Khet Bachao Abhiyan Series: ICAR RCER, Patna

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No-11: Seed treatment with Biofertilizers

Biofertilizers are microorganisms that support plants growth by enhancing the nutrient supply to the host plant when applied to seeds, plants, or the soil. Seed treatment with biofertilizers is an important and eco-friendly agricultural practice in which seeds are coated with beneficial microorganisms before sowing. These microorganisms help in improving seed germination, plant growth, nutrient availability, and resistance against diseases. Biofertilizer seed treatment is widely used in sustainable agriculture because it reduces the dependence on chemical fertilizers and improves soil fertility in an environmentally safe manner.

- **Microorganism used as Biofertilizers:**

  - Nitrogen-fixing bacteria: *Rhizobium*, *Azotobacter,* and *Azospirillum;*
  - Phosphate-solubilizing bacteria (PSB)
  - Potassium-solubilizing bacteria (KSB)
  - Plant growth promoting biofertilizer (PGPB)
  - Beneficial fungi like *Trichoderma* and arbuscular mycorrhizal fungi (AMF).

In leguminous crops, Rhizobium forms nodules on roots and fixes atmospheric nitrogen, making it available to plants. *Azotobacter* and *Azospirillum* also enhance nitrogen availability and produce plant growth-promoting substances. PSB and KSB convert insoluble forms of phosphorus and potassium into available forms, thereby improving nutrient uptake. *Trichoderma* also acts as a biocontrol agent and protects seedlings from soil-borne pathogens.

- **Types of formulations**

Biofertilizer formulations are available in both liquid and solid forms. The commonly used formulations are broadly classified into dry products, such as dusts, granules, and briquettes, and liquid suspensions, including oil-based, water-based, and emulsion formulations. Seed treatment with biofertilizer formulations is an effective method for introducing biocontrol agents into the soil–plant system. Its success largely depends on the ability of the antagonistic microorganisms to establish, colonize, and proliferate in the rhizosphere region surrounding the plant roots.

- **Process of seed treatment with biofertilizers**
  - Select a suitable biofertilizer according to the crop:
  - Prepare a 10% jaggery (gur) or sugar solution by dissolving 100 g jaggery/sugar in 1 litre of water.
  - Boil the solution and allow it to cool before use.
  - Spread the required quantity of seeds on a clean polythene sheet or tray.
  - Sprinkle the cooled adhesive solution over the seeds and mix thoroughly.
  - Add the recommended quantity of biofertilizer culture (approximately 200–250 g per 10 kg of seed).

- Mix the seeds uniformly to ensure an even coating of the biofertilizer on all seeds.
- Dry the treated seeds under shade for 20–30 minutes.

➢ **Precautions**

- Use only fresh biofertilizer packets and check the expiry date before use.
- Select the appropriate biofertilizer strain according to the crop and soil conditions.
- Purchase biofertilizers from reliable and authorized sources.
- Store biofertilizers in a cool, dry place away from direct sunlight and high temperatures.
- Avoid using biofertilizers that have been exposed to excessive heat, moisture, or direct sunlight.
- Ensure that seeds are clean and free from dust, soil particles, and chemical residues before treatment.
- If seed treatment with fungicides or insecticides is required, apply them first and allow the seeds to dry before inoculating with biofertilizers.
- Do not mix biofertilizers directly with chemical fertilizers, pesticides, or fungicides.
- Use clean water and utensils during preparation and application.
- Prepare the adhesive solution fresh and allow it to cool before mixing with the biofertilizer culture.
- Treat seeds in a shaded area and avoid exposure of biofertilizers to direct sunlight during handling.
- Follow the recommended dose and application method specified by the manufacturer.
- Ensure adequate soil moisture at the time of sowing to facilitate the establishment of beneficial microorganisms.
- Use the treated seeds as soon as possible, preferably within 24 hours of treatment.

➢ **Advantages of Biofertilizers**

- Improve seed germination, seedling vigor, promote root growth and overall plant development.
- Enhance biological nitrogen fixation in crops.
- Increase the availability and uptake of nutrients such as phosphorus and micronutrients.
- Improve soil fertility and soil biological activity.
- Reduce dependence on chemical fertilizers thus lower the cost of crop production.
- Help maintain ecological balance and environmental sustainability.
- Improve soil structure and organic matter decomposition.
- Suppress certain soil-borne plant pathogens through beneficial microbial activity.
- Eco-friendly and non-polluting compared to chemical fertilizers.

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