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Field Efficacy of Insecticides and Fungicides against Stem Fly and Root Rot Complex in Greengram

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Pulses are severely affected by the stem fly, *Ophiomyia phaseoli* Tryon (Agromyzidae: Diptera). The attack by stem fly is two- pronged as stem fly attack is subsequently followed by root rot incidence causing heavier yield losses. Experiments in greengram (CO6) to check either of the problem,separately resulted in unsatisfactory control and hence seed treatment with insecticides and fungicides was used in combination to check the insect and disease complex. Seed treatment with carbosulfan in combination with *Trichoderma viride* recorded the least stem fly damage of 9.6 per cent during *Kharif,* 2005 and 9.3 per cent during *Rabi,* 2006 while the control registered a damage of 40.2 and 41.0 per cent, respectively. Similarly, seed treatment with carbendazim and combinations involving *T. viride* showed lesser root rot incidence during both seasons (34 to 49%) compared to control (71.4 and 67.8 % during *Kharif* and *Rabi,* respectively). The seed treatment involving *T. viride* along with carbosulfan and carbendazim successfully checked the combined incidence of stem fly -root rot complex. Thus the above insecticidal and fungicidal combination may be recommended in IPM programmes to effectively check stem fly - root rot complex in greengram.

Key words: Greengram, stem fly-root rot complex, combined seed treatment

India contributes to 26 per cent of the global production of pulses and is a major grower of pulses in the world. Nevertheless, India was forced to import pulses to the tune of 2 million tonnes every year to meet its domestic requirement (Bhuvaneswari, 2001). Among the pulses grown in Tamil Nadu, the major ones are pigeonpea, greengram and blackgram. Of these crops, greengram occupies 31.4 per cent of the total area under pulse cultivation and has an annual production of 0.53 lakh tonnes (SCR, 2004). It is mostly cultivated as a rainfed crop or as an intercrop with cotton, maize and millets or as a rice fallow crop.

The yield of greengram is comparatively low due to biotic and abiotic stresses. Among the biotic factors, insect pests like gram pod borer, *Helicoverpa armigera* Hubner, tobacco cut worm, *Spodoptera litura* Fab., spotted pod borer, *Maruca vitrata* Geyer, blue butterfly, *Lampiedes boeticus* Linnaeus, cowpea aphid, *Aphis craccivora* Koch, whitefly, *Bemisia tabaci* Gennadius, blister beetle, *Mylabris* spp. cause considerable loss. However, in recent years the attack of stem fly has been noticed in severe form in greengram. It was also observed that stem fly damage occurs along with root rot disease as pest and disease complex. The stem fly, *Ophiomyia phaseoli* Tryon (Agromyzidae: Diptera) has a wider host range including blackgram, *Vigna mungo,* greengram, *Vigna radiata,* common bean red gram, *Cajanus cajan Phaseolus* spp., cowpea, *Vigna unguiculata,* pea, *Pisum sativum,* soybean, *Glycine max* and bhendi, *Abelmoschus esculentus* in various parts of India.

Severe yield loss caused by the stem fly, *O. phaseoli* had been reported by many workers all over the world. Kapoor *et al* (1973) reported a yield loss of 15.8 to 47.5 per cent in *Rabi* and up to 96 per cent in *Kharif sown* soybean in India and up to 100 per cent infestation in greengram in Malaysia (Ooi, 1973). Seed treatment with phorate (Bindra and Singh, 1969), disyston (Jotwani and Butani, 1977), carbofuran (Sinha *et al.,* 1993) and dimethoate (Chander and Singh, 1991) had been effective in controlling stem fly incidence at early stages. Foliar sprays with dimethoate (0.03%), endosulfan (0.07%), monocrotophos (0.04%) have also been reported as effective by Jotwani and Butani (1977), Krishnamoorthy and Tewari (1987) and Srivastava and Sehgal (2002). As the stem fly attack is succeeded by root rot incidence, carbaryl @ 1 kg a.i./ha (Saxena *et al.,* 1972), carbofuran @ 1 kg a.i./ ha (Chaudhary *et al.,* 1981) and phorate @ 1 kg a.i./ ha (Brar *et al.,* 1993) have also been applied to the soil to check the disease incidence. However, studies pertaining to stem fly and root rot complex in greengram are meagre. The present paper focuses on the various means of controlling stem fly-root rot complex in greengram with the help of insecticide-fungicide combination.

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Materials and Methods

Field trials with the greengram variety CO 6 were conducted at the Department of Pulses, Tamil Nadu Agricultural University, Coimbatore during *Kharif* 2005 and *Rabi* 2006 seasons. Seed treatment was resorted to with 11 treatments (Table 1) including insecticides, fungicides and their combinations with three replications. The experiment was conducted in a randomized block design in plots of size 5 X 4 m^2. All the recommended agronomic practices were followed for raising the crop.

The stem fly, root rot damage and stem fly- root rot complex was observed from 100 plants removed randomly from each replication. The stem fly/ root rot/ stem fly-root rot complex infestations were assessed on 15th and 30th days after sowing (DAS) and the per cent stem fly damage was worked out using the following formula.

$$\text{Per cent stem fly/ root rot/ stem fly-root rot complex} = \frac{\text{No. of plants with stem fly/ root rot/ stem fly- root rot complex symptoms}}{\text{Total no. of plants observed}} \times 100$$

The observation on 15th and 30th DAS were pooled to obtain the mean per cent damage of stem fly, root rot and stem fly- root rot complex for *Kharif* 2005 and *Rabi* 2006 seasons.

Statistical analysis of data was carried out as described by Panse and Sukhatme (1967) using AGRES package. The percentages were subjected to arcsine transformation.

Results and Discussion

Data on stem fly, root rot and their combined incidence during *Kharif* 2005 and *Rabi* 2006 are presented in Table 1. During *Kharif* 2005 the incidence of stem fly was the lowest in dimethoate + *T. viride* seed treatment (7.7%) and was on par with carbosulfan + carbendazim (8.4%) and dimethoate + carbendazim (9.4%) while the untreated check registered a stem fly incidence of 40.2 per cent. During *Rabi* 2006 also seed treatment with carbosulfan + carbendazim proved its superiority with 5.3 per cent incidence and was on par with dimethoate + carbendazim (5.9%) and dimethoate + *T. viride* (6.5%) with the highest incidence of 41.0 per cent in untreated control. The efficacy of dimethoate in checking stem fly damage finds support from the findings of Chander and Singh (1991).

With respect to root rot incidence, seed treatment with carbendazim alone was found to be superior over other treatments both during *Kharif,* 2005 (34.6%) and *Rabi* 2006 (32.2%) while the control

Table 1. Effect of seed treatment on stem fly, root rot and stem fly - root rot complex on greengram

Treatment	Stem fly incidence (%)		Root rot incidence (%)		Stem fly - root rot complex(%)	
	Kharif 2005	*Rabi* 2006	*Kharif* 2005	*Rabi* 2006	*Kharif* 2005	*Rabi* 2006
Dimethoate 30 EC 5 ml/kg	9.5 (17.9)a	11.7 (20.0)b	72.6 (58.4)c	54.4 (47.5)bcd	7.3 (15.7)c	11.3 (19.6)c
Carbosulfan 200 SL 2 ml/kg	10.6 (19.0)ab	10.8 (19.2)b	72.3 (58.2)c	69.5 (56.4)e	5.8 (13.9)ab	7.8 (16.2)b
Carbendazim 50 WP 2 g/kg	33.9 (35.6)d	35.9 (36.8)d	34.6 (36.0)a	32.2 (34.6)a	8.2 (16.6)cd	11.4 (19.7)c
Trichoderma viride 4 g/kg	37.4 (37.7)de	35.6 (36.6)d	39.5 (39.0)ab	42.7 (40.8)ab	22.4 (28.2)g	28.8 (32.4)e
Pseudomonas fluorescens 1 0 g/kg	33.5 (35.4)d	32.5 (34.8)d	46.2 (42.8)ab	48.1 (43.9)bc	26.7 (31.1)h	34.8 (36.1)f
Dimethoate + Carbendazim 5ml + 2g	9.4 (17.9)a	5.9 (14.1)a	34.2 (35.8)a	45.1 (42.2)ab	6.9 (15.2)bc	6.9 (15.3)ab
Dimethoate + *T. viride* 5ml + 4g	7.7 (16.1)a	6.5 (14.8)a	42.9 (40.9)ab	46.8 (43.1)bc	8.8 (17.3)d	10.6 (19.0)c
Dimethoate + *P. fluorescens* 5ml +10 g	13.0 (21.1)b	11.0 (19.4)b	46.4 (43.0)ab	49.7 (44.8)bc	13.6 (21.6)e	16.3 (23.8)d
Carbosulfan + Carbendazim 2ml + 2g	8.4 (16.8)a	5.3 (13.3)a	36.3 (37.1)ab	49.1 (44.5)bc	4.8 (12.7)a	4.8 (12.7)a
Carbosulfan + 7! *viride* 2ml + 4g	9.6 (18.1)a	9.3 (17.8)b	43.7 (41.4)ab	45.9 (42.7)ab	5.8 (13.9)ab	7.5 (15.9)b
Carbosulfan + *P. fluorescens* 2ml +10 g	22.4 (28.3)c	19.7 (26.4)c	50.1 (45.1)b	61.2 (51.4)cde	15.7 (23.3)f	19.3 (26.0)d
Untreated check	40.2 (39.4)e	41.0 (39.8)e	71.4 (57.7)c	67.8 (55.4)de	39.1 (38.7)i	52.7 (46.5)g
	**	**	**	**	**	**
LSD (P=0.05)	2.98	2.73	8.80	8.46	1.50	2.67
CV (%)	6.98	6.62	11.63	10.95	4.28	6.70

Values in parantheses are arcsine transformed values

In a column means followed by the same letter are not significantly different (P=0.05) by LSD

**Significant at 1 per cent level

exhibited a root rot incidence of 71.4 and 67.8 per cent during *Kharif* 2005 and *Rabi* 2006, respectively. However, seed treatment with *T. viride, P. fluorescens,* dimethoate + carbendazim and carbendazim + *T. viride* exhibited considerable efficacy against root rot incidence. Ramadoss and Sivaprakasam (1993) also opined that seed treatment with carbendazim was effective in controlling root rot incidence. Sinha and Khare (1977) reported that carbendazim when used for seed treatment gave good control of root rot in cowpea. The efficacy of *T: viride* as a seed treatment agent in pulses was reported by Ramakrishnan *et al.* (1994), Raguchander *et al.* (1995) and Adekunle *et al.* (2001).

Under conditions of combined incidence of stem fly and root rot, seed treatment with carbosulfan + carbendazim proved to be the most efficient with a combined incidence of 4.8 per cent during both the seasons, while the control registered 32.1 and 52.7 per cent combined incidence, respectively. The above findings suggested that carbosulfan + carbendazim seed treatment can be effective in checking the incidence of stem fly-root rot complex. As these chemicals are being used as seed dressers they provide additional protection against sucking pests like jassids, whiteflies and aphids, which are major problems in the early stages of greengram.

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