Biofertilizers

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Biofertilizers

Biofertilizers are biologically active products or microbial inoculants of bacteria, algae and fungi.

Biofertilizers also include organic fertilizers (manure) which are converted into an available form by interactions of microorganisms.

Biofertilizers

Biofertilizers are broadly classified into two main groups:

- Biological nitrogen fixing biofertilizers
- Phosphate solubilising (mobilising) biofertilizers

Biofertilizers: Nitrogen fixers

Symbiotic: *Rhizobium, Frankia, Anabaena azollae*

Free living: *Azotobacter, Clostridium, Blue green algae, Acetobacter*

Associative symbiotic: *Azospirillum*

Biofertilizers: Phosphate suppliers

Phosphate solubilizer:

Bacteria: *Bacillus megaterium, Phosphaticum, Bacillus circulans, Pseudomonas striata, Pseudomonas* sp..

Fungi: *Penicillium sp, Aspergillus awamori*

Biofertilizers: Phosphate suppliers

Phosphate absorber:

Arbuscular mycorrhiza: *Glomus sp., Gigaspora sp., Acaulospora sp., Scutellospora sp. and Sclerocystis* sp.,

Ectomycorrhiza: *Laccaria sp., Pisolithus sp., Boletus sp., Amanita sp.*

Orchid mycorrhiza: *Rhizoctonia solani*

Biofertilizers

Sulphur supplier:

Thiobacillus novellus, Aspergillus.

Micronutrients supplier:

Silicate and Zinc solubilizers: *Bacillus* sp.

Advantages of Biofertilizers

- Supplements to chemical fertilisers
- Cost-friendly
- Microbes in biofertilizers provide atmospheric nitrogen directly to plants.
- They aid in solubilisation and mineralisation of phosphates.
- Availability of hormones, vitamins, auxins and other growth-promoting substances improves plant growth.

Advantages of Biofertilizers

- Increase crop yield by 10–20 percent.
- Help in the multiplication and survival of beneficial microorganisms in the root region (rhizospheric bacteria).
- Control and inhibit pathogenic soil bacteria.
- Enhance soil texture by increasing the amount of humus and maintain soil fertility.
- Eco-friendly in nature and pollution free.

Legume -Rhizobium symbiosis

Rhizobium leguminosarum, R. meliloti, R. trifolii, R. phaseoli, R. lupinii and R. japonicum form root nodules in legumes.

The nitrogen fixing ability of legumes inoculated with rhizobia is 50-150 kg per hectare.

Azolla-Anabaena symbiosis

Basal application of green manure- *Azolla* at the rate of 10-12 tonnes/hectare increases soil nitrogen by 50-60 kg/ hectare and reduces 30-35 kg of nitrogenous fertilizer requirement of rice crops.

Cyanobacteria

Cyanobacteria such as *Anabaena, Nostoc, Aulosira, Plectonema, Scytonema, Calothrix, Mastigocladus, nodularia, Lyngbya* and *Tolypothrix* have the capacity to fix atmospheric nitrogen.

In paddy fields cyanobacteria serve as important biofertilizer.

Mycorrhiza

Symbiotic relationship between fungal hyphae and roots of higher plants is known as mycorrhiza.

The fungal partner of mycorrhiza obtains food from the roots of higher plants and in return supplies mineral elements to the roots.

Mycorrhiza **increase root surface area for water and nutrient uptake**.

Vesicular arbuscular mycorrhizal (VAM) fungi penetrate roots and form vesicles or arbuscules inside the cortex.

VAM fungi **increase absorption of nutrients**, especially **phosphorus and copper**, **provide resistance to drought and root infecting pathogens.**