Ecofarming
e-Magazine for Agriculture and Allied Sciences
http://www.rdagriculture.in
e-ISSN: 2583-0791
Ecofarming Vol. 02(01): 29-32, 2022

Bio-fertilizers

A Pathway to Sustainable Agriculture

Rajat Singh[1], Vivak Kumar[2] and Robin Kumar[1]

[1]Department of Soil Science and Agricultural chemistry
ANDUA&T Kumarganj, Ayodhya - 224229

[2]Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut

Email ID: vnsrajat18@gmail.com

Received: **Dec 23, 2021;** ***Revised:*** **Dec 29, 2021** ***Accepted:*** **Dec 31, 2021**

Ecofarming
e-Magazine for Agriculture and Allied Sciences
e-ISSN: 2583-0791

Introduction

Bio-fertilizers are one among the foremost effective current tools and benefit of our agricultural science as a substitute to our long-established fertilizers. Long-established fertilizers contain compost; household wastes and manure and don't seem to be as effective as chemical fertilizers. So, farmers often attempt to use chemical fertilizers within the sector of crop growth and development. But obviously the chemical fertilizers don't seem to be environment friendly because of their chemical toxicity that can cause water, air and soil pollution and may spread cancer causing agents. Additional, they're going to destroy the fertility of the soil during a future. Bio-fertilizer have microorganisms which promote the ample supply of nutrients to the host plants and ensure their suitable development of growth and regulation in their physiology.

'Biofertilizer' is a biological substance contains alive microorganisms, which, when applied to plant surfaces, seeds or soil, enhances growth by raising the provision or availability of primary nutrients to the host plants.

Biofertilizers aren't fertilizer. Fertilizers directly increase soil fertility by adding nutrients. Biofertilizers add nutrients through the natural action by atmospheric nitrogen fixation, Phosphorus mobilization, and enhancing plant growth through the bio-synthesis of growth promoting substances.

Why Bio-fertilizers?

As a secure substitute to chemical fertilizer, it reduces the ecological disturbance and are cost effective, eco-friendly and after they're required in bulk could also be generated at the farm itself.

- They increase crop give up to 10-40% and fix nitrogen up to 40-50 Kg.
- They improve soil texture, pH, water holding capacity (WHC) and other properties of soil.
- They produce plant growth promoting substances IAA, amino acids, vitamins etc.
- They are effective in stimulating plant growth, enhance seed germination and root and shoot growth, decomposition of organic materials and enrichment of compost.
- Improves fruit quality, color and seed weight.
- Earliness in flowering, fruit set and maturation.
- Accelerate vegetative growth.

Biofertilizers are often categorized in numerous groups related to their nature and performance.

Groups	Examples
N_2 Fixing Bio-fertilizers	
Free-living	*Beijerinkia, Azotobacter, Anabaena Nostoc*
Symbiotic	*Rhizobium, Frankia, Anabaen, Azollae*
Associative Symbiotic	*Azospirillum*
P Solubilizing Bio-fertilizers	
Bacteria	*Bacillus megaterium, Bacillus subtilis, Bacillus circulans, Pseudomonas striata*
Fungi	*Penicillium spp, Aspergillus awamori*
P Mobilizing Bio-fertilizers	
Arbuscular mycorrhiza	*Glomus spp., Gigaspora spp., Acaulospora spp.*
Ectomycorrhiza	*Laccaria spp., Pisolithus spp., Boletus spp., Amanita spp.*
Orchid mycorrhiza	*Rhizoctonia solani*
Bio-fertilizers for Micro nutrients	
Silicate and Zinc solubilizers	*Bacillus spp.*
Plant Growth Promoting Rhizobacteria	
Pseudomonas	*Pseudomonas fluorescens*

Methods of application bio-fertilizers

- Seed treatment
- Root dipping
- Set treatment
- Soil application

How to use or apply bio-fertilizers

Seed treatment

One packet of the inoculants (200 g) is mixed with 200 ml of rice kanji to form slurry. The seeds required for an acre are mixed within the slurry so on have a standardized coating of the treatment over the seeds and then shade dried for half-hour. The shade dried seeds sh0uld be sown within 24 hours. One packet of the in0culant (200 gm) is sufficient to treat 10 kg of seeds.

Root dipping

It has better application for transplanted crops. One packets of the in0culant is mixed in 20 liters of water. The basis portion of the seedlings is dipped within the mixture for five to 10 minutes and so transplanted.

Set treatment

This method is recommended generally for treating the sets of sugarcane, base suckers of banana and potato cut pieces. Two packets of inoculants are mixed in 20-30 litres of water. The cut pieces of planting material are dipped into the suspension for half-hour. Shade dries for few times before sowing.

Soil application

1kg of the treatment is blended with 20 kg of powdered and dried farm yard manure (FYM) so broadcasted in one acre of main field just before transplanting.

Microorganisms	Nutrient fixed (kg/ha/year)	Host crop
Algae	25 kg N/ha	Rice
Azolla	900 kg N/ha	Rice
Azospirillum	50-300 kg N/ha	Non-legumes like maize, barley, oats, sorghum, millets, sugarcane etc.
Rhizobium	20-30 kg N/ha	Legumes like pulses, groundnut, beans, clover etc.
Azotobacter	10-20 kg N/ha	Cereals, millets, vegetables
Mycorrhizae (VAM)	Solubilize phosphorus about (60%)	Many tree species, wheat sorghum, ornamentals
Phosphate solubilizing Bacteria and fungi	Solubilize about 50-60% of them fixed phosphorus in the soil	Soil application for all crops

Precautions in using bio-fertilizers

- Bacterial inoculants shouldn't be mixed with insecticide, pesticide, fungicide, herbicide and fertilizer.
- Seed treatment with bacterial inoculants is to be done finally when seeds are treated with fungicides.
- Rhizobium is crop specific, should be used for the desired crop only.
- Keep the packet of culture at a cool and dry place far from direct sunlight and warmth.

Conclusion

As a benefit for farmers, Bio-fertilizers being basic tools of organic farming play crucial role in maintaining long-run soil fertility and sustainability. They're of environment friendly non-bulky and low cost agricultural inputs. Bio-fertilizers would be the viable option for farmers to enhance/reinforce productivity per unit area in organic farming for an era of prosperity and clean environment. Liquid bio-fertilizers have the capacity to interchange the quality chemical fertilizers & carrier-based bio-fertilizers and plays a big role in restoring the soil health.