



## Role of Biofertilizers in Sustainable Agriculture

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Green revolution played a major role in reducing food crisis by introducing and developing High Yielding Varieties (HYV). Since, these varieties are highly fertilizer responsive, the usage of fertilizers increased to maximum extent with an aim to get higher productivity. Indiscriminate use of chemical fertilizers, pesticides and other highly productive systems had a serious effect on our environment.

To sustain production from soil we should use reduce the usage of chemical fertilizers by substituting it with some new technologies. The bio fertilizer is one such technology which is gaining importance in integrated plant nutrient system as it maintains soil health, substitutes the chemical fertilizers thereby reducing their usage, increases microbial population of soil and minimizes environmental pollution.

The microbial population of some useful microbes is essential for increasing availability of nutrients in soil and uptake in plants. This character of bio-fertilizer makes the plant to grow healthy and thereby results in a healthy produce.

### What is a Bio-fertilizer?

Bio-fertilizers are either liquid suspensions or wettable powders with living or latent cells of microbial organisms obtained after mass multiplication of pure mother culture of a known strain.

### Availability and application methods

There are many biofertilizer companies in India who have commercialized their products in market and mostly they are available in two forms 1) liquid suspensions 2) wettable powders Biofertilizers can be applied by seed treatment, seedling root-dip or by soil application. In case of soil application they should be applied along with Farm Yard Manure, vermin-compost etc. This serves as initial feed for microbes. Ability of different microbes in supplying and fixing nutrients vary. They should be applied as per the recommendation from a skilled person in this field.

### Limitations of Biofertilizers

- Biofertilizers soon after application decreases the C:N ratio since they initially uses the available nutrients to build up their protoplasm
- The period of dormancy of these microbes in soil is not known
- Most of these microbes are sensitive to soil pH so their adaptation is difficult
- The shelf life of these biofertilizers is low hence the prepared product should be applied within 6 months of its manufacture

**Classification based on nature and function of bio-fertilizers<sup>[1]</sup>:**

S. No.	Groups	Examples
<b>Nitrogen (N<sub>2</sub>) fixing Biofertilizers</b>		
1	Free-living	<i>Azotobacter, Clostridium, Anabaena, Nostoc,</i>
2	Symbiotic	<i>Rhizobium, Frankia, Anabaena azollae</i>
3	Associative Symbiotic	<i>Azospirillum</i>
<b>P Solubilizing Biofertilizers</b>		
1	Bacteria	<i>Bacillus megaterium var. phosphaticum</i> <i>Bacillus circulans, Pseudomonas striata</i>
2	Fungi	<i>Penicilliumsp, Aspergillus awamori</i>
<b>P Mobilizing Biofertilizers</b>		
1	Arbuscularmycorrhiza	<i>Glomus sp., Gigaspora sp., Acaulospora sp.,</i> <i>Scutellospora sp. &amp; Sclerocystis sp.</i>
2	Ectomycorrhiza	<i>Laccaria sp., Pisolithus sp., Boletus sp., Amanita sp.</i>
3	Orchid mycorrhiza	<i>Rhizoctonia solani</i>
<b>Biofertilizers for Micro nutrients</b>		
1	Silicate and Zinc solubilizers	<i>Bacillus sp.</i>
<b>Plant Growth Promoting Rhizobacteria</b>		
1	Pseudomonas	<i>Pseudomonas fluorescens</i>

**Recommendation to overcome those limitations**

- Recently strain improvement is in pace and hence we should select that improved strain while selecting a Bio-fertilizer
- Even though the application of biofertilizers initially show nutrient deficiency symptoms but they are not permanent they get abated soon after they become active and start their function
- Use the biofertilizers soon after purchase and see the expiry date while purchasing

**Conclusion**

Bio fertilizer technology should be penetrated into the society as a forest fire so that our soils will get slowly reclaimed from the ill effects of chemical fertilizers and by this our agriculture turns towards an initial step of sustainability and this may also be an initiative towards organic era which our society dreams to achieve. If we can't turn the chances at right time we can't do it later. Hence, promoting Bio-fertilizer technology and working seriously on fixing limitations of this technology make this a clear alternative for chemical fertilizers and by which our dream for good and healthy food can be achieved.

**References**

1. Himachal Motghare and Rashmi Gauraha (2012). "Biofertilizers–types & their application". Access online at <https://www.krishisewa.com/miscellaneous/organic-agriculture/115-biofertilizers.html?highlight=WyJzb3JnaHVtII0=>.