

Development of Biopreparations for Biocontrol of Sugar Beet Diseases and Insect Pests

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Aim of the study: The aim of the study is to develop new antifungal, entomopathogenic, and growth-stimulating biological preparations based on microorganisms isolated in Kazakhstan

Material and Methods: 225 isolates of rhizosphere bacteria and actinomycetes (66 isolates of the genus *Streptomyces*, 57 isolates of the genus *Azotobacter*, 50 isolates of the genus *Pseudomonas*, and 52 isolates of the genus *Bacillus*) were isolated in pure culture. The antifungal activity of rhizosphere microorganisms was determined using the agar block technique and the well method against 6 genera of phytopathogenic fungi: *Aspergillus niger*, *Fusarium oxysporum*, *F. solani*, *F. sporotrichiella*, *Alternaria alternate* and *Rhizopus stolonifer*. The nitrogenase activity was determined by the acetylene method using an Agilent Technologies 7697 A gas chromatograph. In laboratory conditions, the test-insects were treated with the culture liquid of 225 isolates of rhizosphere microorganisms. The insecticidal activity was determined using the contact method. The test-insects (beet-leaf aphid *Aphis fabae*) were sprayed once with a bacterial suspension (10^6 CFU/ml), taking into account the death of insects at a later time (after 4, 8, 24 hours). The phyto regulatory activity was determined by soaking the seeds. To carry out the control, the seeds were soaked for the same period in sterile distilled water and in sterile liquid media. After a 24-hour soaking, the seeds were spread on the moistened filter paper in Petri dishes and placed in a thermostat at 25 °C for 10 days

Results: The actinomycete isolates A28, A33, A56, and A57 showed high antibiotic activity. High activity among bacterial cultures was recorded in the *Pseudomonas* (P4; P15) and *Bacillus* (B8; B52) isolates. The culture liquid of 22.7% of the actinomycete isolates had a growth stimulating effect on sugar beet seeds: in bacteria of the genus *Pseudomonas* - 25.3%, *Bacillus* - 27.8%, *Azotobacter* - 20.5%. The culture liquids of actinomycetes possessed the highest toxicity to phytophages. After 4 hours of the experiment, the mortality of aphids amounted to about half of the insects - 45.5%; when spraying with the culture liquid of bacteria of the genus *Bacillus* - 28.5-30.8% of insects died; bacteria of the genus *Pseudomonas* caused the death of 35-40% aphids, and bacteria of the genus *Azotobacter* of 35-40% aphids. The mortality rate after 8 hours varied within 72.5-85.3%. After 24 hours, 95-100% of aphids died. The highest nitrogenase activity was found in the *Azotobacter* isolates Az10, Az48, Az12 (10.1-10.9 nmol C_2H_4 /h per 1 million cells), which are of interest for further studies. The biocompatible cultures of microorganisms will be selected from the promising PGPR strains, and biopreparations for biocontrol of sugar beet diseases and insect pests will be developed.

Acknowledgements: Source of funding for research. Ministry of Education and Science of the Republic of Kazakhstan.

Keywords: sugar beet, rhizosphere microorganisms, biological preparations, nitrogenase, antifungal, growth-stimulating, entomopathogenic activity.