Development of a management strategy against stem weevil and root rot complex in cotton

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ABSTRACT

The effect of neem cake, insecticides and *Trichoderma viride* on the infestation of stem weevil *Pempherulus affinis* (Faust) and incidence of dry root rot *Macrophomina phaseolina* (Tassi) Goid of cotton was studied. Seed treatment (10 ml/kg) and spray drench with chlorpyriphos 20 EC @ 2.5 ml/lit (15, 30, 45, 60 days after sowing -DAS) combined with soil application of *Trichoderma viride* (2.5 kg/ha) on 20 DAS were found to be effective in registering the minimum infestation of stem weevil and root rot and maximum seed cotton yield.

Key words: Cotton, *Pempherulus affinis*, *Macrophomina phaseolina*

INTRODUCTION

Of the economically important insect species, next to bollworms (*Earias* spp, *Helicoverpa armigera*, *Pectinophora gossypiella*), the cotton stem weevil, *Pempherulus affinis* Faust. has been reported as a major pest in South India (Chandramani *et.al.*, 2006). Periodical observations in cotton fields in the country have indicated that the dry root rot as a major disease which infect the crop at seedling stage or after wood (stem) formation. (Rajendran and Jain, 2004). In Tamil Nadu, occurrence of seedling diseases is noticed on a wide scale causing heavy mortality (Suriachandraselvan *et.al.*,2002). Control of root rot with chemicals, host resistance, cultural practices and bio-control agents has been attempted by several workers (Lambhate *et.al.*, 2002; Suriachandraselvan and Ayyanathan 1998; Suriachandraselvan *et al.*,2004; Subramanian *et al.*,2005; Anonymous, 2008). Earlier findings showed that the talc based formulation of *Trichoderma viride* seed treatment was effective against root rot caused by *Macrophomia phaseolina* (Jeyarajan and Ramakrishnan, 1995).

Recently, it is being observed that stem weevil infestation predisposes the infection of *M. phaseolina* and the combined infection accelerate the death of the plants aggressively. The conventional chemical management of cotton diseases involves inherent hazardous effects such as environmental pollution, residual toxicity, development of resistance to the chemical by the pathogens (Mahalaxmi Kumari *et.al.*,2008) , deleterious effects on the ecosystem especially pesticide residues in food we eat, water we drink, air we breathe and shelter we live (David,2008) . Efforts have to be made to use some environment – friendly methods. Hence, this study was made with an objective of evaluating the effect of insecticides and *Trichoderma viride* on the management of stem weevil and dry root rot complex of cotton.

MATERIALS AND METHODS

The experiments were formulated in Randomized Block Design with 10 treatments replicated thrice using the cultivar SVPR 2. The plot size was 20 m^2. Field experiments were conducted in summer season (February –August) of 2005 and 2006 under irrigated conditions. The recommended quantity of neem cake (@ 250 kg /ha) was incorporated in soil after forming ridges and furrows. Soil application of *T.viride* with required quantity was done just before sowing. The acid delinted seeds were used for the experiments. To treat one kg of seed, 0.5 g of *Acacia* gum powder and 20 ml of water were used. Gum was dissolved in water and mixed with the stipulated quantity of insecticides / plant products / antagonistic organisms. The seeds were thoroughly mixed with gum + insecticide mixture, dried under shade and kept for 24 hours before sowing. Untreated acid delinted seeds served as

Table 1. Management of stem weevil and root rot complex using neem products, insecticides and *Trichoderma viride*

Treatments	Germination (%)			Root rot (%)			Stem weevil (%)		
	2005	2006	Mean	2005	2006	Mean	2005	2006	Mean
T_1 - SA of neem cake (250 Kg/ha) + neem oil (1%) drench (20, 30 DAS) + earthing up (45 DAS)	72.5 (58.41)	62.5 (52.33)	67.5(55.37)	12.5 (20.42)	16.0 (23.55)	14.25(21.98)	61.2 (51.50)	48.4 (44.06)	54.8(47.78)
T_2 - T_1+ *T. viride* ST (4 g/kg) and SA (2.5 kg/ha) (20 DAS)	89.8 (72.55)	86.1(68.45)	87.95(70.5)	5.3 (12.67)	9.2 (17.56)	7.3(15.1)	53.5 (47.03)	46.0 (42.72)	49.75(44.88)
T_3 - T_1 + carbendazim ST (2 g/kg) and spray drench (0.05%) (45,60, 75 DAS)	76.4 (61.47)	76.7 (61.15)	76.55(61.31)	8.7 (17.00)	10.1 (18.38)	9.4(17.7)	59.6 (50.56)	48.2 (44.27)	53.9(47.42)
T_4 - Imidacloprid ST (10 ml/kg) and spray drench (0.2 ml/lit) (15,30,45, 60 DAS)	89.8 (71.40)	81.7 (65.07)	85.75(68.24)	6.2(14.26)	8.3 (16.69)	7.3(15.5)	67.9 (55.49)	65.2 (53.90)	66.55(54.70)
T_5 - T_4+ SA of *T. viride* (20 DAS)	88.5 (70.21)	82.7 (65.63)	85.6(67.92)	4.7 (14.26)	6.9 (14.98)	5.8(14.6)	67.4 (55.23)	53.3 (45.88)	60.35(50.56)
T_6 - T_4+ carbendazim spray drench (45,60, 75 DAS)	87.6 (69.62)	80.2 (63.58)	83.9(66.6)	6.4 (14.49)	7.6 (15.71)	7.0(15.1)	66.2 (54.46)	51.4 (45.82)	58.8(50.14)
T_7 - Chlorpyriphos ST (25 ml/kg) and spray drench (2.5 ml/lit) (15,30,45, 60 DAS)	76.9 (61.58)	82.5 (65.27)	79.7(63.43)	2.8 (9.09)	8.8 (17.13)	5.8(13.1)	54.4 (47.55)	46.5 (40.76)	50.45(44.16)
T_8 - T_7 + SA of *T. viride* (20 DAS)	78.2 (62.38)	80.9 (64.77)	79.55(63.58)	1.3 (6.63)	5.1 (12.93)	3.2(9.8)	44.4 (41.75)	36.7 (37.30)	40.55(39.53)
T_9 - T_7+carbendazim spray drench (45, 60, 75 DAS)	74.7 (59.82)	81.3 (64.49)	78.00(62.16)	1.5 (6.95)	6.9 (15.16)	4.2(11.1)	50.8 (45.48)	45.6 (42.45)	48.2(43.97)
T_{10} - Untreated control	64.9 (53.67)	61.3 (51.57)	63.1(52.62)	14.9 (22.45)	18.8 (25.69)	16.9(24.1)	74.2 (59.46)	68.2 (55.81)	71.2(57.64)
C.D (p=0.05)	8.23	8.15		3.81	3.81		3.25	4.58	

Figures in parentheses are arc sin transformed values

experimental control. The seed germination was assessed seven days after sowing and expressed as percentage. The incidence of root rot and stem weevil was recorded and expressed in percentage. Seed cotton yield were recorded at harvest.

RESULTS AND DISCUSSION

The results of the field experiments are presented in tables 1 and 2. The over all mean values indicated that the minimum stem weevil incidence of 40.55% was recorded in the treatment comprising of ST (10 ml/kg) and spray drench (2.5 ml/lit) with chlorpyriphos (15, 30, 45, 60 DAS) plus soil application of *T. viride* (2.5 kg/ha) on 20 DAS as against the maximum of 71.20 per cent in control (Table 1). The treatment comprising of ST (10 ml/kg) and spray drench (2.5 ml/lit) with chlorpyriphos (15, 30, 45, 60 DAS) plus soil application of *T. viride* (2.5 kg/ha) on 20 DAS was the most effective in reducing the root rot incidence to a minimum of 3.2 per cent as against the maximum of 16.9 per cent in the control (Table 1). The observation on reduction in stem weevil and root rot incidence and increased yield in T_8 suggested that the *Trichoderma viride* and chlorpyriphos may have important role in the management of stem weevil and root rot complex. One possible scenario is that a natural extract incorporated with other management strategies may be used for the management of stem weevil and root rot complex in cotton. Saxena and Saxena (1995) have also reported that seed coating and soil application of *T.viride* was significantly effective in controlling root rot up to 96 per cent in chick pea. Studies by Mukhopadhyay (1989) have proved that biological seed treatment in peanut with *T.harzianum* resulted in excellent protection against *Rhizoctonia solani* and *Sclerotium rolfsii* and the treatments were consistently as effective as or better than the fungicidal treatment. Effective control of root rot of ground nut with seed treatment + soil application of *T.hamatum* has been reported by Vimala *et al.*, (2001). Report on the

Table 2. Effect of neem products, insecticides and *Trichoderma viride* on cotton seed yield (kg/ha) and cost benefit ratio (CB)

Treatments	Cotton seed yield			CB	
	2005	2006	Mean	2005	2006
T_1 - SA of neem cake (250 Kg/ha) + neem oil (1%) drench (20, 30 DAS) + earthing up (45 DAS)	1748	955	1352	0.92	0.79
T_2 - T_1+ *T. viride* ST (4 g/kg) and SA (2.5 kg/ha) (20 DAS)	1911	1037	1474	1.69	1.99
T_3 - T_1 + carbendazim ST (2 g/kg) and spray drench (0.05%) (45,60, 75 DAS)	1768	958	1363	0.95	0.82
T_4 - Imidacloprid ST (10 ml/kg) and spray drench (0.2 ml/lit) (15,30,45, 60 DAS)	1906	998	1452	1.45	0.93
T_5 - T_4+ SA of *T. viride* (20 DAS)	2035	1196	1616	2.19	2.51
T_6 - T_4+ carbendazim spray drench (45,60, 75 DAS)	1942	1101	1522	1.93	2.51
T_7 - Chlorpyriphos ST (25 ml/kg) and spray drench (2.5 ml/lit) (15,30,45, 60 DAS)	2084	1318	1701	2.83	3.07
T_8 - T_7 + SA of *T. viride* (20 DAS)	2222	1477	1850	3.42	4.11
T_9 - T_7+carbendazim spray drench (45, 60, 75 DAS)	2123	1408	1766	3.06	3.89
T_{10} - Untreated control	1680	892	1286	—	—
C.D (p=0.05)	202	132	—	—	—

effectiveness of Chlorpyriphos for the management of stem weevil of cotton (Anonymous, 2007) is also available. Further, research in this area has the potential to extent the usefulness of any natural plant products and other bio pesticides in crop production system particularly in the case of cotton crop.

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