

Khet Bachao Abhiyan Series

ICAR-Research Complex for Eastern Region, Patna

No-4: Nitrogenous Biofertilizers: A sustainable solution for N management

Nitrogen is one of the most essential primary nutrients required for plant growth and crop productivity. However, continuous and excessive use of chemical nitrogen fertilizers such as urea has led to declining soil health, reduced fertilizer use efficiency, increased production costs, and environmental pollution. Biofertilizers can be an alternate source for nitrogen supply to crops.

Biofertilizers are preparations containing living microorganisms that enhance nutrient availability to plants through natural biological processes. When applied to seeds, seedlings, or soil, these beneficial microbes colonize the rhizosphere and improve nutrient uptake, plant growth, and soil fertility. Nitrogenous biofertilizers are beneficial microorganisms that fix atmospheric nitrogen and make it available to plants, thereby reducing the dependence on chemical nitrogen fertilizers and improving soil health.

Why N-Biofertilizers?

India consumes a large quantity of nitrogenous fertilizers, particularly urea. However, crops utilize only about 30–35% of the applied nitrogen, while the remaining portion is lost through leaching, volatilization, and denitrification leading to environmental pollution, increase in cost of production and low profitability. Studies have indicated that biofertilizers can save 20–50 kg N/ hectare depending on crop and management practices. Nitrogenous biofertilizers help in:

- Fixing atmospheric nitrogen naturally.
- Reducing fertilizer costs.
- Improving fertilizer-use efficiency.
- Maintaining soil health and fertility.
- Reducing environmental pollution caused by excessive fertilizer use.
- Supporting sustainable crop production under changing climatic conditions.

Major Nitrogenous Biofertilizers

There are many Nitrogen based biofertilizers that can be utilized in different crops for N-fixation. Some of the major N-Biofertilizers along with suitable crops and their functions are given below:

Sl. No.	Biofertilizer	Suitable Crops	Function
1.	Rhizobium	Leguminous crops (pulses, soybean, groundnut)	Forms root nodules and fixes atmospheric nitrogen symbiotically
2.	Azotobacter	Wheat, maize, vegetables, cotton, sugarcane	Free-living nitrogen fixer in non-leguminous crops
3.	Azospirillum	Cereals, millets, grasses	Associative nitrogen fixation and growth promotion
4.	Blue-Green Algae and Azolla	Paddy fields	Fixes nitrogen in water stagnant conditions

Methods of application and doses

There are three methods of application of biofertilizers : seed treatment, seedling root dip and soil application.

1. Seed Treatment: This method is suitable mainly for crops in which nursery is not required e.g pulses, millets, wheat, maize etc. Recommended dose is 200–250 g biofertilizer per 10 kg seed.

Procedure

- Mix 200 g jaggery in 1 litre water and prepare a solution.
- Mix biofertilizer with the solution to form slurry.
- Coat seeds uniformly and shade-dry before sowing.

2. Seedling root dip: It is mainly used for transplanted crops like Rice, Vegetables, Tomato, onion etc.

Procedure

- Mix 1–2 kg biofertilizer in 20–25 litres of water.
- Dip roots of seedlings for 20–30 minutes before transplanting.

3. Soil application: In this case, biofertilizer is mixed with compost/FYM and broadcasted in the field. Generally 2–5 kg biofertilizer per hectare is utilized in the field.

Precautions for biofertilizer use:

- Use crop-specific and fresh biofertilizer cultures.
- Store in a cool and shaded place.
- Avoid mixing with chemical pesticides or fungicides during application.
- Apply preferably in moist soil conditions.

Conclusion: Nitrogenous biofertilizers help reduce dependence on chemical nitrogen fertilizers, improve soil health, lower production costs, and increase crop productivity in an environmentally sustainable manner if followed in desired manner.

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Figure 1 Flow Chart showing seed treatment by Rhizobium