39. The interplay between the inoculation of plant growth-promoting rhizobacteria and the rhizosphere microbiome and their impact on plant phenotype

CUNHA, I. C. M.; REINA, A. V. S.; BOLETA, E. H. M.; PELLEGRINETTI, T. A.; ZAGATTO. L. F. G.; ZAGATTO; S. S. S.; CHAVES, M. R.; MENDES, R.; PATREZE, C. M.; TSAI, S. M.; MENDES, L. W.

Microbial inoculation stands as a pivotal strategy, fostering symbiotic relationships between beneficial microorganisms and plants, thereby enhancing nutrient uptake, bolstering resilience against environmental stressors, and ultimately promoting healthier and more productive plant growth. However, while the advantageous roles of inoculants are widely acknowledged, the precise and nuanced impacts of inoculation on the intricate interactions of the rhizosphere microbiome remain significantly underexplored. This study explores the impact of bacterial inoculation on soil properties, plant growth, and the rhizosphere microbiome. By employing various bacterial strains and a synthetic community (SynCom) as inoculants in common bean plants, the bacterial and fungal communities in the rhizosphere were assessed through 16S rRNA and ITS gene sequencing. Concurrently, soil chemical parameters, plant traits, and gene expression were evaluated. The findings revealed that bacterial inoculation generally decreased pH and V%, while increasing H+Al and m% in the rhizosphere. It also decreased gene expression in plants related to detoxification, photosynthesis, and defense mechanisms, while enhancing bacterial diversity in the rhizosphere, potentially benefiting plant health. Specific bacterial strains showed varied impacts on rhizosphere microbiome assembly, predominantly affecting rhizospheric bacteria more than fungi, indirectly influencing soil conditions and plants. Notably, Paenibacillus polymyxa inoculation improved plant nitrogen (by 5.2%) and iron levels (by 28.1%), whereas Bacillus cereus boosted mycorrhization rates (by 70%). Additionally, inoculation led to increased complexity in network interactions within the rhizosphere (~15%), potentially impacting plant health. Overall, the findings highlight the significant impact of introducing bacteria to the rhizosphere, enhancing nutrient availability, microbial diversity, and fostering beneficial plant-microbe interactions.

Common bean; Microbial ecology; 16S rRNA; ITS