

Rhizoctonia solani infection reduced by bacterial and fungal combination of biofertilizer inoculums on organic potato

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Soil biological functioning and proper agrotechnical management are of key importance in organic agriculture. Beneficial microbial inoculums are used either as plant strengthening products (psp) or also as plant protecting products (ppp). Question is, which type of microbes should be applied to certain soil-plant systems to improve yield or reduce the damage of soil-born plant pathogens? Objective of present study was to compare the effect of inoculums 1 (PPS) with plant growth promoting bacterium strains (PGPR) and inoculums 2 (TPB) with potential biocontrol-agents, including both fungi and bacteria in organic potato production.

Field experiment was conducted at the Organic Research Station of the Szent István University (Babatpuszta, Hungary). Growth and quality of potato (*Solanum tuberosum* var. *Demon*) was studied in the two microbial treatments and control, in four replicates. The PPS inoculums included *Pseudomonas protegens*, *Ps. jessenii* and *Strenotrophomonas maltophilia*, with plant growth promoting (PGPR) effect. TPB inoculums consisted of *Trichoderma hartianum*, *Pseudomonas putida* and *Bacillus subtilis* strains with main biocontrol effects of fungal and bacterium combination. Strains were incubated for 24 hours at 28 °C in a rotary shaker (140 rpm/min) up till cell-number about 10¹⁰ cell.ml⁻¹ in Nutrient broth substrate, and mixed to prepare combined inoculums. Each potato tuber was treated by 10 ml inoculums that was added to 100 ml water respectively with only water at the controls. Yield of potato (10 plants/plot) and tuber quality, i.e. the percentage ratio of scabiness (*Streptomyces scabies*), *Rhizoctonia solani*, and *Fusarium* sp. infection was estimated. Abundance of total aerob and anaerob heterotrophs, total microscopic fungi, pseudomonads bacteria and some sporeforming microorganisms was assessed by the most probable number (MPN) method in soil samples, collected four times during vegetation. Soil enzyme, dehydrogenase (DH) and fluorescein diacetate (FDA) activity was estimated, beside soil physical and chemical characteristics. Statistics, including binomial logistic regression was used for evaluation (IBM SPSS Statistics 22 software).

Aerobic MPN counts were reduced by 0,5 value, anaerobic however were increased by 2 order of magnitude at the end of vegetation period. Both inoculums reduced the fungal counts at 60% of flowering stage, but PPS inoculums improved also the abundance of pseudomonads bacteria in the soil at all sampling stages. Soil dehydrogenase (DH) activity showed a strong seasonal variability, which was about 20-times higher at flowering of potato, more particularly at TPB inoculums. Although yield parameters were only tententiously improved, the presence of *Rhizoctonia solani* infected tubers was significantly less likely (by 70,3%) with TPB inoculums combination. We assumed that presence of biocontrol type of *Trichoderma* fungi in TPB inoculums was the reason for such a significant reduction of *Rhizoctonia* infection. Necessity of previous monitoring of soil-health, including the microbial status of potential biocontrol strains is concluded. The tuber quality of organic potato may be enhanced by using the inoculums tested in this study.

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