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Relative efficacy of Bio pesticides in managment of Dry root rot and collar rot in soyabean and chikpea

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Abstract
Soybean (*Glycine max* (L) *Merrill*) and Chickpea (*Cicer arietinum* L) are an important and most profitable crop sequence of Madhya Pradesh. These crops Soybean and Gram suffer badly with charcoal rot/dry root rot caused by *Rhizoctonia bataticola* (Taub) Butler and Collar rot by S*clerotium rolfsii* Sacc. Respectively. The ecological and economical problem of pests and pesticide in agriculture give rise to several ecofriendly innovative approaches. Inherent hazardous effects involved in conventional chemicals management coupled with the inclination of farmers towards organic farming. In present study six bio pesticides viz – Bio enhancer, Butter milk, Panchagvya, Beejamrite, Cow urine and Vermi wash and one chemical/fungicide Thiram + carbendazim (1:1) were used to manage the soybean charcoal rot and Gram collar rot diseases. All treatments significantly reduced the percent mortality in soybean and Gram caused by charcoal rot and collar rot respectively. The seed treatment with Thiram + Carbendazim (1:1) was found most effective against seedling mortality in Gram and Soybean due to collar rot due to *S. rolfsii* followed by Bio enhancer, Butter milk and Panchagvya respectively. However seed treatment with Panchagvya and Bio enhance (1:10) were found highly effective and superior over Thiram + Carbendazim (1:1) in controlling seeding mortality of soybean due to dry rot caused by *Rhizoctonia bataticola*.

Keywords: chickpea, soybean, collar rot, dry root rot and bio-pesticides

Introduction
Chickpea is the third most important legume crop and India is the largest producer contributing to 65% of world's chickpea production with an area of 82.18 Lakh ha annual production of 77.02 Lakh tones and productivity of 937 kg ha (Anonymous, 2015) [1]. Soybean [*Glycine max* (L.) Merrill] covers an area of 110.656 Lakh ha with a production of 86.42 Lakh tons and a productivity of 781 kg per ha (SOPA, 2015) [9].

Charcoal rot caused by *Rhizoctonia bataticola* Taub and collar rot caused by *Sclerotium rolfsii* Sacc. Are the important soil borne diseases of soybean and chickpea and causes considerable losses in yield? Losses in yield up to 70% caused by charcoal rot in soybean have also been reported by Wrather and Shannon (2010) [12]. This disease is common in M.P., Maharashtra, Rajasthan, Uttaranchal, Punjab and Delhi. Chickpea is also prone to many diseases (Nene *et al*., 1984) [7] and among them dry root rot caused by *Rhizoctonia bataticola* is one of the major constraints in chickpea production and causing 10–20% annual loss (Vishwadhar and Chaudhary, 2001) [11]. The inherent hazardous effects involved in conventional chemical management coupled with the inclination of farmer towards organic farming, use of FYM, green manuring, neem oil, botanical and animal by products such as cow urine butter milk as described in Vedas, Arthshastra, Agnipuran, Surapala (Swaminathan and Nandhakumar, 2011) [10].

In view of the above the present study was undertaken to find out the effect of six eco-friendly bio pesticides against *R bataticola* and *S. rolfsii* incidence on soybean and chickpea and results are embodied here in.

Materials and Methods
To know the efficacy of bio pesticides against dry root rot and collar rot of of soybean and chickpea, six Bio-pesticides viz. Bio-enhancer, Butter milk, Panchagvya, Beejamrite, Cow urine and Vermi wash were undertaken with one fungicides Thiram + Carbendazim. For charcoal rot seed of susceptible variety of chickpea (JG 315) and soybean (JS 95-60)

Was treated with bio-pesticides. Seeds of susceptible variety of chickpea JG 315 and Soybean JS 95-60 were collected from the Department of Breeding and Genetics, Jabalpur. Screening of bio pesticides under laboratory conditions was done as per the technique described by Nene and Reddy (1981) [6] and Gupta (1989) [4] for charcoal rot and collar rot diseases in Soybean and Gram respectively. Observations on germination percentage and pre and post emergence mortality were recorded up to 30 days. Percent mortality was calculated by using the following formula:

$$\text{Per cent mortality} = \frac{\text{Number of diseased plants}}{\text{Total number of seedlings}} \times 100$$

Whereas Root mortality (%) per unit in Charcoal was calculated by the following formula:

$$\text{Root mortality (\%) per unit} = \frac{\text{Mortality (\%)}}{\text{Root index (\%)}}$$

Results and Discussion

1. Effect of seed treatment with bio-pesticide on disease incited by *Rhizoctonia bataticola* of soybean and chickpea under laboratory conditions.

(a) On soybean

Data presented in Table-1 indicated that all the treatments significantly increased per cent germination as compare to control (46%). Among treatments it ranged from 72 to 82 per cent. Maximum germination of 82 per cent was recorded in Thiram + Carbendazim and at par with Panchagvya (80%) and Cow urine (80%) against 46 per cent in control. Similar findings have been reported by Chadha *et al.* (2012) [3], and Ashlesha and Paul (2014) [2] in other crops. Differences among the treatments were also found statically significant. Minimum germination of 72 per cent was recorded in Bio-enhancer and Beejamrite. Root index per cent among treatments ranged from 42.5 to 64.61 per cent as compared to 77.2 per cent in control. This indicated that all the treatments significantly reduced root index per cent. Treatment Thiram +Carbendazim and Cow urine exhibited the minimum/lowest root index per cent 42.5 and 42.85 respectively. Among treatments highest root index per cent of 64.61 was recorded with Beejamrite against 77.2 per cent in control.

So far seedling mortality was significantly controlled and reduced with all treatment which ranged from 41.6 to 62.3 per cent as compare to 100 % in control. Minimum mortality was recorded with Panchagvya (41.6%) and found statistically at par with Bio-enhancer (42.3%), Beejamrite (42.8%), Butter milk (43.3%) and Thiram +Carbendazim (43.3%) treatments. However treatment Panchagvya was found highly effective (58.4 %) in controlling the disease followed by 57.7 and 56.7 per cent with Bio-enhancer and Butter milk against other treatments.

(b) On chickpea

Data of Table- 2 clearly depicted that all the treatments significantly increased germination percentage which varied from 92 to 100 per cent as compare to control (84%). Treatment Thiram +Carbendazim, Panchagvya and Butter milk exhibited 100 per cent germination followed by Bio enhancer (96%), Butter milk and Vermi wash (92%) as compared to 84 per cent in control. Root index per cent among treatments ranged from 50.5 to 62.85 per cent as compared to 90per cent in control. Similar findings have been reported by Chadha *et al.* (2012) [3], and Ashlesha and Paul (2014) [2] in other crops. This indicated that all the treatments significantly reduced root index per cent. Treatment Butter milk and Thiram + Carbendazim exhibited the minimum/lowest root index 50.5 and 50.66 per cent respectively. Among treatments highest root index per cent of 62.85 was recorded with Cow urine against 90.00 per cent in control. However no statistical significant differences were found among Panchagvya, Beejamrite, Vermi wash and Cow urine treatments.

All the treatments significantly reduced seedling mortality per cent ranged from 33.33 to 62.85 per cent as compared to 100 per cent in control. Minimum mortality of 33.33 per cent was recorded with Thiram +Carbendazim followed by Cow urine, Vermi wash, Beejamrite, Bio-enhancer and Panchagvya with 45.71,51.66, 54.61, 58,57 and 62.28 per cent respectively. However treatment Thiram + Carbendazim was found most effective in controlling dry root rot disease of Chickpea followed by Cow urine over other bio pesticides and control.

2. Effect of seed treatment with bio-pesticide on disease incited by *Sclerotium rolfsii* of soybean and chickpea under laboratory conditions

(a) On soybean

The data of Table- 3 clearly revealed that all the treatments significantly increased per cent germination as compared to control. Among treatments it ranged from 73.3 to 83.3 per cent. Maximum germination percentage of 83.3 was recorded with Beejamrite followed by 80.3,79.0,76.6,73.3 and 63.3 per cent with Bio enhancer, Vermi wash, Cow urine, Butter milk and Thiram + Carbendazim respectively against 53.3 per cent in control. Differences among treatments were also found statistically significant. Seedling mortality Was found 0.0 per cent with Thiram + Carbendazim treatment followed by Butter milk (0.9%) Bio enhancer (1.3%) against 3.5 per cent in control. Similarly Thiram + Carbendazim also gave best control against total emergence mortality (15.5%) against 69.0 per cent in control followed by Butter milk (22.6%) and Bio enhancer (23.7%). However, treatment Thiram + Carbendazim was found highly effective in controlling (53.5%) and next to it were Butter milk (46.4%) and Bio enhancer (45.3%). This finding is in agreement with results reported by Natarajan (2002, Chadha *et al.* (2012) [3], and Ashlesha and Paul (2014) [2] in other crops against seedling mortality caused by stem rot, root rot and wilt as soil drench.

(b) On Chickpea

The data presented in Table- 4 depicted that all the treatments significantly increased germination percentage as compared to control (66.67%). Maximum germination of 100 per cent was recorded with Thiram +Carbendazim followed by 93.34, 88.67 and 86.67 per cent with Cow urine, Bio enhancer and Panchagvya respectively. Chadha *et al.* (2012) [3], and Ashlesha and Paul (2014) [2] have reported the similar findings in other crops. Panchagvya was found at par with Beejamrite and Vermi wash. Pre-emergence mortality was significantly decreased in all the treatments as compared to control (27.65%). No pre-emergence mortality was recorded with Thiram + Carbendazim followed by 2.38 per cent with Cow urine and 4.00 per cent with Beejamrite against 27.5 per cent in control. However treatment Panchagvya and Bio-enhancer were found at par with Beejamrite.

Post-emergence mortality among treatments varied from 12 to 44.31 per cent as compared to 47.68 per cent in control. This indicated that all the treatments significantly reduced the post-

emergence mortality. Minimum mortality of 12 per cent was recorded with Thiram + Carbendazim followed by Bio-enhancer 22.56, Butter milk 22.56 and Panchagvya 22.66 per cent respectively. The data revealed that treatment Thiram + Carbendazim exhibited maximum disease control of 63.33 per cent followed by Panchagvya, Bio-enhancer and Beejamrite.

Table 1: Effect of seed treatment with bio-pesticides on the incidence of charcoal rot on soybean caused by *Rhizoctonia bataticola*

Treatments/ Conc. (ppm)	Germ. (%)	Root index %	Mortality %	Root mortality % /unit	Percent disease control
Bio-enhancer (1:10)	72.0	53.07	42.3	0.79	57.7
Butter milk (1:10)	76.0	55.00	43.3	0.78	56.7
Panchagvya (1:10)	80.0	54.75	41.6	0.75	58.4
Beejamrite (1:10)	72.0	64.61	42.8	0.66	57.2
Cow urine (1:10)	80.0	42.85	58.8	1.40	41.2
Vermi wash (1:10)	76.0	50.76	62.3	1.20	37.7
Thiram+ carbendazim (1:1)	82.0	42.5	43.3	1.01	56.7
Control (UT)	46.0	77.2	100	1.20	0
SE(m) ±	2.693	2.280	1.057	-	-
CD at 5 %	8.142	6.895	3.195	-	-

Table 2: Effect of seed treatment with bio-pesticides on the incidence of charcoal rot on Gram caused by *Rhizoctonia bataticola*

Treatments/ Conc. (ppm)	Germ. (%)	Root index %	Mortality %	Root mortality % /unit	Percent disease control
Bio-enhancer (1:10)	96.0	55.71	58.57	1.05	41.43
Butter milk (1:10)	92.0	50.5	62.3	1.23	37.7
Panchagvya (1:10)	100.0	58.57	62.28	1.06	37.72
Beejamrite (1:10)	88.0	60.2	54.61	0.9	45.39
Cow urine (1:10)	100.0	62.85	45.71	0.72	54.29
Vermi wash (1:10)	92.0	60.3	51.66	0.85	48.34
Thiram+ carbendazim (1:1)	100.0	50.66	33.33	0.65	66.67
Control (UT)	84.0	90	100	1.11	0
SE(m) ±	1.429	1.507	1.597	-	-
CD at 5 %	4.321	4.557	4.828	-	-

Table 3: Effect of seed treatment with bio-pesticides on the incidence of collar rot of soybean caused by *Sclerotium rolfsii*

Treatment/ Conc. (ppm)	Germ. (%)	Mortality %			Percent disease control
		Pre emergence	Post emergence	Total mortality	
Bio-enhancer (1:10)	80.0	1.3	22.4	23.7	45.3
Butter milk (1:10)	73.3	0.9	21.7	22.6	46.4
Panchagvya (1:10)	76.3	3.3	44.6	47.9	21.1
Beejamrite (1:10)	83.3	0	44.4	44.4	24.6
Cow urine (1:10)	76.6	1.3	29.6	30.9	38.1
Vermi wash (1:10)	79.0	3.3	54.6	57.9	11.1
Thiram + carbendazim (0.25%)	63.3	0	15.5	15.5	53.5
Control (UT)	53.3	3.5	65.5	69.0	0
SE(m) ±	0.505	0.158	0.517	-	-
CD at 5 %	1.528	0.478	1.563	-	-

Table 4: Effect of seed treatment with bio-pesticides on the incidence of collar rot of chickpea caused by *Sclerotium rolfsii*

Treatment/ conc. (ppm)	Germ. (%)	Mortality %			Percent disease control
		Pre emergence	Post emergence	Total mortality	
Bio-enhancer (1:10)	88.67	4.11	22.56	26.67	48.66
Butter milk (1:10)	80	8.33	25	33.33	42
Panchagvya (1:10)	86.67	4.11	22.56	26.67	48.66
Beejamrite (1:10)	86.67	4	22.66	26.66	48.65
Cow urine (1:10)	93.34	2.38	30.95	33.33	42
Vermi wash (1:10)	86.67	5.77	44.31	50.08	25.33
Thiram+ carbendazim (0.25%)	100	0	12	12	63.33
Control (UT)	66.67	27.65	47.68	75.33	0
SE(m) ±	0.579	0.310	0.431	-	-
CD at 5 %	1.750	0.938	1.303	-	-

Conclusion

In present study all treatments significantly reduced the percent mortality in soybean and Gram caused by charcoal rot and collar rot respectively. The seed treatment with Thiram + Carbendazim (1:1) was found most effective against seedling mortality in Gram and Soybean due to collar rot caused by *S.rolfsii* followed by Bio enhancer, Butter milk and Panchagvya respectively. However seed treatment with Panchagvya and Bio enhance (1:10) were found highly effective and superior over Thiram + Carbendazim (1:1) in controlling seeding mortality of soybean due to *Rhizoctonia bataticola*.

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