BIO-FERTILIZER

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INTRODUTION

- A **biofertilizer** is a substance which contains living microorganisms, when applied to seed, plant surfaces, or soil, colonizes the rhizosphere or the interior of the plant and promotes growth by increasing the supply or availability of primary nutrients to the host plant.

- Bio-fertilizers add nutrients through the natural processes of nitrogen fixation, solubilizing phosphorus, and stimulating plant growth through the synthesis of growth-promoting substances.

What is Bio fertilizer?

- Biofertilizers are natural fertilizers that are microbial inoculants of bacteria, algae and fungi (separately or in combination).
- which may help biological nitrogen fixation for the benefit of plants.
- They help build up the soil micro-flora and there by the soil health.
- Biofertilizer also include organic fertilizers(manure, etc.)
- Use of bio-fertilizer is recommended for improving the soil fertility in organic farming

TYPES OF BIOFERTILIZERS

- Bacterial
- Fungal
- Algal
- Aquatic fern
- Earthworms

Free living bacteria

- Large number of free living or non -symbiotic bacteria (does not form nodules but makes association by living in the rhizosphere) present in soil.
- Commonly used free living bacteria are
  - *Azotobacter*
  - *Klebsiella*

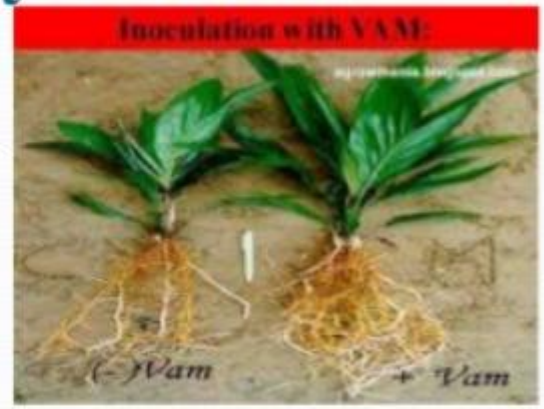
it will not associated with plant.

Azotobacter is a biofertilizer which provides the required amount of nitrogen to the plant from the soil.

Azotobactor

- ***Azotobactor*** is a heterotrophic free living nitrogen fixing bacteria present in alkaline and neutral soils.
- ***Azotobactor*** is the most commonly occurring species in arable soils of India.
- Apart from its ability to fix atmospheric nitrogen in soils, it can also synthesize growth promoting substances such as auxins and gibberellins and also to some extent the vitamins.

Vesicular Arbuscular Mycorrhiza (VAM)



- The term mycorrhiza was taken from Greek language meaning **'fungus root'**. term was coined by Frank in 1885
- The mycorrhiza is a mutualistic association between fungal mycelia and plant roots.
- VAM is an endotrophic (live inside) mycorrhiza formed by aseptated phycomycetous fungi.
- VAM help in **nutrient transfer** mainly of phosphorus, zinc and sulfur.

Uses of VAM

- Enhances the feeding areas of the plant root is as the hyphae spreads around the roots.
- Mobilizes the nutrients from distantance to root.
- Stores the nutrients (sp. phosphorus).
- Removes the toxic chemicals (example : phenolics) which otherwise hinder nutrient availability.
- Provide protection against other fungi and nematodes
- It increase growth rate in plants (*citrus, maize, wheat, etc.*)
- It reduces sensitivity of crop towards high level of salts and heavy metals

Algae as a biofertilizer

- Another group of free living nitrogen fixers are cyanobacteria.
- Commonly called as **Blue green algae.**
- More than 100 species of BGA can fix nitrogen.
- Nitrogen fixation takes place in specialized cells called **'Heterocyst'**
- BGA very common in rice field.
- Unlike *Azotobacter* BGA are not inhibited by the presence of chemical fertilizers.
- No chemical fertilizers added, inoculation of the algae can result in 10-14% increase in crop yields.

Azolla as a bio fertilizer

- Azolla is a tiny fresh water fern common in ponds, ditches and rice fields.
- It has been used as a biofertilizer for a rice in all major rice growing countries including India, Thailand, Korea, Philippines, Brazil and West Africa.
- The nitrogen fixing work is accomplished by the symbiotic relationship between the fern and BGA, ***Anabena azollae.***

In addition to nitrogen the decomposed Azolla also provides K, P, Zn and Fe to the crop

- *Azolla* biomass gets doubled within 5-7 days by vegetative methods.
- fix 40-80 kg nitrogen / ha / year.
- good manure for flooded rice.
- Increase of crop yield up to 15-20% has been observed while fertilizing the rice with *Azolla*
- Hybrids are growing faster
- Tolerant to heat and cold
- Fix 4-5% more nitrogen

Bio - fertilizers application methods

There are three ways of using these N-fixing/P.S.M. bacteria.

- **Seed treatment**
- **Root dipping**
- **Soil applications**

Seed Treatment

- Seed treatment is a most common method adopted for all types of inoculant. The seed treatment is effective and economic.
- Seed treatment with ***Rhizobium, Azotobacter, Azospirillum*** along with ***P.S.M.***
- seed treatment can be done with any of two or more bacteria.
- no side effect.
- important things has the seeds must be coated first with *Rhizobium* or *Azotobacter* or *Azospirillum* when each seeds get a layer of above bacteria then the P.S.M. inoculant has to be treated on outer layer of the seeds.

Root dipping

- Application of *Azospirillum* with the paddy/vegetable plants this method is needed.
- The required quantity of *Azospirillum* has to be mixed with 5-10 ltr of water at one corner of the field and all the plants have to kept for minimum ½ an hour before sowing .

Soil application

- P.S.M. has to be used as a soil application use 2 kgs of P.S.M. per acre. Mix P.S.M. with 400 to 600 kgs of Cowdung along with ½ bag of rock phosphate if available. The mixture of P.S.M., Cowdung and rock phosphate have to be kept under any tree shade or celling for over night and maintain 50% moisture.
- Use the mixture as a soil application in rows or during leveling of soil.

Advantage of biofertilizers

- Renewable source of nutrients
- Sustain soil health
- Supplement chemical fertilizers.
- Replace 25-30% chemical fertilizers
- Increase the grain yields by 10-40%.
- Decompose plant residues, and stabilize C:N ratio of soil
- Improve texture, structure and water holding capacity of soil
- No adverse effect on plant growth and soil fertility.

- Stimulates plant growth by secreting growth hormones.
- Secrete fungistatic and antibiotic like substances
- Solubilize and mobilize nutrients
- Eco-friendly, non-pollutants and cost effective method

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