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Role of Biofertilizers for Improvement of Silkworm Host Plant

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SUMMARY

Chemical fertilizers have serious negative impact on the environment. Employment of alternate source of non toxic methods is very crucial for maintaining the environment and increasing the sericultural host plant and silkworm production. Biofertilizer plays a key role in ecofriendly management of health of soil and environment which are found to be very promising in increasing production as well as productivity. Biofertilizers would be the practicable option for farmers rather than using chemical fertilizers.

INTRODUCTION

Environment plays a very important role in healthy living of silkworm and its food plants. In today's world, environmental contamination may be a major problem. Farmers often apply fertilizers in their paddy fields, tea gardens etc to make ensure higher production. But sericulture is facing many negative impacts because of indiscriminate use of fertilizers and chemicals. Use of chemicals near sericulture fields causing mortality of silkworm. Pollution of groundwater by agricultural chemicals could be a major problem of the many developed countries and thus adoption of alternate source of manures is a crucial prerequisite to save the environment and silk industry. Silkworm larva that drives most required nutrients from the host leaves for its growth and development. Nutrient rich host plants plays a important role in rearing of the silk producing insects. It improves the growth, development, health, feed consumption and conversion of silkworm thereby improving the commercial traits. Good quality and quantity leaf production is highly dependent on the supply of various inputs especially nitrogen and phosphorus fertilizers (El-Khayat *et al.*, 2013). In recent years, use of bio-fertilizers is gaining much popularity since it improves yield of crops and also sustains soil fertility without causing any environmental, water or soil hazards.

Biofertilizers

Biofertilisers are living microorganisms which are bacterial, fungal or algal in origin. It adds nutrients to the soil through natural processes of nitrogen fixation, solubilizing phosphorus and stimulating plant growth through the synthesis of growth-promoting materials. The microorganisms present in the biofertilizers restore the soil's natural nutrient pattern and build soil organic matter. Healthy plants can be grown by the use of biofertilizers which enhancing the sustainability and the health of the soil.

Classification of bio-fertilizer based on type of microorganism are as follows:

- Bacterial Biofertilizers: e.g. Azospirilium, Azotobacter, Rhizobium, Phosphobacteria
- Fungal Biofertilizers: e.g. Mycorrhiza
- Algal Biofertilizers: e.g. Azolla and Blue Green Algae (BGA)
- Actinimycetes Biofertilizer: e.g. Frankia.

Application of Biofertilizers for silkworm host plants

- Rhizobium colonizes plant cells within root nodules. With the help of enzyme nitrogenase they convert atmospheric nitrogen into ammonia (Kumar *et al.*, 2017 and Zahran, 1999). They solublize phosphorous and provide organic nitrogenous compounds such as glutamine to the host plants.
- Azospirillum can positively influence growth and nitrogen content of the silkworm host plants. Azospirillum inoculation causes alteration in root morphology. The increased number of lateral roots and root hairs of the plants enlarges the root surface available for nutrients. And higher root surface leads to higher nutrient uptake by the inoculated roots and an improved water status of the plant, which in turn could be the main factor enhancing plant growth.
- Azotobacters are called as Plant Growth Promoting Rhizobacteria (PGPR). They synthesize growth substance that enhances growth and development of host plants and inhibit phytopathogenic growth by secreting inhibitors. Azotobactors are also found to be helpful in nutrient uptake by the silkworm host plants.

They also produces some biochemical substances such as protein, amino acids etc. Azotobactor increases nutrient availability and restores soil fertility (Jnawali, 1995).

- The Phosphobacteria is a highly efficient phosphate solubilizing bacteria (*Bacillus megaterium*). They grow and secrete organic acids, which dissolves unavailable phosphate into soluble form and makes it available to the plants.
- A mycorrhiza is a symbiotic association between fungus and plant. The term mycorrhiza refers to the role of the fungus in the plant's rhizosphere, its root system. Mycorrhizae play important roles in soil biology, soil chemistry and plant nutrition. The use of VAM fungi reduces 50% in the recommended dose of (N and P) chemical fertilizers on leaf quality traits, silkworm growth and cocoon parameters.
- Blue green algae (BGA) is a kind of prokaryote, which is also regarded as cyanobacteria. Among the BGA some of them are nitrogen fixers. They are free living microorganism that enhances soil fertility, synthesize organic substance and fixes atmospheric nitrogen for growth of host plants. This process is called as biological nitrogen fixation.
- Azolla consists of cyanobacteria which are used as a biofertilizer. Symbiotic cyanobacteria *Anabaena azollae* is responsible for fixing the nitrogen which increases the fertility of the soil and resulting in enhancement of quality and quantity of silkworm host plants (Singh and Singh, 1990). Azolla is rich in proteins, essential amino acids, vitamins, and minerals (Raja, 2012).
- Frankia is a bacteria which can convert atmospheric nitrogen into ammonia via enzyme nitrogenase. The bacteria can supply most or all of the nitrogen requirements of the host plants.

CONCLUSION

Biofertilizers being essential components of organic farming play a significant role in increasing long term soil fertility and sustainability by fixing atmospheric di-nitrogen, mobilizing fixed macro and micro nutrients in the soil into forms available to plants and also improving the state of global environment. Repeated use of chemical fertilizers to improve the soil and to control the unwanted living organisms make the environment unsuitable for sustainable agriculture crop production. Excessive dependence on chemical fertilizers is not practicable in the long run because of the cost, both in domestic resources and foreign exchange involved in setting up of fertilizer plants and sustaining the production. Therefore, biofertilizers would be the viable option for farmers to increase productivity per unit area.

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