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RESEARCH ARTICLE

Effect of *Trichoderma Spp.* as a Bio-control Agent on Cereal Crop Plants

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ABSTRACT

Trichoderma is a Deuteromycetous fungus with hyphae long, creeping, conidiophores erect, philiadic, having conidial heads. *Trichoderma* species produces a chemical, trichodermin; it is the sesquiteroenoid acting as a bio-control agent on the principal of myco-parasitism, antibiosis and competition to control soil borne plant pathogens. The phytotoxic effect was screened by treating cereal crop seeds with culture filtrate of *Trichoderma* species, the effect of culture filtrate was measured in terms of seed germination percentage and results were compared with control one. The obtained results shows percentage of germination in treated seeds was more than the control. The culture filtrate of *Trichoderma harzianum* showed superior effects (95-97%) than that of *Trichoderma viridae* (90-95%) and *Trichoderma virens* (86-92%) on the seed germination of selected cereal crop seeds.

Keywords: Culture filtrates, Trichoderma, Cereal crop seeds.

INTRODUCTION

In advanced technology of agriculture, use of *Trichoderma* species as bio-control agents for the management of crop plant diseases, now it becomes a modern trend. Apart from enzymes, the species of *Trichoderma* are also producers of various metabolites with toxic antibiotic properties (Bruckner *et.al*, 1990., Dennis and Webster, 1971., Stepanovic and Howell, 1982., Tomoda *et.al*.1992., Huang *et.al.* 1995). Number of secondary metabolites are produced by their metabolic pathways. (Sivasithamparam and Ghisalberti, 2002). They are frequently associated with both biocontrol activity and promotion of plant and root growth. (Chet *et.al*.2006, Howell, 1998). Aspite *et.al*. (1996) extracted trichodermin from *Trichoderma viridae* and *Trichoderma harzianum*. Trichonitrin was obtained from the several strains of *Trichoderma harzianum* (Kulisler, 1997). Shanmugam (2001) was made purification and characterization of phytotoxin from *Trichoderma viridae*. The species of *Trichoderma* are known to inactivate the phytotoxins produced by many plant pathogenic fungi. (Sriram *et.al*.2000). Culter and Le Flies (1978) reported that Trichodermin is a potent inhibitor of plant growth and produces other phytotoxic effects. It inhibits wheat coleoptile growth; phytotoxic to tobacco at high concentration and inhibits growth at lower concentrations.

From the review of literature, it was observed that very little information is available regarding the phytotoxic activity of Trichoderma species. The essential fact is that the determination of phytotoxic effects by *Trichoderma* species on crop plants must be needed. The positive and negative phytotoxic effects by the *Trichoderma* species on the crop plants should be determined. By knowing these effects the use of *Trichoderma* species as bio-control agent for disease management will become efficient and convincing. By Keeping in mind above facts, the present investigation was carried out for the determination of phytotoxic effects of *Trichoderma* species on cereal crop plants.

MATERIAL & METHODS

Isolation of Trichoderma species: *Trichoderma* species were isolated from the various sources such as rhizosphere soils of irrigated and non-irrigated crop plants, seeds of different crop plants.

Extraction of Fungal metabolites from *Trichoderma* species: In the present investigation the evaluation of phytotoxins from the isolated *Trichoderma* species was carried out. The *Trichoderma* species were grown on Richard's solution (broth). 25 ml of Richard's broth was poured in 100 ml conical flasks. The flasks along with medium were autoclaved at 15 lbs for 20 minutes. The flasks were allowed to cool and after cooling the flasks were inoculated with 1ml spore suspension of isolated *Trichoderma* species prepared from 7 days old cultures grown on PDA slants. The flasks were incubated for 9 days at 27^0 C. After the incubation period, these flasks were harvested by filtration of their contents through Whatman filter paper No.1. The filtrate were collected in pre sterilized conical flasks and considered as crude toxin preparations. These preparations were tested for their toxicity.

Effect of fungal metabolites on cereal seeds: The toxicity of culture filtrate was determined by using seed germination method. Healthy seeds of cereal crop plants *viz.* Bajra (*Pennisetum typhoideum* L.), Jowar (*Sorghum vulgare* M.), Maize (Zea *mays* L.), Rice (*Oryza sativa* L.) and Wheat (*Triticum aestivum* L.) were collected from local market of Renapur and surface sterilized by treating with 0.1% mercury chloride solution an followed by repeated washing with sterilized distilled water. The surface sterilized seeds were soaked in crude toxin preparation for 24 hours. Then they were placed on moist blotter paper in sterilized petriplates. These seeds soaked similarly in freshly uninoculated liquid medium served as control. The percentage of seed germination was observed and data was recorded in Table 1. (Haikal,2008).

RESULTS & DISCUSSIONS

The detection of phytotoxin from the *Trichoderma* species were examined by treating of culture filtrates with seeds of selected cereal crop plants. The treated seeds were allowed for germination under vitro condition. The culture filtrates of *Trichoderma* species showed effect on seed germination, this indicates that extracellular metabolites in culture filtrates of *Trichoderma* species exhibited their effects on the seed germination; this indicates that extracellular metabolites in culture filtrate of *Trichoderma* species showed their effects on seed germination. The culture filtrates of three isolated *Trichoderma* species grown on glucose nitrate medium for seven days were tested for seed germination of five cereal crops and the results were recorded in Table 1.

The obtained results indicated that, the culture filtrates of *Trichoderma* species proved to be stimulatory for the germination of cereal crop seeds. The culture filtrate of *Trichoderma harzianum* had showed comparatively superior effects than the culture filtrates of *Trichoderma viridae* and *Trichoderma virenson* the seed germination of cereal crops. The culture filtrate of *Trichoderma harzianum* showed its results like Bajra (95%), Jowar (96%), Maize (97%), Rice (97%) and Wheat (95%).The results showed by the culture

filtrate of *Trichoderma viridae* were Bajra (90%), Jowar (93%), Maize (95%), Rice (95%) and Wheat (92%).The results of *Trichoderma virens* were Bajra (97%), Jowar (86%), Maize(90%), Rice (92%) and Wheat (88%) and the controlled results were Bajra (80%), Jowar (83%), Maize (94%), Rice (80%) and Wheat (78%). The overall results indicate that the culture filtrates of *Trichoderma* species proved to be stimulatory for the seed germination of cereal crop plants. The culture filtrate of isolated *Trichoderma* species showed no any adverse effects on the seed germination of cereal crop plants. The species of *Trichoderma* are known to produce a range of metabolites that may affect the growth of microorganisms and plants. The production of antibiotics such as viridian (Grove et.al.1996), trichodermin ergokonin (Kumeda *et.al.* 1994) and viridiofungins A, B and C (Harris *et.al.* 1933) produced by different isolates of *Trichoderma viride* have been involved in biological control. The species of *Trichoderma* are well known bio-control agents against the pathogenic fungi and nematodes. The weed control by using the *Trichoderma* species is still a relatively unexplored field and the few known studies in this area are restricted to *Trichoderma virens* only (Heraux *et.al.* 2005). In the present investigation the culture filtrate showed very promoting effects on the seed germination of cereal seed crops.

CONCLUSION

The main objective of this investigation is that to determine the effects of metabolites through percentage of seed germination and the toxicity of secondary metabolites on the crop plants also considered. From the present investigation, the results indicated that the species of *Trichoderma* induces the seed germination and *Trichoderma* species induced the germination as well as growth of plants along with biological control, so it can be suggested that *Trichoderma* species can be used as safe bio-control agents that are safe for the cereal crop plants.

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Table 1: Effect of culture filtrates of *Trichoderma* species on seed germination

Sr. No.	Cereal crop plants	Control	Percentage of seed germination (%)		
			T. harzianum	*T. viridae*	*T. virens*
1	Bajra (*Pennisetum typhoideum* L.)	80	95	90	87
2	Jowar (*Sorghum vulgare* M.)	83	96	93	86
3	Maize (Zea *mays* L)	84	97	95	90
4	Rice (*Oryza sativa* L)	80	97	95	92
5	Wheat (*Triticum aestivum* L.)	78	95	92	88

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