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The Effect of *Pseudomonas jessenii* RU47 on Phosphomonoesterases Activities and their Gene Abundances in the Rhizosphere of Tomato

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Abstract

Phosphorus (P) is a vital macronutrient for plants and microorganisms and their growth and development are often limited by the lack of P availability in the soil. Therefore, the application rate of artificial P fertilisers has been globally increased. However, excess use of P amendments causes severe environmental problems. The aim of the study was to investigate the application potential of biological alternatives such as soil inoculation with plant growth promoting bacteria (PGPB) to increase direct P mineralisation in the soil. Many soil microbes including PGPB are able to mineralise organic P to a plant-available form by excreting enzymes such as phosphomonoesterases (EC 3.1.3). This enzyme group includes acid and alkaline phosphomonoesterases, which are phylogenetically widely distributed among bacteria and encoded by the genes *PhoD* and *PhoN*, respectively.

A study was conducted in the frame of the "BIOFECTOR" project (funded by the European Commission) in order to investigate the effect of inoculation with *Pseudomonas jessenii* RU47 and additional P fertilisation on tomato plant. Soil samples were collected from bulk soil and the rhizosphere and alkaline and acid phosphomonoesterase activities were measured. The abundance of *PhoD* and *PhoN* genes will be measured in soil metagenomic DNA with quantitative real-time PCR using degenerative primers.

The results obtained so far reveal a higher acid and alkaline phosphomonoesterase activity in the rhizosphere than in the bulk soil ($p < 0.05$). Significant differences in both enzyme activities with respect to the different inoculation treatments were only recorded in the rhizosphere. Higher acid phophomonoesterase activity was observed in bulk soil than the rhizosphere in the P unfertilised rhizoboxes. Further investigation of *PhoD* and *PhoN* gene abundance will determine whether inoculant strains or P fertilisers can increase the genetic potential for P mineralisation in the soil. Results of the study will contribute to further research in P fertiliser alternatives in order to ensure future sustainable agriculture.

Keywords: Acid and alkaline phosphomonoesterase, enzyme activity, microbial mineralisation, phosphorus, qPCR

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