

CONTROL OF ROOT ROT (*Macrophomina phaseolina* (TASSI) GOID.) AND STEM FLY (*Ophiomyia phaseoli* TRYON) ON COWPEA

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Efficacy of soil application of three fungicides viz., carbendazim 0.1 per cent, quintozene 0.1 per cent and TMTD 0.2 per cent and two granular insecticides viz., aldicarb and carbofuran 1.0 kg. a.i. per ha on the control of root rot under laboratory, pot culture and field conditions was assessed. Soil application with carbendazim 0.1 per cent and quintozene 0.1 per cent were effective in controlling root rot disease followed by TMTD 0.2 per cent. But the granular insecticides did not significantly affect the disease incidence in comparison with fungicides. Carbofuran and aldicarb at 1.0 Kg. a.i. per ha and their combinations with carbendazim, quintozene and TMTD were effective in reducing the stem fly incidence.

The use of fungicides and insecticides has become part of routine cultivation practices in agriculture. Though fungicides are applied to control pathogens they may also affect pests. Similarly certain insecticides when applied to soil inhibit soil borne pathogens (Hayman and Dingman, 1967; *et al.*, 1977; Mukhopadhyay and Thakur, 1977).

Root rot (*M. phaseolina*) and stem fly (*O. phaseoli*) are of great importance in Tamil Nadu since they cause considerable damage to cowpea. In our country not much work has been carried out on the interaction of fungicides and insecticides on pests and diseases. This aspect can be considered to be of great importance since useful pesticides can be included in integrated plant protection measures. Studies undertaken on the efficacy of soil application of fungicides and granular insecticides on the control of root rot and stem fly are presented in this paper.

MATERIALS AND METHODS

Efficacy of fungicides and insecticides on the incidence of root rot in the laboratory

Efficacy of fungicides and insecticides on the incidence of root rot was assessed under laboratory conditions. Small plastic cups, 6 x 7 x 4.8 cm. were filled with 100 g of sterilised soil and inoculated with sclerotia of *M. phaseolina* at the rate of 500 mg per kg. of soil. Healthy seeds of C 152 were raised by direct sowing. Each treatment was replicated thrice. Each cup containing five seedlings was considered as a replication. Granular formulations were applied at one g per cup at the time of sowing avoiding direct contact with the seed. The fungicides viz., carbendazim 0.1 per cent, quintozene 0.1 per cent and TMTD 0.2 per cent were applied gradually as soil drenching at 100 ml per cup. The cups were placed over a water bath which was adjusted to

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maintain a soil temperature of 35° C and water holding capacity of 40 per cent. After 15 days, the incidence on seedling rot was recorded in percentage.

Pot culture experiment

Pots were filled up with a soil mixture of uniform composition of nutrients. Healthy seeds of C 152 were raised by direct sowing. Each treatment was replicated thrice. Each pot containing five plants was considered as a replication. Granular formulations were applied at one g per pot at the time of sowing avoiding direct contact with the seed. The fungicides viz., carbendazim 0.1 per cent, quitozene 0.1 per cent and TMTD 0.2 per cent were applied as soil drenching at 100 ml per plant 30 days after sowing. The plants were inoculated with 8 mm mycelial discs of two numbers per plant just 24 hrs prior to soil drenching with the fungicides.

Field experiment

The experiment under field conditions with 12 treatments including control replicated thrice was conducted under natural conditions of infection. Healthy seeds of C152 were sown at the rate of 20Kg per ha with a spacing of 45x15cm and the plants were thinned to 2 per hill after seven days. The plot size was 5 x 2m. Granular insecticides viz.aldicarb and carbofuran were applied each at 1.0 kg per a i. ha at the time of sowing. The fungicides viz, carbendazim 0.1 per cent, quitozene 0.1 per cent and TMTD 0.1 per cent were applied as soil drenching at 100 ml per hill after 30 days of sowing. Observa-

tions on the root rot and stem fly incidence were taken on the entire populations.

RESULTS AND DISCUSSION

Carbendazim, quitozene and TMTD were highly effective in the control of root rot in the laboratory, the per cent reduction over control being 100, 100 and 84.62 respectively. Between the two insecticides tested, carbofuran had a better effect on the control of root rot than aldicarb. But its influence was not comparable to of fungicides. The insecticide carbofuran was compatible with either carbendazim or TMTD in the control of root rot disease, but not with quitozene. The combination effect of aldicarb with the three fungicides tested was significantly inferior to that of carbofuran (Table 1).

When the experiment was repeated under pot culture conditions, no incidence of root rot was observed in the carbendazim, quitozene and TMTD treatments indicating their superiority in the disease control (Table 2). A similar trend on the efficacy of carbendazim, quitozene and TMTD on the control of root rot disease was observed in the field trial also. Stem fly infestation was less in the plots treated with carbendazim+aldicarb, carbofuran, Carbendazim+Carbofuran, aldicarb,TMTD +Carbofuran, TMTD + aldicarb, quitozene +Carbofuran and quitozene+aldicarb. Quitozene+aldicarb, quitozene + carbofuran and TMTD + Carbofuran recorded higher yields of 693.33 668.33 and 621.67g as against 617.33 g per plot in the control (Table 3).

Among the different fungicides and insecticides tested as soil applica-

Table 1. Effect of fungicides and insecticides on the incidence of root rot in the laboratory.

Sl. No	Treatment	Incidence %	% reduction over control
1.	Carbendazim	0.00 (0.71)	100.00
2.	Carbendazim + Aldicarb	26.67 (5.41)	69.23
3.	Carbendazim + Carbofuran	6.67 (1.98)	92.90
4.	Quintozene	0.00 (0.71)	100.00
5.	Quintozene + Aldicarb	60.00 (7.70)	30.77
6.	Quintozene + Carbofuran	20.00 (4.53)	76.92
7.	TMTD	13.33 (2.59)	84.62
8.	TMTD + Aldicarb	53.33 (7.23)	38.47
9.	TMTD + Carbofuran	13.33 (3.26)	84.62
10.	Aldicarb	73.33 (8.57)	15.39
11.	Carbofuran	33.33 (5.75)	61.54
12.	Control	86.67 (9.32)	

(Figures in parentheses represent transformed values)

C. D. (P=0.05) 2.59

Table-2. Effect of fungicides and insecticides on root-rot incidence under pot culture conditions*

Sl. No.	Treatment	Root-rot	
		Incidence %	% reduction over control
1.	Carbendazim	0.00 (0.71)	100.00
2.	Carbendazim + Aldicarb	26.67 (5.16)	71.42
3.	Carbendazim + Carbofuran	33.33 (5.75)	64.29
4.	Quintozene	0.00 (0.71)	100.00
5.	Quintozene + Aldicarb	60.00 (7.70)	35.71
6.	Quintozene + Carbofuran	46.67 (6.83)	49.99
7.	TMTD	0.00 (0.71)	100.00
8.	TMTD + Aldicarb	46.67 (6.83)	49.99
9.	TMTD + Carbofuran	33.33 (5.75)	64.29
10.	Aldicarb	73.33 (8.57)	21.43
11.	Carbofuran	60.00 (7.70)	35.71
12.	Control	93.33 (9.67)	—

(Figures in parentheses represent transformed values)

C. D. (P=0.05) 1.44

*There was no infestation of stem fly.

Table-3, Effect of fungicides and insecticides on root rot and stem fly under field conditions

Sl. No.	Treatment	Number of plants affected by root rot (per plot of 262 plants)			Mean	Number of plants affected by stem fly (per plot of 262 plants)			Mean	Mean yield (g/plot of 10 sq. m.)
		15th day	30 th day	50 th day		15 th day	30 th day	80 th day		
1.	Carbendazim	0.00	0.00	0.00	0.00	0.00	0.66	4.00	1.55	355.00
2.	Carbendazim + Aldicarb	0.00	1.33	2.00	1.11	0.00	0.00	0.66	0.22	633.33
3.	Carbendazim + Carbofuran	0.00	0.33	0.66	0.33	0.00	0.00	0.66	0.22	483.33
4.	Quintozene	0.00	0.00	0.00	0.00	0.00	1.33	4.67	2.00	438.33
5.	Quintozene + Aldicarb	0.00	2.33	3.33	1.89	0.00	0.00	1.33	0.44	693.33
6.	Quintozene + Carbofuran	0.00	1.33	3.00	1.44	0.00	0.00	1.33	0.44	668.33
7.	TMTD	0.00	0.00	0.00	0.00	0.00	1.67	4.00	1.89	489.00
8.	TMTD + Aldicarb	0.00	3.00	4.00	2.33	0.00	0.00	1.33	0.44	576.67
9.	TMTD + Carbofuran	0.00	1.33	3.00	1.44	0.00	0.00	1.33	0.44	621.67
10.	Aldicarb	0.00	3.00	6.33	3.11	0.00	0.00	1.33	0.44	405.67
11.	Carbofuran	0.00	3.33	5.00	2.77	0.00	0.00	0.66	0.22	435.67
12.	Control	0.00	3.33	9.00	4.11	0.00	5.67	11.33	3.78	617.33
	Mean	0.00	1.61	3.03	1.54	0.00	0.78	2.58	0.96	

C. D. (P=0.05)

‡Mean of three replications.

211.63

tions carbendazim 0.1 per cent and quintozene 0.1 per cent were the effective fungicides in controlling root rot disease followed by TMTD 0.2 per cent (Tables 1, 2 and 3). Soil application of carbendazim has been reported to be effective in the control of *M phaseolina* in black gram (Samiyappan, 1976), sesamum (Prakasam, 1976), bengal gram (Chandrasekaran, 1969), and *Euphorbia* (Saroj Singh *et al.*; 1984). Quintozene when used as soil application gave good control of *M. phaseolina* in groundnut (Bouhot, 1967), cotton (Mathur and Singh, 1973; Rajprohit, 1983) and sesamum (Prakasam, 1976). The efficacy of soil application of TMTD against *M. phaseolina* in cowpea has also been reported (Oladiran and Okusanya, 1980). Though the insecticides affected the mycelial growth of *M phaseolina* they appeared to have no significant effect when compared to fungicides on the incidence of root rot of cowpea. However, carbofuran appeared to be better in the control of root rot disease when compared to untreated control (Table-1).

The number of plants affected by stem fly ranged between 0.11 and 3.78. Among the chemicals tested carbofuran and aldicarb (1.0 Kg. a.i. per ha) and their combinations with carbendazim, quintozene and TMTD were effective in reducing the stem fly incidence. Even though there was no appreciable incidence of stem fly in the trial plots, there was a maximum reduction in stem fly incidence in treated plots (Table 3). Significant reduction of the stem fly incidence was obtained by soil application of granular insecticides like phorate at

1.0 Kg. a.i. per ha to soybean (Bhatta charjee, 1976), 1.5 Kg. a.i. per ha to mungbean (Pablo and Pangga, 1971), 2.0 Kg. a.i. per ha to soybeans (Kapoor *et al.*, 1973) and disulfoton 9.0 Kg a.i. per ha to blackgram (Manohar, 1978).

Jotwani and Butani (1977) noted effective control of the stem fly on leguminous vegetables and cowpea by application of aldicarb around root zone at 2.0 kg. a. i. per ha. Hussein (1978) reported the effectiveness of carbofuran 3 g at 5 g per m row to control stem fly. Sundarababu and Rajasekaran (1981) found that soil application of carbofuran 3 g at 1 Kg. a.i. per ha at the time of sowing reduced stem fly to 4.21 per cent with corresponding increase in yield as compared to 10.75 per cent damage in the untreated control. Bhattacharjee (1976) obtained significant protection by aldicarb and carbofuran at 1.0 kg a i per ha to soybean. Sharma *et al.* (1981) observed maximum control of stem fly when the granules were placed below the seeds. In the present study, aldicarb and carbofuran granules as soil treatment applied at the time of sowing was effective at 1 Kg. a. i. per ha.

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