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BIO-EFFICACY OF *TRICHODERMA VIRIDE* IN TALC FORMULATION AGAINST SOIL - BORNE FUNGAL DISEASES OF FCV TOBACCO NURSERIES IN KARNATAKA LIGHT SOILS

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Studies were conducted on the bio-efficacy of *Trichoderma viride* against soil-borne fungal diseases in FCV tobacco nurseries. The experimental results clearly indicated that application of *T. viride* (2 x 10^6 cfu/g) @ 20 g/m^2 (pre-sowing) + *T. viride* (1%) drench (at 25 DAS) was on a par with and *T. viride* (2 x 10^6 cfu/g) @ 30 g/m^2 (pre-sowing) + *T. viride* (1%) drench (at 25 DAS) in significantly reducing the soil-borne fungal diseases *viz.*, damping-off, blight and black shank in FCV tobacco nursery and in subsequently increasing the total healthy transplants count needed for timely planting. The study resulted in development of a schedule involving application of *T. viride* (2 x 10^6 cfu/g) @ 20 g/m^2 (i.e) 2.4 kg/unit nursery (120 m^2) (pre-sowing) + *T. viride* (1%) drench (*i.e)* 1.2 kg/unit nursery (120 m^2) at 25 DAS was an ideal level for the effective and eco-friendly management of soil-borne fungal diseases such as damping-off, blight and black shank in FCV tobacco nursery.

Key words: FCV tobacco, fungal diseases, *Trichoderma viride*

INTRODUCTION

Flue-cured Virginia (FCV) tobacco is grown in Southern Transitional Zone of Karntaka as rainfed commercial crop in *Kharif*. A healthy nursery is pre-requisite for profitable main crop. The nursery phase of the crop suffers heavily due to incidence of soil-borne fungal pathogens. More often the favorable weather factors during March to May coinciding with nursery phase result in disease epiphytotics leading to loss of nursery. Damping- off caused by *Pythium aphanidermatum* (Edson) Fitz:, *P. myriotylum* (Dreschsler) and *Phytophthora parasitica* var. *nicotiane* (Breda de Haan) causing blight and black shank are very important pathogens devastating the nurseries (Shenoi and Nagarajan, 2000). Several chemical and non-chemical methods like soil-solarization were being recommended to manage these diseases (Abdul Wajid *et al.*, 1995). The present study was carried out to study the bio-efficacy of the bio-agent, *Trichoderma viride* in talc formulation and its delivery mechanism to control the diseases effectively and reduce the use of chemical fungicides in the nursery. Several studies were conducted on the effectiveness of *Trichoderma viride* against soil-borne fungal diseases in many crops.

MATERIALS AND METHODS

The trials were conducted during 2011-13 for two seasons in replicated experimentation at CTRI RS, Hunsur. The talc formulation of the bioagent *T. viride was* tested as pre-sowing either singly or together with 1% foliar drench at 25 DAS at 10-30 g/m^2. The spore load at the time of application was recorded to be 2 x 10^6 cfu/g. The study was done in one m^2 nursery replicated thrice. The soil drench and foliar drench of the formulation was done with rose can @ 10 l/m^2. Germination counts were recorded at 15 DAS and observations were noted at regular intervals on damping-off, blight and black shank diseases. Healthy transplants were counted periodically and finally pooled to express the total healthy transplant yield. The pooled data from the two years study were analyzed statistically.

RESULTS AND DISCUSSION

The pooled results indicated better efficacy of the *T. viride* (2 x 10^6 cfu/g) applied to the nursery as soil drench @ 20 g/m^2 followed by 1% foliar drench as an economical schedule for the control of soil-borne fungal diseases in FCV tobacco nursery (Table 1). There was no adverse effect of *T. viride* on tobacco seed germination in nursery beds. No phyto-toxicity was noticed even when *T. viride* was applied as drench. At 30 DAS, *T. viride*

Table 1: Evaluation of *Trichoderma viride* (2 x 10^6 cfu/g) against soil borne fungal diseases in FCV tobacco nursery (Pooled)

S.No.	Treatments details	Average germination at 15 DAS	Damping off at 30 DAS (%)		Damping off + Blight at 45 DAS (%)		Black shank (%)		Transplants count at 60 DAS		Total healthy transplants count	
			1	2	1	2	1	2	1	2	1	2
1.	*T. viride* (2 x 10^6 cfu/g) @10 g/m^2 (pre-sowing) + *T. viride* (1%) drench (at 25 DAS)	23.8	10.5 (18.9)	48.5	10.6 (18.9)	56.6	9.6 (17.9)	48.9	324.0	10.8	602.3	10.0
2.	Jai V Jai- *T. viride* (2 x 10^6 cfu/g) @20 g/m^2 (pre-sowing) + *T. viride* (1%) drench (at 25 DAS)	23.5	6.8 (14.9)	66.6	8.6 (16.9)	65.0	7.9 (16.1)	57.9	479.0	63.8	846.3	54.0
3.	*T. viride* (2 x 10^6 cfu/g) @30g/m^2 (pre-sowing) + *T. viride* (1%) drench (at 25 DAS)	24.1	6.3 (14.5)	69.1	7.7 (15.6)	68.6	8.6 (16.9)	54.2	491.3	67.9	858.6	56.8
4.	*T. viride* (2 x 10^6 cfu/g) @ 10 g/m^2 alone	24.6	13.1 (21.1)	35.7	11.2 (19.3)	54.3	13.3 (21.3)	29.2	328.1	12.3	618.6	12.9
5.	*T. viride* (2 x 10^6 cfu/g) @ 20g/m^2 alone	24.5	10.5 (18.9)	48.5	10.9 (19.0)	55.6	13.4 (21.4)	28.7	402.5	37.7	640.6	17.0
6.	*T. viride* (2 x 10^6 cfu/g) @ 30g/m^2 alone	23.8	11.8 (20.1)	42.1	13.0 (21.0)	47.1	13.5 (21.5)	28.1	366.0	25.2	635.5	16.0
7.	*T. viride* (2 x 10^6 cfu/g) (1%) drench (pre-sowing)	24.4	11.9 (20.1)	41.6	11.1 (19.0)	54.9	14.2 (21.5)	24.4	357.0	22.1	646.8	18.1
8.	*T . viride* (2 x 10^6 cfu/g) (1%) drench (pre-sowing) + *T. viride* (1%) drench (at 25 DAS)	25.8	10.7 (19.0)	47.5	11.2 (19.3)	54.5	13.6 (21.5)	27.6	386.5	32.2	638.5	16.6
9	Control (Untreated)	24.9	20.4 (26.7)	-	24.6 (29.7)	-	18.8 (25.7)	-	292.3	-	547.5	-
	SEm±	**0.90**	**0.26**		**0.82**		**0.29**		**2.53**		**5.59**	
	CD (P=0.05)	**NS**	**0.73**		**2.29**		**0.81**		**7.02**		**15.6**	
	CV (%)	**5.1**	**5.7**		**16.6**		**5.5**		**1.6**		**1.6**	

* Figures in parenthesis are arc sin transformed values; 1= Original mean; 2= % control over check

@30 g/m^2 (pre-sowing) + *T. viride* (1%) drench (at 25 DAS) was found to be the best in recording least disease incidence of 6.3% and was on a par with *T. viride* @ 20 g/m^2 (pre-sowing) + *T. viride* (1%) drench (at 25 DAS), which recorded the reduced disease incidence of 6.8% as compared to 20.4% in untreated check. Disease control in *T. viride* treated nursery beds ranged from 35.7 to 69.1%.

At 45 DAS, *T. viride* @20 g/m^2 (pre-sowing) + *T. viride* (1%) drench (at 25 DAS) was on par with *T. viride* @30 g/m^2 (pre-sowing) + *T.viride* (1%) drench (at 25 DAS) in recording significantly reduced disease incidence of 8.6 and 7.7%, respectively as compared to 24.6% in untreated check. The disease suppression due to application of *T. viride* in FCV tobacco nursery beds ranged from 47.1 to 68.6% compared to check. *T. viride* effected significant decrease in black shank disease incidence in treated FCV tobacco nursery beds ranging from 24.4 to 57.9% as compared to untreated check. *T. viride* @ 20 g/m^2 (pre-sowing) + *T. viride* (1%) drench (at 25 DAS) caused maximum suppression of black shank incidence by recording significantly reduced disease incidence of 7.9% compared to 18.8% in untreated check. In tune with the present results obtained, Susheela and Sarma (2009) reported that neem cake supplement with *Trichoderma* suppressed *Phytophthora* infection in cardamom to the tune of 69%. At 60 DAS, *T. viride* @ 20 g/m^2 (pre-sowing) + *T. viride* (1%) drench (at 25 DAS) and *T. viride* @ 30 g/m^2 (pre-sowing) + *T. viride* (1%) drench (at 25 DAS) were on par with each other in recording significantly increased disease free and healthy seedlings count of 479/m^2 and 491.3/m^2, respectively as compared to 292.3 seedling/m^2 in untreated check beds. Increase in FCV tobacco transplants count due to application of *T. viride* ranged from 10.8 to 67.9% over check. With regards to total healthy transplants count, *T. viride* @30g / m^2 (pre-sowing) + *T. viride* (1%) drench (at 25 DAS) recorded maximum healthy transplants count of 843.3/m^2 and was on a par with *T. viride* @ 20 g /m^2 (pre-sowing) + *T. viride* (1%) drench (at 25 DAS), which recorded significantly increased healthy and disease free transplants count of 858.6/m^2 compared to 547.5 seedlings/m^2 in check. Increase in healthy transplants count in FCV tobacco nursery beds due to application of

Table 2: Economics *of Trichoderma viride* application in FCV tobacco nurseries

S.N	Inputs/operations	Conventional nursery (Rs)	*Trichoderma viride* (2 x 10^6 cfu/g) @20 g / m^2 (pre-sowing) + *T.viride* (1%) drench (at 25 DAS) (Rs)
1	Cost of nursery preparation, seed sowing, watering and fertilization	1800	1800
2	Cost of Farm yard manure (FYM)	500	500
3	Cost of weeding	900	900
4	Cost of bioagent inputs	-	800
5	Total cost	3200	4000
6	Additional cost over check		800
7	Yield of healthy transplants	54800	84600
8	Number of excess transplants over check		29800
9	Amount realized from transplants (@ Rs. 150 per 1000 transplants)	8220	12690
10	Amount realized from sale of additional transplants	-	4470
11	Net returns from the nursery over check	-	3970
12	ICBR of the schedule	-	1:4.6

the bio-agent, *T. viride* in talc formulation ranged from 10.0 to 56.8% respectively over untreated check. Such increase in seedling growth characteristics and decrease in soil-borne fungal infections might also be due to release of certain antibiotic substances by bio-control agents which are inimical to pathogenic fungi (Agrios, 1997). Bhat *et al.* (2003) also, reported similar effect of *Trichoderma* spp. on chickpea wilt.

Hence, it is concluded that, application of *Trichoderma viride* (2 x 10^6 cfu/g) @ 20 g/m^2 (i.e) 2.4 kg/unit nursery (120 m^2) (pre-sowing) + *T. viride* (1%) drench (ie) 1.2 kg/unit nursery (120 m^2) (at 25 DAS) is an ideal level for the effective and eco-friendly management of soil borne fungal diseases such as damping-off, blight and black shank in FCV tobacco nursery. The schedule resulted in an ICBR of 1:4.6 (Table 2).

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