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Comparative Evaluation of Bio-Agents and Seed Dressing Fungicides Against *Aspergillus niger* Causing Collar Rot of Groundnut

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ABSTRACT

Nine biocontrol agents and four seed dressing fungicides were evaluated against collar rot (*Aspergillus niger* Van Teighem.) of groundnut under inoculated conditions for three seasons. The seed treatments of thiram, carbendazim mancozeb and captan each at @ 3.0 g/kg seed were found effective in controlling disease and improving the yield. The maximum net profit and ICBR were recorded in the treatment of thiram. Carbendazim and mancozeb were also found economical for disease control. Among biocontrol agents, *Bacillus* spp. *A. Pseudomonas fluorescens* and *Trichoderma harzianum* were found moderately effective as compared to fungicides.

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INTRODUCTION

Collar-rot (*Aspergillus niger* Van Teighem) is one of the important diseases, which causes heavy loss in pod and fodder yield of groundnut. The most of the cultivars of groundnut are susceptible to this disease. The disease is manifested in pre and post emergence phases. Many seed dressing fungicides are reported to be effective against collar rot of groundnut (Gangopadhyay, *et al.*, 1996, Karthikeyan, 1996) but limited work has been done on successful exploitation of biocontrol agents on management of the disease. It is highly needed to keep the disease below economic threshold level without damaging the agro-ecosystem in soil (Papavizas and Lewis, 1988). Keeping this in view, a study was initiated to investigate into the comparative efficacy of biocontrol agents and seed dressing fungicides against *Aspergillus niger* causing collar rot of groundnut.

MATERIALS AND METHODS

A field trial was conducted during *kharif* 1993, 1995 and 1996 at College Farm, Junagadh to evaluate antagonists and fungicides against collar rot disease. Experiment was laid out adopting randomized block design and replicated three times. The plot size was 3 x 2.7 m keeping 45 cm space between rows and 5 cm between the plants. The groundnut variety GG-2 was used.

Nine biocontrol agents viz., *Trichoderma harzianum T. viride, T. hamatum, T. longisporum,*

Note : These results are recommended to farmers in 26th Joint Agresco meeting held in April, 1997 at Junagdh.

T. koningii, *Pseudomonas fluorescens*, *Bacillus* spp. A, B and D were used @25 ml/kg seed. Spore strength was kept 10^6 cfu/ml for fungal bioagents while it was 10^9 cfu/ml for all bacterial antagonists. Four fungicides namely, carbendazim 25 DS at @2, 3 and 4 g, mancozeb 75% WP thiram (TMTD) 75% SD and captan 75% SD each at 3 g were used as seed treatment. The seeds were inoculated with *A. niger* before giving respective treatments of biocontrol agents and seed dressing fungicides. Seeds inoculated with spore suspension alone served as the check.

The observations on collar rot incidence were recorded upto 50 days after sowing and dry pod weight was also recorded after harvesting of the crop. The results were analysed statistically.

RESULTS AND DISCUSSION

The results presented in Table 1 revealed that all the seed dressing fungicides significantly reduced the collar rot incidence as compared to check. The lowest disease incidence (18.67%) and maximum disease control (52.38%) were recorded in seed treatment with thiram 75% SD @ 3.0 g/kg seed. However, carbendazim 25 DS (4.0 g/kg seed), captan 75% SD, carbendazim 25 DS and mancozeb 75% WP each @ 3.0 g/kg seed were also effective and were at par with thiram. They exhibited 19.34, 22.40, 22.67 and 23.65 per cent disease incidence and 50.67, 42.87, 42.18 and 39.68 per cent disease control as compared to check, respectively.

Maximum pod yield i.e. 1584 kg/ha was recorded in the plots where seeds were treated with thiram (3.0 g/kg seed) and it was significantly higher than check. The yields in the treatment of mancozeb, 75% WP, carbendazim 25% DS and captan 75% SD (at the rate of 3.0 g/kg seed) were 1437, 1432 and 1405 kg/ha respectively and these were at par with thiram (Table 2).

Maximum net return (Rs. 7086/ha) was obtained with highest Incrimental Cost Benefit Ratio (ICBR 1 : 79.73) in the treatment of thiram. Next best treatment was carbendazim (4.0 g/kg seeds) followed by mancozeb (3.0 g/kg seeds), which gave net profit of Rs. 6427 and Rs. 5317 per hectare, respectively. But the ICBR of mancozeb (1:56.96) was greater than carbendazim (1:35.74) due to low market price of the mancozeb (Table 2).

These results are in accordance to those of Karthikeyan, 1996, who achieved good control of collar rot of groundnut with carbendazim, thiram and *Trichoderma viride*. However, *T. viride* was comparatively less effective than *T harzianum* in present investigations and also in agreement of the results obtained by Lashin *et al.*, 1989. Effectiveness of carbendazim or captafol in controlling collar rot of groundnut has also been reported by Gangopadhyay in 1996. Pettit *et al.* (1969) reported association of *Bacillus subtilis* on freshy harvested or dried kernels of groundnut as an effective antagonist against *Aspergillus*.

TABLE 1

Effect of biocontrol agents and fungicides on incidence of collar rot (pooled).

Treatment	*Rate / kg seed*	*Mean disease incidence (%)*			*Pooled mean*	*Per cent disease control*
		1993-94	*1995-96*	*1996-97*		
Trichoderma harzianum	25 ml	41.99 (40.35)	27.54 (31.36)	23.55 (28.99)	31.02 (33.66)	20.88
T. viride	25 ml	47.67 (43.64)	29.85 (33.10)	24.90 (29.91)	34.13 (35.55)	12.95
T. hamatum	25 ml	48.88 (44.34)	26.96 (31.24)	30.18 (33.29)	35.34 (36.29)	09.86
T. longisporum	25 ml	45.63 (42.46)	31.70 (34.25)	29.07 (32.61)	35.46 (36.44)	09.56
T. koningii	25 ml	40.33 (39.40)	26.15 (30.74)	28.70 (32.35)	31.72 (34.16)	19.10
P. fluorescens	25 ml	40.99 (39.79)	27.88 (31.86)	23.79 (29.11)	30.88 (33.59)	21.24
Bacillus spp-A	25 ml	40.66 (39.59)	26.73 (31.11)	24.81 (29.79)	30.73 (33.50)	21.62
Bacillus spp-B	25 ml	36.45 (37.11)	30.66 (33.59)	28.33 (32.13)	31.81 (34.28)	18.87
Bacillus spp-D	25 ml	48.22 (43.96)	29.97 (33.16)	26.66 (31.03)	34.95 (36.05)	10.86
Carbendazim 25 DS	2.0 g	32.11 (34.50)	24.30 (29.52)	19.35 (26.06)	25.25 (30.02)	35.60
Carbendazim 25 DS	3.0 g	26.99 (31.28)	21.85 (27.85)	19.97 (26.44)	22.67 (28.52)	42.18
Carbendazim 25 DS	4.0 g	17.77 (24.76)	21.29 (27.46)	18.87 (25.72)	19.34 (25.99)	50.67
Mancozeb 75% WP	3.0 g	31.65 (34.19)	18.86 (25.70)	20.46 (26.87)	23.65 (28.92)	39.68
Thiram 75% S.D.	3.0 g	16.99 (24.21)	20.13 (26.64)	18.90 (25.73)	18.67 (25.53)	52.38
Captan 75% S.D.	3.0 g	22.25 (28.29)	22.20 (28.09)	22.75 (22.44)	22.40 (28.27)	42.87
Check		49.99 (44.97)	33.44 (30.70)	34.21 (29.64)	39.21 (39.68)	—
(Figures in paranthesis are transformed value)						
C. D. at 5%		(04.24)	(01.95)	(03.67)	(04.73)	

TABLE 2

Effect of biocontrol agents and fungicides on yield of groundnut (pooled).

Treatment	*Rate/kg seed*	*Mean yield kg/ha*			*Pooled yield kg/ha*	*Net return (Rs.)*	*ICBR*
		1993-94	*1995-96*	*1996-97*			
Trichoderma harzianum	25 ml	0972	1310	1390	1227	2777	1 : 25.14
T. viride	25 ml	1017	1273	1254	1182	2237	1 : 20.58
T. hamatum	25 ml	0925	1204	1294	1141	1745	1 : 16.17
T. longisporum	25 ml	0925	0972	1217	1038	0509	1 : 05.42
T. koningii	25 ml	0971	1088	1287	1115	1433	1 : 13.46
Pseudomonas fluorescens	25 ml	1063	1157	1303	1174	2141	1 : 19.61
Bacillus ssp-A	25 ml	0994	1157	1254	1135	1643	1 : 14.64
Bacillus ssp-B	25 ml	1132	1273	1296	1254	2861	1 : 25.87
Bacillus spp-D	25 ml	1064	1134	1271	1156	1925	1 : 17.73
Carbendazim 25 DS	2 g	1362	1226	1440	1342	4172	1 : 42.72
Carbendazim 25 DS	3 g	1389	1435	1472	1432	5209	1 : 37.42
Carbendazim 25 DS	4 g	1642	1504	1464	1537	6427	1 : 35.74
Mancozeb 75% WP	3 g	1179	1527	1604	1437	5317	1 : 56.96
Thiram 75% S.D.	3 g	1688	1643	1423	1584	7086	1 : 79.73
Captan 75% S.D.	3 g	1294	1481	1440	1405	4908	1 : 41.90
Check		0878	1209	0986	—		
C. D. at 5%		0157	0267	0167	0190		

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