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Unit-V

Biofertilizers

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BIOFERTILIZERS

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WHAT IS BIOFERTILIZERS?

- ‘**Biofertilizer**’**-** the name itself is self explanatory.
- **Biofertilizers** are biological preparations of efficient microorganisms that promote plant growth by improving nutrient acquisition.
- They enhance soil productivity by fixing atmospheric **nitrogen**, solubilizing **soil phosphorus**, and stimulating **plant growth**.
- As in organic farming the use of chemical is excluded, therefore biofertilizers are used in organic farming it increase the soil health and soil fertility.

CLASSIFICATION OF BIOFERTILIZERS

1. **For Nitrogen (Nitrogen Fixing):**

- Rhizobium for legume crops.
- Azotobacter/Azospirillum for non legume crops.
- Acetobacter for sugarcane only.
- BGA and Azolla for low land paddy.

2. **For Phosphorous (Solubilization of Soil Phosphorous):**

- Phosphatika for all crops to be applied with rhizobium, Azotobacter.
- VAM(Vesicular Arbuscular Mycorrhiza).

3. **For Enriched Compost (Nutrient Acquisition):**

- Cellulolytic fungal culture.
- Phosphotika and Azotobacter culture.

NITROGEN FIXING BIOFERTILIZER

- The nitrogen fixing bacteria works under two conditions, symbiotic and non-symbiotic.
- The symbiotic bacteria makes an association with crop plants through forming nodule in their roots.
- The non-symbiotic bacteria do not form any association but livs freely and fix atmospheric nitrogen.

RHIZOBIUM

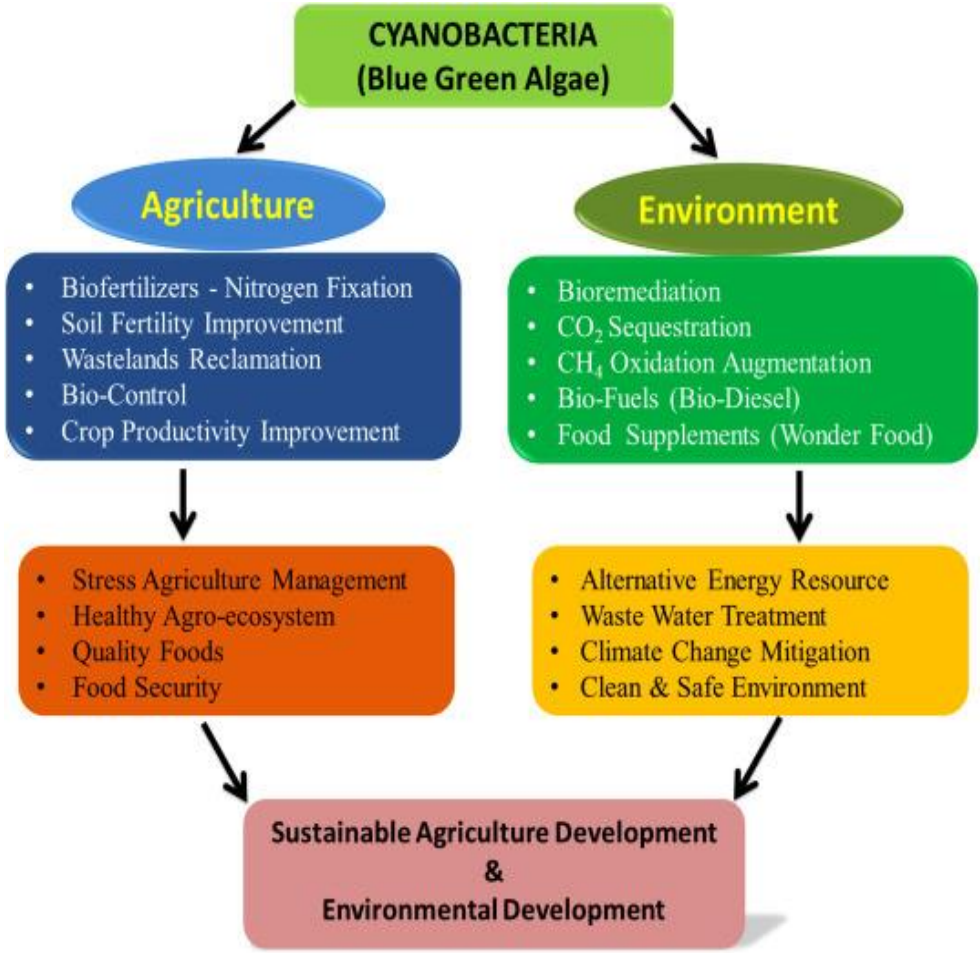
- Rhizobium lives in the root hairs of the legumes by forming nodules.
- The name Rhizobium was established in 1889 by Frank.
- Rhizobium has seven distinct species based on “Cross Inoculation Group Concept”.
- Rhizobium is a gram negative bacteria.
- Rhizobium attaches to the roots of the leguminous plant and produces nodules. These nodules fix atmospheric nitrogen and convert it into ammonia that can be used by the plant for its growth and development.

RHIZOBIUM AS BIOFERTILIZER

- Rhizobium biofertilizer is a substance that contains living microorganisms and is applied to plant surfaces, seeds or soil.
- The Rhizobium bacteria colonize the rhizosphere or the interior of the plant to promote growth by enhancing the supply or nutrient availability to the host plant.
- Rhizobium uses the host plant to fix atmospheric nitrogen and convert it into useful organic compounds, benefiting both, the bacteria and the plant.

BLUE GREEN ALGAE(BGA)

- BGA is another important class of biofertilizer.
- The BGA are the small organisms and can be seen under the microscope as a single cell or large accumulation of cells(colonies) or string of cells(trichomes).
- They have a similar external similar appearance to that of algae and azolla growing in the pond their requirements for light, nutrient and carbon dioxide are also similar.
- Cyanobacteria are used in ecofriendly sustainable agricultural practice for production of biomass of very high value.
- Cyanobacteria have an emerged potential as biofertilizer which are economical and environment friendly.



BGA AS BIOFERTILIZER

- Blue green algae play an important role in maintenance and build-up of soil fertility, consequently increasing growth of the crops and yield as a natural biofertilizer.
- They are photosynthetic nitrogen fixers and are free living.
- They have a greater water-holding capacity through their jelly structure.

- They have chlorophyll and phycobiliprotein and can fix carbon by oxygen-evolution photosynthesis like plants.
- Their genome contains nucleotide sequences which are comparable with that of 16S and 5S rRNA of cubacteria.
- Blue green algae (or Cyanobacteria) are a special group of prokaryotes.

MYCORRHIZA

- The term mycorrhiza was coined by Frank in 1885.
- Mycorrhiza is a mutualistic association between fungal mycelia and plant roots.
- VAM(Vesicular Arbuscular Mycorrhiza) is an endotrophic(inside living mycorrhiza) mycorrhiza formed by aseptate phycomycetous fungi.
- VAM helps in nutrient transfer(mainly phosphorus, zinc and sulfur).
- They also mobilize different nutrient like Cu(Copper), K(Potassium), Al(Aluminum), Mn(Manganese), Fe(Iron) and Mg(Magnesium) from the soilto the plant roots.
- They posses vesicles(sac like structure) for the storage of the nutrients.

MYCORRHIZA AS BIOFERTILIZER

- Mycorrhiza plays a very important role on enhancing the plant growth and yield due to an increase supply of phosphorus to the host plant.
- Mycorrhiza increase root surface area for water and nutrients uptake. The use of mycorrhizal biofertilizer helps to improve higher branching of plant roots.
- Mycorrhiza are endurable to several chemical substances; for example; pesticide such as endrin, chlordane, herbicide such as glyphosate, fuazifopbuty, chemical agents such as , benomyl, mancozed.

METHODS OF BIOFERTILIZER INOCULATION

1. Seed Inoculation:

- This is the most common practice of applying biofertilizers.
- In this method, the biofertilizer is mixed with 10% solution of jaggary.
- The solution is then poured over the seeds on a cemented floor and mixed properly in a way that a thin layer will be formed around the seeds.
- The seeds should be dried in the shade overnight and then they should be used.
- Generally, 750g of biofertilizer is required to treat the legume seeds for one hectare of area.

2. **Soil Application Method:**

- This method is mostly used for the fruit crops, sugarcane, and some other crops.
- At the time of planting the fruit tree, 20g of the biofertilizer was mixed with the compost.
- The biofertilizers are also broadcasted in the soil, so it requires more 10 times biofertilizer.
- Before broadcasting, the inoculants should be incubated with the desired amount of well decomposed by granulating for 24hrs.

3. **Self Inoclation:**

- This method is suitable for application of azotobacter.
- In this method, 50L of water is taken in a drum and 4-5kg of azotobacter biofertilizer is added and mixed well.
- Planting materials should be dipped in the mixture.
- Similarly, if we are treating the potato, then the tubers are dipped in the mixture and planting is done after dying the materials in the shade.

ADVANTAGES OF BIOFERTILIZERS

- Biofertilizers achieve higher crop yields while also enhancing soil health.
- Biofertilizers replace the chemical fertilizers, which are not beneficial for long-term plant health, and can be toxic to the environment and consumers.
- Biofertilizer production may be performed as a by-product of electricity generation from biogas.
- Exclusive use of biofertilizers keep soils chemical free and helps maintain natural fertility.
- Biofertilizers combat pathogens in both soil and plant, and work as a natural pesticide.

DISADVANTAGES OF BIOFERTILIZERS

- Biofertilizers provide lower nutrient density than chemical fertilizers, so more product is often required for the same effect.
- Biofertilizer production requires specific machinery.
- Biofertilizers can be difficult to store and may have a much shorter self-life than chemical fertilizers.
- Biofertilizers are often plant specific; what works on one crop does not work on another.
- Biofertilizers can have a strong and distinctive odour.

Reference

- Subbha Rao, N.S. (1995). Biofertilizers in Agriculture & forestry 3rd Edition. Oxford & IBH Pub.Co, Press.

Thank you!