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Management of Web Blight of Mungbean using chemicals, bio-agents, soil amendments alone and in combination

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ABSTRACT

Web blight incited by R.solani Kuhn is one of the major diseases of kharif mung bean which causes huge loss and holds back the mung bean production. It causes pre- and post- emergence rot in this crop resulting in maximum mortality of seedlings. Management of this disease is a problem due to prolonged saprophytic survival ability and wide host range of the pathogen. In the present study, these components like soil amendments, bio agents , chemicals and their integration were evaluated in various combinations and modes of application under field conditions for management of web blight and higher yield in mungbean. The results revealed that all the organic amendments proved effective and reduced the intensity of web blight disease and increased yield significantly when compared with control. Soil application of Neem + Karanj cake proved to be the most effective treatment in which least disease severity percentage (31.12%) and highest yield (9.50 q/ha) were recorded. It was followed by soil application of Neem cake (8.60q/ha), Karanj cake (8.55 q/ha), Mustard + Karanj (8.50 q/ha) and Neem+Mustard+Karanj cake (8.19 q/ha). Highest blight severity percentage was recorded in soil application of Mustard cake (35.20%). Seed treatment with Bavistin @ 2 g/kg seed proved most effective and gave 26.15 per cent disease severity, 63.66 per cent disease control and 11.12 q/ha yield of mungbean followed by Bavistin + T.harzianum @ 1.0+ 2.5 g/kg seed giving 28.03 per cent disease severity, 61.04 per cent disease control and 9.52 q/ha yield and were significantly at par to each other.The disease control in other treatment ranged from 39.67 to 49.64 per cent. P.fluorescens was less effective and provided only 16.15 per cent disease control. All the bioagents proved effective and reduced the intensity of web blight and increased yield significantly. Soil application of Neem cake precolonized with T. harzianum proved to be the most effective treatment in which least disease severity (31.13%) and highest yield (11.26 q/ha) were recorded. It was followed by Karanj cake precolonized with T. harzianum (36.88% disease severity), Neem cake precolonized with T. viride (41.28%), Neem cake with T. harzianum(R) (43.36%), Neem cake with P. fluorescens (57.35%), Karanj cake precolonized with P. fluorescens (58.54%), respectively.Foliar application with Bavistin proved to be the most effective treatment in which least disease severity per cent (24.99%) and highest yield (11.33 q/ha) were recorded and was significantly superior to other treatments. It was followed by SAAF, T. harzianum, Vitavax, Baan, P. fluorescens where severity per cent (36.22%, 37.24%, 38.77%, 50.66% and 59.52%) recorded. Foliar application with Bavistin yielded 11.33q/ha, followed by SAAF, T. harzianum, Vitavax, which gave 10.87, 10.74 and 9.46 q/ha yield, respectively. Integration trial on management of web blight revealed that all the combinations proved effective and reduced the disease severity of web blight of mungbean and increased yield significantly. Soil application of precolonized T. harzianum + seed treatment with Bavistin proved to be the most effective treatment in which least disease severity (32.31%) and highest yield (11.86 q/ha) were recorded. Yield was also found to be maximum in the plots treated with precolonized T. harzianum + seed treatment with Bavistin (11.86 q/ha) followed by soil application of precolonized T. harzianum(R) + seed treatment with Bavistin (11.81 q/ha)and soil application of precolonized T. viride + seed treatment with Bavistin (10.76 q/ha).

Key words: *web blight , Rhizoctonia solani, chemical, bioagent, soil amendment, mung bean.*

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INTRODUCTION

Web blight caused by the fungus *Thanatephorus cucumeris* (Fr.) Donk (=*Rhizoctonia solani* Kuhn), is a very destructive disease of mungbean and one of the major constraints for low productivity of this crop. Dwivedi and Saksena (1974) reported the occurrence of web blight caused by *Thanatephorus cucumeris* for the first time from Kanpur as seed and soil borne both. Disease was also observed in a very severe form (5-100%) at Kanke itself (Dubey and Mishra, 1991). The pathogen produces a variety of disease

symptoms on different plants globally under diverse environmental conditions. Management is uaually achieved by application of fungicides (Mocioni *et al*; 2003). The fungus infects all above ground parts of the plant i.e., leaves, petioles, stem and pods but most destructive symptom is on foliage. *Rhizoctonia solani* Kuhn causes pre- and post- emergence rot in this crop resulting in maximum mortality of seedlings (Tiwari, 1993). In case of severe infection the diseased plants die prematurely before flowering and pod formation. Management of this disease is a problem due to prolonged saprophytic survival ability and wide host range of the pathogen.In present study, an attempt has been made to manage the disease by using soil amendment, bioagents and chemicals.

MATERIALS AND METHODS

Effect of organic amendments against web blight of mungbean Field trials were conducted for kharif season of 2011 in research farm of Birsa Agricultural University, Ranchi which is situated at $23^0$17' north latitude and $85^0$19'east longitude with an altitude of 625m above mean sea level in sick plots and the effects of organic amendments were examined on the incidence of web blight disease. Neem cake, karanj cake, Mustard cake, and Neem + karanj (1:1) cake. Mustard + Karanj cake(1:1) and Neem + Mustard + Karanj cake (1:1:1) @ 5q/ha were applied as organic manure. All treatments were incorporated in soil before sowing as and when needed. Individual plots measured 1.5 m x4.0 m with a spacing of 30cm row to row and 10cm plant to plant in three replications using randomized block design. Observation of the web blight was taken at 15 days intervals regularly. The web blight incidence and intensity and yield of mungbean were recorded.

Effect of seed treatment with bioagents chemicals on web blight of mungbean Three bioagents like T. harzianum, T.viride , Pseudomonas fluorescens each @ 5.0g/kg and one chemical like carbendazim @ 2.0g/kg alone and in combinations each @ 1.0 + 2.5 g/kg were used as seed treatment in 1.5 x 4.0 m^2 plot size with a spacing of 30cm row to row and 10cm plant to plant in three replications using randomized block design to determine the effect on web blight of mungbean. Then roots of the ninety five seedlings were dipped in the solution of each chemical separately for half an hour. Treated seedlings were transplanted in wilt sick plot in three replication with Randomized Block Design. Good agronomic practices were followed to raise the crops and data on web blight percentage and yield of mungbean were recorded.

Effect of bioagents against web blight of mungbean The field experiment was carried out during kharif 2011 in sick plots in R.B.D. with 3 replications using 1.5 x 4.0 m^2 plot size with a spacing of 30cm row to row and 10cm plant to plant to determine the effects of precolonized bioagents on the incidence of web blight disease. Different isolates of *Trichoderma* and *Pseudomonas* (*T.harzianum* (Delhi), *Trichoderma harzianum* (Ranchi),*T. viride*, *Pseudomonas fluorescens* (Delhi)) were precolonised in cakes likeneem and karanj each @ 1.0 per cent. The cakes precolonized with different isolates were added each @5q/ha in the plot 15 days before sowing. The good agronomic practices were followed to raise the crops and observations on web blight incidence and yield of mungbean were recorded and per cent disease control over check (PDC) was calculated as per standard procedure.

Effect of foliar application of chemical and bioagent on web blight of mungbean

Four fungicides viz., Baan, bavistin, saaf , vitavax each @ 2.0 g/l and two biocontrol agents like *Trichoderma harzianum* (Ranchi), *Pseudomonas fluorescens* (Delhi) each @ 5.0 g/l were evaluated in field as foliar spray against web blight disease during kharif 2011 in sick plots in R.B.D. with 3 replications using 1.5 x 4.0 m^2 plot size with a spacing of 30cm row to row and 10cm plant to plant.first spray was given just after initiation of symptoms followed by second spray after 14 days. The good agronomic practices were followed to raise the crops and observations on web blight incidence and yield of mungbean were recorded and per cent disease control over check (PDC) was calculated as per standard procedure.

Integration of organic amendments, bioagents and chemicals against web blight of mungbean The field experiment was conducted using different combination of organic amendments, bioagents and chemicals in plot size 1.5m x 3.0m with plant to plant distance 10 cm & row to row distance 30 cm with 3 replication in RBD for kharif season of 2012. The treatments were soil application of precolonized *T. harzianum* + seed treatment with Bavistin, soil application of precolonized *T. viride* + seed treatment with Bavistin, soil application of precolonized *P. fluorescens* + seed treatment with Bavistin, Soil application of precolonized *T. harzianum* (Ranchi) + seed treatment with Bavistin, soil application of precolonized *T. harzianum* + seed treatment with *T. harzianum*, soil application of precolonized *P. fluorescens* + seed treatment with *P. fluorescens*.Good agronomic practices were followed to raise the crops and observations on web blight incidence and yield of mungbean were recorded and per cent disease control over check (PDC) was calculated as per standard procedure.

RESULTS AND DISCUSSION

In field condition four treatment combinations were evaluated against the blight. Six organic amendments viz., Neem cake, Mustard cake, Karanj Cake, Neem + Karanj cake, Mustard + Karanj cake, Neem + mustard + Karanj cake were evaluated to study their comparative efficacy in controlling web blight disease of mungbean in the field. Soil application of Neem + Karanj cake proved to be the most effective treatment in which least disease severity percentage (31.12%) and highest yield (9.50q/ha) were recorded(Table 1). Dubey and Patel (2000) evatuated some oil cake and plant extracts against *Thanatephorus cucumeris*, *Glicocladium virens* and *Trichoderma viride* and found that mahua cake inhibited maxium mycelia growth of *Trichoderma viride* followed by karanj, neem and groundnut cakes.

Seed treatments with bioagents alone or in combination with Bavistin @ 2 g/kg seed proved most effective and gave 26.15 per cent disease severity, 63.66 per cent disease control and 11.12 q/ha yield(Table 2). This treatment is proved to be most effective. Vidhyasekaran and Lewin (1987) reported that captaf and Carbendazim gave good protection against *Thanatephorus cucumeris*. Saikia and Phookan (1983) tested efficacy of 11 fungicides viz., Fycol 40A, Benlate, Bavistin, Difolatan, Panocil, Dithane Z-78, Dithane M-45 Macuprex, Cumin, Hinosan and Syttil 65 against corticium sasakii causal agent of mung bean blight. The results indicated that among the chemicals tested Bavistin and Benlate were the most effective fungicides.

Four bioagents viz., *T. harzianum, T. viride*, *T. harzianum* (R) and *P. fluorescens* were evaluated to study their comparative efficacy in controlling web blight in the field. Soil application of Neem cake precolonized with *T. harzianum* proved to be the most effective treatment in which least disease severity (31.13%) and highest yield (11.26 q/ha) were recorded. It was followed by Karanj cake precolonized with *T. harzianum* (36.88%), Neem cake precolonized with *T. viride* (41.28%), Neem cake with *T. harzianum(R)* (43.36%), Neem cake with *P. fluorescens* (57.35%), Karanj cake precolonized with *P. fluorescens* (58.54%), respectively (Table 3). Dubey (1998) observed that the soil application of *G. virens* increased the seed germination and decreased the seedling mortality of horsegram. Dubey (2000) conducted experiment on biological management of web blight disease of groundnut and observed that *Gliocladium virens* was most effective which inhibited maximum mycelial growth (59.8%) and sclerotial production (70.0%) followed by *Trichoderma viride* in respect of mycelial inhibition. Soil application of *Gliocladium virens* gave maximum seed germination (83.3 %) and minimum seedling mortality (19.8%).

Foliar application of fungicides clearly indicated that seed treatment with Bavistin @ 2 g/kg seed proved most effective and gave 26.15 per cent disease severity, 63.66 per cent disease control and 11.12 q/ha yield of mungbean followed by Bavistin + *T.harzianum* @ 1.0+ 2.5 g/kg seed giving 28.03 per cent disease severity, 61.04 per cent disease control and 9.52 q/ha yield(Table 4). *T. harzianum* and Vitavax also performed well and very close to SAAF. In terms of yield, Bavistin gave the best result followed by SAAF. Jhooty and Bains (1973) concluded that the isolates of *R. solani* were more sensitive to systemic than to non systemic fungicides. There was no correlation between the doses reported for complete inhibition of *R. solani* in culture and disease control potential. Dubey and Toppo (1997) reported that three sprays of Contaf (0.1%) at 15 days interval was found most effective and economical for the management of Sheath blight of rice. Shailbala and Tripathi (2004) studied the efficacy of fungicides on web blight disease of urdbean and found that Tilt (0.1%) gave lowest disease severity, highest grain yield and maximum thousand grain weight followed by Bavistin (0.1%) Dithane M-45 (0.25%), Bavistin (0.05%) sprayed plots, respectively. Antracol was found comparatively less effective in comparison to other treatments.

Among various integration treatments, Soil application of precolonized *T. harzianum* + seed treatment with Bavistin proved to be the most effective treatment in which least disease severity (32.31%) and highest yield (11.86 q/ha) were recorded. It was followed by soil application of precolonized *T. harzianum*(R) + seed treatment with Bavistin (33.33%), soil application of precolonized *T. viride* + seed treatment with Bavistin (34.16), soil application of precolonized *T. harzianum* + seed treatment with *T. harzianum* (37.75%) and soil application of precolonized *P. fluorescens* + seed treatment with Bavistin (39.11%), respectively. All the treatments were significantly at par and differed significantly when compared with cheek only(Table 5).The similar result was also observed by Dubey (2000), Sharma and Tripathi (2001), Dubey (2003 a) and Dubey (2007) .

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Table-1: Effect of soil amendments on web blight disease and yield of mungbean

Sl. No.	Treatments	Dose (q/ha)	Disease Severity (%)*	Disease Control (%)	Yield (q/ha)*
T_1	Neem cake	5	31.97(34.35)**	36.31	8.60
T_2	Mustard cake	5	35.20(36.33)	29.88	7.75
T_3	Karanj cake	5	32.65(34.75)	34.96	8.55
T_4	Neem + Karanj cake	2.5 + 2.5	31.12 (33.84)	38.00	9.50
T_5	Mustard + Karanj cake	2.5 + 2.5	33.16(35.06)	33.94	8.50
T_6	Neem + Mustard + Karanj cake	1.6 + 1.6 + 1.6	34.18 (35.71)	31.91	8.19
T_7	Control	-	50.20 (43.09)	-	6.11
	SEm±		3.60		0.43
	CD (p=0.05)		11.21		1.35
	CV (%)		17.57		9.22

* Average of 3 replications ** Figure in the Parenthesis is angular transformed value

Table 2: Effect of Seed treatment with bioagents and chemicals on web blight disease and yield of mungbean

Sl. No.	Treatments	Dose (g/kg)	Disease Severity (%)*	Disease Control (%)	Yield (q/ha)*
T_1	*T. harzianum*	5	38.11(38.09)**	47.03	8.26
T_2	*T. viride*	5	43.41(41.19)	39.67	7.68
T_3	*P. fluorescens*	5	60.33(50.96)	16.15	7.41
T_4	Bavistin	2	26.15(31.88)	63.66	11.12
T_5	Bavistin + *T.harzainum*	1.0 + 2.5	28.03(30.67)	61.04	9.52
T_6	Bavistin + *P. fluorescens*	1.0 + 2.5	36.23 (36.96)	49.64	8.67
T_7	Control	-	71.96 (58.05)	-	6.13
	SEm±		2.51		0.54
	CD (p=0.05)		7.82		1.70
	CV (%)		10.01		11.28

* Average of 3 replications

** Figure in the Parenthesis are angular transformed value

Table 3: Effect of Soil Application of Bioagents on web blight disease & yield of mungbean

Sl. No.	Treatments	Dose (q/ha)	Disease Severity (%)*	Disease Control (%)	Yield (q/ha)*
T_1	Neem cake precolonized with *T. harzianum*	5	31.13(33.75)**	55.87	11.26
T_2	Neem cake precolonized with *T. viride*	5	41.28(39.93)	41.48	10.84
T_3	Neem cake precolonized with *T. harzianum* (R)	5	43.36(41.15)	38.53	10.11
T_4	Neem cake precolonized with *P. fluorescens*	5	57.35 (49.22)	18.70	9.87
T_5	Karanj cake precolonized with *T. harzianum*	5	36.88(37.35)	47.72	11.13
T_6	Karanj cake precolonized with *P. fluorescens*	5	58.54 (49.90)	17.02	9.73

T_7	Control	-	70.55 (57.11)	-	7.10
	SEm±		3.03		0.62
	CD (p=0.05)		9.45		1.94
	CV (%)		10.85		10.83

* Average of 3 replications** Figure in the Parenthesis are angular transformed value

Table 4:Effect of fungicides and bioagents on web blight disease and yield of mungbean

Sl. No.	Treatments	Dose (g/l)	Disease Severity (%)*	Disease Control (%)	Yield (q/ha)*
T_1	Baan	3.0	50.66(45.37)**	29.21	9.32
T_2	SAAF	2.0	36.22(36.95)	49.40	10.87
T_3	Vitavax	2.0	38.77(38.47)	45.84	9.46
T_4	Bavistin	2.0	24.99 (29.90)	65.08	11.33
T_5	*T. harzianum*	5.0	37.24(37.59)	47.98	10.74
T_6	*P. fluorescens*	5.0	59.52 (50.49)	16.86	9.28
T_7	Control	-	71.59 (57.82)	-	7.04
SEm±			2.84	0.61	
CD (p=0.05)			8.85	1.92	
CV (%)			10.79	10.98	

* Average of 3 replications

** Figure in the Parenthesis are angular transformed value

Table 5: Integrated disease management of web blight disease and yield of mungbean

Sl. No.	Treatments	Dose (g/ha)	Disease Severity (%)*	Disease Control (%)	Yield (q/ha)*
T_1	Soil application of precolonized *T. harzianum* + Seed treatment with Bavistin	5q/ha + 2g/kg	32.31(34.60)**	55.91	11.86
T_2	Soil application of precolonized *T. viride* + seed treatment with Bavistin	5q/ha + 2g/kg	34.16(36.33)	52.01	10.76
T_3	Soil application of precolonized *P. fluorescens* + seed treatment with Bavistin	5q/ha + 2g/kg	39.11(38.66)	46.63	9.89
T_4	Soil application of precolonized *T. harzianum* (R) + Seed treatment with Bavistin	5q/ha + 2g/kg	33.33 (5.19)	54.52	11.81
T_5	Soil application of precolonized *T. harianum* + Seed Treatment with *T. harzianum*	5q/ha + 2g/kg	37.75(37.86)	48.49	10.57
T_6	Soil application of precolonized *P. fluorescens* + seed treatment with *P. fluorescens*	5q/ha + 2g/kg	54.25 (47.42)	25.98	9.13
T_7	Control	-	73.29 (58.88)	-	6.15
SEm±			2.89	0.78	
CD (p=0.05)			9.00	2.45	
CV (%)			11.48	13.62	

* Average of 3 replications

** Figure in the Parenthesis are angular transformed value

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