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Opinion

Trichoderma harzianum: A Potential Bioagent and Plant Growth Promoter

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Plant diseases are one of the major limitations in crop production universally, which results in loss of billions of dollars of crop produce annually. There is an utmost need to manage diseases and to have constant and steady supply of marketable crop produce for the rapidly increasing world populace. Plant diseases caused by soil borne pathogens are called soil borne disease, which are very difficult to predict, detect, and diagnose. Investigations on these pathogens are further limited by the nature of the complex soil environment, which makes understanding of soil borne plant pathogens and the diseases they cause, a challenging aspect for their management. These diseases are very difficult to manage due to their highly heterogeneous incidence, and lack of knowledge on the epidemiological aspects of soil borne pathogens. The effective control of the soil borne diseases is possible only through detailed study on survival, dissemination of soil borne pathogens; effect of environmental conditions role of cultural practices and host resistance. The chemical pesticides used for these soils borne disease has adversely affected non-target beneficial organisms, toxic compound accumulation, which are potentially hazardous to human health and environment and resistance build up in the pathogens due to their indiscriminate and continuous use. Keeping in view these global problems, effective alternatives to chemical control is the need of hour. Biological control is one of the potential, cheap, ecofriendly and alternative approach for managing plant diseases and to combat the above said problems. Among the various microbes, a few fungi and bacteria have been studied for their effective bioagent characteristics. Some *Trichoderma* spp. in fungi are considered as potential and promising biocontrol and growth promoting agents for many crop plants against array of soil borne plant pathogenic fungi. The genus *Trichoderma* comprises a various number of fungal species and their antagonistic properties are based on the activation of multiple mechanisms. *Trichoderma harzianum* is one of the most effective biocontrol agents, which can be exploited commercially for preventive protection from several soil pathogenic fungi. It is a species aggregate, grouped on the basis of conidiophore branching patterns with short side branches, short inflated phialides, and smooth small conidia. It has been divided in three, four, or five sub specific groups, depending on the strains and on the attributes considered. Control of several soil borne fungal pathogens using *Trichoderma harzianum* has been reported by many workers worldwide, yet there is little information available on the use of *T. harzianum* as biocontrol agents against various soil borne pathogens in different crops. The mechanism of suppression of pathogenic fungi includes the inhibition of the growth of the pathogen population in the rhizosphere through nutrient competition, production of antibiotics and toxins, which have a direct effect on other pathogenic organisms. The antagonist hyphae either grow along the host hyphae or coil around it and secrete different lytic enzymes such as chitinase, glucanase, and pectinase that are involved in the process of mycoparasitism. Examples of such interactions have been reported against various soil borne pathogens like, *Fusarium oxysporum, F. roseum, F. solani, Phytophthora colocasiae* and *Sclerotium rolfsii* etc. Besides inhibition of growth of soil borne plant pathogenic fungi, it can also have potential to enhance yield along with quality of produce by enhancing shoot and root length, solubilisation of phosphates and micronutrients, augment in nitrogen fixation and promote healthy growth in early stages of crop. It can release biochemical elicitors of disease, and can induce disease resistance in plants in advance. It can have huge potential to be used to develop transgenic plant, by introduction of endochitinase gene into plants to increase their resistance against fungal pathogens e.g. in potato against *Phytophthora*. It can play an important role in the bioremediation of soil that are contaminated with pesticides and herbicides as *Trichoderma* has the ability to degrade a wide range of insecticides: organochlorines, organophosphates, and carbonates. Hence, *T. harzianum* can be utilised not only for disease management of soil borne pathogens but also has the capacity to improve plant growth parameters, and soil health.

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