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Sweet Potato Cultivation of a Multicomponent Microbiological Soil Inoculant

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Introduction

Worldwide, the production and consumption of sweet potatoes (*Ipomoea batatas*) are on the rise. There is a growing demand for environmentally friendly, biological solutions that will allow for increased quantities of healthy crops and effective disease management due to the potential pollution of soil, water and air caused by the use of chemical pesticides and fertilizers in its cultivation. In recent decades, agricultural applications of microbiological agents have grown in importance. Our objective was to foster a farming soil inoculant from numerous microorganisms and test its application potential in yam development. Two strains of Trichoderma were chosen: *Trichoderma afroharzianum* strain SZMC 25231 for bio control purposes against fungal plant pathogens and *Trichoderma ghanense* strain SZMC 25217 for the biodegradation of plant residues based on its extracellular enzyme activities. For bio control purposes against fungal plant pathogens, the Bacillus velezensis strain SZMC 24986 was chosen because it was found to be the most effective growth inhibitor of the nine tested strains of fungal species known as plant pathogens.

Description

As a component with the potential to fix nitrogen, *Arthrobacter globiformis* strain SZMC 25081 was chosen due to its rapid growth on nitrogen-free medium. SZMC 25872, a strain of Pseudomonas resinovorans, was chosen for its capacity to produce indole-3-acetic acid, one of the essential characteristics of potential plant growth-promoting rhizobacteria (PGPR). The selected strains tolerance to abiotic stressors like pH, temperature, water activity and fungicides, which have an impact on their ability to survive in agricultural environments, was tested in a series of experiments. In two separate field experiments, the selected strains were used to treat sweet potato. In both cases, there was a difference in yield between the plants treated with the selected microbial consortium (synthetic community) and the control group. Our findings suggest that sweet potato plantations could benefit from the newly developed microbial inoculant. This is, to the best of our knowledge, the first report of a successful sweet potato cultivation using a fungal-bacterial consortium [1].

The climate accommodating strategies for crop the executives are a higher priority than at any other time, particularly since the European Commission has been wanting to diminish the synthetic substances utilized in the farming to half by 2030. Pesticides and chemical fertilizers used in crop management have polluted the soil, water and air. These substance compounds are unsafe to the climate and human wellbeing. The crop management of the future may rely on microorganisms rather than chemicals. Beneficial microorganisms have been widely used in agriculture over the past few decades for fertilization, encouraging plant growth and biological control of bacterial or fungal phytopathogens and eventually nematodes or pests. It is reasonable to develop multicomponent agricultural soil inoculants because these inoculants may be able to meet a wide range of agricultural requirements [2].

Due to their beneficial effects on plants and soil, many biological soil inoculant products contain Trichoderma components. These filamentous fungi play a role in the soil's degradation of plant residues and support the level of nutrients in the soil. Trichoderma strains are useful agents against plant pathogens, particularly fungi, due to their antagonistic abilities, which include the production of secondary metabolites, efficient competition for space and nutrients and eventually mycoparasitism. Trichoderma strains also promote plant growth and induce Systemic Acquired Resistance (SAR) in plants.

The genera Bacillus and Pseudomonas are among the most famous bacterial parts of soil inoculants. Among the beneficial effects of Bacillus species are competition with other microorganisms in the soil for nutrients and space, antibiosis through the production of secondary metabolites like lipo peptides, the induction of Systemic Acquired Resistance (SAR) in plants and the promotion of plant growth through the production of indole-3-acetic acid (IAA). Pseudomonas species are also frequently used in agriculture to promote and regulate plant growth through IAA, produce siderophore and make it easier for nutrients to be taken in through phosphate solubilisation [3].

Ipomoea batatas (sweet potato) cultivation has grown in popularity over the past few decades due to its abundance of nutrients, particularly beta-carotene and anthocyanin, ease of cultivation due to its adaptability to a variety of soils and climates, high yield and edible roots, shoots and leaves. Bio control, improvement of plant tolerance to abiotic stress and growth promotion of sweet potato plants have all benefited from the testing of beneficial microorganisms. The creation of a multicomponent agricultural soil inoculant was the goal of this study. Our objectives were to assemble a synthetic community from microbial strains chosen based on their promising features, to examine its performance in sweet potato cultivation and to characterize fungal and bacterial isolates for various properties (eco physiological features, bio control potential, nitrogen fixation, phosphorus mobilization, polysaccharide degradation, pesticide tolerance) [4,5].

Conclusion

In this review we gathered and tried a microbial consortium (engineered local area) for the treatment of yam, comprising of two contagious (T. ghanense SZMC 25217, T. afroharzianum SZMC 25231) and three bacterial strains (B. velezensis SZMC 24986, *Arthrobacter globiformis* SZMC 25081, *P. resinovorans* SZMC 25872), which were chosen to possibly meet a progression of measures as an engineered local area (organic control of plant microorganisms, plant development advancement by phosphorus preparation and nitrogen supply, polysaccharide corruption). In sweet potato cultivation, field tests with the assembled soil inoculant revealed that the yield per plant and average tuber size of the treated plants were greater than those of the untreated controls, both with and without fertilization. The average tuber size and yield per plant were also significantly higher in the treatment group than in the untreated control group when the sweet potato propagation material was soaked and inoculated later. We were successful in developing a sweet potato-growing microbiological soil inoculant based on the findings. This is, to the best of our knowledge, the first report of a successful sweet potato cultivation using a fungal-bacterial consortium. The data on increased yields suggest that the use of microbial mixtures with elements from both fungi and bacteria is a promising method for the effective biological production of sweet potatoes.

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Conflict of Interest

None.

References

1. Teo, Tiffany L.L., Heather M. Coleman and Stuart J. Khan. "Occurrence and daily variability of pharmaceuticals and personal care products in swimming pools." *Environ Sci Pollut Res Int* 23 (2016): 6972-6981.
2. Suppes, Laura M., Ching-Hua Huang, Wan-Ning Lee and Kyle J. Brockman, et al. "Sources of pharmaceuticals and personal care products in swimming pools." *J Water Health* 15 (2017): 829-833.
3. Gibs, Jacob, Paul E. Stackelberg, Edward T. Furlong and Michael Meyer, et al. "Persistence of pharmaceuticals and other organic compounds in chlorinated drinking water as a function of time." *Sci Total Environ* 373 (2007): 240-249.
4. Nam, Seung-Woo, Byung-Il Jo, Yeomin Yoon and Kyung-Duk Zoh, et al. "Occurrence and removal of selected micropollutants in a water treatment plant." *Chemosphere* 95 (2014): 156-165.
5. Wyczarska-Kokot, Joanna, Anna Lempart-Rapacewicz, Mariusz Dudziak and Edyta Łaskawiec, et al. "Impact of swimming pool water treatment system factors on the content of selected disinfection by-products." *Environ Monit Assess* 192 (2020): 1-21.

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