Abstract

In vitro effect of four fungicides on mycelial growth of Trichoderma harzianum was evaluated. Among the systemic fungicides, myclobutanil was the more toxic, followed by cymoxanil. Toxicity of the contact fungicides was lower than that of the systemic fungicides, among which copper oxychloride and sulphur were highly incompatible, no inhibition was observed at lower concentrations. The present results will help to delineate the possibility of combining T. harzianum biocontrol agents and agrochemicals for use in integrated pest management approach.

1. Introduction

Trichoderma harzianum is cosmopolitan. Trichoderma spp. produces antibiotics against plant pathogens and induces systemic and localized resistance. In addition to resistance Trichoderma spp. synthesize plant growth regulators which enhance plant vigour [10]. Biological control suppresses the population of the pathogenic organisms through competition, parasitism and antibiosis through toxin production [6], [9]. Therefore biological control through Trichoderma spp. have acquired much attention [14],[5],[16]. Trichoderma spp. are potential biocontrol agents, against pathogenic fungi,[8], like Macrophoma phaseolina, [1], Rhizoctonia solani, and Pythium species [11], against primary and secondary root diseases [4];[2]. Integrated pest management (IPM) involves the use of biological, physical, and chemical measures to manage pest and pathogen populations in a cost-effective way [17]. Today the combined use of biocontrol agents like Trichoderma spp. and chemical pesticides had attracted much attention of researchers in the control of soil-borne pathogens and in integrated pest management.
2. Materials and Methods

Isolation and Identification of *Trichoderma harzianum*

*Trichoderma harzianum* was isolated from soil samples of Pravara area by using potato dextrose agar (PDA) medium. Samples were inoculated over plates by multiple tube dilution technique (MTDT) and the plates were incubated at 30°C for 4 days. The fungal colonies were picked up and purified by streaking on PDA plate and incubated at 30°C for 7-8 days. Green conidia forming fungal bodies were selected and microscopic observation confirmed identification of *Trichoderma harzianum*. The pure culture was maintained on PDA slants.

In all, two systemic fungicides (Systhane 10 WP), (Myclobutanil 10w/p), Curzate M8 (cymoxanil 8% WP + mancozeb 64% WP), and two contact fungicides copper (copper oxychloride 50% WP), Suphur 80 WP (Sulphur 80% WP) were used. In-vitro bio-efficacy of the test compounds was determined using the poisoned food technique [15]. Stock solutions (1000 ppm) of agrochemicals were prepared by dissolving the required quantities of each into sterile distilled water. Appropriate quantities of the respective solutions were added to molten PDA medium (50 mL) from stock solution so as to obtain the required concentrations and were mixed thoroughly by gentle shaking. About 15 ml. of sterilized medium was poured into 90-mm sterilized petri plates. After solidification, the plates were inoculated with 5-mm discs of 4-day-old *T. harzianum* culture. Four replicates were used for each concentration of every tested compound. Inoculated PDA plates without any compounds served as controls. The inoculated plates were incubated at 25 ± 1 °C and radial colony diameter data was recorded 5 days after inoculation [17].

3. Results and Discussion

<table>
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<tr>
<th>Concentration (PPM)</th>
<th>Myclobutanil</th>
<th>Cymoxanil + Mancozeb</th>
<th>Sulphur</th>
<th>Copper Oxychloride</th>
<th>Glyphosate</th>
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Selected fungicides were tested for biodegradation activity of *T. harzianum*. Among these *T. harzianum* proved its biodegradable activity up to 25 ppm in myclobutanil, 300 ppm in cymoxanil + mancozeb, 500 ppm in sulphur and copper oxychloride. Insecticide like dichlorovos (Nuvan) also tested against biodegradable activity *T. harzianum*. It proved that *T. harzianum* acquired resistance / biodegradation capacity up to 300 ppm. Herbicide like glyphosate was also tested against biodegradation activity *T. harzianum*. This supports that *T. harzianum* was able to degrade this herbicide up to 300 ppm. Use of fungicides causes undesirable effects on non-targeting organisms, so the use of fungicides insecticides and herbicides that antagonize plant pathogenic fungi is risk free [3]. The combination of fungicide and tolerant biological control agents like
Trichoderma spp. will reduced levels of fungicide integrated control strategies and would promote the degree of disease suppression similar to that achieved with full dosage of fungicides [13]. There are reports where the bio-control agents, which can tolerate fungicides up to a certain level, were mixed with fungicides and resulted in eradication of diseases [7], Latore etal; suggested that antagonistic activity of bio-control agents might be effective if it is integrated with other control practice and may result in acceptable levels of disease control with reduce level of chemicals use [12]. The results of the present work would help in the selection of bio-control agents, which can be used, with reduced dose of selected fungicides, insecticide and herbicide for the control of plant pathogenic fungi, insects and weeds.

4. Conclusion

The present results will help delineate the possibility of combining T. harzianum bio-control agents and agrochemicals for use in an integrated pest management approach.

5. References


1st. Dr. Ashok M. Bhosale M.Sc. Ph.D. (Botany)
Head and Associate Professor, Department of Botany,
Arts Commerce and Science College , Satral
Rahata, Ahmednagar-Maharashtra

2nd. Borade Swapnil V. M.Sc. Biotechnology
Senior Research fellow, Maharashtra Rajya Draksha Bagaitdar Sangh Pune.
(Nashik Division) Maharashtra (India)