THE OCCURENCE OF INVASIVE FUNGI *ERYSIPHE FLEXUOSA* AND *PHYLLOSTICTA PAVIA* ON THE HORSE CHESTNUT IN THE REPUBLIC OF BELARUS

V. A. Timofeeva, I. I. Butko
State Scientific Institution "Central Botanical Garden of NAS of Belarus", 2B Surganova Str., 220012, Minsk, Belarus
Corresponding author: B. A. Timofeeva (*v.a.timofeeva@mail.ru*)

Introduction. Based on the results of long-term monitoring of the spread of alien species of pathogenic fungi (2005–2020), an analysis of the occurrence and harmfulness of the pathogens of powdery mildew (*E. flexuosa*) and brown leaf spot (*Ph. paviae*) in horse chestnut (*Aesculus hippocastanum* L.) plantations in the territory of the Republic Belarus was made.

Materials and methods. The plantings of the horse chestnut in different categories of urban green spaces (parks, squares, boulevards, streets, yards) and nurseries of the republic were examined. The degree of damage to chestnut crowns caused by powdery mildew and brown leaf spot was assessed on a 5-point scale: point 0 means zero, no damage done; point 1 means little damage, up to 10 % of the crown is affected; score 2, medium, 10–50 % of the crown is affected; point 3, extensive damage, more than 50 % of the crown is affected; score 4 is complete damage, the entire crown is affected. The weighted average score of crowns infestation was calculated (Mamedov, 2011).

Results. Powdery mildew and brown leaf spot in plantations of the horse chestnut were noted in all regions of the Republic of Belarus. First observations of the disease appearance date back to 2018–2020: powdery mildew appeared in the – 1st–3rd decades of May, brown spot, in the 1st decade of May, which indicates an increase in the harmfulness of fungi *E. flexuosa* and *Ph. paviae*. Powdery mildew and brown spot leaf infection continues until the end of September. In case of 10 % lesion of horse chestnut trees, their decorativeness and vitality are significantly reduced, with the development of diseases up to 50 % or more mature trees pass into the category of severely weakened. Development of powdery mildew and brown spot in nurseries lead to stunted growth and development of chestnut seedlings which greatly affects the quality of planting material. It was noted that leaves, which were largely covered by the mycelium of the fungus *E. flexuosa*, were not damaged by the chestnut moth. However, powdery mildew infestation of leaves damaged by chestnut moth (many mines on the leaf blade) was noted with late plant infection in August-September. In the categories of urban plantations with a less pronounced degree of air pollution (parks) and presence of litterfall, there is a significant distribution of powdery mildew on horse chestnuts. Under favorable conditions for the development of the fungus, a high degree of plant damage is observed. The lesion of the leaves with powdery mildew leads to premature leaf fall (1.5 months ahead of schedule) and a decrease in the decorative effect of plants.

The occurrence of powdery mildew is quite high in all regions of the republic and varies depending on the category of plantings (0.2–1.0). The weighted average score of powdery mildew affection of horse chestnut tree crowns is higher in plantations of the Minsk, Mogilev and Gomel regions. According to the results of the examination of horse chestnut in different categories of urban plantings and the analysis of the occurrence of fungi-causative agents of powdery mildew and brown leaf spot, the species of green plantations that are most vulnerable to invasion of pathogens were identified. In anthropogenically transformed phytocenoses of urban plantations, all categories of chestnut plantations and plants in nurseries located in urban areas are vulnerable to the invasion of *E. flexuosa*. Within the boundaries of cities, chestnut grows on boulevards, squares, parks, i.e. locations where a large number of trees are concentrated in a limited area, which makes them more vulnerable (frequency of occurrence is 1.0) to invasion. Within street plantings, the frequency of occurrence of the pathogen varies greatly (0.4–1.0),

reaching high values (1.0) on streets with heavy traffic, where trees are weakened by the influence of various abiotic factors.

The degree of powdery mildew damage to the crowns of horse chestnut trees in urban plantings depends on the type of tree planting. In parks and squares, the weighted average score of tree crowns infestation with powdery mildew is higher in single-row planting of trees along paths (1.4–2.5), compared to group planting on the lawn (0.8–1.1). Within chestnut plantations on boulevards, along highways and streets with heavy traffic, trees in a double-row planting are more affected (the weighted average score on boulevards is up to 1.4; along highways and streets, up to 1.2 points), compared with a single-row planting (on boulevards, along highways and streets it comprises up to 0.4 points). In courtyard areas in single and group plantings of horse chestnut, the occurrence of powdery mildew varies from medium to high (0.5–1.0) with a weighted average score of 0.1–1.3. Less vulnerable (frequency of occurrence equal to 0.01–0.3) to infestations of the fungus *E. flexuosa* are seedlings of chestnut plants in nursery plantings located far from urban areas, due to the lack of nearby sources of infection. An increase in the prevalence and harmfulness of powdery mildew on horse chestnut on the territory of the republic is noted every year.

The damage of chestnut caused by brown spot was noted in different categories of urban plantings in all regions. The occurrence of the fungus *Ph. paviae* is high (0.2–0.9) in the plantations of the Mogilev, Vitebsk, Gomel, Brest regions with a high degree of damage (up to 4 points). In urban plantations of the Minsk and Grodno regions, the frequency of occurrence of the pathogen is low (0.1–0.3) with the weighted average score of 1–2 crowns. In 2017–2020 in urban plantings, a decreasing or moderate desease development was noted, because of a low level of occurrence (0.2–0.9) of the causative agent of brown leaf spot with an average or high level of severity (weighted average score of crown infestation equal to 1.0–4.0). In recent years, there has been an increase in the incidence of the fungus *Ph. paviae* affecting chestnut leaves. In nurseries, an epiphytotic development of brown spot on seedlings is observed annually – high occurrence (1.0) of the pathogen with a high level of severity (weighted average score of crown infestation is 2.5–3.4).

The expansion of the range of affected host plants has been revealed. For the first time the infection of powdery mildew and brown spotting was noted in *Aesculus carnea* (Grodno – 2016; Brest, Minsk – 2017), which were considered resistant to these diseases.

Conclusion. Based on the results of the survey of chestnut plantations and analysis of the occurrence of invasive fungi *E. flexuosa* and *Ph. paviae*, maps of the fungi distribution on the territory of the Republic of Belarus were compiled. A rapid spread of alien pathogenic fungi, earlier infection of plants, expansion of the range of affected host plants, and high harmfulness indicate an increase in the aggressiveness of pathogens and good adaptation to new habitat conditions. Pathogenic fungi *E. flexuosa* and *Ph. paviae* have high invasive potential for chestnut plantations in the country. It is necessary to develop measures to limit the spread of alien pathogens in the plantings of the republic and tighten measures to control the phytosanitary quality of planting material.

References

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