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Bio-fertilizers

Ashna S. David and Sreelakshmi M.V*

Nehru Arts and Science College, Coimbatore, India.

*Corresponding author: sreelakshnimvnai97@gmail.com

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Introduction

A group of beneficial microorganisms are capable of enhancing the productivity of soil and enrich the nutrient quality of the soil. This is done by fixing atmospheric nitrogen or by solubilizing the soil phosphorus or by stimulating the plant growth. It refers to the use of microorganisms instead of chemicals to enhance the nutritional content of the soil. Bio-fertilizers are very important in organic farming because they are completely environment-friendly and less harmful. Only 40% of India's total area of cultivation is covered with fertilizers, where the fertilizers for irrigation are available, and the remaining 60% of the land uses a negligible amount of fertilizers. The farmers in these areas use organic manners to enhance soil fertility. By applying organic manners mainly, bio-fertiliser is the best way to improve soil organic carbon which is an essential compound for the enrichment of soil and the growth of the plant.

Important characteristic features of biofertilizer

- **Nitrogen fixers:**
 - a) *Rhizobium*: Useful for Pulse legumes like Pea, Black gram and Red gram. It can fix atmospheric nitrogen by symbiotic association with the legumes and certain non-leguminous plants.
 - b) *Azospirillum*: It has the nitrogen-fixing ability, and they are also able to produce growth regulating compounds. It also forms an associative symbiosis with many plants. It can mainly be used for Maize, Sugarcane and Pearl millet.

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- c) *Azotobacter*: These are mostly present in neutral or alkaline soils. This bacterium produces anti-fungal antibiotics which inhibit the growth of pathogenic fungi in the root region.
- d) Blue-green algae (Cyanobacteria): It also helps in nitrogen fixation by producing heterocyst in low Nitrogen environments. It is an important agricultural asset because of the ability of cyanobacteria to fix elemental nitrogen. It is commonly used for the cultivation of Rice and Beans. e.g.: *Nostoc*, *Anabaena*
- **Phosphorous solubilizers:**
Several bacteria and fungi are capable of solubilizing phosphate present in the soil by secreting an enzyme called as a phosphatase.

Types of biofertilizers

There are mainly three types of biofertilizers

1. Bacteria: The excellent example of biofertilizer is root nodules that are formed by the association of the bacterium (*Rhizobium*) with the root of leguminous plants. These nodules help for the fixation of atmospheric nitrogen into organic compounds. Plants use these organic compounds as their nutritional source.
2. Fungi: The symbiotic association of fungi with plants is called “Mycorrhizae”. The fungus associated with the root of plants absorbs phosphorous from the soil. The plants that grow with these association show different characteristics like tolerance to drought conditions, resistance to root borne pathogens and an increase in plant growth and development.
3. Cyanobacteria: Blue-green algae are commonly found in water or land. They also help in fixing atmospheric nitrogen. They have a symbiotic association between the aquatic fern *Azolla* and *Anabaena*.

Conclusion

Bio-fertilizers help to increase the availability of plant nutrients and helps in the maintenance of soil fertility. As discussed earlier many microorganisms have the beneficial role of biological nitrogen fixation for the supply of nitrogen to crops. Bio-fertilizers are economical, renewable and eco-friendly. The use of bio-fertilizer is an essential component of organic farming. These characteristics of bio-fertilizers make them more valuable.

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