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Efficacy of soil amendment on seed germination, web blight intensity and yield of Frenchbean (*Phaseolus vulgaris*)

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ABSTRACT

Web blight of Frenchbean (*Phaseolus vulgaris* L.) caused by *Rhizoctonia solani* Kühn is one of the most important disease. Experiment was conducted in field to find out the effect of soil amendment on seed germination, web blight intensity and yield of Frenchbean. Seed germination was maximum in neem oil cake (97.7%) amended soil followed by 93.1, 89.8, 86.1 and 82.1% germination in soil amended with mustard oil cake, mahua oil cake, linseed oil cake, saw dust as compared to non-amended soil (71.5%), respectively. Maximum disease control (43.6%) and green pod yield (62.4 q/ha) were recorded in neem oil cake followed by mustard oil cake (35.2%, 57.0 q/ha), mahua oil cake (28.1%, 52.4 q/ha), linseed oil cake (26.6%, 51.3 q/ha), saw dust (19.6%, 36.8 q/ha) and unamended soil (0.0%, 36.9 q/ha), respectively.

Key words: Management, *Phaseolus vulgaris, Rhizoctonia solani,* Soil amendments, Web blight

Frenchbean (*Phaseolus vulgaris* L.) is one of the most important leguminous vegetable crops and most commonly known as rajmash. It is known for rich source of protein, vitamins and minerals particularly calcium, phosphorus and iron and thus are highly nutritious (Saulunkhe and Kadam 1998).

Web blight of Frenchbean caused by *Rhizoctonia solani* Kühn is an important soil borne disease. It is widely distributed throughout country and cause heavy losses in yield. Yield losses of green pods varies from 8.45 to 64.68% at different stages of plant growth (Sharma and Sohi 1980).

The management of this disease is difficult because of soil-borne nature of the pathogen, wide host range of the pathogen, long survivility of sclerotia and unstable source of resistance due to high level of variability in pathogen. Many bioagents have been found effective against this pathogen under *in vitro* conditions but not performed well in field. In recent years, soil amendments is an alternative ecofriendly disease management strategy of soil-borne plant pathogens has attained importance in modern agriculture and organic farming to minimize the hazards of intensive use of toxic chemicals. Therefore, present study was undertaken to evaluate soil amendments (neem oil cake, mustard oil cake, linseed oil cake, mahua oil cake and saw dust) on seed germination, disease severity and yield of Frenchbean.

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MATERIALS AND METHODS

A field experiment was laid out in randomized block design during *kharif* season 2005-06 and 2006-07. Soil amendments, viz. neem oil cake, mustard oil cake, linseed oil cake, mahua oil cake and saw dust ware mixed in the soil two weeks prior to sowing @ 52 q/ha followed by light irrigation. Plots without amendment served as check. Frenchbean susceptible cv. Contender was sown in plots on 3 November 2005 and 8 November 2006 with three replications. All agronomical practices were followed for raising good crop. Germination per cent was noted and disease severity was observed in 20 plants of 100 leaves and 100 pods which were randomly selected in 0-5 scale (Mathew and Gupta 1996) at seven days intervals from the first appearance of the disease till maturity of the crop. The per cent disease intensity (PDI), per cent disease control (PDC) and avoidable loss in yield (%) as per following formula given below:

$$\text{Per cent disease intenstity (PDI)} = \frac{\text{Sum of all numerical value}}{\text{Total number of leaves examined} \times \text{maximum grade}} \times 100$$

$$\text{Per cent disease control (PDC)} = \frac{\text{PDI check} - \text{PDI in treatment}}{\text{PDI in check}} \times 100$$

$$\text{Avoidable loss in yield (\%)} = \frac{\text{Yield in protected plot} - \text{Yield in unprotected plot}}{\text{Yield in protected plot}} \times 100$$

RESULTS AND DISCUSSION

Effect on seed germination

The maximum seed germination (97.07%) was observed in T_1 (neem oil cake) followed by T_2 (mustard oil cake), T_4 (mahua oil cake), T_3 (linseed oil cake), T_5 (saw dust) and T_6 (unamended soil) which were 93.06, 89.82, 86.11, 82.10 and 71.45%, respectively. All the treatments differed significantly from each other.

Effect on disease intensity

Minimum disease intensity (37.44%) was recorded in T_1 (neem oil cake) followed by T_2 (mustard oil cake), T_4 (mahua oil cake), T_3 (linseed oil cake), T_5 (saw dust) and T_6 (unamended soil) which were 43.05, 47.77, 48.71, 53.38 and 66.38%, respectively. Significant difference in disease intensity was noted in each treatment but it was at par in T_4 and T_3.

Effect on per cent disease control (PDC)

Maximum disease control (43.59%) was recorded in T_1 (neem oil cake) followed by T_2 (mustard oil cake), T_4 (mahua oil cake), T_3 (linseed oil cake) and T_5 (saw dust) which were 35.16, 28.05, 26.63 and 19.59 %, respectively. Significant difference in per cent disease control was noted in each treatment but it was at par in T_4 and T_3.

Effect on green pod yield

Maximum green pod yield was recorded (62.38 q/ha) in T_1 (neem oil cake) followed by T_2 (mustard oil cake), T_4 (mahua oil cake), T_3 (linseed oil cake), T_5 (saw dust) and T_6 (unamended soil) which were 56.99, 52.41, 51.31, 47.36 and 36.83 q/ha, respectively. Significant difference in green pod yield was recorded in each treatment but it was at par in T_4 and T_3.

Avoidable loss in pod yield

The avoidable loss in pod yield by soil amendment was maximum (40.96%) in T_1 (neem oil cake) followed by T_2 (mustard oil cake), T_4 (mahua oil cake), T_3 (linseed oil cake) and T_5 (saw dust) which were 35.37, 29.70, 28.20, and 22.23%, respectively. Each treatment differed significantly to each other but it was at par in T_4 and T_3.

Effect on seed yield

Maximum dry seed yield was recorded (10.76 q/ha) in T_1 (neem oil cake) followed by T_2 (mustard oil cake), T_4 (mahua oil cake), T_3 (linseed oil cake), T_5 (saw dust) and T_6 (unamended soil) which were 9.99, 9.36, 9.28, 8.59 and 6.82 q/ha, respectively. Dry seed yield significantly differed in T_1 and T_2. However, it was at par in T_2, T_4 and T_3 but showed significantly higher dry seed yield as compared to T_5 and T_6.

Avoidable loss in seed yield

The avoidable loss in seed yield was maximum (36.62 %) in T_1 (neem oil cake) followed by T_2 (mustard oil cake), T_4 (mahua oil cake), T_3 (linseed oil cake) and T_5 (saw dust) which were 31.74, 27.14, 26.34, and 20.62%, respectively. Per cent increased seed yield significantly differ in T_1 and T_2. However, it was at par in T_4 and T_3 but it was higher as compared to T_5.

Jayarajan *et al.*(1987) observed that soil amendment with neem oil cake reduced disease intensity and increased yield in Frenchbean. Mustard oil cake amended soil resulted

Table 1 Effect of soil amendments on seed germination, diseases intensity, per cent disease control (PDC) and yield of Frenchbean (Pooled data for 2005-06 and 2006-07)

Treatment	Dose (q/ha)	Seed germination (%)	Disease intensity	PDC	Green pod yield (q/ha)	Avoidable loss in green pod yield (%)	Dry seed yield (q/ha)	Avoidable loss in dry seed yield (%)
T_1-Neem oil cake	42	97.07	37.44	43.59	62.38	40.96	10.76	36.62
		(–80.17)	(–37.72)	(–41.31)		(–39.79)		(–37.24)
T_2-Mustard oil cake	42	93.06	43.05	35.16	56.99	35.37	9.99	31.74
		(–74.62)	(–41)	(–36.36)		(–36.48)		(–34.29)
T_3-Linseed oil cake	42	86.11	48.71	26.63	51.31	28.2	9.26	26.34
		(–68.11)	(–44.25)	(–31.06)		(–32.08)		(–30.87)
T_4-Mahua oil cake	42	89.82	47.77	28.05	52.41	29.7	9.36	27.14
		(–71.39)	(–43.71)	(–31.98)		(–33.02)		(–31.39)
T_5- Saw dust	42	82.1	53.38	19.59	47.36	22.23	8.59	20.62
		(–64.97)	(–46.94)	(–26.28)		(–28.12)		(–27.01)
T_6- Control		71.45	66.38		36.83		6.82	
		(–57.7)	(–54.56)					
SEm_+		1.35	0.9	0.56	1.14	0.77	0.33	0.75
CD (P=0.05)		3.02	2	1.25	2.53	1.73	0.74	1.68

Figures in parentheses are arcsine-transformed value

in thickening, swelling and lysis of cells of *R. solani* hyphae, particularly due to soil bacterial activity. In water and n-butanol extracts of mustard oil cake amended soil, the growth of *R. solani* was highly reduced due to volatile gaseous substances emitted by decomposing oil cake in amended soil (Sarkar *et al*. 2002). Upmanyu *et al*. (2002) and Gupta *et al.* (2011) also reported that the maximum seed germination and minimum disease intensity in neem oil cake amended soil followed by mustard oil cake, mahua oil cake and saw dust. This is in agreement with present finding. Nitrogen possibly lost through ammonia resulting in increased concentration of CO_2 in soil, which is unfavourable for the survival of *R. solani*. Besides, the possibility of inhibitory action of resins contained in saw dust on the pathogen population couldn't also be ruled out. Jakhar *et al*. (2002) found different oil cakes were effective against *R. solani* causing root rot disease in cotton. Senapoty (2010) also found neem cake, rice husk and mustard oil cake were effective in management of sheath blight of rice caused by *R. solani*.

REFERENCES

Gupta R P, Yadav B C and Singh S K. 2011. Effect of soil amendment on seed germination, web blight intensity and yield of French bean. (*In*) *National Symposium on Biology of Infection, Immunity and Disease Control in Pathogen-plant Interactions*, 2-4 December 2011, Department of Plant Sciences, School of Life Sciences, University of Hyderabad, Hyderabad.

Jakhar S S, Duhan J C and Chauhan S H. 2002. Effect of soil amendment with oil cake on root rot of cotton caused by *R. solani*. *Plant Disease Research* **17**(1):16–20.

Jeyarajan R, Doraiswamy S, Bhaskaran R, Jayaraj S and Schmutterer. 1987. Effect of neem (*Azadirachta indica*) and other plant products in the management of plant diseases in India. *Natural pesticides from the neem tree Azadirachta indica A. Juss and other tropical plants*, pp 635–44.

Mathew K A and Gupta S K. 1996. Studies on web blight of French bean caused by *Rhizoctonia solani* and its management. *Indian Journal of Mycology and Plant Pathology* **26** (2): 171–7.

Sarkar M K, Acharya A and Sengupta P K. 2002. Management of sheath blight of rice caused by *R. solani* by oil cake amendment of soil. *Journal of Mycopathological Research* **40**(2): 153–8.

Saulunkhe D K and Kadam S S. 1998. French bean. (*In*) *Hand Book of Vegetable Science and Technology*, pp 457–69. Marcel Dekker Inc, New York.

Senapoty Daisy. 2010. Efficacy of soil amendments for the management of rice sheath blight. *Indian Phytopathology* **63**(1): 94–5.

Sharma S R and Sohi H S. 1980. Assessment of losses in French bean caused by *Rhizoctonia solani* Kuhn. *Indian Phytopathology* **33**: 366–9.

Upmanyu S, Gupta S K and Shyam K R. 2002. Innovative approaches for the management of root rot and web blight (*Rhizoctonia solani)* of French bean. *Indian Journal of Mycology and Plant Pathology* **32** (3): 317–31.