

## Biofertilizer & It's Role in the Agricultural Production System

**Pragati Pandey, Pravendra Kumar Pathak and Neeraj Kumar**  
Department of Soil Science and Agricultural Chemistry, ANDUA&T, Kumarganj,  
Ayodhya-224229

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### Abstract

Nitrogen is one of the most important mineral nutrients for plants, it helps plants in growth and development, and it also helps in increasing the productivity of crops under various abiotic stress conditions through the application of suitable nitrogenous fertilizers. But the application of increased doses of nitrogen may also increase the cost of production, and excessive use of nitrogenous fertilizers may also cause some serious negative impacts on an agricultural production system. Therefore, we need to have an alternative option of chemical fertilizers sustainably. Because they are comparatively more environmentally benign, bio fertilizers have grown in importance in the agricultural industry. In order to preserve long-term soil fertility and the sustainability of crop production, biofertilizers are a crucial part of sustainable farming. Given that it is a far more affordable supply of nitrogen, it will assist farmers in lowering their production costs.

**Keywords:** Abiotic stress, bio fertilizer, fertilizer, crop production, soil fertility.

### Introduction

Bio fertilizers are biologically active products containing living because they are comparatively more environmentally benign, bio fertilizers have grown in importance in the agricultural industry. In order to preserve long-term soil fertility and the sustainability of crop production, bio fertilizers are a crucial part of sustainable farming. Given that it is a far more affordable supply of nitrogen, it will assist farmers in lowering their production costs. A microorganism that helps in involving plant nutrition and stimulating plant growth. azotobacter, which is a non-symbiotic bio fertilizer is capable of fixing 20 to 30 kg N/hac. It can be applied through soil application, seed inoculation, or seedling dipping. Various crops, including rice, cotton, and sugarcane, can also be grown with it. The importance of bio fertilizers is owing to the bigger advantages they provide in comparison to the costs incurred,

as they are less expensive than chemical fertilizers. Some other nitrogen fixer like rhizobium is capable of fixing nitrogen in association with the leguminous crop. Nitrogen makes up 78% of the atmosphere, and carbon dioxide makes up 0.3%. Plants can assimilate carbon dioxide through photosynthesis, but most plants cannot fix atmospheric nitrogen though it is abundant. So, rhizobium helps in fixing atmospheric nitrogen, while some others help in increasing the availability of nitrogen.

### **Bio fertilizer**

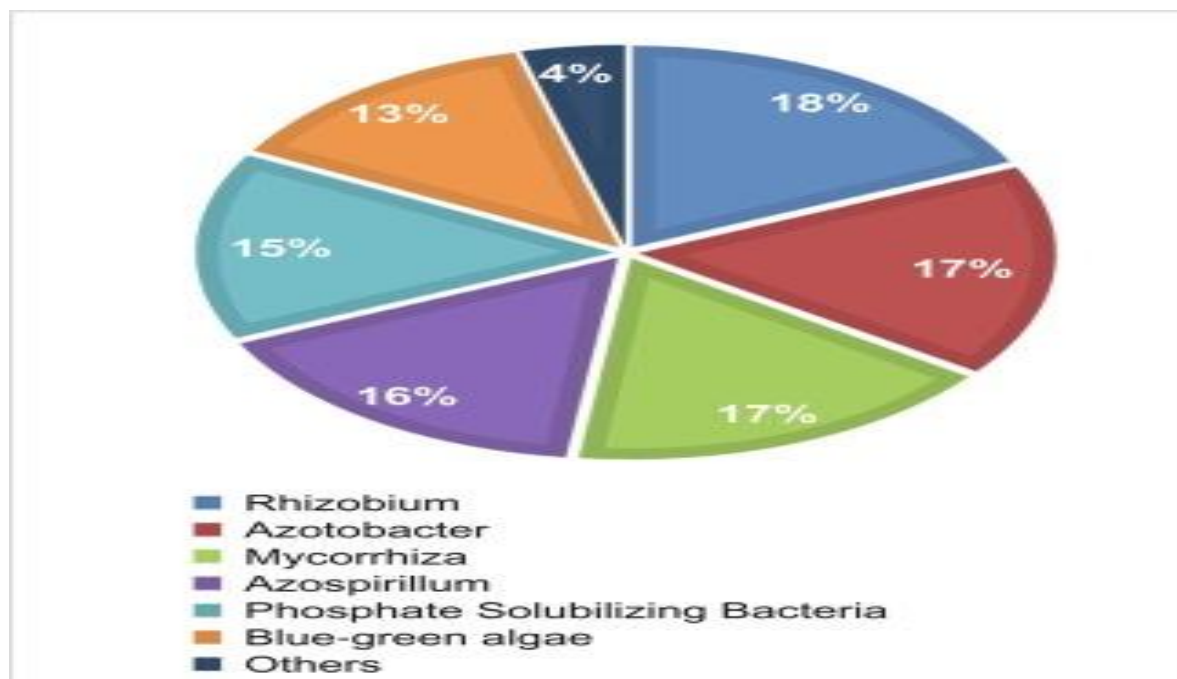
Bio fertilizers enhances the growth-promoting qualities of the plant and also increase crop production with their different methods like nitrogen fixation, phosphate fixation, phosphate solubilisation, phosphate mobilization, different micronutrient solubilisation and prevent the soil from the harmful effect of chemical fertilizers and increases soil's physical properties such as water holding capacity cation exchange capacity and its buffering capacity. Bio fertilizers can reduce the effect of chemical fertilizers by increasing the organic value in soils, but they are not able to replace their use.

### **Different Types of Bio fertilizers**

- Nitrogen Fixers
- Phosphate Solubilizers
- Phosphate Mobilizers
- Silicates and Zinc Solubilizer
- Pottasium Solubilizer
- Plant Growth Promoting Rhizobacteria

### **Nitrogen Fixation**

Biological nitrogen fixation accounts for 69% of the world's nitrogen fixation, with non-biological activities making up the remaining 31%. The most significant is the legume-rhizobium symbiosis, which meets 80–90% of the total nitrogen needs of legumes and raises grain output by 10%–15% in field settings (Verma and Bhattacharyya, 1990). Legumes' ability to fix nitrogen is maximized by inoculating the crops with a productive Rhizobium strain.



### Rhizobium

Rhizobium is the most popular bio fertilizer and shows consistent benefits. Rhizobium species enter the roots of host plants and form nodules on the root surface and supply nitrogen to the host. Rhizobium is categorized under the symbiotic association, and they are the maximum contributors to biological nitrogen fixation in nature.

### Azospirillum

Azospirillum is frequently discovered in the roots of grasses and grains. Azospirillum is tolerant of high temperatures (30–40°C), has a low energy need, and is widely established in cereal roots. Azospirillum is documented in crops grown in the acidic to alkaline range and is a mesophilic organism. Azospirillum inoculum can endure salinity and alkalinity. Thus, it is appropriate for tropical settings. Total nutrient absorption (NPK) is seen to be higher in Azospirillum-inoculated plants than in uninoculated plants. Increases in yield were produced by bacterial growth, which may be related to chemicals that encourage plant development and improved nitrogen uptake by plants. 1991 (Wani *et al.*)

### Azotobacter

Azotobacter is a free-living and non-leguminous plant. species of azotobacter are capable of fixing atmospheric nitrogen up to 20-30 kg N/hac. Azotobacter can be used in different cereal crops like rice, wheat, millets, and other cereal crops. Azotobacter inoculation has had advantageous results for dryland crops.

## **Azolla**

Freshwater ferns like Azolla are typically found in ditches, rice fields, and ponds. Azolla pinnata is the most widespread species of Azolla found in India. Azolla can fix up to 30 to 40 kg N/ha of nitrogen. The symbiotic interaction between the fern and BGA allows them to fix nitrogen. Along with nitrogen, Azolla also supplies the crop with a number of other nutrients including K, P, Zn, and Fe. The monsoon season and low temperatures are excellent for Azolla's growth.

## **Mycorrhiza and Phosphorus Solubilizing Bacteria:**

Mycorrhiza is obligate symbionts that depend upon living plants. It is a symbiotic association between plant roots and the fungi of higher plants. VAM plays a major role in inducing the plant crop. Mycorrhiza aids in transferring several nutrients from the soil to the roots of plants, including copper, potassium, aluminium, and iron. Dry and green forage, chiles, and peanuts have all shown yield increases after applying VAM. *Pseudomonas striata* and *Bacillus polymyxa* are significant phosphate solubilizing organisms.

## **Government Encourages the Use of Bio fertilizers Over Chemical Fertilizers**

The Indian government has promoted the use of bio fertilizers rather than chemical fertilizers through a number of state-level programs. Improved and effective strains of bio fertilizers tailored to various crops and soil types have been produced by ICAR as part of the network project on Soil Biodiversity-Bio fertilizer. According to an ICAR study, bio fertilizers can increase agricultural productivity by 10% to 25%.

## **GOVERNMENT SCHEMES FOR THE PROMOTION OF BIOFERTILIZERS**

- Paramparagat Krishi Vikas Yojana (Pkvy)
- National Mission on Oilseeds And Oil Palm
- National Food Security Mission
- Integrated Nutrient Management & Integrated Pest Management.

## **Conclusion**

As bio fertilizers assist farmers in lowering production costs and boosting crop production, they are essential to their daily lives. It aids in preserving the long-term fertility of the soil. They support soil health, provide a renewable source of nutrients, and act as a supplement to chemical fertilizers. Plant leftovers are broken down, and the soil's C:N ratio is stabilized. The usage of chemical fertilizers will raise the cost of production, which may not



be beneficial in the long run. Bio fertilizers are a preferable substitute because they are an affordable source of many nutrients. Therefore, since it is eco-friendly, less hazardous to plants, non-polluting, and affordable, bio fertilizer is a superior choice for farmers.

