ROOT-BENEFIT
Symposium & 3rd MC Annual Meeting, Granada 26

BENEFICIAL MICROORGANISMS FOR SOIL HEALTH AND AGRICULTURE

Book of abstracts

Root-Benefit
Beneficial root-associated micro-organisms for sustainable agriculture

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management systems. Preliminary findings from this ongoing study indicate that rye diversification, particularly when combined with organic inputs, promotes greater microbial diversity and distinct community assemblages compared to monoculture systems. These changes are associated with improved nutrient dynamics and enhanced soil biological activity, suggesting strengthened ecological interactions within the rhizosphere. The results highlight the potential of integrating crop diversification and organic amendments to stimulate beneficial soil microorganisms, contributing to improved soil health and long-term agroecosystem resilience. This work aligns closely with the objectives of ROOT-BENEFIT by advancing biologically driven solutions for sustainable and climate-resilient agriculture.

P.4.5. Effects of long-term tillage and fertilisation regimes on arbuscular mycorrhizal fungi in the roots of selected crops. Irena Maček (University of Ljubljana, Slovenia)

Reduced tillage intensity is known to increase soil organic carbon in the topsoil and also benefits soil plant-beneficial arbuscular mycorrhizal (AM) fungal communities. In this study, the effects of different types of tillage (no-till and conventional mouldboard tillage) combined with three fertilisation regimes (unfertilised control, mineral NPK, and organic compost) on root colonisation by mycorrhizal fungi were examined two decades after the experiment was initiated in three crop species (*Secale cereale*, *Triticum aestivum*, and *Zea mays*). AM fungi associated with all three species responded similarly to mechanical disturbance (tillage) and fertilisation regime, with lower root fungal colonisation and arbuscule density in conventional tillage and NPK-fertilised plots. The lowest root colonisation and arbuscule density in all three crops were found in the combined tillage and NPK treatments, with the strongest response observed in *S. cereale*. Our results show a direct response of AM fungi to agricultural intensification and highlight the importance of sustainable practices with minimal soil disturbance and reduced use of mineral fertilisers.

P.4.6. Microbial inoculants in vineyards: Field impacts on grapevine performance and soil health. Sofia Pereira (Universidade Católica Portuguesa, Portugal)

Agriculture is increasingly challenged by climate change, creating an urgent need for agroecological strategies that enhance crop resilience while maintaining productivity and environmental sustainability. Among the proposed solutions, microbial inoculants have emerged as promising allies due to their potential to promote plant growth, improve nutrient availability, and strengthen plant tolerance to abiotic stress. However, field-based evidence under real vineyard conditions remains limited, particularly regarding effects on soil biological functioning and must composition. A field trial was established in the Douro wine region to evaluate the impact of selected microbial inoculants on grapevine performance, soil biodiversity and enzymatic activities, and must attributes. The study aimed to provide an integrated assessment of both agronomic and soil health responses under real vineyard conditions. Results indicated that microbial inoculation did not significantly influence grapevine productivity compared with the control. However, notable changes were observed in must composition, with inoculated treatments showing higher sugar concentrations and increased organic acid content. Soil biological activity responded positively to inoculation, as evidenced by elevated dehydrogenase and acid phosphatase activities, suggesting enhanced microbial metabolic functioning and nutrient cycling potential. In contrast, soil bacterial biodiversity did not differ between treatments, indicating that inoculation did not alter the native microbial community structure. Overall, these findings suggest that microbial inoculants can enhance soil functional activity and improve must composition without adversely affecting indigenous soil biodiversity, supporting their potential as an agroecological tool for sustainable viticulture under climate change pressures. Nevertheless, further long-term studies are required to elucidate their consistency and underlying mechanisms across diverse environmental conditions.

P.4.7. Field performance of tailored fungal–bacterial consortia against *Rhizoctonia solani* in lettuce. Giulia Capella (Research Institute of Organic Agriculture FiBL, Switzerland)

Soil-borne fungal pathogens are a major threat to high-value crops such as vegetables. Although synthetic fungicides remain the most effective control strategy, their intensive use threatens ecosystem functioning and long-term sustainability. Microbial biocontrol agents offer a promising alternative, but their effectiveness in the field is often inconsistent and requires improvement. This study aimed to enhance biocontrol efficacy