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# BIO-FERTILIZERS : BOON FOR FARMERS

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Use of microbial; inoculants as source of biofertilizers has become a hope for most countries as far as economical and environmental view points are concerned. There are several reports of free living and symbiotic bacteria, which fix atmoshperic N and are used as biofertilizers as a supplement for nitrogenenous fertilizer. Biofertilizers are better alternatives for replamation of wasteland when compared with chemical fertilizers.

Biofertilizers is a living fertilizers composed of micro organisms which are able to fix atmospheric nitrogen. Biofertilizers are efficient nitrogen fixing, phosphate solubilizing are cellulose decomposing microorganisms. They enhance availability of nutrients to plants on application to need or soil and offer an ecofriendly, economically viable and socially acceptable means of reducing external put of chemical fertilizers. Biofertilizers are boon for farmers and a need of time because it aids in creasing soil fertility. Organic system, which is fully pendent upon synthetic fertilzers and pesticides, has been adopted in Madhya Pradesh at Rural Institute, Rasulia Oshangabad, Madhya Pradesh. In 1980-81 some microorganisms which helps plants in nitrogen trition are given in Table 1.


Modern agriculture is input intensive *i.e.*, aimed at more output but it results an imbalance he soil reserves, which is turn affect acrobial ecology, fertilizer use agency, and hence production entails. Effectiveness of Biofertilizers can be increased by its application field with higher organic carbon.

Biofertilizers mixed with compost and manure help in their survival and better environmental for their activities. According to Dr. John Reaganold (Washington State University) organic matter plays a major role in maintaining soil quality. It improved soil quality and productivity by enhancing the granulation, porosity, water-holding capacity, nutrient supply rate and activity of soil biota. Biofertilizers also improve soil texture structure and proliferate useful soil microorganisms. Various microorganisms are their association used in production of Biofertilizer are given (Table 1).

**Actinorrhizae :** These are found in nodules of non-leguminous shrubs and trees. Actinorrhizae belongs to genus actinomycetes. Frankia is a well known actinorrhizae, which fixes upto 150 kg $N_2$/ha/year. Nitrogen fixation occurs in terminal swellings of the actinomycetes hyphae called vesicle.

**Azospirillum :** Azospirillum root association have reported to improve crop yield in wheat, pearl millet, sorghum and several grasses. Azospirillum species cvz. A brasilence, A. lipoforum and A. amazonae were indetified for improving crop yield. Azospirillum can fix/ ha. Besides nitrogen-fixation, it is known to secret plant growth promoting substances, increase plant vigour and hence photo photosynthetic ability.

**Azotobacter :**Azotobacter culture is especially beneficial for oilseeds crops. They fix atmospheric nitrogen independently near the root zone. They fix 0.026 to 20 kg N/ha. Besides, they also produce growth promoting substances likes Indole acetic acid, gibberillic acid etc. along with chemicals which are inhibitory to certain root pathogens.

**Rhizobium:** Amount of nitrogen fixed every year varies from 50 to 300 kg/ha. For a long period. It was thought that rhizoba can fix nitrogen only inside the nodules but recently nitrogen fixation has been demonstrated explanta in the laboratory under microaerophillic conditions. Rhizobium is also capable of nudulating the non legume Parasponia of family uimaceae. It is not entirely restricted to leguminous host.

**Azolla :** It is floating fresh water fern. Its nitrogen-fixing ability is because of Anabaena as endosymbiont which is generally used as biological source of nitrogen in the cultivation of rice. Main growth limiting factor for Azolla fixes 850-900 kg N/year/ha in association with BGA under favourable conditions.

**Mycorrhizae :** It is a relationship between microorganisms and roots of higher plants. Mycorrhizal fungi have several attributes in modern agricultural system, *viz.,* Mycrohizal plants increase water uptake and, or change the plant's physiology to adopt stress condition as soil drought, VAM fungi increase efficiently mineral uptake resulting in enhanced growth, Mycorrhizal plants reduce plant response to other soil stresses like cell toxicities, heavy metal toxicity, imbalance in soil elements and high salt concentrations, Some mycorrhizal fungi produce metabolities having the capability to change the

| Microorganisms | Nutrient fixed (kg N/ha/yr) | Crop plants which receive benefits |
|---|---|---|
| Rhizobium sp. Living symbiotically in root nodules | 50-300 | All grain legumes (pulses), some oil yielding legumes (e.g., soybean) |
| Rhizobium sp. | 50-300 | Trema sp. –a special case |
| Nostoc, Anabaena, Aulosira and other (free living blue green algae) | 25 | Rice (*Oryza sativa* Linn) |
| Anabaena azollae living symbiotically in the water fern, Azollae sp. | 25 | Rice (*Oryza sativa* Linn) |
| Nostoc, sp. | 25 | Cyacas encephalartos, Gunnera, Bryoph etc. |
| Azotobacter chrococcum (free living bacterium) | 0.026-20 | e.g. rice maize, cotton and other non-specific |
| Frankia sp. (actinomycete) living | 150 | Alnus, Casuarina and others symbiotically in non-legume root nodules |
| Photosynthetic bacterium (*Rhodopseu domonas*) | 10-20 | In stem and root nodules of Aeshynomene |
| *Azospirillum* sp. | | e.g. maize sorghum, pearl millet, finger millet and others |
| *Bacillum polymyxa*, *Clostridium* sp., *Rhodospirillum* sp. | 10-20 | Non-specific, all plants |

root morphology resulting in increased absorptive surface area and feeder root longevity, Mycorrhizal fungi change the soil texture by increasing soil particle aggregation and stability and They help plant to withstand high temperature.

**Blue green algae (BGA) :** Japanese workers developed technique for mass production of BGA increasing soil particle aggregation and stability and (vi) They help plant to withstand high temperature.

**Blue green algae (BGA) :** Japanese workers developed technique for mass production of BGA to be used as biofertilizers in paddy fields. Later it was established in Indian rice fields also. Algae are typically the inhabitants of aquatic environment, soil surface and also found in association with fungi as lichens and plants as ferns and cycads. BGA or cyanobacteria fix approximately 25 kg/ N/ha/year. BFA is suitable nitrogen fixer for paddy fields. Besides BGA also adds considerable biomass in the soil. Which in turn liberate organic acids and other compounds having chelating properties and so help in converting insoluble form of phosphorous to soluble form.

Biofertilizers are not so popular because of various reasons like lack of education, lack of proper manufacturing and distribution channels and deficiency of quality of guarantee products. Besides being non-toxic and cheaper, biofertilizer can provide employment to a large number of graduates. The use biofertilizers would would reduce the cost chemical fertilizers involved in crop production. The effective utilization biofertilizers for crop will not only provide economic benefits to the farmers but also improve the maintain soil fertility. These bio-resource represent a great diversity in chemical physical and biological characterization their efficient use depends upon the particular agro-ecological environment and local availabity.

The benefits derived by crop cultivated through biofertilizers application would approximately equivalent to the output derived the application of 30-40 kg Na/ha. The saving in chemical and synthetic fertilizers is undoubtedly worthwhile to developing countries where farm oriented technologies can profitably by utilized.

**Summary :** Biofertilizers can not replaced chemical fertilizers, but certainly any capable of reducing their input. The response of application varies with various agro-ecological condition suggesting to evolve region-specific quality biofertilizers. In view of assessing the potential of biofertilizers, this eco friendly technology need to transferred to farmers.