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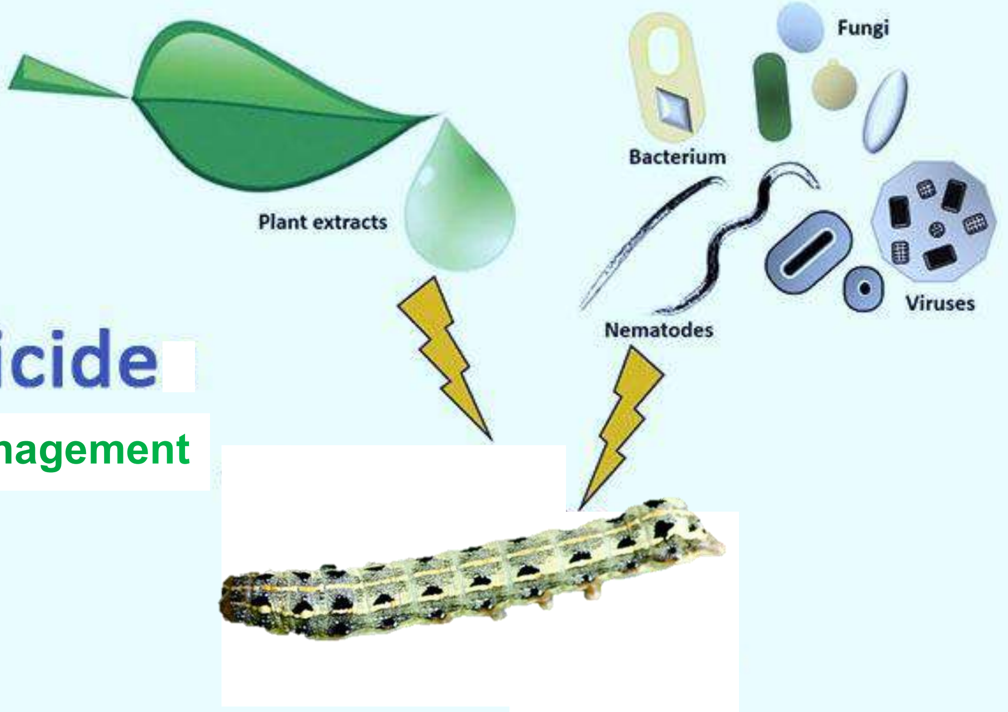
Uses of Biopesticide in Pest Management



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Introduction

Biopesticides are pesticides that are made from natural elements such as animals, plants, microbes, and minerals. Canola oil and baking soda, for example, have pesticidal properties and are considered biopesticides. There are 299 active biopesticide components and 1401 active biopesticide product registrations as of April 2016. Bio-pesticides are environmentally friendly pesticides made from naturally occurring compounds such as biochemicals, microorganisms, and plants. Biopesticides are not all natural products. Some are chemical pesticides if they affect the pest's nervous system. Agriculture and health programmes can both benefit from the usage of biopesticides on a larger scale. Some currently being developed bio-pesticides could be excellent alternatives to chemical pesticides. There are several locally available plants in India, such as beshram, neem, garlic, triphala, and pinus. Kesia, etc., which are easily processed and help India's biopesticide use. Some biopesticides, such as Bt, NPV, neem-based insecticides, Trichoderma, and others, have previously been registered and are in use in India.

1. Microbial biopesticides

Bacteria, fungus, viruses, and protozoa are all employed to manage pest insects, plant infections, and weeds biologically. The insect pathogenic bacterium *Bacillus thuringiensis* (Bt) creates a protein crystal (the Bt-endotoxin) during bacterial spore production that can cause gut cell lysis when ingested by sensitive insects. The -end toxin is host-specific and can kill the host in 48 hours. It is harmless to vertebrates, humans, beneficial organisms, and the environment. Bt sprays are becoming more popular for pest control on fruit and vegetable crops, where their excellent selectivity and safety are desired, and resistance to synthetic chemical pesticides is a concern a problem. Bt sprays have also been employed on broad-acre crops like maize, soya bean, and cotton, although Bt transgenic crop varieties have recently supplanted them. Other microbial pesticides include those based on baculoviruses and fungi that are entomopathogenic to insects. The *Cydia pomonella* granulovirus (CpGV) is employed as an inundative biopesticide against the codling moth on apples in the United States and Europe. It is employed on 13% of the apple crop in Washington State, the country's largest apple producer. In the mid-1990s, the soya bean caterpillar *Anticarsia gemmatalis* nucleopolyhedro virus was utilised on up to 4 million acres (about 35 percent) of the soya bean crop in Brazil. For use against insects, at least 170 distinct biopesticide compounds based on entomopathogenic fungus have been created at least five insect and acarine orders have been found in glasshouse crops, fruit and field vegetables, and broad-acre crops, with Central and South America accounting for around half of all products. The fungus has also been produced for the control of locust and grasshopper pests in Africa and Australia, and is recommended for locust management by the United Nations' Food and Agriculture Organization (FAO).

Trichoderma harzianum, an antagonist of Rhizoctonia, Pythium, Fusarium, and other soil-borne pathogens, is a microbial biopesticide used against plant infections. Crown gall (*Agrobacterium tumefaciens*) is controlled with the K84 strain of *Agrobacterium radiobacter*, whereas damping-off and soft rots are controlled with specific strains of *Bacillus subtilis*, *Pseudomonas fluorescens*, and *Pseudomonas aureofaciens*. Microbial antagonists, such as yeasts, filamentous fungus, and bacteria, are also employed to control post-harvest infections in fruits and vegetables, primarily Botrytis and Penicillium. Collego was a northern joint vetch bio herbicide used in soya beans and rice from 1982 to 2003. DeVine is used to combat the alien invasive vegetation strangler vine in Florida citrus groves. For roughly a year following application, it gives 95–100% control.

2. Biochemicals

Pyrethrins, which are fast-acting insecticidal chemicals generated by *Chrysanthemum cinerariaefolium*, are one of them. They are low in mammalian toxicity, but disintegrate quickly after use. Synthetic pyrethrins were developed in response to the short persistence of natural pyrethrins (pyrethroids). Neem oil, an insecticidal chemical produced from the seeds of *Azadirachta indica*, is the most extensively used botanical substance. Based on secondary metabolites generated by soil actinomycetes, two highly effective insecticides are available. They meet our definition of a biopesticide, yet regulatory agencies have assessed them as if they were synthetic chemical pesticides. *Saccharopolyspora spinosa* produces Spinosad, which is a combination of two macrolide molecules. It has a low toxicity for mammals, and residues dissolve quickly in the field. Following its release in 1997, it was widely utilised by farmers and producers, however several major pests, such as western flower thrips, have acquired resistance. *Streptomyces avermitilis* produces an abamectin-like macrocyclic lactone molecule. It is effective against a variety of pest species, however tetranychid mites have evolved resistance to it.

3. Semiochemicals

Insect sex pheromones, some of which can now be produced, are the most frequently employed semiochemicals for crop protection. They are used for monitoring or pest management through mass trapping, lure-and-kill systems, and mating disruption. Mating disruption is employed on over 660000 ha around the world, and it's especially effective in orchard crops. Biopesticides have a number of appealing characteristics that make them useful IPM tools. Most are selective, leave little or no hazardous residue, and have substantially lower research costs than traditional synthetic chemical pesticides. Microbial biopesticides have the ability to proliferate on or near the target pest, providing self-perpetuating control. Many biopesticides are suited for small-scale manufacturing and may be administered with farmers' existing spray equipment. Biopesticides have a slower death rate than conventional chemical pesticides, have a shorter persistence in the environment, and are more susceptible to unfavourable environmental circumstances. Biopesticides are not suitable for use as stand-alone treatments since they are not as effective as traditional chemical pesticides. However, because of their selectivity and safety, they can make a significant contribution to incremental pest management advances. The entomopathogenic fungus *B. bassiana*, for example, is being employed against two-spotted spider mites on greenhouse crops in conjunction with invertebrate predators. *Beauveria bassiana* has a short harvest interval, is efficient against spider mites, and can be used with predators. As a result, it is currently the recommended additional treatment for spider mite on greenhouse crops across Europe as an IPM component.

Biopesticidial products are being used in the field:

Bt products are primarily used to control the following pests in vegetables: tobacco bud worm grass looper, diamondback moth, maize borer, cassava hornworm , potato leaf miners, citrus leaf miner, potato, and plantain mites are all controlled using the acaricide. Mosquito disease vectors are controlled using *Bt* var. *israelensis* strains. In 1997, Cuba generated approximately 1000 tonnes of Bt, with 24 percent coming from industrial fermentation and 76 percent from solid substrate culture. Mosquitoes are killed by the larvicidal activity of neem oil (*Azadirachta indica*). Insecticidal activities have been discovered in *Azadirachta indica* (Meliaceae) and its derivatives. An emulsified concentrate of formulated neem oil (neem oil with polyoxyethylene ether, sorbitan dioleate, and epichlorohydrin) is extensively used for agricultural and farming reasons because of its larvicidal efficiency.