[Article ID : 01/I/19/0121]

# BIO-FERTILIZERS: A NUTRIENT BOOSTER FOR PLANT

**Jhutan Debnath[1], Anwesha Acharya[2]**

[1]PhD Research Scholar, Department of Soil Science and Agricultural Chemistry
Uttar Banga Krishi vishwavidyalaya, Pundibari, Cooch Behar, West Bengal, India.
[2]PhD Research Scholar, Department of Nematology,
College of Agriculture, OUAT, Bhubaneswar, India.
*Corresponding email id: jhutandebnath1234@gmail.com

## 1. Abstarct

Bio-fertilizer is a substance which is used to increase the fertility status of the soil. It contains micro-organisms which make the soil nutrient available for cultivation. Bio-fertilizer has been identified as an alternative source for increasing soil fertility and crop production in sustainable farming. Bio-fertilizer can be an important part of integrated nutrients management. Due to scarcity of land, the people has stopped using natural fertilizers and are using the chemical fertilizers and chemical pesticides to gain more productivity.

**Keywords :** BGA, bio-fertilizer, INM

## 2. Introduction

The term “bio-fertilizer” has been defined in different ways over the past 20 years, which derives from the improved understanding of the relationships occurring between the plant and rhizosphere microorganisms. A bio-fertilizer contains living microorganisms which is applied to a seed or plant surface, the soil and it colonizes the rhizosphere and promotes growth by increasing the supply or availability of nutrients to the host plant (Vessey 2003). The use of chemical fertilizers causes air and ground water pollution as a result of eutrophication of water bodies (Youssef *et al*., 2014). Organic farming is a way that not only ensures food safety and also adds to biodiversity of soil (Raja 2013). The use of bio-fertilizers leads to improve plant tolerance to biotic and abiotic factors, plant growth, nutrients and water uptake. Bio-fertilizer may be used to include all organic resources for plant growth which are rendered in available form for plant absorption through microorganisms (Khosro *et al*., 2012). The extensive uses of chemical fertilizers have adverse effects on human health. Heavy use of chemical fertilizers and chemical pesticides contributed in loss of soil productivity (Aggani 2013). The chemical fertilizers causes harm to plenty of beneficial organisms that contribute high value functions in agricultural areas (Preap 2009).

## 3. Importance of bio-fertilizer

Bio-fertilizers play an important role in improving fertility of the soil. Application of bio-fertilizers to soil improves the structure of the soil and minimizes the use of chemical fertilizers. The application of blue green algae (BGA) with Azospirillum proved significantly beneficial in improving yield of grain under low land conditions. Bio-fertilizers inoculation with Vesicular Arbuscular Mycorrhiza, Azotobacter and Rhizobium gave the highest increase in straw and grain yield of wheat plants with rock phosphate (Ritika *et al*., 2014). Azolla is eco-friendly, economical and provides carbon and nitrogen enrichment of soil. Growth, yield and quality parameters of certain plants significantly increased with bio-fertilizers containing bacterial nitrogen fixers, phosphate and potassium solubilizing bacteria and microbial strains of some bacteria (Khosro and Yousef 2012). Soil characteristics like salinity, acidity, drought; water logging affects the use of bio-fertilizers (Ritika *et al*., 2014).

## 4. Different types of bio-fertilizers

### 4.1. Rhizobium (RHZ)

They fix atmospheric nitrogen in association with plants forming nodules in roots. RHZ are limited by their specificity and certain legumes are benefited from this symbiosis. They belongs to family Rhizobiaceae, symbiotic in nature, fix nitrogen 50-100 kg/ ha in association with legumes only.

### 4.2. Plant Growth Promoting Rhizobacteria (PGPR)

These kind of soil bacteria are aggressively colonize plant roots and benefit plants by providing growth promotion. PGPR are associated with plant roots and increases plant productivity, immunity. PGPR might also preventing the accumulation of nitrates and phosphates in agricultural soils and increase nutrient uptake from soils , thus reducing the need for fertilizers.

### 4.3. Azospirillum

It belongs to family Spirilaceae and they are heterotrophic, associative in nature. They also produce growth regulating substances. Their nitrogen fixing ability is 20-40 kg/ha. The Azospirillum is forms associative symbiosis. It is mainly recommended for maize, sorghum, sugarcane, pearl millet etc.

### 4.4. Azotobacter

It belongs to family Azotobacteriaceae, aerobic, free living. They are heterotrophic in nature. They are occur in neutral or alkaline soils. The population of Azotobacter is generally low in uncultivated soils and in the rhizosphere of the crop plants. The occurrence of this organism has been found from the rhizosphere of different crop plants like sugarcane, bajra, rice, maize, vegetables and plantation crops.

### 4.5. Zinc solubilizers

Zinc solubilizing bacteria are potential source for zinc supplementation. They are convert applied inorganic zinc to available forms. Zinc solubilizing microorganisms solubilize zinc through various mechanisms like acidification. Zinc-solubilizing bacteria (Zn-SB) are promising bacteria which can be used for sustainable agriculture. Zn-SB have plant growth-promoting (PGP) properties such as nitrogen fixation, K solubilization, Zn solubilisation, P solubilization and production of phytohormones.

### 4.6. BGA and Azolla

Blue-green algae are actually types of bacteria and they are known as Cyanobacteria. They normally look green in colour and sometimes may turn bluish. BGA can fix 20-30 kg N/ha in submerged rice fields. N is required in large quantities for low land rice production. Soil N and BNF by associated organisms are major sources of N for lowland rice (Raja 2013). BGA forms symbiotic association capable of fixing nitrogen with fungi, ferns and flowering plants. Azolla contains 0.2-0.4 % N on wet basis and 4-5 % N on dry basis. It can be used as potential source of organic manure and nitrogen in rice production. Azolla is used as bio-fertilizer for rice crop due to its quick decomposition in the soil and efficient availability of its nitrogen to rice plants.

### 4.7. Phosphate Solubilizers

Phosphate solubilizing bacteria (PSB) are beneficial bacteria. They are capable of solubilizing inorganic phosphorus from insoluble compounds. Rhizosphere micro-organisms having P-solubilization ability is considered to be one of the most important traits associated with plant phosphate nutrition. PSB have been introduced as phosphate bio-fertilizer to the agricultural community

## 5. Caution in the use of Bio-fertilizers

There are several caution in using bio-fertilizers. They are as follow as given below:

- Bio-fertilizers are stored at room temperature, not below 0°C and above 35°C.
- Never expose bio-fertilizers to sunlight directly.
- Never mix bio-fertilizers with nitrogen fertilizers.
- Never apply bio-fertilizers with fungicides.

## 6. Different Microorganisms used in Bio-fertilizer Production :

| Groups | Examples |
|---|---|
| Free living | Azotobacter, Clostridium |
| Symbiotic | Rhizobium, Anabaena, Frankia |
| Associative Symbiotic | Azospirillum |
| Arbuscular Mycorrhiza | Gigaspora Spp., Glomus Spp. |
| Bacillus Spp. | Silicate and zinc solubilizers |
| Pseudomonas | Pseudomonas fluorescens |
| Ectomycorrhiza | Pisolithus Spp., Laccaria Spp. |

## 7. Conclusion :

Bio-fertilizers can help to solve the problem of food need of the increasing global population. It is important to realize the usefulness of bio-fertilizers so as to apply it in modern agricultural practice. Application of bio-fertilizers containing beneficial microbes promote to a large extent of crop productivity. These potential biological fertilizers would play a important role in productivity and sustainability of soil. It can also protect the environment as it is eco-friendly and cost effective inputs for the farmers (Khosro and Yousef 2012). One of the few limiting factors to bio-fertilizers usage is ignorance regarding improved protocols of bio-fertilizers application to the field . Use of bio-fertilizers can minimize the use of synthetic fertilizers, decreasing environmental hazards, improve soil structure and promote leveraging agriculture. Bio-fertilizers are cheaper and significant in affecting the yield in cereal crops. Research exertions are required for exploring better and new agronomic effectiveness of bio-fertilizers in cereals, flowers, vegetables and orchards.

## 8. References

Aggani S.L (2013). Development of bio-fertilizers and its future perspective. Scholars Academic Journal of Pharmacy. *2*(4): 327-332.

Khosro M and Yousef S (2012). Bacterial bio-fertilizers for sustainable crop production: A review. APRN Journal of Agricultural and Biological Science. 7(5):237-308.

Preap V (2009). Enhancement of farmers' knowledge and skill in pest management on leguminous crops in Cambodia upland conditions. CARDI.

Raja N (2013). Bipesticides and biofertilizers: ecofriendly sources for sustainable agriculture. Journal of Biofertilizer Biopesticide. 4:112-115.

Ritika B and Uptal D (2014). Bio-fertilizer a way towards organic agriculture: A Review. Academic Journals. 8(24):2332-2342.

Rosen C.J and Horgan B.P (2009). Prevention pollution problems from lawn and garden fertilizers. Journal of Science. (7):97-103.

Vessey J.K (2003). Plant growth promoting Rhizobacteria as bio-fertilizers. Journal of Plant and Soil. 225(43):571-86.

Youssef M.M.A and Eissa M.F.M (2014) Biofertilizers and their role in management of plant parasitic nematodes: A review. Biotechnology Pharmaceutical Resources. 5(1):1-6.