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Beneficial microorganisms: An opportunity to improve the yielding quality of crop plants

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Research Institute of Horticulture 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-stimulators, composts, and bacterial and mycorrhizal inocula. The use of chemical means of plant production e.g. synthetic NPK fertilizers, have been shown to have a negative effect on the occurrence and activity of beneficial soil microorganisms. The resources accumulated in SYMBIO BANK include strains of fungi belonging to 30 species of arbuscular mycorrhizal fungi (AMF). Further identifications will include 53 thousand AMF spores, 1418 strains of bacteria and filamentous fungi. The mechanisms of action of beneficial microorganisms include the formation of siderophores (500 strains), spores (125 strains), dissolution of phosphorus compounds (200 strains), decomposition of cellulose (40 strains), atmospheric nitrogen fixation (100 strains). 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 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 plants 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. Bio-preparations stimulating the vegetative growth and yield of vegetable plants and having a protective effect were developed. As a result of the application of beneficial microorganisms in organic cultivation significantly higher yields of the tested vegetable species were achieved, with better storage and processing qualities compared to conventional production. Vegetables of high health-enhancing (biological) and industrial (processing and storage) qualities were obtained. An eco-friendly technology of vegetable cultivation based on the use of beneficial microorganisms and natural plant extracts will be implemented into horticultural practice in Poland.

Biography

Sas-Paszt Lidia has experience in research projects and R&D projects carried out in collaboration with academic and industrial partners in Poland and abroad. Research achievements in implementation of R&D results: studies in the area of rhizosphere and nutrient management strategies in fruit and vegetable crops, development of microbial inocula and bioproducts for horticultural production. She has represented Poland in the Program Committee of the European Commission in FP6 (2002-2006) and in the Program Committee of the 7th EU Framework Program (2007-2012), expert of EFSA – European Food Safety Authority (2007-2012), expert evaluating research projects/reports of the 6th and 7th EU Framework Programs (2002-2013) and Horizon 2020 (2014-2020).

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