyšek et al., 2022).

*Knautia macedonica* Griseb. belongs to the genus *Knautia* L. (Caprifoliaceae Juss.), which comprises 61 recognised species (including 11 hybrids). Members of this genus are widely distributed in temperate regions of Eurasia, particularly in the Mediterranean, and have also been introduced to North and South America (POWO, 2025).

*Knautia macedonica* is a polycarpic plant. Its flowers are pollinated by insects. The thin, branched stem grows to a height of 75–80 cm. The inflorescences are cushion-shaped and measure 1.5–4 cm in diameter. This species has two characteristic morphologi-

cal features: the uniform distribution of simple leaves along the stem, and the withering of the basal, pinnately lobed leaves during flowering (Tutin et al., 1976; Jäger et al., 2008). The plant is cold-resistant and can withstand temperatures as low as  $-20^{\circ}\text{C}$ . It is increasingly cultivated as an ornamental plant. It often reproduces by seed in culture without human intervention. In cultivation, it requires a sunny position and prefers neutral or alkaline soil (Tutin et al., 1976).

*Knautia macedonica* is native to Central Europe, including Albania, Bulgaria, Serbia, North Macedonia, Greece and the north-western Balkan Peninsula. It also grows in Romania and the European part of Turkey (Kırklareli), where it thrives in temperate climates within shrub, grassland and forest habitats (Davis et al., 1988; Dimopoulos et al., 2013; POWO, 2025). Recently, however, it has been observed to become naturalised outside its native range in countries such as Hungary (Balogh et al., 2004; Griebel, 2020), Belgium (Groom, 2012), the Czech Republic (Lepší & Lepší, 2019), the Netherlands (Floron, 2020), Germany (Griebel, 2020), Austria (Vitek et al., 2021; Hohla, 2021), Slovakia (Dudáš et al., 2023), and the United Kingdom (POWO, 2025).

Four taxa of the genus *Knautia* were recorded in Ukraine, three of which are native: *Knautia arvensis* (L.) Coult. (Fedoronchuk, 2023), *Knautia drymeja* Heuff. (*Scabiosa ciliata* Kit.; *Trichera drymeja* (Heuff.) Nyman) (iNaturalist, 2025a) and *Knautia maxima* subsp. *pocutica* (Szabó) ined. (*Knautia dipsacifolia* subsp. *pocutica* (Szabó) Ehrend.) (Tutin et al., 1976; Zyman & Hamor, 2009; Fedoronchuk, 2023), and one alien species, *Knautia macedonica* Griseb. (iNaturalist, 2025b). During floristic research in the Kyiv region, we recorded a population of the alien species *Knautia macedonica* beyond the boundaries of cultivation for the first time. This species had not previously been reported in Ukraine (Mosyakin & Yavorska, 2002; Fedoronchuk, 2023; Koniakin et al., 2024; Shynder et al., 2024). Therefore, this study aimed to describe this new alien species for the flora of Ukraine and characterise its self-sustaining population.

## MATERIALS AND METHODS

*Knautia macedonica* was identified based on the morphological characteristics described by Tutin et

al. (1976). Herbarium specimens were collected in 2023 and 2024.

To classify alien species according to the method of their introduction, the terminology defined by Protopopova & Shevera (2015) was used. Ergasiophytes are species that were deliberately introduced by humans and escaped to the wild near their cultivation sites.

The time of appearance of the species was determined according to the principles defined by Richardson et al. (2000). Neophytes are alien plant species that were intentionally or unintentionally introduced to an area after 1492 through global trade and transport.

The habitat was determined according to the European Nature Information System (Chytrý et al., 2020). GBIF (2025) and POWO (2025) were used as sources of information to analyse the chorological data for *Knautia macedonica*.

## RESULTS

This is the first report of alien species *Knautia macedonica* in Ukraine. The total area occupied by the population was 365 m<sup>2</sup>. The maximum density of generative individuals in the population was 5–7 individuals per m<sup>2</sup>, with a mean density of 1–2 individuals per m<sup>2</sup>. The *Knautia macedonica* population was found in the Right-Bank Forest-Steppe (Fig. 1) in the village of Khotiv (Obukhiv District, Kyiv Region, Ukraine) at the Khotiv Hillfort archaeological site of national importance (50.33350° N, 30.49213° E; 162 m above sea level; iNaturalist, 2025b).

During field surveys, information was collected about the habitat and vegetation in which *Knautia macedonica* occurred. We established that the habitat of the studied species was confined to two types (Fig. 2): grassland (a habitat of thermophilic perennial grasses) and a synanthropic habitat (fallow fields with annual and perennial weed communities).

The plant community in which *Knautia macedonica* was found to grow included 49 species from 15 families. Fourteen of these were grassland plant species: *Agrimonia eupatoria* L., *Dactylis glomerata* L., *Daucus carota* L., *Knautia arvensis* (L.) Coult., *Medicago lupulina* L., *Scabiosa ochroleuca* L., among others. Meadow-steppe plants play a significant role in the plant cover, including *Artemi-*

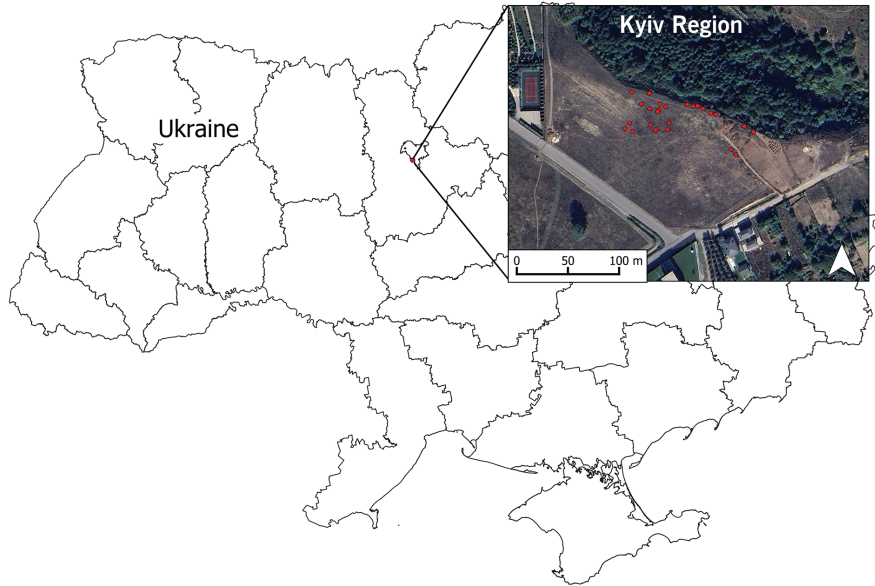


Fig. 1. Distribution of *Knautia macedonica* in the territory of the Khotiv Hillfort archaeological monument of national importance (Kyiv Region).



Fig. 2. *Knautia macedonica* in the forest-steppe zone of Ukraine: inflorescence (A), cauline leaf (B), plant (C), habitat in a grassland (D). Photographs by S. Koniakin.

*sia marschalliana* Spreng., *Phlomoides tuberosa* (L.) Moench, *Salvia nemorosa* L., *Salvia pratensis* L., *Poa angustifolia* L., *Medicago falcata* L., *Falcaria vulgaris* L., *Nonea pulla* L., etc. Psammophilous species recorded in the community included *Trifolium arvense* L., *Berteroa incana* L. and *Pilosella echinoides* (Lumn.) F.W.Schultz & Sch.Bip. There was also

an invasion of alien species typical of ruderal habitats, including *Artemisia absinthium* L., *Armoracia rusticana* G.Gaertn., B.Mey. & Scherb., *Cichorium intybus* L. and *Malva thuringiaca* (L.) Vis. The habitat contained species with high invasive potential, such as *Ambrosia artemisiifolia* L., *Asclepias syriaca* L., *Erigeron annuus* L., *Oenothera biennis* L.



and *Solidago canadensis* L., which transform the meadow-steppe phytocenosis.

The population was self-sustaining. In our opinion, this species escaped from cultivation due to the disposal of garden waste from local households. Alternatively, it may have escaped from the nearby cultivation area through the natural spread of seeds.

## DISCUSSION

It should be noted that *Knautia macedonica* escapes and spreads in transformed habitats in the floras of other European countries. For instance, in Dessel, Belgium, *Knautia macedonica* was found near a household waste landfill in 2011 (Groom, 2012). In the Czech Republic, *Knautia macedonica* was first registered as a new alien species in 2018 (Lepší & Lepší, 2019). Kutlvašr et al. (2019) have investigated the viability and spread of various ornamental plants under cultivation, including *Knautia macedonica*. They found that this species easily escapes from its original cultivation sites to neighbouring flowerbeds and nearby areas. In the village of Nedabily in southern Bohemia, it has been observed growing in cracks in the pavement and in disturbed areas of the lawn near a new building (Jäger et al., 2008; Lepší & Lepší, 2019). The probability of the species spreading in this country is relatively low, and it is categorised as an accidental species (Pyšek et al., 2022).

In Lambrecht, Austria, *Knautia macedonica* has been recorded on the roadside (Hohla, 2021). The author speculates that this ornamental species probably escaped from perennial flower beds, park displays and so-called natural gardens. The author also speculates that the removal of topsoil along roads and the use of machinery might contribute to the further spread of *Knautia macedonica*, from street to street, landfill and ruderal areas, and eventually to fields.

Dudáš et al. (2023) have noted the naturalisation of this species in abandoned meadows between private gardens in the Danube Lowland (Slovakia). They suggest that the initial introduction of *Knautia macedonica* is due to its cultivation in neighbouring private gardens (Dudáš et al., 2023).

Thus, ornamental plants introduced from abroad and possessing a high level of adaptability can spread beyond cultivation and become a source of potentially invasive species. They first penetrate trans-

formed habitats and can then spread to seminatural and natural ecosystems. The spontaneous spread of *Knautia macedonica*, in particular, is attributed to its use in landscape design, uncontrolled cultivation on homestead plots and in private gardens, and failure to comply with garden waste disposal rules. Under the influence of climate change, this species may gain an advantage in terms of its further spread, or conversely, its habitat may be limited; therefore, it requires further monitoring in both natural and artificial habitats.

## ACKNOWLEDGEMENTS

The study was financially supported by the Institute of Evolutionary Ecology of the National Academy of Sciences of Ukraine (state registration number 0125U000528).


**Author contributions.** AP: conceptualisation and supervision, methodology, field surveys, photographic documentation, writing the original draft and figure preparation. GL: methodology, field surveys, photographic documentation and writing the original draft. Both authors read and approved the final version of the article.


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