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COMBATING THE *POLYSTIGMA RUBRUM* FUNGUS IN PLUM PLANTATIONS BY APPLYING INNOVATIVE FUNGICIDES

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Abstract. *This paper presents the results of testing new remedies for control using fungicides with rapid uptake in plants against the obligate parasitic pathogen Polystigam rubrum that causes red spot on plum leaves. The action of phytosanitary products, Signum, Folpan 80 WDG, Bellis, Amistar, Score EC was investigated in terms of their effectiveness, comparing those with a single active substance and those with two active substances, the results obtained being without obvious differences in terms of their effectiveness, which allows their recommendation in the integrated management of plum protection. Amistar and Bellis fungicides are part of the strobilurin category with systemic and contact action at the same time, being the most recommended in plum protection against the fungus Polystigam rubrum because they have immediate action upon the appearance of the disease and then later during the vegetation period of the trees. Reducing crop losses requires addressing the problem of identifying effective measures for plum protection, which would contribute to reducing the intensity of the development of key diseases and their harmfulness, by applying a minimum number of chemical treatments. The success of combating diseases through chemotherapy requires the correct determination of the timing of treatment applications, the use of highly effective fungicides, as well as the diversification of the range of approved chemical products.*

Keywords: *plum, pathogen, fungicide, efficiency, frequency, intensity, degree of attack*

INTRODUCTION

Phytopathogenic microorganisms, in contact with host plants, cause disruption of the functional balance and determine a decrease in the amount of organic substances accumulated through photosynthesis. Overall, cultivated plants show a higher sensitivity to disease attack compared to their wild relatives, because they are forced to develop in monoculture conditions (WYCZLING et al. 2010). Currently, obtaining major productions cannot be conceived without the use of appropriate protection methods, which must include legislative and phytosanitary quarantine measures - measures regarding the improvement and cultivation of more resistant varieties, measures regarding cultural hygiene, physical-mechanical methods and means; agro-phytotechnical measures, biological method, forecasting and warning measures, and in strictly necessary cases chemical control (BĂDĂRĂU, 2012). The administration of products with fungicidal action to combat phytopathogenic microorganisms has a positive effect on the productivity of fruit crops, but also generates negative consequences on the preparations used that may come into contact with the respective substances, on consumers of agricultural products and, last but not least, on the environment.

Most phytosanitary products are toxic chemicals for humans and animals, which requires the application of strict measures to prevent possible poisoning of humans and animals, but also to prevent pollution of agricultural production, soil, water and vegetation. However, when applied rationally and correctly, chemotherapy has high efficacy, rapid effect, economic efficiency and saved crops, which exceed the value of the expenses incurred. Very dangerous in agrocenoses are diseases caused by obligate parasites, since, in this case, the agrotechnical

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measures undertaken by man, oriented towards obtaining vigorous and well-developed plants, contribute to a better provision of pathogens with fresh food. The mode of nutrition of obligate parasites allows them to directly use the cytoplasm from the living cells of the host plant, without prior processing of the food. In this context, for combating obligate parasitic fungi, the chemical method of control is irreplaceable.

According to the specialized literature, the evolution of disease epidemics is favored by factors such as: increased relative air humidity, frequent precipitation, fog, dew, excessive seeding density, insufficient aeration, application of excessive doses of nitrogen, susceptibility of varieties to disease attack and moderately high temperatures (18–27 °C).

MATERIAL AND METHOD

Five phytosanitary products were used in the experiment, which differed in the content of the active substance they contained. The experiments on the state testing of new triazolo-strobilurin fungicides were carried out on the Stanley plum variety

The experiment was set up in the spring of 2025, using the Latin rectangle method. Each experimental variant included four repetitions, and the plots for each repetition had dimensions of 25 x 2 m (50 m²). In order to avoid overlapping of the working solution between the experimental variants, the plots were separated by paths. Each experimental variant and repetition was identified by plates installed in front of the respective plots, on which their numbers were indicated.

Three treatments were carried out: the first on May 19, 2025, the second on June 4 and the third on June 25, 2025. The treatment of the plants was carried out using a portable sprinkler, in windless hourly intervals, to ensure uniform application of the solution.

Phenological observations and evidence surveys were carried out periodically, before and after the application of chemical treatments.

The biological efficacy of the treatments with fungicides tested to combat the fungus *Polystigma rubrum* was determined using the following calculation formula:

E% = Im-Ie/Imx100

E % – biological efficacy; where

Im – intensity of disease development in the control variant without treatments;

Ie – intensity of disease development in the experimental variants.

The data obtained during the experiments were statistically processed.

RESULTS AND DISCUSSIONS

Red leaf spot is a very common disease in plum plantations, causing significant losses. The disease is favored by high air humidity and high temperatures. The attack manifests itself on the leaves, starting in May, by the appearance of almost circular spots, 5–20 mm in diameter, initially yellowish-green, then brick-red (Figure 1).

The tissues next to the spots are thicker, brittle and slightly convex towards the lower surface of the leaf. The spots are isolated or confluent, sometimes in such large numbers that they occupy almost the entire surface of the leaf blade. On the lower surface of the leaves, small, brown dots can be observed next to the spots, which represent the openings of the pycnidia. Towards the end of summer, the tissues next to the spots turn blackish-brown, starting from the center.

Heavily attacked leaves fall prematurely, which results in the loss of a high percentage of fruit in the case of massive defoliation. In the fallen leaves, instead of pycnidia, the perithecia of the fungus are formed over the winter, which reach maturity in spring.

Figure 1. *Polystigma* (*https://en.wikipedia.org/wiki/Polystigma*)

When humidity conditions are favorable, the ascospores are projected out of the asci, reaching the leaves, where they germinate and penetrate the tissues, producing primary infections. Secondary infections are absent, being replaced by primary infections, which occur staggered over 30–45 days.

The parasite overwinters only in the attacked leaves, in the form of perithecia. Red leaf spot is a widespread disease, favored by precipitation falling in April–May. Trees are susceptible to attack for 30–45 days from the moment the trees bud.

As a result of a strong attack, the trees accumulate few nutrients, which is why the flowers and young ovaries are shaken off en masse the following spring.

For effective disease control, correct diagnosis of diseases and accurate identification of pathogens are necessary. Based on their biological characteristics, specific control measures and integrated control can be applied.

The phytosanitary condition of the plantation depends on compliance with agrotechnical requirements within the framework of crop technology. It is well known that trees weakened due to unfavorable environmental conditions become more susceptible to diseases caused by saprophytic fungi and facultative parasites.

To obtain good yields, in conditions favorable for the development of key diseases, the use of fungicides becomes absolutely necessary, even in the context of the application of alternative protection methods, such as the cultivation of resistant varieties, proper preparation and balanced fertilization of the soil, as well as crop maintenance in accordance with technological requirements. In such situations, chemotherapy remains the radical method of control involving 2–3 specialized chemical treatments with approved fungicides.

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The success of chemical control indicates the expansion of the assortment of preparations, approved through the state testing procedure. This approach aimed to determine the biological efficacy of preparations subject to state testing.

The experimental results obtained show that the products tested, both those with a single active substance and those with two or more active substances, achieved good efficacy in control.

The Amistar fungicide tested and initially used in cereals was successfully introduced in treatments in fruit growing where the best efficacy of 95.2% was obtained.

Table 1

Results of the biological effectiveness of new phytosanitary products against the fungus *Polystigma rubrum*.

The fungicide applied (active substance)	**Spectrum of action**	**Dose conc.**	**F%**	**I %**	**E%**
SIGNUM (boscalid 26% + piroclostrobin 7%)	Contact-systemic	0,5 kg/h	13,9	3,6	90,1
FOLPAN 80 WDG (folpet80%)	contact	0,2%	9,4	5,3	88,2
BELLIS (boscalid 250g/kg+piroclostrobin 128g/ha)	Contact-systemic	0,2%	7,5	4,8	91,1
AMISTAR (azoxistrobin)	Contact-systemic	1l/ha	6,8	3,0	95,2
SCORE 250 EC (difenoconazol 250g/l)	systemic	0,2%	11,5	4,2	90,8
Nontreated control		-	30,6	50,3	-

Very good efficacy was given by the treatment with the Bellis fungicide product from the strobilurin category like Amistar with preventive and curative action, providing surface protection but also inside the leaves. Ensuring the economic efficiency of plant protection measures is a basic criterion for making the crop profitable.

Success in limiting losses caused by pathological processes triggered by the attack of pathogens can only be complete by using the entire range of prevention and control means.

Table 2

The effectiveness of treatments applied based on the phenological phases of the plant and based on warning

Phenological phase	**Date of application**	**Degree of attack %**	**Production (kg) /500 trees**
First treatment (T1) in May after shaking the petals	19 mai	7,3	2870 kg/500 trees
T2 14 days after the first treatment - Hazelnut-sized fruit	4 iunie	6,4	2950
T3 15 days after the second treatment Normal-sized fruit	25 iunie	5,8	3030
Untreated control		29,3	2210

Table 2 shows that the degree of attack was reduced from 7.3 at the first treatment to 5.8 at the third treatment and by 23.5% compared to the untreated control.

The complex of pathogens in plum plantations represents an important limiting factor in the production of this crop in years with conditions favorable to pathological processes. Success in limiting losses consists in applying special protection measures, especially fungicides, to obtain the desired effectiveness.

The application of treatments during the vegetation period is decided based on real knowledge of the phytosanitary status at plot level, the option based on bioecological criteria for establishing the opportunity of treatments, with the application of fungicides in different appropriate combinations.

Treatments during the vegetation period have an important role in prevention and control because the periods of maximum sensitivity of the host plant overlap with the periods favorable from a climatic point of view for the pathogenesis processes.

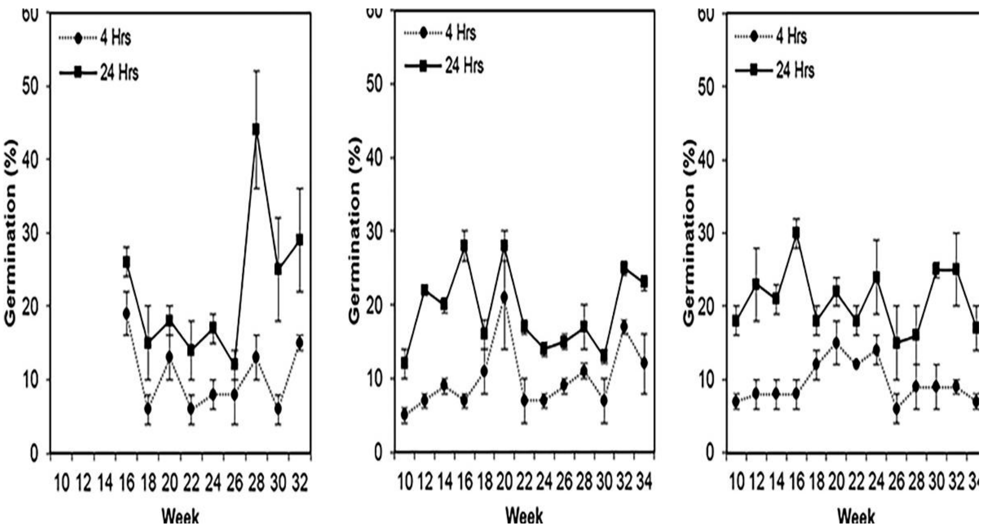

Figure 2. Projection of ascospores over time in hours

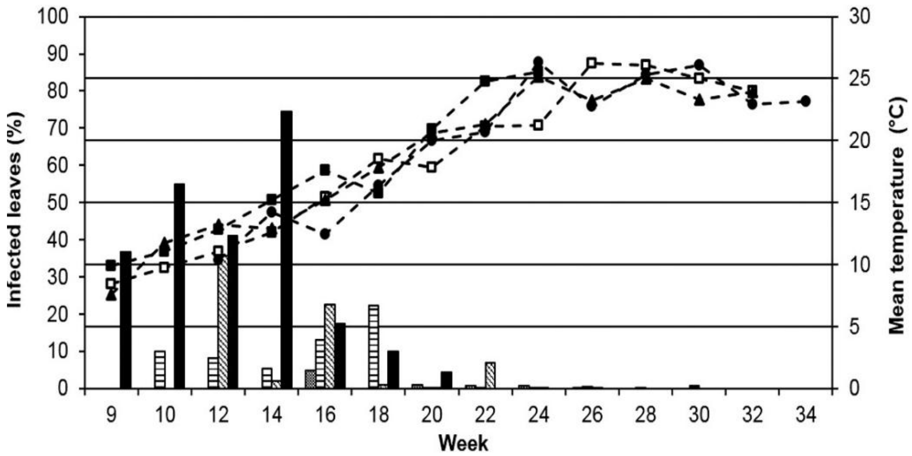

Figure 3. Graph of ascospore germination correlated with the number of infected leaves

The opportunity to apply treatments and their number during the vegetation period is established taking into account the particularities of the biological cycle of the *Polystigma rubrum* fungus and the pathogen-host impact, the different sensitivity of the host depending on the phenological phase and the evolution of meteorological phenomena recorded in the forecasts.

The data related to the warning for the pathogen *P. rubrum* were given to us by correlating the period of formation and release of conidia or ascospores with the evolution of environmental conditions, through which we obtained the optimal moment for fungicide treatment.

CONCLUSIONS

The *Polystigma r.* fungus had evolutionary conditions since April, when the projection of ascospores was triggered, the phase that corresponds phenologically to the white button phenophase.

The triggering of the projection of ascospores also occurred as a secondary infection during the flowering period - the beginning of the shaking of the petals.

Fungus control must be done on a timely basis based on the study of a complex of factors that include the biology of the fungus, climatic conditions, phenology and age of the plants.

The annual appearance of the pathogen leads to accelerated defoliation of the tree trunks, which results in premature aging of the trees.

The pathogen is not dangerous through direct damage, as it can be controlled through minimally applied treatment programs, but it is dangerous because it leads to the sensitization of the plant to unfavorable climatic conditions through frostbite of the tree trunks, defoliation and their drying over the winter.

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