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Studies on the compatibility of *Trichoderma viride* with certain Agro-chemicals

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ABSTRACT

Trichoderma viride is a biocontrol agent which shows antagonistic activity toward a broad spectrum of phytopathogens. *Trichoderma viride* was more compatible with fertilizers and pesticides, and can be safely used with chemical fertilizers that give major nutrients for any crop. The latest insecticide, Lambda cyhalothrin (second-generation synthetic pyrethroid), was more compatibile than conventional pesticides. If the fungus is mixed with these chemicals, the resultant efficacy may not be severe. However, fungicides did not show compatibility. It would not be advisable to mix the fungus with inorganic fungicides as the latter may nullify the effect of the microbial agent.

Key words: *Trichoderma viride,* agro-chemicals, compatibility.

INTRODUCTION

Biocontrol agents are safe and environmental friendly alternatives for pesticides in agriculture application. *Trichoderma viride* performed a high level of antagonistic activity toward a broad spectrum of phytopathogens and was determined as a biocontrol agent. *Trichoderma viride* is a filamentous fungus that is widely distributed in the soil, plant material, decaying vegetation, and wood that can be used as a bio fungicide[1,2]. It is used for seed and soil treatment for suppression of various diseases caused by fungal pathogens. Colonies of *Trichoderma viride* grow rapidly and mature in 5 days. At 25°C and on potato dextrose agar, the colonies are wooly and become compact in time. From the front, the color is white. As the conidia formed, scattered blue-green or yellow-green patches become visible[3,4].

The choice of active *Trichoderma* strains is important in designing effective and safe biocontrol strategies. Many species of *Trichoderma* have multiple strategies for fungal antagonism, and indirect effects on plant health (such as plant growth promotion effects and fertility improvements) also vary. Some strains are potent antibiotic producers, and their suitability for use in biocontrol systems must be carefully assessed. However, many other active strains have no antibiotic capacity, and these are likely to be more useful in food production systems. *Trichoderma* biocontrol strains have evolved numerous mechanisms for both attacking other fungi and enhancing plant and root growth[5]. The colonization of the root system by rhizosphere competent strains of *Trichoderma* results in increased development of root and/or aerial systems and crop yields[6]. Other activities, like the induction of plant systemic resistance and antagonistic effects on plant pathogenic nematodes[7], have also been described. These facts strongly suggest that during the plant-*Trichoderma* interactions, the fungus participates actively in protecting and improving its ecological niche. The dual roles of antagonistic activity against plant pathogens and promotion of soil fertility make *Trichoderma* strains appealing alternatives to soil fumigation technologies such as methyl bromide.

Strains of *Trichoderma* may also be aggressive biodegraders [8] and act as competitors to fungal pathogens in their saprofitic phases, especially when nutrients are a limiting factor [9]. Strains have been reported as promoting activities of non-pathogenic bacteria[10] and mycorrhizal fungi[11]. In the 1990s, the ability of *Trichoderma* strains to synthesize substances inducing SAR-like responses in plants was shown[11,12]. Molecules produced by *Trichoderma* and/or its metabolic activity also have potential for promoting plant growth[13]. Application of the species *T. viride* to plants resulted in improved seed germination, increased plant size, and augment of leaf area and weight[14].

Soil application of *T. viride* talc formulations at the rate of 200 g each/palm in combination with 50 kg FYM was found effective against the basal stem rot caused by *Ganoderma lucidum* [15]. Antagonists which differed in their ecology could be combined so that they could effectively utilise the root exudates and survive in association[16].

In the light of importance of *Trichoderma viride* as a biocontrol agent, studies on the impact of commonly used agro-chemicals on the growth of *Trichoderma viride* were conducted in broth and agar media.

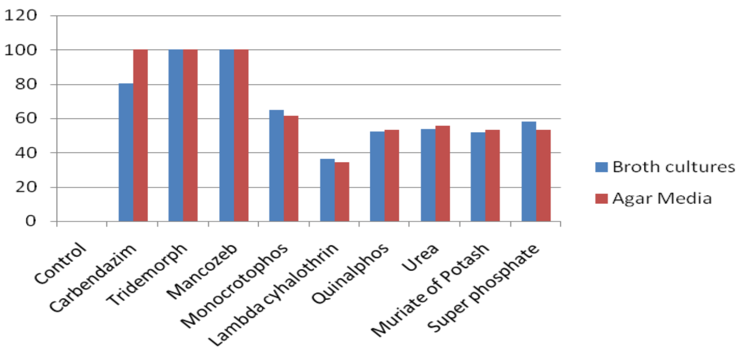
MATERIAL AND METHODS

Potato dextrose agar (PDA) was prepared in flasks and sterilized. Desired concentration of chemical was prepared by mixing with medium under constant stirring. The medium was poured into sterilized Petri plate and allowed to solidify. A disc of 7 mm diameter of the test fungus grown on solid medium was cut with the help of the sterilized cork borer and placed aseptically in the middle of the Petri plate and incubated at room temperature for 7 days. The culture discs grown without the test fungus served as control and the diameter of the fungal colony was measured after incubation.

Potato dextrose broth was prepared and sterilized. Concentration of the chemical solution was prepared as for PDA. A disc of 7 mm diameter of fungal growth as described earlier was transferred to the medium, mycelial mat was removed by filtration and the dry weight was determined. Controls had no fungus in the solution.

Concentrations of fungicides, insecticides and fertilizers for field application were 2 g/l for Carbendazim, Mancozeb, Tridemorph, Lambda cyhalothrin and Quinalphos; 1.5 ml/l for Monocrotophos; 10 g/l for Urea and 20 g/l for Muriate of Potash and Super phosphate.

The Percent inhibition of growth was calculated by the standard formula[17].



and agar (radial growth), fertilizers (Urea, Muriate of Potash and Super Phosphate) did not show any

Fig. 1: Effect of Agro-chemicals on the growth of *Trichoderma viride*

negative impact on the growth of *Trichoderma viride.* Muriate of Potash and Super Phosphate showed more compatibility than Urea. Percent inhibition was also less with Muriate of Potash and Super Phosphate. Among insecticides, second-generation synthetic pyrethroid, Lambda cyhalothrin was less harmful than conventional insecticides, Monocrotophos and Quinalphos. All the fungicides, Carbendazim, Mancozeb and Tridemorph showed negative impact on growth. Impact was less in case of Carbendazim in the broth culture (Fig. 1).

DISCUSSION

Application of *T. viride* enriched FYM, however, brought economy in the use of fertilizer N by 45.2 kg ha^{-1} and also increased the yield by 6.1 t ha^{-1}compared to the control treatment. Overall, strategic planning in terms of an integrated application of these bioagents with fertilizer N will not only sustain soil fertility but will also benefit farmers in terms of reducing their dependence and expenditure on chemical fertilizers [18]. In the present investigation, among insecticides, second-generation synthetic pyrethroid, Lambda cyhalothrin was less harmful than conventional insecticides, Monocrotophos and Quinalphos under field conditions. A laboratory study conducted by [19] concluded that *Trichoderma viride* was not compatible with fungicides dithane M-45, thiram carbendazim, hexaconazole and thiophanate-methyl.

CONCLUSION

The study revealed that *Trichoderma viride* cannot be applied to crops along with fungicides or insecticides. While applying with fertilizers, care may be taken by avoiding the place and time of application of both.

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