Research Paper :

Trichoderma based granular formulation for control of root diseases of crops

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SUMMARY

Biological control is one of the key components of integrated pest management that envisages the conservation and augmentation of naturally occurring bio-agent such as parasitoids, predators, entomopathogens and antagonistic fungi and bacteria. Biofungicides include in a broader sense fungicides of biological origin *i.e.* botanical and microbial. In the present paper, *Trichoderma viride* based nutrient rich granular formulation developed which can be easily applied in the field, have visible bio-inoculums on granules and have a pretty long viability at room temperature. The nutrient based sago preparation has also been compared with the other base materials.

Key words : *Trichoderma viride*, Root disease, Bio-control, Farmulation

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Use of chemicals in crop production is unavoidable. However, their excessive use is creating health problem due to pollution of air, water and soil, *i.e.*, environment and food product, now under IPM strategies biopesticides and botanical pesticides have emerged as a eco-friendly approach to protect environment for sustainable agriculture and life on the plant (Tiwari, 1995).

Members of the fungal genus *Trichoderma* have been extensively studied particularly due to their ability to acts as bio-control agents and their antagonistic activity. The inappropriate and indiscriminate uses of fungicides and antibiotics have led to serious environmental threat to human life. Growers are using fungicides and antibiotics for the control of various diseases ignoring the persistency of these chemicals.

Besides their non-target effects and hazardous nature, they are becoming more expensive and some are loosing their effectiveness because of development of resistant strains. Thus, there is an all-round compulsion to go in for bio-rational alternative arsenals, which can be eco-friendly and benign to environment. Bio-control agents are the best alternative available today. The antagonistic activity of the bio-control agents has long been recognized as an important factor in the management of soil borne diseases.

There is considerable interest in manipulating the soil microbial community to achieve the biological control of soil borne plant pathogens (Cook and Baker, 1983). Biocontrol is primarily linked to a sustained increase in active propagules of the antagonist. Root rot is the most serious disease caused by *Rhizoctonia solani* and it is soil borne. *Trichoderma* species are widely used for the biological control of *Rhizoctonia solani* infection in root rot of crops and vegetables. They are recommended to use it along with locally available organic material like farmyard manure, neem cake, vermi-compost etc.

MATERIALS AND METHODS

In the present study different base material *i.e.* groundnut cake, mustard cake, neem cake, mahuwa cake, sesame cake, linseed cake, niger cake, saw dust and sago have been tried. The oil cakes and saw dust were crushed in powder from and moistened with water separately. To enrich with nutrient sago granules, were soaked in 1% of yeast, peptone and glucose for 3 minutes. Sago dipped in plain water was maintained as a control.

The saw dust, moist oil cakes and sago 100 gram each were filled in 250 ml conical flasks and plugged with cotton. These flasks were inoculated with 5 discs of 7-10 days of old culture of *Trichoderma viride* maintained on Potato dextrose agar medium. These flasks were prepared for each treatment and incubated for three weeks at $26+2^0$ C. The observations were recorded for growth and

Table 1: Effect of various substrate based on growth and sporulation of *Trichoderma viride*

Sr. No.	Substrate used	Sporulation	Observation
1.	Groundnut cake	+ +	Medium mycelial growth
2.	Mustard cake	-	No mycelial growth
3.	Neem cake	+	Poor mycelial growth
4.	Mahuwa cake	+ +	Medium mycelial growth
5.	Sesame cake	+ +	Medium mycelial growth
6.	Linseed cake	+	Poor mycelial growth
7.	Niger cake	+	Poor mycelial growth
8.	Saw dust	-	No mycelial growth
9.	Sago + Peptone + Yeast + Glucose	+ + + +	Good mycelial growth
10.	Sago water	-	No mycelial growth

++++ Excellent, ++ Good, + Moderate, - Nil

sporulation.

To keep sago granules free, another experiment was conducted. In treatment sago granules were dipped in 1% of yeast, peptone and glucose for 3 minutes and spread over blotter paper then mixed with 1% (w/w) calcium carbonate ($CaCO_{3)}$, calcium sulphate ($CaSO_4$) and saw dust separately and filled in 250 ml conical flask.

RESULTS AND DISCUSSION

Although *Trichoderma viride* based bio-pesticides are being used extensively for the control of soil borne plant pathogen but a major constraint is its application in soil. It is because of this, the biopesticides based formulation are recommended generally for seed treatment (Mukhopadhyay *et al.*, 1992).

Trichoderma is a cellulolytic fungus, its efficacy is considerably reduced in absence of such nutrient base carrier substrate. In the present research work out of ten carrier substrates tried, sago granules dipped in yeast glucose peptone for 3 minutes recorded good mycelial growth with abundant sporulation, followed by mahuwa cake, sesame cake and groundnut cake on which medium mycelial growth and sporulation were recorded in neem cake, linseed cake and niger cake whereas sago water, saw dust and mustard cake did not show any growth and sporulation (Table 1).

All the cakes formed clumps and got contaminated with bacteria and secondary fungi, whereas no growth and sporulation were observed on sago water. This may be due to absence of nutrient base glucose, yeast and peptone which is an essential requirement for spore germination and further colonization of granules.

The three sago treatments *viz*., calcium carbonate ($CaCO_3$), calcium sulphate ($CaSO_4$) and saw dust, the later acts as separating agent (Table 2). Sago dipped in yeast, glucose and peptone mixed with 1% calcium carbonate ($CaCO_3$) supported best growth and sporulation. The granules have been fully covered by mycelium and remained free from each other. The growth and sporulation were medium to good on sago calcium sulphate ($CaSO_4$) and saw dust mixture, respectively.

Table 2 : Growth and sporulation of *Trichoderma viride* on treated sago

Separating medium	Growth and sporulation	Observation
Sago + 1% $CaCo_3$	+ + + + +	Produce free granules
Sago + 1% $CaSO_4$	+ + +	Produce free granules
Sago + 1% saw dust	+	Produce clumps and easily contaminated
Control (Sago alone)	+ + +	Produce small clumps

+++++ Excellent, +++ Good, + Moderate

The formulation can maintain for longer time in soil as sago granules retain moisture for longer duration and secondly under moisture stress the fungus forms chlamydospores on surface of sago granules. As soon as the substrate granules get moisture, the fast growth and abundant spores surround the granules. A successful biocontrol system is one, which is easy and economical to produce, safe, stable in the environment and easily applied during the conventional agricultural practices. One important factor is the formulation in the nutrient status of the support or additives. It is usually necessary for biocontrol agents to proliferate and become established quickly (Tronsmo and Hjelijord, 1998).

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REFERENCES

Cook, D. and Baker, A. (1983). Improved media for isolation of *Trichoderma* spp. or *Fusarium spp.*, *Phytoparasitica*, **11** (1): 55-58.

Mukhopadhyay, A.N., Shretha, S.M. and Mukherjee, P.K. (1992). *FAO Plant Protec. Bull.*, **40**:21-29.

Tronsmo, A. and Hjelijord, L.G. (1998). Biological control with *Trichoderma* species. In: *Plant-microbe interactions and biology control* (Ed. Boland, G.J. and Kuykendall, L.D.) pp: 111-126, Marcel Dekker, New York.

Tiwari, R.K.S. (1995). Comparative evaluation of three systemic fungicides against *sclerotium rolfsi* causing sclerotial root rot in gram and sunflower. *Indian J. Mycol. Pl. Pathol.,* **25** (3) : 243-245.

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