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Trichoderma spp. - mechanisms of action in the control of storage pathogens – Review

Angela AMUZA[1,2], Roxana ZAHARIA[1], Viorel FATU[1], Alin GHEORGHE[1], Ion LEVEANU[1]
[1]Research and Development Institute for Plant Protection, Bucharest, Romania;
[2]University of Agronomic Sciences and Veterinary Medicine Bucharest

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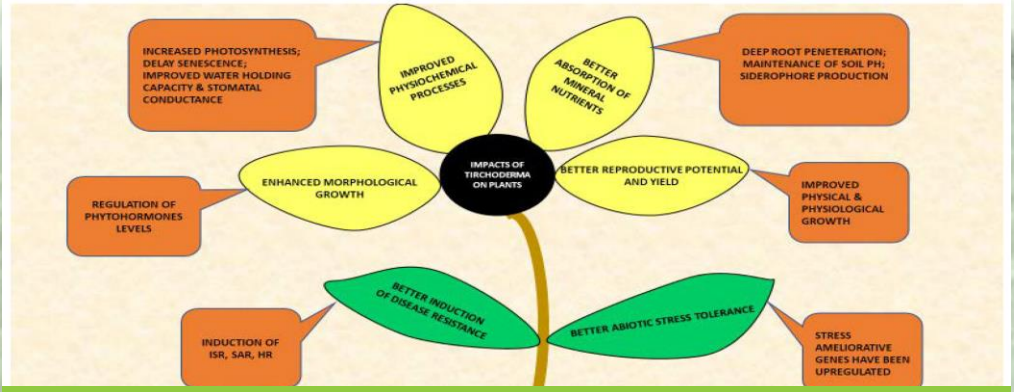
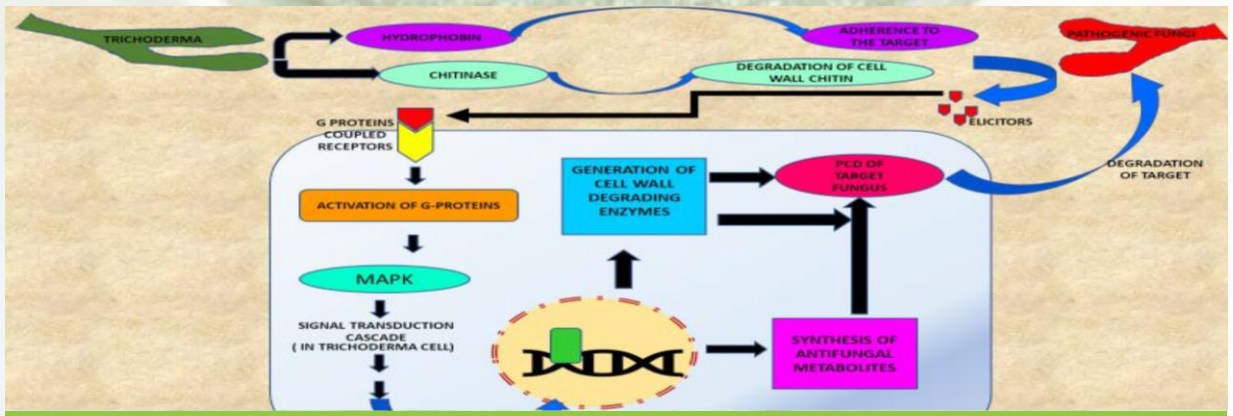
Aim: The purpose of the paper is to revise the multiple methods of biological control with *Trichoderma* spp. The need to reduce the use of fungicides in phytosanitary control and makes it necessary to develop technologies that allow easy, economical and effective ways to obtain products from endogenous microorganisms with sufficient quality and quantity to their application in the crops areas. In addition to the industrial importance of the genus, certain *Trichoderma* species have the ability to antagonise plant pathogens. *Trichoderma* interacts with other microorganisms, but mainly with pathogenic fungi. These interactions include hyperparasitism, competition, and antibiosis. Hyperparasitism is connected with the direct contact of an antagonist with a pathogen and is composed of such stages as: pathogen recognition, attack, gradual penetra- tion of the pathogen cells and death. In this process a considerable role is played by cell wall degrading enzymes, lytic enzymes, synthesised by *Trichoderma* species that facilitate hydrolytic degradation of pathogen cell walls, composed of chitin and glucan polysaccharides. *Trichoderma* species are also capable of producing cell wall degrading enzymes such as cellulase, xylanase, pectinase, glucanase, lipase, amylase, arabinase, and protease.



The impact of *Trichoderma* spp. on plants in rhizosphere (web source)

Chitinases are the most important lytic enzymes playing a key role in the degradation of cell walls. An important role is also attributed to proteolytic enzymes (endoan exoproteases), which in *Trichoderma* are responsible for the control of exocellular enzyme secretion. The proteolytic enzymes influence the activity and stability of exocellular enzymes and participate in post-secretion modifications of cellulases. Small grain cereals (such as wheat, barley, oat, rye, and triticale) and maize are the main commodities grown all over the world in different climatic conditions.



Mode of action of *Trichoderma* spp. in destroying pathogenic fungi

Conclusions: Biological control is applicable and many novel methods are being discovered, mostly based on microbiological research and the application of microorganisms that can suppress fungal growth and detoxify mycotoxins. *Trichoderma* reduce the damage and suppress the fungal growth, it is common to add antifungal substances during growth in the field or storage. Peptaibols, linear oligopeptides produced by *Trichoderma spp.*, inhibit beta-glucan synthase which prevents the pathogen from reconstructing its cell wall. Culture filtrates of a *T. harzianum* isolate changed the colony color of *A. flavus* and had a clear effect on the growth. *T. viride* showed a potent antagonisms of *F. verticillioides* in an in vitro assay which was proven by the suppression of radial extension of the fungus by 46% after 6 days and by 90% after 14 days.