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Role of Microbial Pesticides in IPM

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Introduction

Microbial pesticides are naturally occurring or genetically altered bacteria, fungi, algae, protozoan or viruses. Chemical insecticides can be replaced with these alternatives. Microbial toxins are biological toxin material derived from microorganisms, viz. bacterium or fungus. The microbial pesticides have targeted specificity and are safe to the environment, which makes them both useful alone and in combination with other pest management programmes. As we know Integrated pest management (IPM) is an ecologically based pest control strategy. In an integrated pest management program, multiple pest control measures are considered, and the interaction between them, along with cultural operations, weather, other pests, and the crop itself is considered.

The effect of microbial entomopathogens occurs due to invasion through the integument or gut of the insect, which results in multiplication of the pathogen causing killing of the host, e.g. insects. Insecticidal toxins are produced by the pathogens. There is a wide range of structure, toxicity and specificity in the peptide toxins produced by microbial pathogens.

Role of Microbial Pesticides in IPM

Crop protection made farmers to depend basically on synthetic chemical pesticides in the past, but now their use is declining as a result of new laws and legislations and also the evolution in the process of insect resistance. Therefore, it is necessary for the farmers to replace the pest management strategy. Microbial pesticide will be the best alternative to synthetic chemical pesticides based on the living microorganisms or any natural products. In this regard, the use of microbial pesticides and bioagents has assumed significance as an important component of IPM due to their economic viability and eco-friendly nature instead of chemical synthetic pesticides. Microbial pesticide application as a component of IPM programmes can play an important role in overcoming the disadvantage of chemical

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insecticides that have some important characteristics like biodegradable, self-perpetuating and less harmful on beneficial pests, most importantly host specific and less shelf life.

Advantages of Microbial Pesticides

The main advantages of microbial pesticides are as follows

- They are not toxic or pathogenic to humans, wildlife or other organisms not closely related to the target pest to use microbial insecticides. The greatest strength of microbial pesticides is their safety.
- Microbial insecticides have toxic mode having specificity to a single group or species of insects. Most of the microbial insecticides generally do not affect beneficial insects directly in treated fields.
- Microbial insecticides along with chemical insecticides can be used by the farmers in conjunction as in most cases they are not deactivated by residues of conventional insecticides.
- Residues of microbial insecticides have no hazards to humans or other beneficial organisms. So these can be applied by the farmers even at the time when a crop is almost ready for harvest. 18 Microbial Pesticides: Development, Prospects and Popularization in India 466
- It is possible for microbial pesticides to become established in future generations of pests or in their habitats, providing them with pest control during the next season or generation.
- In addition to encouraging beneficial microflora in the soil, they also enhance root and plant growth. As a result, crop yield is increased.

Disadvantages of Microbial Pesticides

Naturally, there are also limitations, which are listed below, but advantages overcome the disadvantages. These factors just provide farmers to choose effective microbial products. Because microbial insecticides are specifically formulated for specific pest species or groups, they may control only a specific pest in a field. Other types of pests which are present in the treated area remain continue to cause damage. Synthetic insecticides also have limitations because they do not work against all pests equally. There is a negative aspect to selectivity indeed, and it seems to be more apparent in general predators, chemicals, and microbials.

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Additionally, predators and chemicals can cause harm to other beneficial insects in a threatened area.

- New formulations and storage procedures are needed for microbial pesticides.
- As we know, many of the microbial insecticides are pest specific or target specific, the potential market for these microbial insecticides may be limited. Consequently, some microbial insecticides are not commonly available or are relatively expensive (several insect viruses). Although, biopesticides are used as alternative pest management strategies, several constraints such as developing stable formulations, standardizing appropriate delivery methods, lack of biopesticides/microbial pesticides based pathogenic microorganisms specific to a target pest.

Conclusion

Various success stories about utilization of microbial pesticides and biocontrol agents in Indian agriculture have been reported. *Bacillus thuringiensis* controls diamond back moths and Helicoverpa on cotton, pigeon pea and tomato; Beauveria controls mango hoppers, mango mealy bugs and coffee pod borer; NPV controls Helicoverpa on gram; Trichogramma controls sugarcane borer; and Trichogramma-based products control rots and wilts in various crops.

Various microbial pathogens have shown resistance to *B. thuringiensis*. Within the last few years, at least 16 insect species have been identified that exhibit resistance to *B. thuringiensis*. δ-Endotoxins under laboratory conditions and field evolved resistance have been documented in noctuids such as *Spodoptera frugiperda*, *Busseola fusca* and *H. zea*.

Despite several advantages of biopesticides, the rate of their consumption is not up to mark as compared to chemical pesticides. The main reasons are short shelf life, susceptibility to environmental conditions, expensive production systems and efficacy problems.

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