ALIEN AND POTENTIALLY INVASIVE SPECIES OF PHYTOPATHOGENIC FUNGI AND OOMYCETES IN PLANT COMMUNITIES OF BELARUS

V. D. Poliksenova, A. K. Khramtsov, N. A. Lemeza, S. G. Sidorova, M. A. Stadnichenko
Belarusian State University, Faculty of Biology, Department of Zoology, 4, Nezavisimosti Ave., 220030, Minsk, Belarus
Corresponding author: V. D. Poliksenova (*polyksenova@gmail.com*)

Introduction. Biological invasions are regarded today as one of the main threats to biodiversity. The main focus here is traditionally on plants and animals, but so far there are few studies on the distribution of phytopathogenic fungi [1, 2].

As a result of invasions of phytopathogens, epiphytotics of new diseases often occur in natural and artificial phytocenoses, causing enormous economic and environmental damage [3, 4].

All the more alarming is the fact that in recent decades there has been an exponential dynamics of the emergence of alien plant pathogens in Europe [5]. This problem is both regional and international, it is associated with human economic activities, transboundary flows, climate change, and the biology of pathogenic fungi and their hosts.

Materials and methods. Plants with symptoms of infection by phytopathogenic micromycetes were collected in various plant communities in Belarus. Identification was carried out according to keys and monographs.

Results. As a result of the research, 188 species and intraspecific taxa of alien phytopathogenic micromycetes were identified, which cause downy mildew and powdery mildew, rust, smut, various spots, rot and deformations of organs of wild and cultivated plants.

They belong to 44 genera, 13 families, 8 orders, 7 classes, 4 divisions (Oomycota, Ascomycota, Basidiomycota, Deuteromycota), 2 kingdoms (Stramenopila, Fungi). Among them, imperfect fungi dominate (104 species, 55.3%). All species belonged to the same ecological group - phylloplan micromycetes. The degree of commonality of phytopathogenic mycobiota for cultivated and wild plant species depends on the broad or narrow specialization of the pathogen.

The wider occurrence of the phytopathogen (score 2–5) is usually accompanied by a higher score of plant damage (3–4). Single finds of an alien species are characterized by insignificant damage to plants (score 1–2). With a fairly high score (3-4) of plant damage and more than a single occurrence, 75 out of 188 alien species of fungi (39.9 %) were recorded. They can be classified as potentially invasive species. Among them, only 15 species were recorded on wild plants and 60 species on cultivated plants. Thus, cultivated plants are obviously more susceptible to attack by invasive phytopathogens or, in the case of a highly specialized pathogenic fungus, are their vectors and spread vectors.

It is noted that the appearance in Belarus and the advancement of dangerous alien species of phytopathogenic fungi and oomycetes to new territories is associated with the spread of thermophilic species of mainly cultivated host plants against the background of observed climatic changes. Alien phytopathogenic micromycetes were recorded on cultivated and wild gymnosperms and angiosperms of 144 species, 123 genera, and 48 families. At the same time, almost three times fewer species were found on wild plants (54) than on cultivated plants. The degree of commonality of the phytopathogenic mycobiota for cultivated and wild plant species is generally small and depends on the broad or narrow specialization of the pathogen.

It seemed interesting to find out what types of phytopathogenic fungi have been developed on invasive plant species. According to the available data, 54 species and intraspecific taxa of phytopathogenic micromycetes were registered on 37 invasive species of wild plants included in the Black Book of the flora of Belarus (2020). Among them, almost half – 26 species (48.1 %) belong to aliens for Belarus.

The fact is that they are highly specialized and at present parasitize only on the indicated invasive plant species. The remaining 28 species (51.9%) affect both native and alien plants. Probably, these pathogens have expanded their trophic niche, moving from native to alien plants.

Indicators that determine the invasive activity of phytopathogenic fungi have been identified: distribution on the territory, frequency of occurrence and the degree of damage to host plants in a certain area, climatic phenomena and weather factors. A group of 75 potentially and actually invasive species was identified.

Conclusion. As a result of the research, a base of information was created on the distribution and degree of development of 188 alien species, including potentially invasive and invasive, phytopathogenic microscopic fungi and oomycetes. There are 12 maps of the distribution of the 30 most dangerous species have been compiled. It has been established that only a part of alien pathogens spread together with invasive species of host plants, the rest of alien pathogens enter the territory in connection with human economic activities and intentional or accidental introduction of the respective host plants.

It has been shown that alien and invasive phytopathogenic micromycetes as a by-product of Neolithic evolution have been spread over a specific territory depending on the degree of its anthropogenic transformation, the presence of a range of host plants and the respective climatic conditions. The results of the study make it possible to predict possible epiphytotics of new plant diseases.

References

Desprez-Loustau M.-L., Courtecuisse R., Robin C., Husson C., Moreau P.-A., Blancard D., Selosse M.-A., Lung-Escarmant B., Piou D., Sache I. 2010. Species diversity and drivers of spread of alien fungi (sensu lato) in Europe with a particular focus on France. *Biological Invasions*, **12**: 157–172. DOI: 10.1007/s10530-009-9439-y.

Tomoshevich M.A. 2019. Interrelations between Alien and Native Foliar Fungal Pathogens and Woody Plants in Siberia. Contemporary Problems of Ecology, **12**: 642–657.

Dyakov Yu.T., Levitin M.M. 2018. Invazii phytopatogennyh gribov [Invasions phytopathogenic fungi]. – M.: LRNAND. 260 s. (In Russian).

Poliksenova V.D., Khramtsov A.K. 2015. Chuzherodnyye phytopathogennyye micromycety v Belarusi [Alien phytopathogenic micromycetes in Belarus]. *BSU Bulletin. Ser. 2.* **3**: 43–48. (In Russian).

Santini A., Liebhold A., Migliorini D., Woodward S. 2018. Tracing the role of human civilization in the globalization of plant pathogens. *The ISME Journal*, **12**: 647–652. DOI: 10.1038/s41396-017-0013-9.