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Promoting Sustainable Plant-Based Nutrition through Microbial Priming: Impact on Almond Seed Germination and Growth

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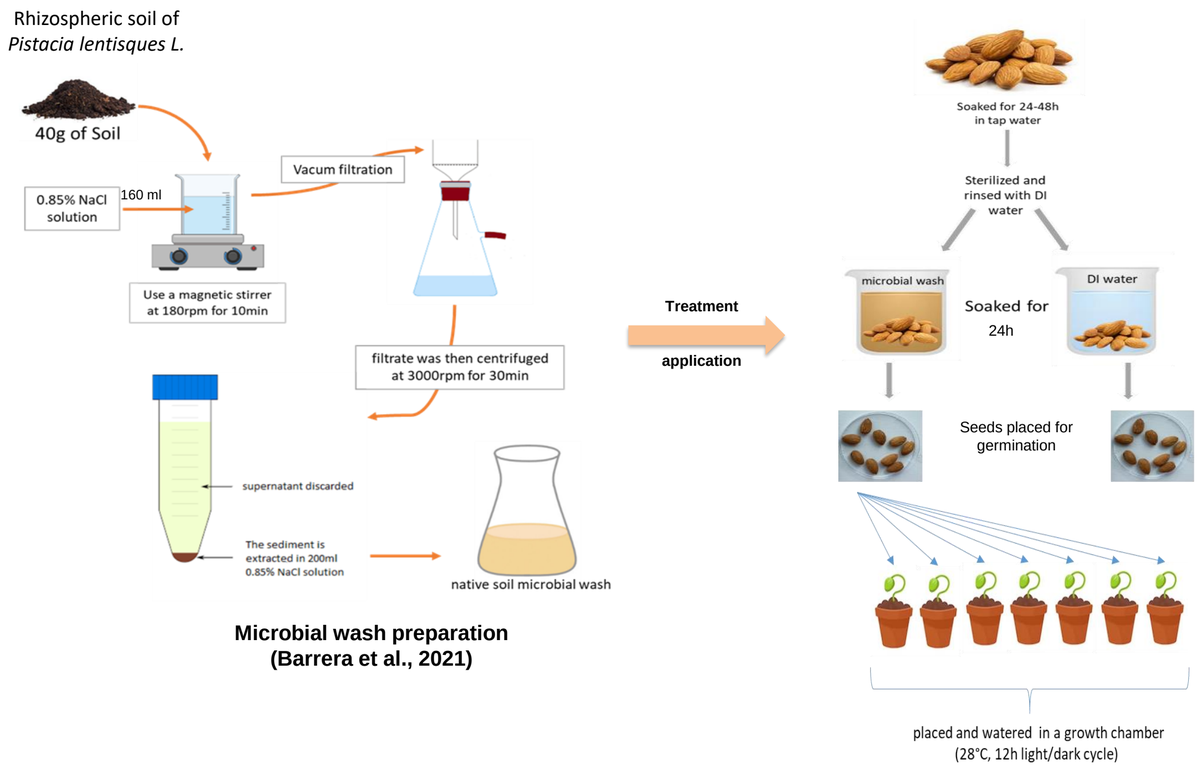
INTRODUCTION & AIM

Microbial priming is an innovative agricultural technique that leverages beneficial microorganisms to improve crop productivity, enhance plant resilience, and boost the nutritional value of produce. By utilizing specific microbes, this method promotes healthier plant growth, increases resistance to environmental stressors, and contributes to more sustainable agricultural practices. This research specifically explores the application of microbial priming to almond cultivation, with a focus on enhancing seed germination, stimulating seedling development, and improving the overall nutritional profile of the plants. The goal is not only to increase crop yields but also to support the growing demand for plant-based diets by producing almonds with superior nutritional quality. Through this approach, microbial priming can contribute to more sustainable food systems, offering a natural solution to improving both agricultural efficiency and the health benefits of plant-based foods.

METHOD

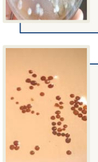
The extraction of the microbial wash and the application of the microbial priming from the studied native soils was conducted according to the following experimental design.



Microbial wash preparation (Barrera et al., 2021)

► Three treatments has been applied:

Microbial wash (MW)



Arbuscular Mycorrhizal Fungi (AMF) priming (Myco)

Composite (MW+Myco)

► Positive control (G :Gibberellic acid) & Negative control (T :sterilized deionized water)

This study examined germination percentage and seedling growth parameters, alongside detailed analyses of soil physico-chemical properties and microbial communities. Additionally, the research assessed Arbuscular Mycorrhizal Fungi (AMF) colonization, chlorophyll levels, as well as total sugar and protein content.

RESULTS & DISCUSSION

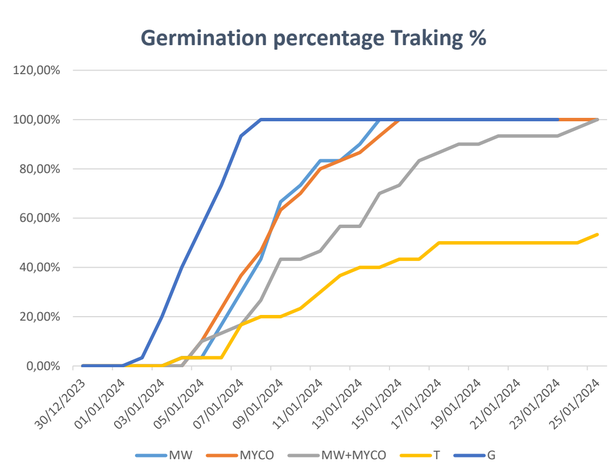
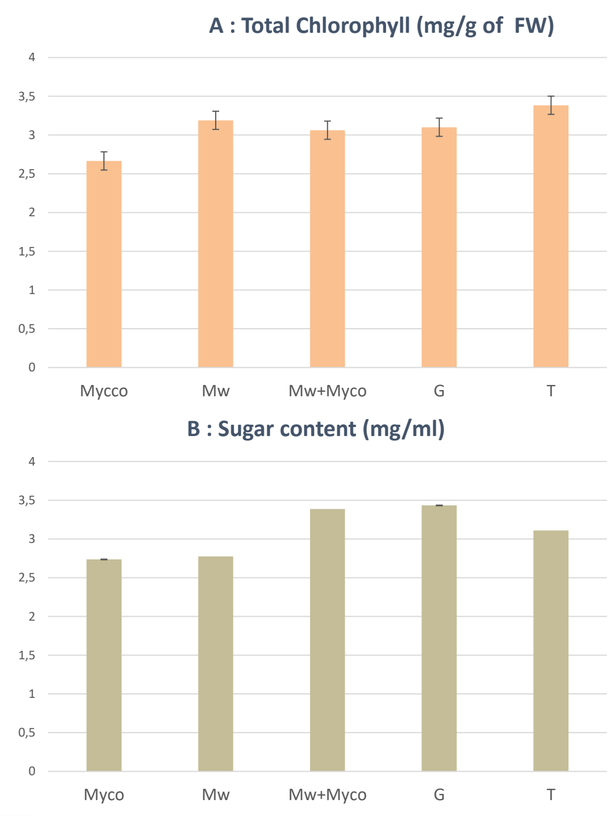


Fig. 1 : This figure represents the germination percentage for different treatments.

Fig. 2 : Seedling vigor index based on the length of the seedling.



Plant-associated microbes and microbiomes play a crucial role in enhancing plant growth, controlling pathogens, and alleviating abiotic stress (Fukamachi et al., 2019). In this study, microbial priming significantly improved germination percentages (Fig,1) and promoted seedling growth (Fig,2) compared to untreated controls. Soil analysis revealed increased nutrient availability and a higher abundance of beneficial microorganisms. On the other hand, Yaman et al. (2023) explored how rhizobacteria influence the biochemical composition of apple fruit cultivars. Our findings demonstrate that microbial priming positively impacted total chlorophyll, protein, and sugar content in the seedlings (Fig,3).

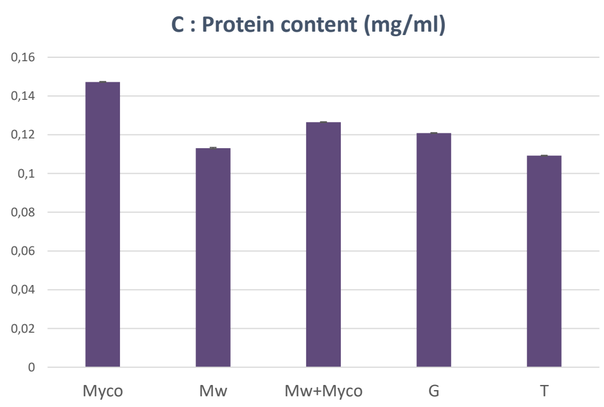


Fig. 3 : chlorophyll (A), protein (C), and sugar content (B) in seedling's leaves.

CONCLUSION

Microbial priming boosts almond seed germination and growth, enhancing productivity, nutritional quality, and sustainability. It supports eco-friendly, plant-based food systems by promoting healthier plant development and more resilient agricultural practices.

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