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Commentary

Recombinant DNA Technology's Contribution to Microbial Insecticide Durability

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DESCRIPTION

The discovery of the Nobel Prize-winning substance DDT in the 1940s increased the use of agrochemicals in the battle over insect pests. However, scientists have been driven to develop and deploy more environmentally friendly procedures as a result of the deleterious effects of chemicals like DTT on the environment, human health, and no target creatures. Microorganisms (viruses, bacteria, fungus, microsporidia, and nematodes) or their toxin products make up eco-friendly microbial insecticides. These toxins, in many circumstances, have no adverse effects on non-target organisms and can be employed alongside traditional pesticides. Microbial insecticides have a significant benefit over standard pesticides in that they can be used even during harvest.

However, their sensitivity to harsh weather conditions and Ultraviolet light following administration, the establishment of resistance to pests, and the brief persistence of insecticides in the field are all disadvantages. As a result, researchers have turned to recombinant DNA and bioengineering to solve these drawbacks. Gene isolation, genetic manipulation, gene cloning, and gene expression are all examples of recombinant DNA technology. New ways for controlling insect pests have emerged as a result of advancements in recombinant DNA technology. One of these innovative approaches is the use of genetically engineered microbial pesticides, which have a number of advantages over natural microbial insecticides, including minimal spraying requirements, long-term persistence, decreased insect resistance, and higher efficiency.

In the agricultural and horticultural industries, commercial microbial pesticides are available to manage insect pests. Insect pathogens (entomopathogenic bacteria, including *Bacillus thuringiensis*, entomopathogenic fungi, baculoviruses, and microsporidia) and entomopathogenic nematodes are among these insecticides. Sprays, powders, liquid concentrates, wettable powders, and granules are all possible formulations. The most effective ways for their utilization are determined by the particular qualities of each product. Because practically all insect pests are susceptible to fungal infections, Entomopathogenic Fungi (EPF) is critical for microbial management. Because of their strong reproductive powers, target-specific activities, short production times, and capacity to generate saprobic phases that allow them to survive longer in the absence of a host, EPF are promising biocontrol agents.

Insects belonging to the orders Lepidoptera, Orthoptera, Homoptera, Coleoptera, and Diptera are infected by EPF, which has a greater host range than other biological control agents. Entomopathogenic Viruses (EPV) is common, and virus-based biological control has shown to be successful. At least 16 viral families have been found to be effective against pest insects, including RNA viruses like spoviruses, dicistroviruses, nodaviruses, and tetraviruses, as well as DNA viruses including densoviruses, entomopoxviruses, ascoviruses, iridoviruses, nudiviruses, hytrosaviruses, and baculoviruse. Baculoviruses have showed promise as biocontrol agents for pest insects in agriculture, forests, and greenhouses. These viruses are employed to manage pest insects from the orders Lepidoptera, Diptera, and Hymenoptera, in particular, and commercial formulations of these agents are available.

Bacillus sporogenes is a spore-forming bacteria which is wide spread in the environment and can be easily isolated from soil, water, plants, insect feces, and grain dust using basic media such as nutrient agar. When resources are abundant, the spore germinates, forming a vegetative cell that develops and reproduces by binary fission. The bacterium multiplies until it runs out of nutrients to continue growing vegetatively. The bacteria sporulate under these conditions, producing a spore and a parasporal body, the latter of which is primarily made up of insecticidal protein toxins. *B. thuringiensis* spp, *thuringiensis* spp, *thuringiensis* Cry1Aa, Cry1Ab, Cry1Ac, and Cry2A are four main endotoxin proteins produced by kurstaki, which have a broad spectrum of activity against lepidopteran pests.

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CONCLUSION

For many years, microbial insecticides, often known as eco-friendly insecticides, have been successfully used. However, compared to natural microbial insecticides, genetically engineered microbial insecticides have a number of advantages, including reduced dose requirements, long-term persistence, and better efficacy. As a result, the development of more efficient pest-control measures will be dependent on the discovery of new microbial insecticides and biotechnology breakthroughs.