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Biofertilizer for Crop Production and Soil Fertility

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Introduction

Agriculture plays a pivotal role in the growth and survival of nations therefore, maintaining its quantity and quality is essential for feeding the population and economic exports. Modern agriculture involves usage of pesticides and chemical fertilizers with an essence of increasing the world's food production, as these serve as a fast food for plants causing them to grow more rapidly and efficiently. Continuous application of chemical fertilization leads to the decay of soil quality and fertility and might lead to the collection of heavy metals in plant tissues, affecting the fruit nutritional value and edibility.

Hence, in the recent years, many organic fertilizers have been introduced that act as natural stimulators for plant growth. A particular group of organic fertilizers includes outcomes based on plant growth-promoting microorganisms identified as 'Biofertilizers'. Organic farming has appeared as a prime concern area globally in aspect of the growing demand for safe and healthy food, durable sustainability and issue on environmental pollution associated with random use of agrochemicals.

What is Biofertilizers

A **Biofertilizer** (also **bio-fertilizer**) is a substance which contains living micro-organisms which, when applied to seeds, plant surfaces, or soil, colonize the rhizosphere or the interior of the plant and promotes growth by increasing the supply or availability of primary nutrients to the host plant. Biofertilizers add nutrients through the natural processes of Biofertilizers add nutrients through the natural processes of nitrogen fixation, solubilizing phosphorus, and stimulating plant growth through the synthesis of growth-promoting substances.

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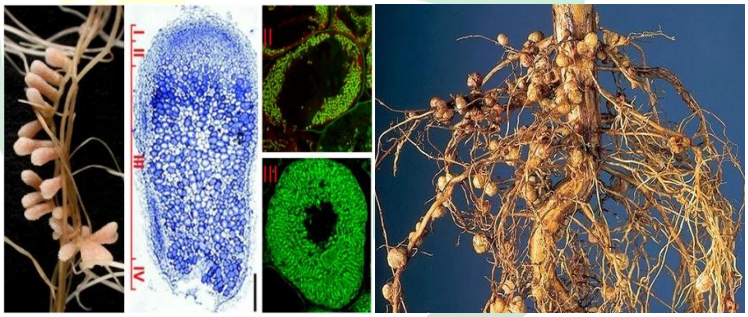
Types and features of biofertilizers

Based on type of microorganism, the bio-fertilizer can also be classified as follows:

- **Bacterial Biofertilizers**: e.g. Rhizobium, Azospirilium, Azotobacter, Phosphobacteria.
- **Fungal Biofertilizers**: e.g. Mycorhiza
- **Algal Biofertilizers**: e.g. Blue Green Algae (BGA) and Azolla.
- **Actinimycetes Biofertilizer**: e.g. Frankia.



Application-Method of applying biofertilizers

Seedling root dip: This method is usually applicable for rice crops. The seedlings are sowed in the bed of water and kept for 8-10 hours.

Seed Treatment: The seeds are soaked in the mixture of nitrogen and phosphorus fertilizers. These seeds are then left to dry and are sown as soon as possible.

Soil Treatment: The biofertilizers along with the compost fertilizers are blended and kept for one night. This mixture is then scattered on the soil where the seeds have to be sown.

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Tips to get good response to biofertilizer application

- Biofertilizer product must contain good effective strain in appropriate population and should be free from contaminating microorganisms.
- Select right combination of biofertilizers and use before expiry date.
- Use suggested method of application and apply at appropriate time as per the information provided on the label.
- For seed treatment adequate adhesive should be used for better results.
- For problematic soils use corrective methods like lime or gypsum pelleting of seeds or correction of soil pH by use of lime.
- Ensure the supply of phosphorus and other nutrients.

Precautions to take while using biofertilizers

Biofertilizer packets need to be stored in cool and dry place away from direct sunlight and heat. Other chemicals should not be mixed with the biofertilizers. While purchasing one should ensure that each packet is provided with necessary information like name of the product, name of the crop for which intended, name and address of the manufacturer, date of manufacture, date of expiry, batch number and instructions for use. The packet has to be used before its expiry, only for the specified crop and by the recommended method of application. Both nitrogenous and phosphatic biofertilizers are to be used to get the best results. Biofertilizers are not replacement of fertilizers but can supplement plant nutrient requirements.

Biofertilizer for Soil Fertility

Nutrition is a prerequisite required for the production of crops and healthy food for the world's enlarging population. Plant nutrients are a key component of sustainable agriculture. The 16 essential plant nutrients (N, P, K, Ca, Mg and S (macronutrients), and Fe, Zn, Cu, Mo, Mn, B and Cl (micronutrients)) in required quantities to achieve maximum yield in crop production are well-established.

A fertile soil should possess all the macro and micronutrients as these minerals promote plant nutrition. Good fertility is basic for successful plant growth, and the approach

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of fertilizes and manures is a necessary graining activity. The maintenance of sufficient levels of nutrients in soil is important for healthy plant growth.

Increased crop yield largely depend on the type of fertilizers used to provide essential nutrients for plants. For optimal plant growth, nutrients must be available in adequate and in balanced quantities. From the soil nutrients, only a small portion is released each year by biological activities or chemical processes. Hence, fertilizers are designed to supply the nutrients already present in the soil.

Bio fertilizing Agents and Plant Disease Control

Bio fertilizing agents control the plant pathogenic fungi directly as well as indirectly. Directly they parasitize the pathogens; application of rhizobium culture on the legume seeds control seed borne fungi such as *Colletotrichum*, *Ascochyta*, *Helminthosporium*, etc. The rhizobia produce a toxic substance when they multiply on the seed and rhizosphere. Phosphate solubilising fungi such as *Aspergillus niger* and other *Penicilla* produce antibiotic substances and thus kill the pathogenic fungi. Indirect killing of the plant pathogens is achieved by producing healthy seedlings and phytoalexins. Application of mycorrhizae produce better root systems which overcome the attack of root rotting and soil borne pathogens. Numerous reports are available that applications of biofertilizers in the soil stimulate and augment the activity of saprophytic microorganisms.

Advantages of biofertilizers

Biofertilizers act as supplements to chemical fertilizers. Biofertilizers are cost-friendly and can aid to decrease consumption of such fertilizers. Microbes in biofertilizers provide atmospheric nitrogen directly to plants. They aid in solubilisation and mineralization of other plant nutrients like phosphates. Better synthesis and availability of hormones, vitamins, auxins and other growth-promoting substances improves plant growth. On an average crop yield elevates by 10–20 percent by their use. They help in the multiplication and survival of beneficial micro-organisms in the root region (rhizospheric bacteria). They control and inhibit pathogenic soil bacteria. They enhance soil texture by increasing amount of humus and maintain soil fertility. Eco-friendly in nature and pollution free.

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Disadvantages

Biofertilizers require special care for long-term storage because they are alive. They must be used before their expiration date. If other microorganisms contaminate the carrier medium or if growers use the wrong strain, they are not as effective. The soil must contain adequate nutrients for biofertilizer organisms to thrive and work. Biofertilizers complement other fertilizers, but they cannot totally replace them. Biofertilizers lose their effectiveness if the soil is too hot or dry.

Conclusions

Biofertilizers are a good approach to increasing crop productivity. In recent years, the biofertilizers are used to provide the essential nutrients to the plant and significantly increase its yield. These are eco-friendly, cost effective, provides the natural environment to the plant, boost the defense system of the plant, and protect the plant from drought, acidity and other strict conditions. Research efforts are still required in this field to explore and identify soil-specific strains, to gain further insights into biofertilizer composition, and to improve the existing strains using biotechnological methods.