Bioinsecticides

Through the development of new and recent technologies that incorporate the use of microorganisms as biological control agents on species of organisms considered pests, due to mass reproduction and its effects on agricultural crops, it has been possible to consolidate the management of formulations called **bioinsecticides**. In this category of agrobiological inputs, the control of a wide variety of insects in various plant crops is contemplated, covering the different existing agricultural production schemes.

Essentially a microbial **bioinsecticide** is a biotechnological product that includes as an ingredient or active ingredients strains of entomopathogenic microorganisms previously evaluated under laboratory and field conditions that, due to their biological and propagative activity, can optionally use insects as host organisms to reproduce and complete their life cycle. This is a negative and devastating pathogenesis effect on host insects, eventually causing their death.

Bioinsecticides made from microscopic entomopathogenic fungi act by direct contact with the exoskelete of insects or occasionally by ingestion. A **bioinsecticide** that includes fungi such as *Beauveria bassiana* or *Metarhizium anisopliae* aims to control insect populations at the plant or soil level, where adults or immature states of these pests inhabit and cause damage directly or indirectly to plant tissue.

The main propagative and infective structures of these two species of entomopathogenic fungi are spores, which are usually the active ingredient of **bioinsecticides**. When in contact with the surface of the host, the spores germinate and produce enzymes that degrade the cuticle of the insect, while fungal structures called apressors are generated, which mechanically break the exoskeleton, penetrating until it reaches the celoma of the insect (internal cavity), where the mycelium of the fungus finishes developing and through enzymatic action consumes the available nutrients. An insect infected with *B. bassiana* or *M. anisopliae* begins to show erratic behavior towards the second or third day after the application of **bioinsecticide** (infection); this behavior is characterized by gradually slower movements, partial or total immobilization, and cessation of its feeding, until finally it dies from severe mycosis occasionally manifested by the emergence of the fungus' mycelium from the natural orifices of the insect such as the mouth or spiracles, and through the membranes that join the stiffer sections of its exoskeleton.

Both *B. bassiana* and *M. anisopliae* are entomopathogenic fungi with a wide spectrum of pathogenicity and virulence in host insects, among which stand out orders of economic importance in agriculture such as Coleoptera, Orthoptera, Diptera, Lepidoptera and Hemiptera, among others, so a **bioinsecticide** of this type has a great potential for biological control with high efficiency.

The use of **bioinsecticides** in agricultural activities is an increasingly recurrent practice, due to the advantages involved, based on a comprehensive management approach and more harmonious with natural environments, promoting the sustainability of agricultural systems in the medium and long term, in addition to contributing to improving the quality of food and raw materials from the field.

From several research and applied studies, it has been proven that **bioinsecticides** formulated with these microscopic fungi do not have toxic effects due to residual traces and are not a risk factor for human health, as is the case with agrochemicals.