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COMPETITIVE ABILITY OF INVASIVE WEED SPECIES AND THEIR INFLUENCE ON PHYTOCENOSE BIODIVERSITY

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The global threat from the spread of invasive plant species leads to an imbalance of plant living conditions in the agrocenosis and depletion / destruction of biodiversity. Ukrainian scientists are conducting a research on the impact of alien species of flora in the context of environmental threats to phytoinvasions. Invasive plants are especially dangerous both for the integrity of natural ecosystems and for various areas of economic activity. Invasive plant species cause significant damage to agriculture, forestry and water management, nature reserve areas.

Less common invasive plant species create one of the biggest environmental problems in the world. This is a scientifically proven fact, which is legally reflected both in international conventions and in the legislation of individual countries.

The foundation of an ecosystem is made by its flora. Therefore, invasive plant species are a blow to its foundation. If climatic conditions are suitable for invasive plants, they have a huge competitive advantage over native species, as they have no or limited natural enemies/consumers and diseases in the local ecosystem that could deter their spread. Therefore, they simply squeeze out local species from the territories, dooming them to extinction.

The extinction of native plant species leads to extinction of native species of animals, fungi and many microorganisms that have built ties with the aboriginal flora for thousands or millions of years. They are directly dependent on it and are organically interconnected. That is why the invasion of an alien species does not increase the number and activity of local biodiversity, but, on the contrary, leads to the death of a significant number of species of flora and fauna dominated by only one or more species of invasive plants.

In Ukraine, the impact of non-native plants on the environment is growing every year. In terms of Adventist flora, Ukraine ranks first among other flora in the world. The spontaneous fraction of adventive flora of Ukraine has 830 species of vascular plants (including 18 % – archeophytes and 82 % – kenophytes), which is about 14 % of the total flora of the country, which has more than 6,000 species of vascular plants (including all aboriginal and adventitious species), as well as the main cultivated and wild plants.

Key words: biodiversity, invasion, weeds, control measures.

Шувар І., Корпіта Г., Дудар І., Ліпінська Г. Конкурентна спроможність малопоширених видів бур'янів та їх вплив на біорізноманіття фітоценозів

Світова загроза від поширення інвазивних видів рослин призводить до дисбалансу умов життя рослин в агроценозі та збіднення/знищення біотичного різноманіття. Учені України проводять дослідження впливу чужорідних видів флори у контексті екологічних загроз фітоінвазіям. Інвазивні рослини особливо небезпечні як для цілісності природних екосистем, так і для різноманітних сфер господарської діяльності. Інвазивні види рослин завдають значних збитків сільському, лісовому та водному господарствам, територіям природного заповідного фонду.

Малопоширені інвазивні види рослин – одна з найбільших екологічних проблем у світі. Це науково доведений факт, який відображено юридично як у міжнародних конвенціях, так і в законодавстві окремих країн.

Фундамент екосистеми становить її флора. Тому інвазивні види рослин – це удар по її основі. Якщо кліматичні умови для чужаків підходять, то вони мають величезну перевагу в конкуренції над аборигенними видами, оскільки у них відсутні або обмежені природні вороги/споживачі та хвороби в місцевій екосистемі, які могли б стримувати їх поширення. Тому вони просто витискають місцеві види з оселищ, прирікаючи їх на вимирання.

Зникнення місцевих видів рослин призводить до зникнення місцевих видів тварин, грибів та багатьох мікроорганізмів, які будували зв'язки з аборигенною флорою упродовж тисяч або мільйонів років, безпосередньо залежать від неї і органічно пов'язані між собою. Саме тому інвазія чужорідного виду не впливає на збільшення чисельності і активності місцевого біорізноманіття, а, навпаки, – призводить до загибелі значної кількості видів флори та фауни з домінуванням лише одного або кількох видів чужинців.

В Україні вплив неаборигенних рослин на довкілля зростає з кожним роком. За рівнем адвентизації флори Україна посідає чільне місце серед інших флор світу. Спонтанна фракція адвентивної флори країни налічує 830 видів судинних рослин (зокрема 18 % – археофіти та 82 % – кенофіти), що становить близько 14 % від загальної кількості видів флори країни, у банку якої понад 6000 видів судинних рослин (разом з усіма аборигенними та адвентивними видами), а також основні культивовані та здичавілі рослини.

Ключові слова: біорізноманіття, інвазія, бур'яни, заходи боротьби.

Formulation of the problem. Invasive weed species are any plant species that have not grown in specific conditions and are damaging the ecosystem. They have a particularly significant effect on the structure of plant groups, cause impoverishment of their species composition and structure, and even contribute to replacement of the regional indigenous plant complexes. Invasive weeds can change the function of the ecosystem, reduce productivity and profitability of the primary industry, and severely limit the long-term sustainability of all the state's agricultural and natural resources. Invasive pests threaten agrocenoses of crops, pastures, waterways, national parks and the urban environment.

As they take root in local ecosystems, invasive species become competitors / aggressors and displace natural species. They can destroy valuable tree species that create shade, carbon sequestration and wildlife habitat, or even increase the risk of forest fires. They are able to have a significant impact on the development of erosion processes and soil degradation, deterioration of groundwater quality [1–4].

Analysis of recent research and publications. Analysis of recent researches and publications. Our research was conducted during 2013–2021 [9–10], devoted to the invasion of rare harmful weeds and its impact on agrocenoses and biodiversity of Ukraine. A number of scientific works by other authors [6–8; 11] indicate the threat of the significant number of them on the territory of Ukraine. In particular, such segetal / ruderal plants as Heracleum sosnowskyi, Solidago canadensis, Acer negúndo, Quercus rubra, Phytolacca Americana, Ambrosia artemisiifolia, Asclepias syriaca, Hordeum murinum L. etc.

This extraordinary plasticity of many weed species can be explained by their nature as pioneer species, adapted to high levels of disturbance due to the presence of many phenotypes that can be manifested in a particular environment.

The adaptive advantage of plasticity allows invasive species to make better use of natural resources, as they tend to respond better to increasing the availability of the latter.

Global climate changes (rising temperatures, rising CO_2 emissions) or changes in humidity are causing highly plastic reactions in invasive weeds. Conversely, non-invasive plants adapted to more stable environmental conditions cannot adapt so quickly to sudden changes in the growing conditions.

Invasive alien species are likely to interact with climate change, which will require active management.

Setting objectives. Weed infestations pose a serious threat to natural ecosystems. For many years, economic and sustainable methods of reducing and dominating harmful weeds have been sought. The number of invasive species can be controlled by mechanical or chemical methods, as well as biocontrol agents. Because the value of biological control is obvious and attractive, evaluation of the potential insects to make biocontrol is a long and costly process, so mechanical control and herbicides are most often used to control weeds. Mechanical removal by pruning or application of herbicides provides fast suppression of weeds, but they can be easily regenerated.

Presenting main material. Destruction of natural habitats due to anthropogenic impact, reduction of biodiversity, intensification of agriculture, imperfection of the control system for the import of plants and animals from abroad over the past decades have led to penetration of many species of flora and fauna that have never been found on its territory.

Today, almost the entire territory of Ukraine is to some extent affected by such alien plant species. A significant number of them exhibit invasive properties, and the processes of mass development are often characterized as biological pollution. Increasing globalization, climate changes, habitat fragmentation and degradation, overpass construction and the use of

potentially dangerous invasive genetically modified organisms increase the rate of invasion of alien species into new areas outside their natural habitats and increase their invasive properties.

Invasive alien species are considered one of the main factors of the negative impact on biodiversity, which leads to a decrease in the number and extinction of a number of local species of wild flora due to changes in the ecosystem structure, predation, competition, disease and others. They cause multimillion-dollar damage to agriculture and spheres, and some species threaten human quality of life and health.

World agriculture is developing special weed control programs where they are the most useful for biodiversity and the greatest cultural and social value, in particular, can be removed from areas where they affect endangered species and their habitats.

Over the years of research, it is have found that in the western forest-steppe the area of distribution of Heracleum sosnowskyi, which was cultivated as a silage plant in the middle of the XX century, is growing every year. Its leaves and fruits are rich in essential oils containing furanocoumarins – photo-sensitizing substances that, if applied to the skin, cause photochemical burns.

This plant grows everywhere (in riparian areas and on both sides of roads, meadows, pastures, recreational complexes, forests, as well as in homesteads and agricultural soils). The exponential phase of invasive propagation of Heracleum sos-nowskyi continues to this day.

In addition to Heracleum sosnowskyi, the weed Solidágo canadénsis L. is spreading on a large scale. According to the degree of danger to the environment and human well-being, this alien invasive species is almost on a par with Ambrosia artemisiifolia L. and Heracleum sosnowskyi. As of today, Solidágo canadénsis L. causes a significant damage to Ukrainian agriculture. Nevertheless, this process can still be brought under control right now.

In the western forest-steppe (Ivano-Frankivsk region) we found the emergence and intensive spread of another invasive species of weed – Asclepias syriaca, which has so far been distributed in Kyiv, Poltava, Chernihiv, Cherkasy, Dnipropetrovsk, Sumy and other central and southern regions of Ukraine. Given that Asclepias syriaca is a very vicious weed that multiplies rapidly, it is important to know that it is not the subject to chemical or mechanical destruction, and can contaminate crops of about 40 crops (corn, soybeans, sorghum, sugar beets, vegetables, cereals, etc.)

Conclusions. In Ukraine, most stakeholders often have limited / no knowledge of the range of threats posed by invasive species. Therefore, it is difficult to mobilize the necessary efforts to control their spread, even those that affect human health or its basic economic interests. A striking example is the rapid spread of the quarantine species of ragweed (Ambrosia artemisiifolia L.) in Ukraine and its penetration not only into agrocenoses, but also into steppe, meadow and forest ecosystems. The damage to agriculture and human health is estimated at millions of hryvnias. However, despite the significant threat posed by this species, appropriate measures have not been taken, including due to a lack of public awareness of the possibilities of counteracting the spread of the species. Deep awareness and under-standing of the impact of invasive species is important for the development of shared responsibility, encourages private structures and increases the effectiveness of appropriate measures.

Weeds interfere with a variety of human activities, and a number of methods have been developed to suppress or eliminate them. These methods vary depending on the nature of the weed itself, means of disposal and the method impact on the environment. Usually, for financial and environmental reasons, the methods used in a public park should not be used in pastures or forests. Herbicides sprayed on roadsides to remove weeds that threaten fire or traffic are unsuitable for use in agrocenoses.

Mulching, which is used to control weeds in backyards, is not possible for large farms. Weed control, in any case, has become a highly specialized activity. In agriculture, weed control is an important part of the technology of growing crops and obtaining high quality products with minimal negative impact on the environment.

Invasive weeds are so effective in suppressing native plants that they lose the ability to thrive in biodiversity. They affect our national parks, competing with local plants for water, sunlight and space. Under these conditions, dense areas of ve-getation are formed, which suppress / kill local plants, which, in turn, adversely affects of local animals. Weeds reduce the food source of these animals and destroy the habitat that is important for their survival.

Developing a strategy to control invasive weed species will help to effectively control them in own area, namely:

- abide by laws against invasive plants;
- integration of control measures and methods;
- coordination of control activities with neighboring territories;

- increase the effectiveness of measures by ensuring the priority of control activities and the use of resources in the optimal period.

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