

## Liquid Bio-Fertilizers: A Replacement Tool for Chemical Fertilizer

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### Introduction

Liquid Biofertilizer a substance which helps to grow plants rapidly and produce fruits, flower and vegetable more quantity in proper time, otherwise fertilizer be a compound which fulfill the needed minerals or Clements require for the growth of plants and vegetables to grow and fruits in proper time. Liquid Biofertilizer is natural fertilizers which are microbial inoculants of bacteria algae fungi alone or in combination and they augment the availability of nutrients to the plants.

The liquid Bio fertilizers are suspensions having agriculturally useful microorganisms, which fix atmospheric nitrogen and solubilize insoluble phosphates and make it available for the plants. The use of this Bio fertilizer is environment friendly and gives uniform results for most of the agricultural crops and directly reduces the use of chemical fertilizer by 15 to 40%. The shelf life of the liquid bio fertilizer is higher (in the range of one to two years) compared to that of solid matrix base biofertilizer. There is a growing demand for organic foods in the global market. The use of these liquid biofertilizers would help the Indian farmers to produce organic crops so as to compete in the global market.

### Types of Biofertilizers Formulation

There are a wide variety of formulation types, both liquid and solid. The main types currently used for organisms have been classified by into dry products (dusts, granules and briquettes) suspension (water-based and emulsions). A wider range of intululation types, together with additive types are

**There are several types of biofertilizer formulations, including:**

1. **Liquid biofertilizers:** Microorganism solutions applied directly to soil or foliage.

2. **Granular biofertilizers:** Dry, granular microorganism formulations applied directly to soil or seedbed.
3. **Tablets or capsules:** Compressed microorganism formulations applied directly to soil or seedbed.
4. **Inoculants:** Microorganism formulations for inoculating seeds, plants, or crops.
5. **Compost inoculants:** Microorganism formulations inoculate compost piles for faster decomposition.
6. **Bio-Pesticides:** Microorganism-based bio-pesticides control crop pests.

### Function of liquid bio fertilizer

The main function of liquid biofertilizers is to provide plants with beneficial microorganisms that can help to improve the overall health and growth of the plant. These microorganisms can perform a variety of functions, including:

- **Nitrogen fixation:** Rhizobia and Azotobacter convert atmospheric nitrogen into plant-useable form, reducing synthetic fertilizer use.
- **Phosphate solubilization:** PSB microorganisms break down phosphates in soil for plant uptake.
- **Potassium solubilization:** Microorganisms convert insoluble potassium into plant-available form.
- **Mycorrhizal association:** Mycorrhizal fungi enhance plant root nutrient and water absorption through symbiotic relationships.
- **Pest control:** Some liquid biofertilizers contain microorganisms that can act as bio-pesticides and control pests in crops.
- **Disease control:** Some liquid biofertilizers can act as bio-control agents and can control certain diseases in crops.
- **Improving soil structure:** Liquid biofertilizers enhance soil structure, decompose organic matter, and improve aeration.
- **Improving soil fertility:** Liquid bio fertilizers enhance soil fertility by increasing beneficial microorganisms, enhancing plant nutrient availability.

### Advantages of liquid bio fertilizer

- ★ Longer shelf-life -12-24 months.
- ★ No contamination.

- ★ Easy identification by typical fermented smell.
- ★ Better survival on seeds and soil.
- ★ Very much easy to use by the farmer.
- ★ High commercial revenues.
- ★ No loss of properties due to storage up to 45°C. – Greater potentials to fight with native population.

### **Method of application of liquid bio fertilizer**

There are several methods for applying liquid biofertilizers, including:

- ✓ **Foliar application:** Spray liquid biofertilizer onto plant leaves for quick results, but care needed for sensitive plants.
- ✓ **Soil drenching:** Apply liquid biofertilizer directly to plant soil, promoting root growth and overall plant health.
- ✓ **Irrigation:** Liquid biofertilizer added to irrigation water, applied to plants for large-scale commercial applications.
- ✓ **Seed treatment:** Liquid biofertilizer treats seeds before planting, inoculating with microorganisms, improving growth and yield.
- ✓ **Compost tea:** Compost tea is a liquid biofertilizer that enhances plant growth and soil health.

### **Precaution taken at the time of application of liquid bio fertilizer**

- Never mix it with nitrogenous fertilizers
- Don't apply with fungicides
- Never expose it to direct sunlight so that the microbes will not die.
- Must be stored in the temperatures between 0° to 35°C.
- Prepare every time the fresh solution dilution before spraying it to crops

### **Constraints of liquid bio fertilizer**

There are several factors that can affect the effectiveness of liquid biofertilizers, including:

- ❖ **Temperature:** Liquid biofertilizers are sensitive to temperature, potentially losing effectiveness.
- ❖ **pH:** Liquid biofertilizers function within specific pH range; outside range may affect effectiveness.

- ❖ **Moisture:** Liquid biofertilizers require moisture for effective colonization; too dry soil may hinder their effectiveness.
- ❖ **Competition with other microorganisms:** Liquid biofertilizers require moisture for effective colonization; dry soil hinders effectiveness.
- ❖ **Quality of the biofertilizer:** Biofertilizer effectiveness depends on quality; improper storage, transportation, or expiration can cause loss.
- ❖ **Compatibility with other fertilizers or pesticides:** Liquid biofertilizers may not work with certain chemical fertilizers or pesticides.
- ❖ **Inadequate knowledge and technical know-how:** Farmers' lack of knowledge on appropriate liquid biofertilizer application rates, timing, and methods reduces effectiveness.

#### **Biofertilizers Market:**

The demand in the global market for biofertilizers is anticipated to surge at a hearty CAGR of 12.9% within the forecast period from 2021 to 2030, picking up footing from various factors, for example, growing awareness with respect to its wellbeing and environmental advantages, steady move from chemical farming strategies to natural organic ones, developing popularity of biofertilizers in soil fertility administration activities, development of the organic food sector, and ascend in the cost of pesticides and chemical fertilizers. Then again, less awareness in a few potential developing markets, poor framework, and technological limitations are hampering the potential growth of the biofertilizers market.

The biofertilizers market is driven by factors like environmental awareness, soil fertility enhancement, and growing demand for organic food. However, factors like lack of awareness and lower farmer adoption rate hinder growth. Opportunities for growth include favorable government policies and agriculture-dominated economies. The market is segmented into fruits and vegetables, cereals, pulses, oilseeds, and plantations, with fruits and vegetables being the most produced crops, enhancing the scope for biofertilizers.

#### **Future prospect (how liquid fertilizer is an innovative tool for sustainable agriculture)**

Liquid biofertilizers are considered an innovative tool for sustainable agriculture because they offer several benefits over traditional chemical fertilizers:

- **Environmentally friendly:** Liquid biofertilizers are environmentally friendly, natural microorganism-based alternatives to chemical fertilizers.

- **Improve soil health:** Liquid biofertilizers enhance soil health by promoting beneficial microorganism growth, reducing chemical fertilizer use.
- **Increase crop yield:** Liquid biofertilizers boost crop yield by promoting healthy root growth and nutrient availability.
- **Resistance to biotic and abiotic stress:** Liquid biofertilizers contain microorganisms for plant resistance to stress.
- **Cost-effective:** Liquid biofertilizers cost less and are more efficient.
- **Versatile:** Liquid biofertilizers use various methods for soil, seed, and compost treatment.
- **Can be used for organic farming:** Liquid biofertilizers offer safe, effective organic farming alternatives to chemical fertilizers.
- **Can be used for precision agriculture:** Liquid biofertilizers enable precision agriculture for specific crops, reducing costs and increasing efficiency.

### Conclusions

Biofertilizers enhance plant nutrient availability and soil fertility, with microorganisms playing a beneficial role in nitrogen fixation, phosphate solubilization, and biomass production. They are economical, renewable, and eco-friendly, but cannot replace chemical fertilizers entirely. Biofertilizers are essential for Integrated Nutrient Management and organic farming, as changing agricultural practices and environmental hazards demand a more significant role for biofertilizers.

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