

Bio Fertilizers – A Thruway to Enhance Crop Productivity and Soil Fertility

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Abstract:-

Current agriculture and nutrient management strategies mainly depends on continuous use of inorganic fertilizers which adversely effects the physio-chemical properties of soils, reduces the organic matter content and also decreases the microbial activity drastically. Bio fertilizers usage is an eco-friendly approach to supplement chemical fertilizers and maintain soil fertility. They play a crucial role in sustaining soil health and crop productivity as they contain microorganisms which promote the adequate supply of nutrients to the host plants and ensure their proper growth and development.

Introduction:

Biological soil fertility management is an ecological approach for sustaining soil health and crop productivity. Bio fertilizer refers to preparations containing live microbes which helps in enhancing the soil fertility either by fixing atmospheric nitrogen, solubilizing phosphorus or decomposing organic wastes or by augmenting plant growth by producing growth hormones with their biological activities. The exploitation of beneficial microbes as bio-fertilizers has become important in agricultural sector due to their potential role in improvement of soil fertility, sustainable crop production and their ability to mobilize nutrients from non-usable form through biological processes. Soil microbes plays a crucial role to transform plant essential nutrients and make them available to plant. Bio fertilizers are organic, bio-degradable and enrich the soil environment with different micro and macro-nutrients through nitrogen fixation, phosphate and potassium solubilisation or mineralization, release of plant growth regulating substances, production of antibiotics, hormones like auxins, cytokinins and biodegradation of organic matter in the soil for providing better

nutrient uptake. Bio-fertilizers, when applied as seed or soil inoculants, multiply and participate in nutrient cycling and lead to crop productivity.

Types of bio fertilizers:-

There are mainly two types of bio fertilizers

- a) Nitrogen Fixing Bio fertilizers (NFB): These bio fertilizers add nitrogen to the soil by reducing the atmospheric nitrogen. Major NFB include *Rhizobium*, *Azotobacter*, *Azospirillum*, Blue green algae. *Rhizobium* is crop specific and symbiotic bio fertilizers whereas *Azotobacter*, *Azospirillum*, Blue green algae are free living and non crop specific.
- b) Phosphorus solubilising bio fertilizers (PSB):- The PSB's have the ability to solubilize the bound phosphates in soil and increase its availability to plants. The common PSB's are *Pseudomonas striata*, *Bacillus polymyxa*, *Aspergillus awamoori* and *Pencillium digitatum*.

Different Formulations of bio fertilizers:

1. Liquid formulations
2. Carrier based formulations
3. Granular formulations
4. Encapsulated formulations

Role of bio fertilizers in improving soil fertility and crop productivity:

The bio fertilizer interaction with plant root determine crop yield and soil nutrient status as they provide numerical benefits like decomposition of organic matter, nutrient and water acquisition, nutrient recycling. *Azotobacter* plays an important role in the nitrogen cycle, produce plant hormones indole acetic acid, gibberellins and cytokinins. *Azospirillum* increases the number of lateral roots and enhances root hairs formation to provide more root surface area to absorb sufficient nutrients. *Rhizobium* is an efficient nitrogen fixer which plays an important role in increasing yield by converting atmospheric nitrogen into usable forms. Microorganisms involved in phosphorus acquisition form symbiotic associations and act as bio-ameliorators, they have the potential to enhance the rhizosphere soil characteristics considerably and improves soil structure so as to promote plant growth under normal as well as stressed conditions. *Azolla* as bio fertilizer quickly decomposes in the soil and fixes Nitrogen and also contribute significant amounts of P, K, S, Zn, Fe, Mb and other



micronutrient. Microorganisms are central to the soil phosphorus (P) cycle and play a significant role to transfer of P between different inorganic and organic soil P fractions, subsequently releasing available P for plant acquisition. P uptake by plants can be enhanced by inoculation of phosphate solubilizing fungi (PSF) mainly *Aspergillus* species because of their strong ability to provide available P.

Conclusion

Generally 60% to 90% of the total applied fertilizer is lost either through leaching, volatilization, denitrification and only 10% to 40% is taken up by plants, so bio fertilizers plays a key role to sustain agricultural productivity. Bio fertilizer technology is fully adopted as the first choice to address soil fertility challenges. Bio fertilizers are cheaper, effective and environmental friendly are gaining importance for use in crop production as they restore the soil's natural fertility and pose no danger to the environment So, integrated application of bio fertilizers along with chemical fertilizers in a sustained way can meet the nutrient need of plant besides maintaining the soil health and environmental safety.

References:-

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