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Talc-Based Formulation of *Trichoderma viride* for Biocontrol of *Macrophomina phaseolina*

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ABSTRACT

A simple formulation of *Trichoderma viride* Pers ex. S.F. Grey for seed pelleting was developed by mixing talc powder with *Trichoderma* biomass obtained by growing the fungus in molasses-yeast medium for 15 days and drying. For effective adherence to the seeds CMC was added @ 0.5% level after drying. This formulation packed in polythene bags yielded 8 x 10^7 colonies/g after 120 days. Seed treatment with this product effectively reduced the root rot diseases of urd bean (*Vigna mungo* (L.) Hepper caused by *Macrophomina phaseolina* (Tassi) Goid. both in the artificially infested soil and natural soil in farmers fields.

KEY WORDS : *Macrophomina phaseolina*, biocontrol, *Trichoderma viride*, talc-based formulation, *Vigna mungo*

The application of *Trichoderma harzianum* Rifai in diatomaceous earth moistened with molasses for the control of *Sclerotium rolfsii* Sacc. was the first successful attempt in biological control (Backman and Rodriguez Kabana, 1975). Subsequently, sand-corn meal (Lewis and Papavizas, 1980), lignite and stillage (Jones *et al.*,1984), wheat bran, peat or combination of these (Howell, 1982; Sivan *et al.*, 1984; Papavizas, 1985) have been developed for delivery of biocontrol agents to soil. However, these methods required large quantities of inoculum of biocontrol agents and make it difficult to adopt in large areas. Elad *et al.* (1982) reported the control of *Rhizoctonia solani* Kuhn in cotton by coating the seeds with a spore suspension of *T. harzianum*. Similar results were reported in the control of seedling blight of cotton (Alagarsamy *et al.*, 1987). As pointed out by Harman (1991), bioprotectant applied as a seed treatment grows on the planted seed, gets transferred to the emerging root, colonises and protects the plant portions. Jeyarajan and Ramakrishnan (1991) and Jeyarajan *et al.* (1991) demonstrated the efficacy of talc-based *Trichoderma* in reducing the root rot diseases in grain legumes and oilseed crops. This paper deals with the efficacy of talc-based *Trichoderma* stored over a period of 120 days and the results of the field demonstrations in farmers fields.

MATERIALS AND METHODS

Trichoderma viride Pers ex. S.F. Grey isolate 6 which was found to inhibit *M. phaseolina in vitro* in this laboratory was multiplied in molasses-yeast medium for 15 days and the biomass along with the medium was incorporated into the different carriers *viz.*, talc, peat, lignite and kaolin @ 50 ml suspension per 100 g. The contents were dried and 500 mg CMC was added and stored in polythene bags. Samples were drawn at periodical intervals and the cfu of *Trichoderma* was assessed by serial dilution technique in *Trichoderma* - selective medium (TSM) (Papavizas and Lumsden, 1982). Talc powder (aluminium silicate ore)-based formulation was used for coating urd bean, *Vigna mungo* (L.) Hepper seeds @ 4 g/kg as dry or slurry treatment. The slurry was prepared by mixing 4 g talc-based formulation in 25 ml of water. The seeds so treated were sown @ 10 seeds per pot in *M. phaseolina* - infested soil.

Five replications were maintained for each treatment. The formulation was tested periodically for its effectiveness against root rot disease. The per cent mortality of the plants was recorded. The formulation was also utilised for seed treatment in several demonstrations in the farmers fields with one ha plot each for seed treatment and control. The per cent root rot was recorded.

RESULTS AND DISCUSSION

The results revealed that *T. viride* population was maintained at the same level during the first 15 days of storage after which there was a gradual reduction in the number of cfu. Even after 120 days of storage, sufficient number of viable colonies of *Trichoderma* was obtained from all the four carriers tested. Talc-based formulation yielded the maximum cfu (Fig.1). However, there was more than 70% reduction in the recovery of *Trichoderma* after 120 days of storage.

Talc-based formulation of *Trichoderma* significantly reduced root rot of urd bean in both the methods of application. The powder formulation of *T. viride* with and without CMC recorded 7.0 and 8.7 per cent root rot respectively when applied as dry seed treatment, while the slurry form recorded 9.0 per cent root rot as against 23.9 per cent in control.

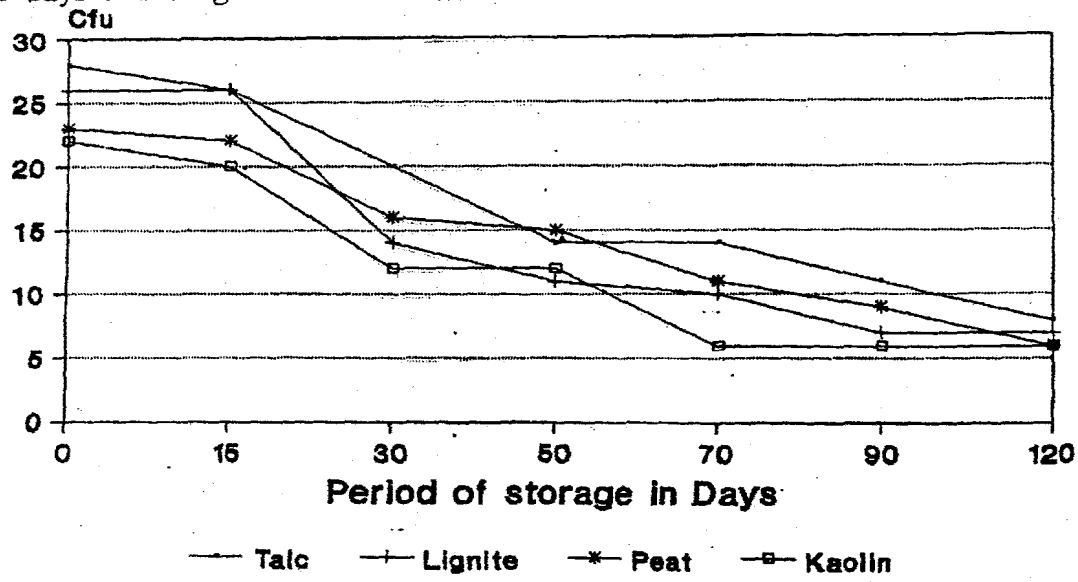

Fig.1 Viability of *Trichoderma viride* in different carriers in storage

Table 1. Incidence of urdbean root rot after seed treatment with *T.viride* formulation at different storage periods

Storage period (days)	Root rot (%)
0	11.3 (19.64)
20	12.4 (20.62)
50	16.7 (24.12)
70	16.1 (23.66)
90	17.6 (24.80)
120	13.1 (21.22)
Untreated	68.9 (56.11)
CD (P = 0.05)	(6.04)

(Figures in parentheses are transformed values)

Results of the experiment on the effect of *T.viride* formulation at different periods of storage indicated that seed treatment with *T.viride* formulation effectively reduced the root rot incidence in urd bean even 120 days after storage. The efficacy of the formulation appeared to be uniform throughout the period (Table 1).

Demonstrations were conducted in farmers' fields in peanut (9), sesamum (10), urd bean (3) and chickpea (7). The results

Table 2. Efficacy of *T. viride* formulation in farmers fields

Crop	% root rot incidence			Yield (kg/ha)		
	T. viride	Control	C.D*	*T. viride*	Control	C.D.*
Groundnut	2.1 (9.67)	9.3 (18.28)	(3.19)	1467	1242	84
Sesamum	4.4 (11.94)	13.7 (21.59)	(2.24)	792	670	78
Urdbean	4.0 (11.52)	12.5 (20.60)	(1.38)	518	418	72
Chickpea	2.5 (9.02)	14.9 (22.07)	(6.38)	655	515	94

(Figures in parentheses are transformed values)
* CD at 5% level

indicated that seed treatment with *T.viride* formulation effectively reduced the root rot disease incidence in all the crops tested. Maximum reduction in disease incidence was observed in chickpea and groundnut. The treatments increased the yield in the crops tested (Table 2).

The talc-based *T. viride* formulation was found to be effective in reducing the root rot incidence. Of the four carriers tested, talc was found to be superior to others. Though there was reduction in the cfu when stored for 120 days, still there was sufficient viable population (8×10^7 cfu/g).

The efficacy of the talc formulation stored for different periods was almost uniform and reduced the root rot disease incidence by more than 50% in artificially infested soil where the population of *M. phaseolina* is expected to be very high. The efficacy of seed treatment in biocontrol of the soil-borne disease throughout the crop growth period can be attributed to the rhizosphere competence of *Trichoderma*. Ahmad and Baker (1985) found 10^6 cfu/g of rhizosphere soil for *T. harzianum*. In chickpea, the population of *T. viride* in rhizosphere soil was 80×10^3/g 75 days after sowing (Selvarajan, 1990). The results clearly indicated that the formulation can be safely stored for 120 days. In field demonstrations in farmers fields also, this formulation reduced the root rot incidence by more than 60 per cent. Peanut, sesamum, urdbean and chickpea are raised as rainfed crops. For these crops chemical control is not effective and economical. Hence biocontrol with this cheap formulation for seed treatment offers good promise.

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