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## APPLICATION OF BIO-FERTILISERS IN FODDER PRODUCTION FOR COMMERCIAL ANIMAL HUSBANDRY

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**A**pplication of chemical fertiliser deteriorates soil health as well as contaminates natural water bodies. Chemical fertilisers possess anthropogenic compounds which are hazardous, result in poor soil quality, poor crop nutrition and pollute the water table (Sonali et al., 2022). Wide application of synthetic agrochemicals (e.g., chemical fertiliser) has been a significant contributor to environmental pollution (Sabki et al., 2021). The elevated use of inorganic fertilisers due to poor soil quality and the need for an increase in food production to meet the demand of the increasing global population has led to fertility decline in soil (Mukhuba et al., 2018). As a result of that, productivity of crops decreases. Fodder crops grown for feeding scientific animal husbandry are also facing the similar problems. Indiscriminate use of fertiliser also depreciates the quality of fodder crops which ultimately results in poor productivity and health problems of livestock. Application of bio-fertilisers can solve these problems by reducing the overdependence on chemical fertilisers and improving the soil health for better production of fodder crops. Increased interest in low-input agriculture in recent years has seen the growing development and use of commercial biological inoculants (bacteria and/or fungi) to increase the mobilisation of key nutrients (Owen et al., 2015). Application of bio-fertiliser can reduce the cost of fodder production and enhance the productivity in animal husbandry in the long run.

### What are Bio-fertilisers?

Bio-fertilisers contain live micro-organism which improves the fertility of soil and results in increased production and nutritional quality of fodder crops. Micro-organisms capable of synthesis or assimilation of nitrogen from environment, fix nitrogen in the soil. On the other hand some micro-organism mobilise potassium and phosphate bound in soil for use in plant growth.

### **Benefits of Using Bio-Fertiliser in Animal Husbandry**

- ✓ Through application of bio-fertiliser the productivity of fodder crops can be increased up to 20-30 percent.
- ✓ As bio-fertiliser can replace the use of chemical fertiliser, the cost of cultivation can be reduced significantly.
- ✓ Some bio-fertiliser helps in releasing enzymes fixed in soil which can increase the growth of fodder plants
- ✓ Bio-fertilisers improve soil health by mobilising phosphate and potash fixed in soil and mixing environmental nitrogen in the field. Soil texture also improves by use of bio-fertilisers.
- ✓ In some cases, bio-fertilisers enhance the immunity of fodder crops to fight against diseases.
- ✓ Application of bio-fertiliser has no ill effect on environment and eco-friendly

### **Application of Bio-Fertilisers in Scientific Fodder Production**

Bio-fertilisers are available at markets in both liquid and powder form. Bio-fertiliser is a mixture of different bacteria, fungus, algae or other micro-organisms. Bio-fertilisers can be used along with application of manure in field or seed treatment. In some cases, roots of plants are dipped in bio-fertilisers before planting. For cultivation of green fodder, following bio-fertilisers can be used:

**Rhizobium:** Rhizobium is a type of micro-organism which can be found in the roots of leguminous fodder crops like berseem, lucerne, cowpea, ricebean etc. Through symbiosis, these bio-fertilisers can fix 50 to 100 kg of environmental nitrogen per hectare on yearly basis, which is equivalent to 125 kg to 250 kg of nitrogen.

**Azotobacter:** This type of bio-fertilisers also fixes environmental nitrogen in the soil. Application of azotobacter can enhance the height of plant as well as the amount of foliage in fodder crops which ultimately increase the yield of fodder. This type of bio-fertiliser can be used for cultivation of fodder maize or fodder sorghum through seed treatment or directly applying to soil along with manure.

**Azospirillum:** Azospirillum can fix 20 to 40 kg environmental nitrogen in 1 hectare of land per year which is equivalent of application of 50 to 100 kg urea in soil. This bio-fertiliser not

only fixes nitrogen but also supply some essential enzymes required for fodder growth. In different types of fodder crops like fodder maize, sorghum etc. azospirillum can be used.

**Phosphate Solubilising Bacteria:** *Bacillus megaterium*, *Bacillus subtilis*, *Pantoea agglomerans* (formerly known as *Enterobacter agglomerans*), *Pseudomonas putida* etc. are exploited in utilising phosphate bound in soil for plant use. These phosphate solubilising bacteria can mobilise 10 kg of phosphate per hectare per year which is equivalent to 62.50 kg of single super phosphate. These bio-fertilisers can be used for all types of fodder crops.

**Potash Mobilising Bacteria:** These micro-organism can release potash fixed in soil for use of plants. *Bacillus Mucilaginosus*, *Bacillus edaphicus* etc. are some of the example of this type of bio-fertiliser. These bio-fertilisers can be used in the field while application of manure or by seed treatment. These can also be used for all type of fodder crop cultivation.

### Mechanism of Application of Bio-Fertilisers for Fodder Production

- Different species of rhizobium bio-fertilisers are used for different leguminous fodder crop like berseem, lucerne, cowpea etc. For 1 hectare of land 1.50 kg of rhizobium bio-fertiliser is required.
- If azotobacter/ azospirillum are used for seed treatment, then 1.50 kg to 1.75 kg of bio-fertiliser is required for seeds necessary to sow in 1 hectare of land. In case where these bio-fertilisers are used with manure then they may be mixed with manure one day before application to the field. In that case for per hectare of land 3.75 kg to 6.00 kg of bio-fertiliser is required.

### Conclusion

Chemical fertiliser and bio-fertilisers should not be applied together. Bio-fertilisers should not be stored in high temperature, rather they should be stored in cool shaded place. The effectiveness of bio-fertilisers deteriorates as the time progresses, hence the date of manufacturing should be checked before purchase of bio-fertilisers. For effective result of bio-fertilisers, the field should contain adequate amount of humus. To ensure that, manure may be applied once or twice before application of bio-fertilisers. In case of problem soil, soil amendments like gypsum, lime etc. may be applied prior to application of bio-fertilisers. If chemicals are used for seed treatment, then bio-fertilisers may be used at least 24 hours after the use of chemical. Different types of bio-fertilisers can be used together. Scientific and methodical application of bio-fertiliser can enhance the quality and quantity of fodder crops,

which in-turn results in high economic return in animal husbandry enterprise. Replacing chemical fertiliser with bio-fertiliser can improve the soil health and can ensure farming system which is economically and ecologically sustainable.

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