

MANAGEMENT OF ROOT ROT (*Macrophomina faseolina*) OF COWPEA (*Vigna sinensis* Endl.)

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Abstract: An experiment was conducted at Pulses Research Station, S. D. Agricultural University, Sardarkrushinagar, Gujarat during the *Kharif* seasons of 2014 to 2016 to find out effective management strategies for root rot disease of cowpea. The experiment was conducted on cv. Gujarat Cowpea-4 (GC-4) with seven seed dressing agents viz, T₁ : Seed treatment (ST) with carbendazim 50% WP (2 g/kg seed), T₂ : ST with captan 50% WP (2 g/kg seed), T₃ : Seed soaking in garlic clove extract (1:1) @ 10% for 30 minutes in 300 ml water/kg seed, T₄ : Soil application of *Trichoderma harzianum* @1.5 kg/ha, T₅ : T₁+T₄, T₆ : T₂+T₄, T₇ : T₃+T₄ and T₈: Untreated control. All the treatments were found effective in controlling the disease. However, the minimum root rot disease incidence was recorded in the seed treatment of carbendazim 50% WP @ 2 g/kg seed + soil application of *Trichoderma harzianum* @1.5 kg/ha (7.36 %) followed by captan 50% WP @ 2 g/kg seed + soil application of *Trichoderma harzianum* @1.5 kg/ha (10.69 %). The yield data revealed that the highest grain yield (549.07 kg/ha) and ICBR (ICBR 1 : 67.5) were recorded in the seed treatment of carbendazim 50 % WP @ 2 g/kg seed + soil application of *Trichoderma harzianum* @1.5 kg/ha (549.07 kg/ha) followed by Carbendazim 50% WP (2 g/kg seed) (ICBR 1 : 64.1) and captan 50% WP @ 2 g/kg seed + soil application of *Trichoderma harzianum* @1.5 kg/ha (ICBR 1 : 59.3).

Keywords: Cowpea, *Macrophomina faseolina*, root rot, seed dressing.

INTRODUCTION

Cowpea (*Vigna sinensis* Endl.) is one of the most important leguminous crop in India. Cowpea proved vulnerable to root rot disease caused by *Macrophomina faseolina* [1] which attack roots causing damping- off and root rot diseases. These diseases cause substantial loss to the crop. Management of soil borne pathogen is of course, very difficult and costly too. Soil amendments and seed treatments are gaining importance in management of many soil borne plant pathogens as an alternative for environmental safety and low cost technology. Hence, the study was conducted to ascertain management of different fungicides, bio-agents, botanical and in combination with fungicidal seed treatments.

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MATERIALS AND METHODS

A field experiment was conducted at Pulses Research Station, S. D. Agricultural University, Sardarkrushinagar, Gujarat during the *Kharif* seasons of 2014 to 2016. A most popular cowpea cultivar Gujarat Cowpea-4 (GC-4) was sown by drilling method keeping seed rate 15 kg/ha with a spacing of 45 cm x 10 cm. Pre-sowing seed dressing treatments were done with the help of hand rotary seed dresser. Seven seed dressing agents were evaluated in this experiment viz, T₁ : Seed treatment with carbendazim 50% WP (2 g/kg seed), T₂ : ST with captan 50% WP (2 g/kg seed), T₃ : Seed soaking in garlic clove extract (1:1) @ 10% for 30 minutes in 300 ml water/kg seed, T₄ : Soil application of *Trichoderma harzianum* @1.5 kg/ha, T₅ : T₁+T₄, T₆ : T₂+T₄, T₇ : T₃+T₄ and T₈ : Untreated control. The treatments were applied immediately before sowing of the seed in field. Bio formulation *T. harzianum* was containing 1×10^7 c.f.u./g. The experiment was laid out in randomized block design (RBD) with three replications. All other recommended practices required for cultivation of the crop were followed. The final data for disease incidence (%) recorded 15 days before harvest considering root rot infected plants among total plant population for each treatments. Grain yield (kg/ha) of cowpea from each treatment were recorded at harvest after proper threshing. Economics of different treatments were worked out as suggested by [2, 3].

RESULTS AND DISCUSSION

Perusal of results presented in table 1 revealed that all the seed dressing agents were found significantly superior in reducing the root rot disease over control during all the years as well as in pooled results. However, in all the individual years as well as in pooled results, the minimum root rot disease incidence was recorded in the seed treatment of combination of Carbendazim 50% WP @ 2 g/kg seed + Soil application of *Trichoderma harzianum* @1.5 kg/ha followed by treatment Captan 50% WP @ 2 g/kg seed + soil application of *Trichoderma harzianum* @1.5 kg/ha during all the years. In pooled data, the minimum root rot incidence was recorded in the seed treatment of combination of Carbendazim 50 % WP @ 2 g/kg seed + soil application of *Trichoderma harzianum* @1.5 kg/ha (7.36 %) followed by Captan 50% WP @ 2 g/kg seed + soil application of *Trichoderma harzianum* @1.5 kg/ha (10.69 %).

The results pertaining to grain yield of cowpea (Table 2) revealed that significantly maximum grain yield was obtained in the seed treatment of combination of Carbendazim 50 % WP @ 2 g/kg seed + soil application of *Trichoderma harzianum* @1.5 kg/ha during all the years as well as in pooled results. In pooled data, the maximum grain yield was obtained in the seed

treatment of combination of Carbendazim 50 % WP @ 2 g/kg seed + soil application of *Trichoderma harzianum* @1.5 kg/ha (549.07 kg/ha) followed by treatment Captan 50% WP @ 2 g/kg seed + soil application of *Trichoderma harzianum* @1.5 kg/ha (517.44 kg/ha). The similar results were also reported by [4, 5 and 6].

The economics computed on various seed treatments (Table 3) revealed that highest the net gain was obtained in the seed treatment of combination of Carbendazim 50 % WP @ 2 g/kg seed + soil application of *Trichoderma harzianum* @1.5 kg/ha (Rs.16946/ha) followed by treatment Captan 50% WP @ 2 g/kg seed + soil application of *Trichoderma harzianum* @1.5 kg/ha (Rs. 14735/ha). The maximum ICBR was obtained in the seed treatment of combination of Carbendazim 50 % WP @ 2 g/kg seed + soil application of *Trichoderma harzianum* @1.5 kg/ha (1: 67.5) followed by seed treatment with Carbendazim 50% WP 2 g/kg seed (1: 64.1) and treatment Captan 50% WP @ 2 g/kg seed + soil application of *Trichoderma harzianum* @1.5 kg/ha (1: 59.3)

CONCLUSION

From the results of the experimentation it can be concluded seed treatment with carbendazim 50 % WP @ 2 g/kg seed + soil application of *Trichoderma harzianum* @1.5 kg/ha and seed treatment captan 50% WP @ 2 g/kg seed + soil application of *Trichoderma harzianum* @1.5 kg/ha found better for enhancing yield as well as managing root rot disease of cowpea.

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Table 1. Effect of different treatments on % disease incidence of root rot (60 day after germination)

Treatments		Disease incidence of root rot (%)			
		2014	2015	2016	Pooled
T ₁	ST with carbendazim 50% WP (2 g/kg seed)	29.93 * (25.00)	26.04 (19.50)	26.98 (20.68)	27.65 ^b (21.73)
T ₂	ST with captan 50% WP (2 g/kg seed)	33.48 (30.50)	27.70 (21.82)	29.63 (24.50)	30.27 ^b (25.61)
T ₃	Seed soaking in garlic clove extract (1:1) @ 10% for 30 minutes in 300 ml water/kg seed	33.06 (29.82)	26.04 (19.50)	28.96 (23.50)	29.35 ^b (24.27)
T ₄	Soil application of <i>Trichoderma harzianum</i> @ 1.5 kg/ha	24.54 (17.50)	19.16 (10.82)	24.10 (16.82)	22.60 ^c (15.05)
T ₅	T ₁ +T ₄	19.39 (11.08)	12.03 (4.50)	14.54 (6.50)	15.32 ^e (7.36)
T ₆	T ₂ +T ₄	22.29 (14.50)	14.50 (6.50)	19.37 (11.08)	18.72 ^d (10.69)
T ₇	T ₃ +T ₄	26.84 (20.50)	21.40 (13.50)	22.21 (14.50)	23.49 ^c (16.17)
T ₈	Control	36.49 (35.50)	35.89 (34.50)	40.03 (41.50)	37.47 ^a (37.17)
	S. Em. ±	0.88	0.65	0.77	0.94
	C.D. at 5%	2.66	1.97	2.35	2.86
	Y X T				2.23
	C.V. %	5.38	4.92	5.21	5.22

ST: Seed treatment

Note: *Arc sign transformed value

Figures in the parentheses are retransformed values

Table 2. Effect of different treatments on grain yield (kg/ha) of cowpea

Treatment		Grain yield (kg/ha)			
		2014	2015	2016	Pooled
T ₁	ST with Carbendazim 50% WP (2 g/kg seed)	542.27	332.20	443.67	439.38 ^{cd}
T ₂	ST with Captan 50% WP (2 g/kg seed)	490.87	281.30	423.33	398.50 ^d
T ₃	Seed soaking in garlic clove extract (1:1) @ 10% for 30 minutes in 300 ml water /kg seed	517.30	306.97	438.33	420.87 ^d
T ₄	Soil application of <i>Trichoderma harzianum</i> @1.5 kg/ha	609.57	400.43	470.00	493.33 ^{abc}
T ₅	T ₁ +T ₄	643.73	433.47	570.00	549.07 ^a
T ₆	T ₂ +T ₄	624.27	414.73	513.33	517.44 ^{ab}
T ₇	T ₃ +T ₄	584.27	374.57	490.00	482.94 ^{bc}
T ₈	Control	402.40	192.80	315.00	303.40 ^e
	S. Em. ±	32.73	32.56	31.93	16.63
	C.D. at 5%	99.30	98.73	96.86	47.69
	Y X T				NS
	C.V. %	10.27	16.49	12.08	12.46

ST : Seed treatment

Table 3. Effect of different treatments on economics of cowpea

Sr. No.	Treatments	Qty of treatment (kg/ha)	Price of Treatment (Rs./ha)	Labour cost (Rs/ha)	Total cost of treatment (Rs/ha)	Yield (Kg/ha)	Gross Realization (Rs/ha)	Net Realization over control (Rs/ha)	Net Gain (Rs/ha)	ICBR
1	ST with Carbendazim 50% WP (2 g/kg seed)	0.030	16.20	130.00	146.20	439.38	30757	9519	9373	1:64.1
2	ST with Captan 50% WP (2 g/kg seed)	0.030	13.50	130.00	143.50	398.50	27895	6657	6514	1:45.4
3	Seed soaking in garlic clove extract (1:1) @ 10% for 30 minutes in 300 ml water /kg seed	1.500	240.00	130.00	370.00	420.87	29461	8223	7853	1:21.2
4	Soil application of <i>Trichoderma harzianum</i> @1.5 kg/ha	1.500	105.00	130.00	235.00	493.33	34533	13295	13060	1:55.6
5	T ₁ +T ₄	0.030 + 1.500	16.20 + 105.00	130.00	251.20	549.07	38435	17197	16946	1:67.5
6	T ₂ +T ₄	0.030 + 1.500	13.50 + 105.00	130.00	248.50	517.44	36221	14983	14735	1:59.3
7	T ₃ +T ₄	1.500 + 1.500	240.00 + 105.00	130.00	475.00	482.94	33806	12568	12093	1:25.5
8	Control	--	--	--	-	303.40	21238	-	-	

ST : Seed treatment

Cowpea Price Rs. 70/kg; Carbendazim Rs. 540/kg; Captan Rs. 450/kg; Garlic clove Rs. 160/kg; *Trichoderma harzianum* Rs. 70/kg; Urea Rs. 7.00/kg; DAP Rs. 24/kg; Labour cost Rs. 260/day