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Increasing Fertility of Soil by Microbial Stacking

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Abstract: *The microbial stacking strategy involves the mixing of different types of microbial inoculants and carbon source components to maximize microbial soil quality and improve its fertility status. The technique takes advantage of microbial synergism for improved nutrient cycles, carbon and organic matter decomposition, as well as nutrient availability for plants.*

Primary Techniques

Stacking microalgaes with carbon-based products such as humic acids and organic fertilizers nourishes soil microbes, increasing their activity on NPK mineralization and improving the formation of roots by up to 26% of additional root area and 19% of additional biomass production in crops like lettuce; it boosts microbial biomass in the soil by 20-30%.

Applications of Microbial Stacking

In regenerative farming, stacking microbial food supplements with microbe-stimulating agents such as seaweed helps crops to thrive and produce increased yield by 10%+. Additional cropping systems provide increased bacterial biodiversity and density through indirect stacking.

Results of Trials

According to field trials conducted by researchers, microbial stacking helps regenerate poor-quality soils, stimulating the rate of soil organic matter (SOM) production and promoting biodiversity in positive feedback processes. The method provides up to 25-40% crop increase with proper fertilization and increases organic carbon content.

Keywords: *microbial stacking*

I. INTRODUCTION

Sustainable agriculture requires soil fertility since the latter determines production rates, nutrition, and ecological balance. However, the excessive use of artificial fertilizers along with inadequate land management techniques has contributed to soil deterioration, a drop in microbial populations, and low productivity levels. The emergence of novel biological approaches, namely microbial stacking, is expected to overcome these issues.

The term microbial stacking means the simultaneous use of several microorganisms (e.g., bacteria, fungi, and actinomycetes) to improve soil condition and fertility. The mentioned microorganisms are involved in such processes as nitrogen fixation, phosphate solubility, organic matter breakdown, and protection from soil pathogens. Combined and used as a whole, microorganisms become more efficient than separately.

Thus, not only does microbial stacking provide for effective nutrient cycling and soil structure improvement, but it also facilitates better growth of plants and improves their resistance to environmental hazards. As a result, one can claim that this approach can restore microbial soil balance, thus being a way to develop environmentally friendly farming.

In conclusion, increasing soil fertility via microbial stacking is seen as a viable option.

II. LITERATURE REVIEW

The practice of microbial stacking or the use of microbial consortia is the use of several beneficial microbes in enhancing soil fertility. Fertility of the soil depends on its biological, physical, and chemical composition. Biological factors include the presence of microorganisms that aid in the cycling of nutrients. Rhizobium and Azotobacter fix

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nitrogen, while Bacillus and Pseudomonas aid in the solubilization of phosphorus and decomposition of organic compounds. This improves nutrient content in the soil and consequently helps the crops grow healthy and strong.

The idea behind microbial stacking lies in the principle that microorganisms perform various tasks and are effective in their roles when used together. Microorganisms form a symbiotic relationship whereby each member of the microbial community complements the other. This makes soil healthier through efficient nutrient cycling and microbial diversity. Moreover, the use of microbial consortia aids in the growth of the plants by producing hormones and enzymes that increase plant growth and produce natural antibiotics that protect plants against diseases.

Although there are numerous benefits of microbial stacking, this approach poses problems like incompatibility among microbes, environmental sensitivity, and poor performance in field settings. But with the development in the realm of microbes and biotechnology, this approach can be immensely beneficial for agriculture in the future.

III. METHODOLOGY

The methodology of the project includes an experiment on 2chilli plants where one was without any process of microbial stacking and other was including the process of microbial stacking. We planted both the plant in an glass container as to compare the growth between the procces.

After the planting process was over we give 2 types of microbes which were Microbes DG which was a blend of several microbes and other was microbe containing beneficial bacterias for plant growth

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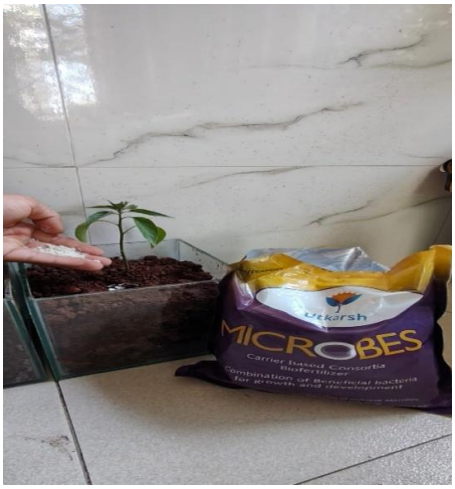

After applying microbes to one plant we waited and watered both plants daily and in the time span of 20-25 days we started to notice significant changes in their growth. As they were small plants so they took few time but in the bigger field it will take 2-6months

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IV. RESULTS AND DISCUSSION-

The results were significant and as per our expectation where we saw difference in growth of plants where one with microbial stacking has more growth and can be seem healthier as most of the deficiencies were reduced and other without microbes was having less growth

The use of microbial stacking is evident when the fertility of the soil is considered. This method contributes to soil fertility improvement by increasing nutrient availability and plant growth due to the activities of microbes. The practice enhances soil structure, microbial diversity, and facilitates better root growth. Moreover, it assists in reducing the occurrence of diseases. Nonetheless, microbial stacking may be subject to changes in the environment and the interaction between microbes. In general, microbial stacking is a ssviable strategy for improving soil fertility.

V. CONCLUSION

Stacking of microbes is a promising and eco-friendly strategy for enhancing the fertility of soils through the use of different types of beneficial microbes which interact with each other and contribute to better nutrient availability and improved soil conditions. Some of the processes performed by these microbes include nitrogen fixing, phosphorous solubilization, and organic material breakdown which contribute to the overall improvement of soil conditions. Synergistic interactions between different types of microbes make this process more effective than other methods like stacking of single strains.

Apart from contributing to increased production of crops, microbial stacking is an environmentally sustainable method as it decreases reliance on artificial chemicals and maintains microbial diversity. Environmental parameters like type of soil, moisture, and temperature influence the effectiveness of microbial stacking. Compatibility between different microbes is also another important parameter that must be taken into account when developing this method.

Overall, microbial stacking is a promising solution that can help increase soil fertility. With careful development and application, this method has the potential to become one of the most important practices in sustainable agriculture.

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