

A **biofungicide** is a product made up of one or more microorganisms that have the ability to control the growth of many of the disease-causing fungi in crops.

The active ingredients of the **biofungicides** line are fungi of the genus *Trichoderma* and bacteria of the genera *Bacillus* and *Pseudomonas*, which have different mechanisms of action against fungi, bacteria and phytopathogenic nematodes.

The use of **biofungicides** within an integrated management of the crop promotes the remediation of soils, as well as a better management of phytopathogenic microorganisms due to their specificity and the decrease in the use of chemicals that increase their resistance, soil erosion and contamination of aquifers. The species of the genus *Trichoderma* are saprophytic fungi, facultative anaerobes widely used in the elaboration of **biofungicides** due to their ubiquity, rapid growth in different substrates, high sporulation and that they do not attack higher plants. They fight a high spectrum of fungi, mainly those of the genera *Botrytis*, *Rhizoctonia*, *Sclerotinia*, *Sclerotium*, *Pythium*, *Phytophthora*, *Fusarium*, *Armillaria*, *Verticillium*, *Gaeumannomyces* and nematodes. The main mechanisms of action of *Trichoderma* are: direct competition for space or nutrients to colonize greater surface area due to its high adaptability, its antibiosis; in which metabolites are produced that inhibit the growth of other microorganisms that come into contact and mycoparasitism; in the hyphae of *Trichoderma* adhere, coil and penetrate the hyphae of the phytopathogenic fungus, in addition they can generate cell lysis due to the hydrolytic enzymes it produces.

Bacillus are gram-positive aerobic or facultative anaerobic saprophytic microorganisms, endospore-forming, which gives them a wide distribution and resistance to different types of environments, they are mostly found in the soil. The pathways in which *Bacillus* act are: by excretion of antibiotics mostly lipopeptides that adhere to the plasma membrane of phytopathogenic organisms causing an imbalance and therefore inhibiting their development, production of lytic enzymes such as chitinases or β -glucanases causing lysis in the components of the cell wall of phytopathogenic microorganisms, production of iron-scavenger siderophores making it less available to other microorganisms and finally production of elicitors that induce systemic resistance in the plant.

Pseudomonas fluorescens are aerobic Gram-negative saprophytic bacilli, with low nutritional requirements being widely distributed. Like the genus *Bacillus*, the methods of biocontrol they exert is by production of antibiotics, siderophores, lytic enzymes and induction of systemic resistance in the plant, coupled with the production of hydrogen cyanide, an inhibitor of the transport of electrons and the enzyme cytochrome oxidase in the cells of phytopathogens present in the rhizosphere and competition for space and nutrients.

Trichoderma and the *Trichoderma* consortium with *Bacillus* and *Pseudomonas* bacteria, result in biofungicide products capable of protecting the host plant from the root, adaptable to different types of substrate due to their biology and resistance structures, exercising synergistic defense mechanisms against phytopathogenic microorganisms, as well as achieving a higher yield in the productivity of plant crops.

