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BIOPREPARATIONS FOR PLANT PROTECTION – THE FOUNDATION FOR PRESERVING THE BIODIVERSITY OF AGROECOSYSTEMS

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Biological plant protection products based on fungi, bacteria, viruses, and their metabolites form the basis for maintaining ecological balance in agroecosystems. Broad-spectrum biological products that protect plants against a wide range of diseases prevalent in the agrocenosis are particularly important. Selectivity towards target organisms, safety for beneficial organisms, the preservation of soil health, and the absence of accumulation in the environment and agricultural products all contribute to the conservation of biodiversity in agroecosystems.

Rhizosphere bacteria of the genus *Pseudomonas* are key organisms in agroecosystems. They act as natural biostimulants and biopesticides, increase crop yields, improve soil structure, and protect plants from stress. The aim of this research is to broaden the fungicidal spectrum of the bacterium *Ps. fluorescens* AP-33(V-3481), the producer of the biological product Rizoplan, in order to control pathogens in crops where it has not previously been used.

Phytopathogens were isolated from infected plant parts, fruits, roots, and seeds of agricultural crops. The antagonistic activity of the bacterium *Ps. fluorescens* AP-33(V-3481) against phytopathogenic fungi was determined on PDA medium using the dual culture method. The fungicidal activity of the Rizoplan biopreparation based on *Ps. fluorescens* AP-33(V-3481) was determined by applying the method of secondary metabolite diffusion in agar.

As a result, 20 pathogens were isolated from the infected plant parts and cultured in pure culture. The cereal crops were infected by *Fusarium graminearum*, *F. langsethiae*, *F. poae* and *F. oxysporum*. *F. verticillioides* was isolated from maize; the white rot pathogen *Sclerotinia sclerotiorum* was isolated from the flower heads and root collars of sunflowers; and *F. sporotrichioides* was isolated from soya beans. The following fungi were isolated from cucumbers: *Albifimbria verrucaria* (seeds), *F. gibbosum* (stems), and *S. sclerotiorum* (fruit). The following were isolated from to-

matoes: *F. solani*, *Botrytis cinerea*, *Phytophthora infestans* and *Alternaria alternate*. From the root zone of cabbage seedlings: *Rhizoctonia solani*, *Thielaviopsis basicola*, and from peppers – *F. sporotrichioides*. *Monilia cinerea* and *M. fructigena* were isolated from fruit crops, and *B. cinerea* and for *Trichothecium roseum* from grape bunches. In practice, *Alternaria sp*. fungi were isolated from virtually all crops, with several species isolated from walnuts.

Cultivation in the dual culture with the bacterium *Ps. fluorescens* AP-33(V-3481) and plant pathogens revealed high antagonistic activity by the *Pseudomonas.* Sterile zones of growth inhibition formed between the bacterium and the pathogens within 6-8 days. A maximum sterile zone of 41.5 mm was observed between the antagonist and the moniliosis pathogen *M. fructigena*. The zones of growth inhibition for *B. cinerea* and *M. cinerea* were 28 mm and for *T. roseum* 21.7 mm. The antagonistic activity of *Pseudomonas* AP-33(V-3481) was significantly evident against *Fusarium* species: the zone of inhibition for *F. oxysporum* was 24.8 mm, for *F. solani*, 22.2 mm, and for *F. langsethiae*, 21.7 mm.

The pathogens showed lower sensitivity to the metabolites than to live bacteria. The secondary metabolites had the highest effect on the pathogen *M. fructigena*, with an inhibition zone of 23.3 mm. For *A. alternata*, *F. verticillioides,* and *M. cinerea*, zones of inhibition ranged from 16.8 to 18.8 mm. The metabolites affected the remaining pathogens, as evidenced by zones of inhibition ranging from 7.7 to 13.7 mm.

The present study revealed that the fungicidal spectrum of the biological product Rizoplan, based on the bacterium *Ps. fluorescens* AP-33(V-3481), has been expanded to include 20 plant pathogens. When implementing measures to protect plants from harmful organisms in agroecosystems, it is advisable to use biological products containing live microbial cultures. This will help to reduce pathogenic potential, increase the levels of antagonists in the soil, promote sound environmental management, and preserve the biodiversity of agroecosystems.

Keywords: biodiversity, biopreparation, antagonists, phytopathogens, rhizobacteria *Pseudomonas fluorescens,*

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