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Invasive plant species and their threat to biodiversity

Abstract. The problem of the uncontrolled spread of alien plant species matured in the world in the second half of the 20th century, and in recent decades it has become the main threat to the biological diversity of various regions of the world. Prevention of biological Invasions is a new urgent task

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in the field of nature protection, which determines the relevance of the study. The purpose of the study is to determine and predict the distribution area of invasive plants, based on the use of the following methods: comparative morphological-ecological-geographical, route using determinants and atlases of plants of Ukraine, and the method of structural analysis. It is established that the characteristic features of invasive plant species are very high tolerance to habitat and climatic conditions, high rate of reproduction, simple and effective distribution by wind, water, animals, and rapid growth, which contributes to the displacement of slow-growing plants of other species and uncontrolled spread in the absence of natural enemies and restrictions. A particular danger to the biodiversity of Ukraine is the spread of invasive plant species: Sosnowsky's Hogweed (*Heracleum sosnowskyi),* Canadian Goldenrod (*Solidago canadensis L*), American maple *(Acer negundo L.*), Red Oak (*Quercus rubra*), Common Ragweed (*Ambrosia artemisiifolia L.),* Common Milkweed *(Asclepias syriaca L.),* Silver Berry (*Elaeagnus angustifolia)*, American pokeweed *(Phytolacca Americana),* Ecballium *(Ecballium elaterium),* Common Sandbur *(Cenchrus pauciflorus Benth),* Wall Barley *(Hordeum murinum L.),* Jerusalem Artichoke *(Helianthus tuberosus),* etc. The results of the study are an important scientific and practical basis for developing national and regional strategies for controlling invasive plant species

Keywords: weed plants; appearance; distribution area; harmfulness; control methods

INTRODUCTION

Invasive plant species spread naturally or through human intervention and pose a threat to the flora and fauna of the local ecosystem. This can lead to the extinction of native species, which is a particular problem. In addition to environmental impacts, invasive plant species also cause economic damage in crop cultivation, forestry, and other industries that depend on biodiversity and ecosystem services. In particular, invasive plant species can reduce yields, worsen soil quality, reduce the potential for ecotourism, etc. The economic damage in the European Union from invasive plant species reaches 12 billion euros per year (Reges *et al*., 2018; Shuvar *et al*., 2021).

Based on the results of extensive research by a number of authors, for practical reasons, such alien species were also included in invasive species, the introduction and/or spread of which is a threat to the economy and/or human health. Invasive species have a negative impact on the environment, due to the transformation of natural habitats and the displacement of native species in the process of competition or depletion of the nutrient medium (Bhowmik, 2014; Ivashko, 2019; Shuvar *et al*., 2019)

Such researchers as A. Bang, F. Verloove, B. Bharat *et al.* argue that almost all over the world, invasive alien plant species have been introduced to local communities as a result of agricultural or horticultural activities. Among them are previously cultivated species (agricultural, vegetable, medicinal, ornamental plants) or accidentally introduced other taxa. Researchers estimate that in Europe, almost 80% of invasive species were introduced in this way (Bharat *et al*., 2014; Verloove *et al.*, 2021; Bang *et al.*, 2022).

Alien plant species are able to adapt more easily and quickly in unstable phytocenoses with a disturbed natural structure and mechanisms of their functioning. This agroecosystem group, as habitats under constant pressure and strongly altered by humans, is most susceptible to invasion by other atypical plants. In addition to arable land, they include meadows, perennial plant-

ings, vacant lots and fallows, and adjacent territories (trees and shrubs in the field, roads and roadways, and territories around residential and outbuildings). These areas become habitats for plants of foreign origin, because natural habitats with little human intervention are more difficult to control, and the process of introducing invasive plants can take hundreds of years (Tiwari *et al*., 2014; Rashid *et al*., 2021; Sharma *et al*., 2022).

According to researchers, in particular, V.V. Protopopova *et al*. (2003), out of almost 3,500 plant species, about 30% are species of foreign origin (Protopopova *et al*., 2003). However, only a few of them threaten nature in modern conditions and can be classified as invasive alien species (Lastrucci *et al*., 2019, Khoury *et al*., 2019; Kumar *et al*., 2020).

Thus, most studies are devoted to the biology of invasive species and the ecology of their distribution. However, few studies have identified methods of preventing such invasions. Therefore, timely and effective counteraction to biological invasions is important in the field of nature protection and biodiversity conservation and determines the relevance of the study.

The purpose of the study is to identify and predict the spread of invasive plants.

MATERIALS AND METHODS

The study was conducted during 2010–2022 in accordance with existing methods, collected herbariums and an analytical review of literature sources on individual taxa, their morphological, ecological, and other features. The object of research is species of invasive plants in the composition of natural, semi-natural, anthropogenic flora complexes and plant communities of vegetation cover.

When investigating the species diversity of flora complexes, a comparative morphological-ecological-geographical method was used. The species composition of invasive plants was determined by the route method using determinants and atlases of plants of Ukraine. The obtained information about plant species is reduced to taxonomic (The Plant List..., n.d.) and syntaxonomic correspondence. A group of invasive plants was examined using classical methods of structural analysis.

The studies covered the main areas of invasive vegetation growth: residential areas, ruderal areas, park and forest-park zones, lawns, arable land, and degrading natural ecotopes in the western Forest-Steppe of Ukraine.

The study was conducted in accordance with ethical requirements. Experimental plant studies, including the collection of plant material, were in accordance with institutional and international guidelines. The study also followed the standards of the Convention on Biological Diversity (1992) and the Convention on Trade in Endangered Species of Wild Fauna and Flora (1963).

The climate of the area of the study zone is characterised as temperate continental (Fig. 1).

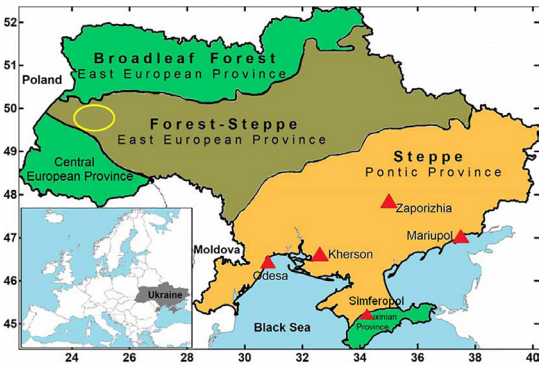

Figure 1. Geographical location of the research area

Note: on the map – the research area is the western Forest-Steppe of Ukraine

In addition, in the course of the study, to achieve this goal, practical recommendations, scientific and methodological provisions were used to determine possible ways of spreading and

controlling invasive plant species. In addition, the theoretical segment of the study includes papers of researchers in the field of herbology, and the information components of the study were official materials and publications, in particular: the Strategy for the Biodiversity Protection (European Union) and the Strategy for Biosafety and Biological Protection for 2022-2025 (Ukraine).

Monographic and periodical literature was also used, including the results of the authors' findings. A comparison method was used to process the materials and an abstract-logical method aimed at investigating the causes of the spread of invasive plant species.

In the course of the study, a complex of special and general scientific groups of methods was used, namely: induction and deduction (for a more complete analysis and study of factors contributing to the development of invasive plant species, namely induction was used to obtain data, and deduction – to create general principles based on these data), dialectical (to clarify the patterns of modern causes of the spread of invasive species), analysis (to analyse the collected information, draw conclusions, provide recommendations, determine the prospects for further research), statistical methods (for quantitative identification of the obtained data), synthesis (to combine the acquired knowledge in a single whole), and comparative analysis (for compiling the results obtained).

The study of the possible spread of invasive plant species and the development of a forecast model was conducted for the following species: Sosnowsky's hogweed (*Heracleum sosnowskyi),* Canadian goldenrod (*Solidago canadensis L*), Common Milkweed *(Asclepias syriaca L.)* American pokeweed (*Phytolacca Americana).* Using the Python programme, a model was developed that characterises the state and intensity of the increase in the number of these species for the period up to 2050.

RESULTS AND DISCUSSION

Assessment of the nature of the spread of adventitious plants in Ukraine as dangerous for natural development and optimal functioning of regional flora gives grounds to consider it appropriate to take a comprehensive and global approach to solving the problem of phytoinvasions. Ultimately, it should be considered as one of the priority areas of research and the effectiveness of environmental organisations. It is in this aspect that research continues in institutions of higher education that provide monitoring and control of adventitious weeds of agroecosystems, since preventing the negative impact of adventitious plants on biodiversity at different levels (species, cenotic, ecosystem) is the basis for establishing the diversity of invasive species and slowing/stopping the biological invasion of alien plants.

Studies conducted by experts from different countries have shown that adventitious plants pose a threat mainly to stenotopic species, changing the ecotopes in which they grow, causing insularisation of their populations and, as a result, genetic, taxonomic, and cenotic depletion of natural vegetation cover. The migration of plants, especially invasive species, leads to certain shifts in the balance of ecosystems. These changes (population suppression or decline) with negative consequences occur at all levels (Blicharska *et al*., 2019; Lyytimäki *et al*., 2020; Zhou *et al*., 2022; Dorber *et al*., 2023).

The protection of agricultural biodiversity has recently become an important challenge for countries around the world, including Ukraine. On the one hand, measures are aimed at protecting rare plant and animal species, and valuable natural habitats, and on the other hand, more and more attention is paid to the protection of biocenoses as an integral functional ecosystem. The source of threats to biological diversity is the introduction of alien plant species that show the

ability to constantly and spontaneously populate, develop, and modify plant communities.

It is established that alien species entered and still enter the territory of Ukraine deliberately to increase agricultural and forest production, market competitiveness, and pest control. Numerous species of them have been used and are still being used as ornamental plants, while the search for new forms for introduction into the culture or natural flora continues.

In modern conditions, the biggest problem for certain plant species is the climate, so some plants die, unable to withstand long periods of drought or harsh winters. However, those plants that come from areas with similar climatic conditions quickly adapt to new conditions and even conquer new territories. The mainstay at the first stages of settlement is usually ruderal places of stay – areas of ports, railway stations, and places of cargo transhipment. However, new plant species migrate (carried by wind, water, etc.) and get to another substrate and begin the next stage of territory capture. Those of the plants that settle on a native alien range are the most expansive – they produce viable offspring, often in large numbers, settle over long distances from the mother plants and colonise large territories in a short time

Among the methods of spreading invasive plants, the following are distinguished:

- clogged seeds, feed grain, hay, straw, mulch, irrigation water, manure, peat compost, manure;
- completely uncontrolled penetration of various invasive forms of weeds into the territory of Ukraine;
- movement of contaminated equipment and vehicles in clean areas;
- animal husbandry and wildlife;
- construction/repair of communication routes using weed-infested material; recreation;
- water and wind transfers (natural disasters, hurricanes, dust storms, floods).
- freight rail and road transport.

Among the plants in Ukraine, according to various estimates, there are from 600 to 800 alien species, which consists of 14% of the plant world, of these, about 50 species are dangerously invasive (Shuvar *et al.*, 2021, Protopopova *et al.*, 2003).

Three stages of settlement of new territories by invasive species have been established: 1) Introduction – consists of the transfer of material for reproduction of a certain species outside the current area of its distribution and ends with the formation of an adult population; 2) colonisation – during which the initial population reaches the level of self-reproduction and expansion of the area of its existence; 3) placement/capture of territory and penetration into natural groups.

As a result of the study, a database of invasive plant species established in agricultural areas and ruderal cenoses on the territory of the western forest-steppe of Ukraine was created (Table 1).

Table 1. List of invasive and potentially invasive plant species identified in the western Forest-Steppe of Ukraine (2010-2022)

Species name	Origin	Life form	Hygroform
Asclepias syriaca L.	North American	Perennial	Xero-mesophyte
Heracleum sosnowskyi	Caucasian	Biennial Perennial	Mesophyte
Solidago canadensis	North American	Perennial	Xero-mesophyte
Heracleum mantegazzianum	Caucasian	Biennial, Perennial	Mesophyte

Table 1, Continued

Species name	Origin	Life form	Hygroform
Ambrosia artemisiifolia L.	North American	Annual	Xero-mesophyte
Bidens frondosa	North American	Annual	Xero-mesophyte
Xanthium albinum (Widd.) H. Scholz	Avg. European	Annual	Xero-mesophyte
Conyza canadensis	North American	Annual	Mesoxerophyte
Echinocystis lobata	North American	Annual	Mesophyte
Helianthus tuberosus	North American	Perennial	Xeromesophyte
Hordeum murinum L.	North African	Annual	Mesophyte
Impatiens glandulifera	East Asian	Annual	Mesophyte
Impatiens parviflora	Central Asian	Annual	Mesophyte
Lepidotheca suaveolens	North American	Annual	Mesophyte
Lupinus polyphyllus	North American	Biennial Perennial	Mesophyte
Oenothetra rubricaulis	North American	Biennial	Mesoxerophyte
Phalacroloma annuum	North American	Annual	Mesophyte
Phytolaccae americanae	North American	Perennial	Mesophyte
Vicia villosa	Mediterranean	Annual	Xero-mesophyte
Xanthoxalis dillenii	North American	Perennial	Xero-mesophyte

Source: European Commission, Directorate-General for Environment (2002)

Predicting the rate of spread of invasive plant species depends on many factors, such as climatic conditions, soil type, the presence of natural enemies, and human activity. The developed predictive models use various approaches, such as mathematical models, statistical methods, or geographic information systems. Predictive models can help identify potential risk areas for the spread of invasive species and develop effective measures to control and manage them. However, it is important to note that predictive models cannot predict all possible scenarios for the development of invasive species, so continuous monitoring and analysis of data is key to effective control of them.

In the completed study, the study of the possible spread of invasive plant species and the development of a forecast model was conducted for Sosnowsky's hogweed (*Heracleum sosnowskyi),* the Canadian goldenrod (*Solidago canadensis L*), Common Milkweed *(Asclepias syriaca L.), and* American pokeweed (*Phytolacca Americana).* Considering the rate of spread of these species and their prevalence among other biological groups of weeds, the Python study developed a model that characterises the state and intensity of the increase in the number of these species for the period up to 2050 (Fig. 2).

Thus, it is established that invasive plant species, if no measures are taken to control them, can spread quite quickly, and in the period until 2050, the number of such plants will be more than twice their current number. The developed predictive model indicates the rate of spread of invasive plant species and serves as a scientific basis for developing specific effective measures to control their abundance. The spread of invasive plant species creates a problem for diversity in different countries of the world. Therefore, the EU countries have developed and approved a strategy for the protection of biodiversity, covering 6 priority tasks (Osipenko, 2020).

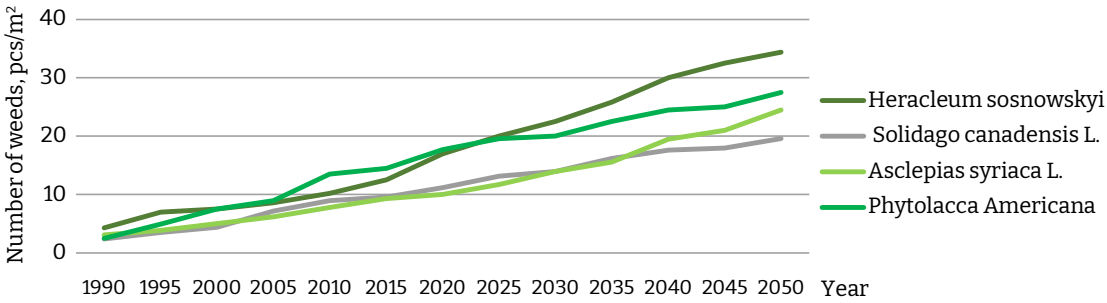

Figure 2. Forecasting the spread of *Heracleum sosnowskyi*, *Solidago canadensis L*, *Asclepias syriaca L.* and *Phytolacca Americana*

1. Protection and restoration of the natural state;

2. Maintaining and improving ecosystems and their functions;

3. Ensuring sustainable development of agriculture and forestry;

4. Ensuring sustainable use of fish resources;

5. Control of invasive alien species;

6. Overcoming the global biodiversity crisis.

According to researchers' estimates 80% of invasive foreign plants were imported to Ukraine as ornamental or agricultural plants. An example is Japanese Larch (planted in forests as an ornamental, creating hybrids with native European larch), Sosnowsky's hogweed (potentially forage plant), alfalfa (legume forage plant, for green manure), etc. (Najberek *et al.*, 2022, Reges *et al.*, 2018).

Invasive species threaten the flora of a particular area by competing with local taxa for an ecological niche, which can lead to complete habitat control in new areas due to basic traits, including:

- very high tolerance to the habitat and climatic conditions;
- high activity of generative or vegetative reproduction and reproduction during the growing season and long viability of seedlings;
- rapid seedling growth, early maturity for reproduction, and relatively short life cycle;
- easy and efficient distribution by wind, water, or animals;
- anthropogenic intervention and various logistics routes within the state and from abroad;
- ability to cross with other species, create polyploids and ecotypes;
- rapid growth, which leads to silencing and complete displacement of weaker plants of other species;
- rampant spread in the absence of natural restrictions and enemies.

The characteristic features of invasive plants are also indicated by M. Dumitraşcu, I. Grigorescu, G. Kuscicsa, M. Doroftei, M. Năstase, C. Dragotă, T.S. Dvirna, claiming that they include: rapid growth and reproduction, ability to occupy uncultivated land, short development cycle, early flowering and self-seeding, generation of large numbers of fruits and/or seeds, efficient reproduction, ability to use local pollinators, excellent phenology from native species helps them compete effectively, resistance to disease and pest damage (Dumitraşcu *et al.*, 2014).

As for the causes of plant invasiveness, Z. Paukova, V. Kaderova, L. Bakay, K.O. Reinhart, A. Packer, V.D. Putten, I.A. Shuvar note that the movement and spread of alien species in a new environment are facilitated by the absence of natural enemies and other restrictions in their natural environment. Pollution of the surrounding

habitat and human destruction of natural habitats of native species are also substantial factors. A particularly serious threat is progressive climate change, in which alien species are more likely to settle in new areas where it is more difficult for native species to survive (Reinhart *et al*., 2003; Paukova *et al*., 2013; Shuvar *et al*., 2021).

According to C. Brickell, G. Stohlgren, D.T., Barnett, J.T. Kartesz, a number of factors contribute to the spread of invasive plants. Thus, most often plants are spread by seeds, through the wind (anemochoria), water (hydrochoria), and animals (zoochoria). Distribution is also possible when plant residues are accidentally or intentionally dumped into sewers, ponds, forests, compost, etc. (Brickell *et al*., 2016, Stohlgren *et al*., 2003).

The sources of invasive plant species and the causes of their spread were examined by a number of researchers: J. Andreu, P. Hulme, I. Shuvar, H. Korpita, etc. Thus, the authors established that introduction, natural mechanisms of distribution, climate change, and anthropogenic factors most affect the spread of invasive species, which correlates with the study performed (Hulme *et al*., 2008; Andre *et al*., 2019; Shuvar & Korpita, 2021).

Invasive alien species are often established in all types of habitats. They were accidentally introduced to the local flora or imported as cultivated, ornamental, or medicinal species. Among agricultural land, in addition to arable land, there are also areas that are not used for agriculture (fallows, field roadsides, roads, drainage ditches, etc.), which are often a place of growth of invasive plants. Such habitat environments, which are located in the field of human activity, are more easily captured by aggressor plants than by natural plant grouping. Under favourable conditions, invasive plants can enter adjacent ecosystems from them. The authors' studies show that extensive agricultural ecosystems (ecological, with simplified tillage or cultivation of perennials for energy needs) are more at risk of penetration of invasive segetal plants than ecosystems that are subjected to constant anthropogenic pressure due to intensive plant cultivation (crop cultivation technology, plough tillage).

Action programmes on invasive plant species as a threat to biodiversity, which are confirmed in the conducted study, were considered in their papers by S.M. Haq, P.E. Hulme. Among the measures to prevent the spread of invasive plants, the following deserve special attention:

- vehicles and equipment must be free of invasive plants and seeds;
- minimising ground disturbance during all construction and maintenance work;
- promoting the creation of a healthy plant community;
- limiting the movement of soil or gravel clogged with weeds;
- using certified seed mixes that are weed-free;
- elimination of locations – the neutralisation of existing invasive plant groups and control of new ones;
- maintenance and restriction of the movement of invasive plants from neighbouring land or administrative territories;
- highways, railways, and waterways are often corridors that need to be monitored to limit the spread of invasive plants.;
- protection of areas that are clean from invasive plants;
- providing information to the general public about the limited distribution of weeds;
- production, distribution among various segments of the population and placement of informative materials for familiarisation (tables, posters, information leaflets, etc.);
- keeping machinery and vehicles clean (Hulme *et al.*, 2008; Haq *et al.*, 2021).

According to R. Dean, invasive plant species are able to quickly adapt to new environments and cover large areas. They can also have a major

impact on biodiversity and ecosystem functioning and can change the structure and composition of soils, disrupt interactions with animals and other plants, and affect energy and material flows in the ecosystem, which is also confirmed in the conducted study (Dean *et al.*, 2016).

Another confirmation of the study is that invasive plant species can be carriers of diseases and pests, which can cause even more damage to local ecosystems and the economy (Heshmati, 2019).

In his study, the author argues that invasive plant species can be effective tools for solving soil erosion problems and restoring degraded ecosystems. However, their potential impact on local ecosystems and other risks should be carefully examined before use (Jamil *et al.*, 2022). In addition, the conducted study correlates with the opinion of leading researchers, in particular, C.K. Peres *et al.* (2018) that an invasive alien species is a descendant species from another ecosystem whose introduction and/or spread threatens local biodiversity.

The results of this study are confirmed in the studies of a number of authors – K. Najberek, A. Olszańska, B. Tokarska-Guzik, K. Mazurska, Z. Dajdok, W. Solarz, L. Lastrucci, G. Fiorini, L. Lunardi, D. Viciani, who believe that it is necessary to develop comprehensive methods for localising, controlling and preventing the spread of invasive plant species (Lastrucci *et al.*, 2019; Najberek *et al.*, 2022). In his papers, V. Manral, together with his co-authors, highlights various action programmes for invasive plant species that are confirmed in practical implementation. Among them, the following can be distinguished: control and monitoring, physical destruction, biological control, chemical control, the use of agrotechnical means (cover crops, mulching, and composting), and legislative control (Manral *et al.*, 2020).

I. Rashid notes that the introduction of environmental education and raising public awareness about the negative impact of invasive species on local ecosystems can be an effective measure to prevent their spread and reduce the harmful impact on biodiversity. It is also important to develop and implement management strategies for invasive species that regulate their distribution and effectively use resources to control them. Special attention should be paid to preventing the spread of invasive species through international trade in plants and seeds. Quality control and compliance with international standards for plant exports and imports can substantially reduce the risks of spreading invasive species from one territory to another, which is also highlighted in the study (Rashid *et al.*, 2021).

Notably, the decree of the Cabinet of Ministers of Ukraine No. 573 "On approval of the action plan for the implementation of the biosafety and biological protection strategy for 2022-2025" (2022, July) came into force in Ukraine. The implementation of this strategy is aimed at ensuring human safety and preserving biological diversity in Ukraine. The action plan provides for a number of actions to prevent and control the spread of invasive plant species, including the creation of a database on invasive species, the development of action plans to reduce and control them, and the raising of public awareness about the problem of the spread of invasive species. These measures can contribute to the conservation of biological diversity in Ukraine and reduce the negative impact of invasive species on ecosystems.

CONCLUSIONS

Unlimited movement of people, goods, and services contributes to the spread of invasive species, the sources of which are most often: seeds, vegetable seedlings imported from abroad, and ornamental plants grown in containers. In addition to the ill-conceived and destructive destruction of ecosystems by humans, species invasions pose the greatest threat to natural biodiversity.

Invasive species negatively affect the native components of plant communities. In extreme cases, they can lead to a complete destruction of the natural ecological balance of habitats. They cause substantial economic damage to the global economy. It is necessary to assess the risk before introducing new species to cultivation to reduce the impact of this negative process.

Measures aimed at limiting the emergence and prevention of colonisation by invasive species, which include methods aimed at reducing the area occupied by foreign species (for example, regular mowing or spot destruction of plants in the initial phase of colonisation) are also important, which contribute to reducing seed production and germination due to mechanical removal of inflorescences and harvesting of plants before seed maturity.

It is important to reduce the area of land that can be a potential habitat for invasive species (for example, areas with a disturbed ecological structure, and devastated and abandoned land). Deliberately spreading invasive species and using them in large-scale public plantings should be avoided, considering that many problematic taxa were introduced to botanical gardens as ornamental plants.

Training of advisory personnel and training of farmers will substantially affect the restriction of the distribution area of this group of plants, which are a real threat to the biodiversity of agrophytocenoses and the environment in general.

It is considered appropriate to develop a comprehensive programme for investigating invasive processes in natural and cultural phytocenoses of Ukraine, aimed at implementing a set of priority scientific research to reduce the threat of invasive plants, in particular:

a) introduction and maintenance of a register of invasive plant species with the determination of the degree of threat to individual regions;

b) creation of a system for monitoring invasive plant species in forests, meadows, and other types of phytocenoses to determine the rate of invasion and distribution area of individual species;

c) development of a strategy to prevent, manage, and reduce the risks associated with invasive plant species in agriculture and forestry in the context of global climate change;

d) elucidation of the economic, social, and environmental consequences of the expansion of invasive plant species;

e) strengthening coordination and information exchange between researchers (in Ukraine and internationally) by users of natural plant resources and regulatory authorities on integrated approaches to managing and preventing invasive processes.

It is particularly important to increase the involvement of ecosystem users in training to ensure early detection and control of the number of invasive plants within a certain distribution area. In addition, such measures will increase scientific understanding of the mechanisms of the spread of invasive species and ensure the effectiveness of control measures.

The scientific originality of the study is that for the first time in the territory of the western Forest-Steppe of Ukraine, taxonomic observation of the detection and spread of invasive plants was performed to develop predictive models of their behaviour and methods for controlling the number and distribution area.

The prospect of further research is to examine the mechanisms and factors that influence the spread and increase of populations of invasive plant species, develop effective strategies for their control and management.

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CONFLICT OF INTERESTS

None.

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Інвазійні види рослин та їх загроза біорізноманіттю

Анотація. Проблема неконтрольованого поширення чужорідних видів рослин назріла у світі в другій половині XX століття, а в останні десятиліття стала головною загрозою біологічному різноманіттю різних регіонів світу. Запобігання біологічним інвазіям є новим актуальним завданням у сфері охорони природи, що зумовлює актуальність дослідження. Мета дослідження – визначити та спрогнозувати ареал поширення інвазійних рослин на основі використання методів: порівняльного морфолого-еколого-географічного, маршрутного з використанням визначників та атласів рослин України та методу структурного аналізу. Встановлено, що характерними особливостями інвазійних видів рослин є дуже висока толерантність до середовища існування та кліматичних умов, висока швидкість розмноження, просте та ефективне поширення вітром, водою, тваринами та швидкий ріст, що сприяє витісненню повільно зростаючих. рослин інших видів і неконтрольоване поширення за відсутності природних ворогів і обмежень. Особливу небезпеку для біорізноманіття України становить поширення інвазійних видів рослин: борщівник Сосновського (*Heracleum sosnowskyi*), золотарник канадський (*Solidago canadensis L*), клен американський (*Acer*

negundo L.), дуб червоний (*Quercus brabra*), амброзія звичайна (Амброзія полинолиста (*Ambrosia artemisiifolia L.*), молочай звичайний (*Asclepias syriaca L.*), срібляста ягода (*Elaeagnus angustifolia*), американська польова трава (*Phytolacca Americana*), екбалліум (*Ecballium elaterium*), піщаниця звичайна (*Cenchrus pauciflorus Benth*), ячмінь стінний (*Hordeum murinum L.*), топінамбур (*Helianthus tuberosus*) та ін. Результати дослідження є важливою науково-практичною основою для розробки національних та регіональних стратегій боротьби з інвазійними видами рослин

Ключові слова: бур'янисті рослини; зовнішній вигляд; зона розподілу; шкідливість; методи контролю