



Biofertilizer: An Important Tool for Enhance Farm Crop Production

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World population is increasing with increasing rate along with more and more food production demand in agriculture. It has become essential for us to increase the crop productivity by using various fertilizers, insecticides, pesticides. But over use of these products the soil has been affected badly because of the depletion in the essential minerals of the soil. Soil is the reservoir of several plant nutrient but it is some time present in unavailable form. So application of bio fertilizer to make un available to available form. Bio fertilizers is a promising technology for future sustainable farming systems in view of rapidly decreasing phosphorus stocks and the need to more efficiently use available nitrogen (N). It is the serve as a fast food for plants, causing them to grow more rapidly and efficiently. The use of bio-fertilizers leads to improved nutrients and water uptake, plant growth and plant tolerance to abiotic and biotic factors. These potential biological fertilizers would play a key role in productivity and sustainability of soil and also in protecting the environment as eco-friendly and cost effective inputs for the farmers.

Introduction

Agriculture plays a pivotal role in the development of our nations; it is main source of supplying food, fodder and fibre to everyone therefore, maintaining its quantity and quality is essential. Last few decades in agriculture sector undergo much scientific research and development make agriculture sector is very modern. In intensive agriculture huge quantity of agro chemical is use for increasing crop production. So continues use of all those chemical fertilizer leads to the decline of soil quality and fertility status and might lead to the collection of heavy metals in plant tissues, affecting the fruit nutritional value and edibility (Farnia and Hasanpoor, 2015).

Hence, last few years, trends of organic farming is continues rising: now scientist also start research on organic farming and many organic fertilizers have been introduced that act as natural stimulators for plant growth. A particular group of organic fertilizers includes results based on plant growth-promoting microbes identified as 'Biofertilizers'. This bio-fertilizer is an important component of integrated nutrients management. Such microorganisms that are commonly used as bio-fertilizer components include; nitrogen fixers (N-fixer), potassium and phosphorus solubilizers, growth promoting rhizobacteria (PGPRs), endo and ecto mycorrhizal fungi, cyanobacteria and other useful microscopic organisms. One benefits to use of biofertilizers in farming to leads for improving nutrients and water uptake, plant growth and plant tolerance to abiotic and biotic factors. Biofertilizers approach pose lots of such benefits from an economic, social and environmental point of view (Carvajal-Muñoz and Carmona-Garcia, 2012).

What is Biofertilizer?

A bio-fertilizer is simply a substance which contains living microorganisms which when applied to the soil, a seed or plant surface colonizes the rhizosphere and promotes growth by



increasing the supply or availability of nutrients to the host plant (Vessey, 2003). A bio-fertilizer is a modernized form of organic fertilizer into which beneficial microorganisms have been incorporated (Swathi, 2010)

History of the Biofertilizer

Bio-fertilizers such as *Rhizobium*, *Azotobacter*, *Azospirillum* and Blue green algae (BGA) have been in use a long time ago. The knowledge about biofertilizer is increases and passes from generation to generation of the farmer. The commercial history of bio-fertilizer began with the launch of “Nitragin” by Nobbe and Hilther in 1895. This was followed by the discovery of *Azotobacter* and then Blue-green algae and a host of other microorganisms which are being used till date as bio-fertilizer (Kribacho, 2010).

Importance of Biofertilizer

Bio-fertilizers play an vital role in agriculture to enhancing and maintaining fertility status of the soil. In addition, the application of biofertilizer to soil improves the structure of the soil and minimizes use of chemical fertilizers. Under low laying area were water logging situation (e. g. Rice field) the application of blue green algae (BGA) and *Azospirillum* gate significant results to improving crop yield. Bio-fertilizers inoculation with *Azotobacter* and *Rhizobium* and Vesicular Arbuscular Mycorrhiza gave the highest increase in straw and grain yield of wheat plants with rock phosphate as phosphate fertilizer (Ritika and Uptal, 2014). Azolla is low-cost, eco-friendly fern use in agriculture to gate benefit in terms of carbon and nitrogen improvement in soil. It was recorded microorganisms such as *Bacillus subtilis*, *Thiobacillus thioxidans* and *Saccharomyces* species can fix atmospheric nitrogen symbiotically and about 80–90% nitrogen demand could be supplied by soybean through symbiosis (Ritika and Uptal, 2014). 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).

Advantages of bio fertilizer

- Due to activity of microbes to secretion of plant growth hormones which help in plant growth.
- Protection of the plant against attack by pathogens.
- Increasing fertility status of the soil.
- No special care is require during application of bio fertilizer.
- To reduce the supply & use of chemical fertilizers reduce pollution hazards.
- Bio-fertilizers are cost effective compared to synthetic fertilizer to save cost of produce.
- Bio-fertilizers restore the soil’s natural, nutrient cycle and build soil organic matter and carbon.
- Bio-fertilizer provides essential growth regulator and protection against drought.

Limitation of bio fertilizer

- ❖ Bio fertilizer can’t supply require quantity of nutrient as compared to chemical fertilizer.
- ❖ Bio-fertilizer use can sometimes not lead to the expected positive results because of exposure to high temperature or hostile conditions before usage.
- ❖ Unavailability of suitable strains of all plant nutrient and unavailability of suitable carrier materials.
- ❖ Biofertilizer has short life cycle.
- ❖ Lack of awareness among farmers to sue of biofertilizer and ther benefits.



- ❖ Some environment constrain such like alkalinity, acidity of soil, drought, water logging condition may no gate proper results.

Attention in the use of Bio-Fertilizers

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

Microorganism use in bio fertilizer

Some microorganisms that are commonly used as bio-fertilizers include nitrogen fixers, phosphorus solubilise, potassium solubilises, phosphorus mobilizers, used solely or in combination with of fungi.

Nitrogen Fixture: Examples include *Rhizobium Spp.*, *Azospirillum Spp.* and blue-green algae; these are use as fixing atmospheric nitrogen and converting them to plant useable forms in the soil and root nodules of legumes, Nitrogen fixing bio-fertilizers are crop specific bio-fertilizers (Choudhury & Kennedy, 2004).

Phosphate solubilizing bio-fertilizer (PSB): Examples include *Pseudomoona Spp.* and *Aspergillus Spp.* These work as solubilizing the insoluble forms of phosphate in soil. Most of phosphorus in soil occurs as insoluble form which is cannot be used by plants and these organisms accomplish this by secreting organic acids which lower the pH of the soil and cause the dissolution of bound forms of phosphate making them available to plants (Gupta, 2004).

Phosphate mobilizing bio-fertilizers (PMB): Examples are Mycorrhiza. They work by scavenging phosphates from soil layers and mobilizing the insoluble phosphorus in the soil to which they are applied. Chang and Yang stated that phosphorus solubilizing biofertilizer (PSB) sometimes act as phosphate mobilizers. Phosphate mobilizing bio-fertilizers are broad spectrum bio-fertilizers.

Potassium solubilizing bio-fertilizer (KSB): Examples include *Bacillus Spp.* and *Aspergillus niger*. Potassium which is available in soil are occurs mostly as silicate minerals which are inaccessible to plants. Which is available only when they are slowly weathered or solubilized. PSM solubilize silicates by producing organic acids which cause the decomposition of silicates and helps in the removal of metal ions thereby making them available to plants. Potassium solubilizing bio-fertilizers are broad spectrum bio-fertilizers.

Sulphur oxidizing bio-fertilizer (SOB): Example of sulphur oxidizing microorganism is *Thiobacillus Spp.* These work by oxidizing sulphur to sulphates which can usable by plants.

Plant growth promoting bio-fertilizer (PGPB): Examples of plant growth rhizobacteria, *Pseudomonas Spp.* etc: these are producing hormones and anti-metabolites during their regularly body activity and they promotes root growth, decomposition of organic matter which help in mineralization of the soil thereby increasing availability of nutrients and improving crop yield (Khosro and Yousef, 2012).

Conclusion

Bifertilizer popularity is increasing in many country of the world and many crop. They plays an important role in supplementing nutrients to the plants and restoring the soil fertility, regenerates



soil productivity leading to the sustainable farming. The application of bio-fertilizers containing beneficial microbes promote to a large extent, crop productivity and reduce our dependency on only chemical fertilizer and pesticide as well as reduces pollution of chemical industries. Bio fertilizer protect soil and environment as eco-friendly and cost effective inputs for the farmers.

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