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 Trichoderma 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 27º 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 typhoidum 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 in 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 virens 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 (93%) and Wheat (92%). The results of *Trichoderma viridae* 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 viridae* 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.

**REFERENCES**


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

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Cereal crop plants</th>
<th>Control</th>
<th><em>T. harzianum</em></th>
<th><em>T. viride</em></th>
<th><em>T. virens</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bajra (<em>Pennisetum typhoideum</em> L.)</td>
<td>80</td>
<td>95</td>
<td>90</td>
<td>87</td>
</tr>
<tr>
<td>2</td>
<td>Jowar (<em>Sorghum vulgare</em> M.)</td>
<td>83</td>
<td>96</td>
<td>93</td>
<td>86</td>
</tr>
<tr>
<td>3</td>
<td>Maize (<em>Zea mays</em> L.)</td>
<td>84</td>
<td>97</td>
<td>93</td>
<td>90</td>
</tr>
<tr>
<td>4</td>
<td>Rice (<em>Oryza sativa</em> L.)</td>
<td>80</td>
<td>97</td>
<td>93</td>
<td>92</td>
</tr>
<tr>
<td>5</td>
<td>Wheat (<em>Triticum aestivum</em> L.)</td>
<td>78</td>
<td>95</td>
<td>92</td>
<td>88</td>
</tr>
</tbody>
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