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Beneficial microorganisms improving organic cultivation of horticultural crops and soil fertility

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The Research Institute of Horticulture in Skierniewice is the birthplace of Poland's first bank of symbiotic mycorrhizal fungi and beneficial bacteria isolated from the rhizosphere of horticultural plants growing in different soil and climatic conditions of Poland. Studies have shown high effectiveness of the beneficial microorganisms collected in SYMBIO BANK in the stimulation of vegetative growth and yielding of horticultural plant species. Some bacterial strains have a protective effect against *Botrytis cinerea*, *Fusarium oxysporum* and *Verticillium dahliae*. The most effective strains and species of microorganisms are used as components of the newly developed biological preparations: bio-stimulants, composts, and bacterial and mycorrhizal inocula. The use of chemical means of plant production, e.g. synthetic NPK fertilizers, has been shown to have a negative effect on the occurrence and activity of beneficial soil microorganisms. The knowledge of the role of symbiotic microorganisms that have the greatest influence on the availability and uptake of nutrients will contribute to the development of sustainable plant cultivation methods. The aim of the study was to evaluate the effects of the applied fertilization combinations, including the use of microorganisms, on the growth and yield of selected species of vegetable and fruit plants, the amounts of micro- and macro-elements in them, and the size of microbial populations in the rhizosphere soil. The results of the field experiments demonstrated a positive influence of the organic method of cultivating vegetable and fruit crops with the use of beneficial microorganisms on the occurrence of beneficial groups of microorganisms in the rhizosphere of those plants, including increase in the population of diazotrophs and in the population of spore-forming bacteria. As a result of the application of beneficial microorganisms in organic cultivation significantly higher yields of the tested vegetable and fruit species were achieved, with better storage and processing qualities, compared to conventional production. The study assessed the effect of the newly developed bioproducts on improving the quality of soils in horticultural crops, i.e. the size of the populations of beneficial microorganisms, and the pH and mineral composition of soils after the application of the microbiological bioproducts. New biofertilizers were developed, i.e. a bacterial-mycorrhizal inoculum, an organic fertilizer Bioilsa, a compost based on lignite and biochar, and humic acids enriched with beneficial soil microorganisms. The trials showed high effectiveness of the beneficial microorganisms from SYMBIO BANK in the stimulation of vegetative growth and yielding of horticultural plants. The use of beneficial microorganisms in organic cultivation of horticultural plants will multiply their positive impact on the yield potential of horticultural plants and improve the quality of soils. Widespread use of the innovative bioproducts in organic cultivation of vegetables and fruits will help improve the yield quality of crops and increase the profitability of horticultural farms by reducing production costs.

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