

# Biofertilisers

Biofertilisers are nutrient-supplying inoculants containing living or dormant forms (such as spores or strains) of beneficial microorganisms. When applied to seeds, seedlings, or soil, these microbes colonise the plant rhizosphere, enhancing nutrient availability and uptake and supporting healthy plant growth and development. By using biofertilisers, farmers can reduce the use of chemical fertilisers by up to 20%.

*Table 1: Different types of biofertilisers*

| Groups | Examples |
|---|---|
| **Phosphate-mobilising biofertilisers** | |
| Ericoid mycorrhizae | *Pezizella ericae* |
| Ectomycorrhiza | *Amanita* sp., *Pisolithus* sp., *Laccaria* sp., and *Boletus* sp. |
| Orchid mycorrhiza | *Rhizoctonia* sp. |
| Arbuscular mycorrhiza | *Scutellospora* sp., *Gigaspora* sp., *Acaulospora* sp., *Sclerocystis* sp., and *Glomus* sp. |
| **Phosphate-solubilising biofertilisers** | |
| Fungi | *Aspergillus awamori and Penicillium* sp. |
| Bacteria | *Pseudomonas striata, Phosphobacteria* sp., *Bacillus megaterium* var. *phosphaticum, Bacillus subtilis, and Niallia circulans* |
| **Potassium-mobilising biofertilisers** | |
| Bacteria | *Frateuria aurantia* |
| **Nitrogen-fixing biofertilisers** | |
| Associative symbiotic | *Azospirillum* sp. |
| Free-living | *Beijerinckia* sp., *Azotobacter* sp., *Klebsiella* sp., *Anabaena* sp., and *Nostoc* sp. |
| Symbiotic | *Frankia* sp., *Anabaena azollae*, and *Rhizobium* sp. |

| Groups | Examples |
|---|---|
| **Plant growth-promoting rhizobacteria** | |
| Pseudomonas | *Pseudomonas fluorescens* |
| **Biofertilisers for micronutrients** | |
| Silicate and zinc solubilisers | *Bacillus* sp. |

## Method of preparation and application

Biofertilisers are available in two forms, i.e., carrier-based solid and liquid formulations. There are three methods of application for these forms as described below.

### Seed inoculation or seed treatment



#### Dry

Mix one packet (200 g) of biofertiliser with 200 ml of rice kanji or gruel, then thoroughly mix with 10 kg of seeds to ensure uniform coating. Allow the mixture to dry in the shade for about 30 min. Ensure the seeds are sown within 24 hours of treatment.



#### Liquid

In a plastic bag, mix 2 kg of seeds with 200 ml of liquid biofertiliser. Close the bag, leaving some space for mixing, and shake thoroughly for about 2 min. to ensure uniform coating. Then open the bag, spread the seeds in the shade, and dry them for about 20–30 min. before sowing.

For seeds requiring treatment with two or more biofertilisers, first coat the seeds with *Rhizobium* sp., *Azotobacter* sp., or *Azospirillum* sp. Once this layer adheres to the seeds, apply a second layer of phosphate-solubilising biofertiliser, which pulls phosphate towards the seeds. This layering ensures that each tiny seed is packed with beneficial microbes, improving effectiveness.

*Table 2: Recommended biofertilisers according to the crop*

| Biofertiliser | Crop |
|---|---|
| *Rhizobium* sp. | Field crops – pulses and oilseeds (pea, soybean, chickpea, beans, lentil, lucerne, black gram, berseem, groundnut, green gram, cowpea, and pigeon pea) |
| *Azotobacter* sp. or *Azospirillum* sp. | Cereals (oat, wheat, and barley), cotton, and sugarcane |
| *Azospirillum* sp. | Paddy, maize, and sorghum |
| *Azotobacter* sp. | Millets (pearl millet, finger millet, and foxtail millet) |
| | Forage crops and grasses (para grass, Sudan grass, Bermuda grass, star grass, and Napier grass) |
| | Other miscellaneous plantation crops (tobacco and vegetables) |
| | Oil seeds (linseed, sesame, sunflower, mustard, and castor) |
| *Azospirillum* sp. | All crops and vegetables |

## Root dip of the seedling



### Dry

This method is used for transplanted crops such as paddy. Dilute 2 packets (400 g) of inoculant powder in 40 litres of water to prepare the solution. Before transplanting, dip the seedlings in the solution for 5–10 min. and transplant immediately.



### Liquid

Add 10–15 ml of the appropriate biofertiliser to 5–10 litres of water and stir thoroughly. Dip the roots of the seedlings in this solution for about 30 min., then transplant them into the field. *Azospirillum* sp. or *Phosphobacterium* sp. is commonly used for crops such as paddy, cotton, sugarcane, and vegetables.

## Application in the main field



### Dry

Mix 20 kg of dried and powdered farmyard manure with four packets (800 g) of biofertilisers (phosphate-solubilising and potassium-mobilising biofertilisers). Apply this mixture by broadcasting over one acre of land before transplanting or sowing.



### Liquid

Liquid biofertilisers can be applied directly to plants by foliar spraying or soil irrigation, including drip irrigation. To prepare the solution, dilute 1–2 ml of biofertiliser in 1 litre of water and apply as a spray or through irrigation. This is the most effective application method and can be used for all types of crops.



## Benefits of biofertilisers

- Reduce chemical or synthetic fertiliser use, thereby being environmentally friendly.
- Enhance soil biological activity and restore soil fertility and productivity.
- Increase seed germination rates.
- Improve nutrient availability to plants to enhance crop growth, yield, and quality.

## Important things to consider while applying biofertilisers



Store in a cool, dry place, away from direct sunlight, and use before the expiry date.



Use only in the prescribed combination.



Do not mix with unapproved chemicals.



Use only for the recommended crops.

**AI tools were used to optimise images.*