

Effect of intercropping on the fungicides of foot and collar rot in soybean

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ABSTRACT

Effect of intercropping on the incidence of foot and collar rot disease in soybean. 9 crops, there each among the cereals, pulses, and oilseeds as intercrops along with soybean as a sole crop to see their effect on incidence of the disease. Diseased soybean plants exhibiting typical symptoms of foot and collar rot were collected from the field research experiment at the site and samples were placed in a clean bell jar at room temperature (22-28°C) in the laboratory. The diseased specimens were examined in the laboratory. The influence of root exudates from these crops was studied on the biology of pathogen and its known antagonist *Trichoderma harizanum in vitro*. The incidence of foot and collar rot in soybean was greatly reduced by employing intercrops such as maize, sorghum and pearl millet.

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INTRODUCTION

Soybean [*Glycine max* (L.) Merrill] is one of the major oilseed/legume crops in India. Madhya Pradesh has the privilege to own the status of "Soybean State" by virtue of occupying a large area during the *Kharif* season for the last 20 years.

It is a miracle crop of the twentieth century, containing 18 to 20 per cent of oil and 38 to 40 per cent of high quality protein, employed to a variety of uses. The crop also fixes atmosphere nitrogen symbiotically in soil at the rate of 65 to 100 kg/ha.

Foot and collar rot caused by *Sclerotium rolfsii* Sacc. is an important soil-borne disease of the crop. The

fungus was first recorded from the United States by Rolf's (1892) as a cause of tomato blight in Florida.

It is difficult to manage the diseases caused by soil-borne pathogens because of complex soil environment of physical, chemical and biological origin. The present investigation was, therefore, undertaken with the following objectives:

To study the effect of intercropping on the incidence of foot and collar rot disease in soybean.

MATERIAL AND METHODS

The present investigation was undertaken on the effect of intercropping on the incidence of foot and collar

Sr. No.	Crops	Inter crop ratio	Variety	Seed rate (kg/ha)	Fertilizer doses (kg/ha)		
					N	P	K
1.	Soybean	Sole	JS-335	100	20	60	20
2.	Maize	4:2	JM-216	20	60	40	30
3.	Sorghum	4:2	SPV-1022	12	80	40	40
4.	Pearl millet	4:2	WCC-75	7	60	40	20
5.	Pigeonpea	4:2	ICPL-88039	15	20	50	0
6.	Moong bean	4:2	MI24-91	20	20	50	0
7.	Urd bean	4:2	IV 8-6	15	20	50	0
8.	Groundnut	4:2	Jyoti	100	20	40	20
9.	Sunflower	4:2	Modern	20	40	40	0
10.	Cotton	2:1	Vikram	5	80	40	40

Observations on the incidence of foot and collar rot of soybean were recorded up to 35 days after sowing

rot in soybean and the materials and the methods followed are being described herein.

Diseased specimens :

Diseased soybean plants exhibiting typical symptoms of foot and collar rot were collected from the field research experiment at the site of Cropping System Research Project, College of Agriculture, Indore.

The samples were placed in a clean bell jar at room temperature (22-28°C) in the laboratory. The diseased specimens were examined in the laboratory and isolations were periodically made to obtain the pure culture of *S. rolfisii*.

Seed:

Seeds of soybean variety JS-335 were used in the present investigation. Seeds of the crops (3 each among the cereals, pulses and oilseeds) used as intercrops with soybean *i.e.* maize (*Zea mays* L.), sorghum (*Sorghum bicolor*), pearl millet (*Pennisetum typhoides*), pigeonpea (*Cajanus cajan*), urd bean (*Vigna mungo*), moong bean (*Vigna radiata*), groundnut (*Arachis hypogaea* L.), sunflower (*Helianthus annuus* L.) and cotton (*Gossypium hirsutum* L.) (Table A), were obtained from the Cropping system Research Project and Regional Pulse Project, College of Agriculture, Indore.

RESULTS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under the following heads:

Incidence of foot and collar rot on different intercrops :

The data on incidence of foot and collar rot presented in Table 1 showed that greater disease was recorded in cotton (21.44) as an intercrop, which was significantly higher than the disease incidence in soybean (19.91) as a sole crop. Groundnut (18.44), urd bean (18.05) recorded lower but statistically identical. Moong bean (17.36) and pigeonpea (16.22) showed statistically significant difference among them. Sunflower supported the least incidence 8.70 of collar rot, whereas maize, sorghum and pearl millet did not harbor any disease and remained as non-hosts for this pathogen. Hence, growing maize sorghum and pearl millet as intercrops with soybean reduce the collar rot incidence in soybean.

Effect of different intercrops on the yield of soybean:

The soybean equivalent yield (SEY) was computed with soybean as sole crop and when grown with 9 intercrops namely maize, sorghum, pearl millet and pigeonpea, moong bean, urd bean and groundnut, sunflower and cotton. The data in Table 2 showed the significant differences among the SEY.

The maximum SEY was recorded in groundnut (33.28q/ha) as an intercrops followed by cotton (32.50 q/ha), pigeonpea (26.96 q/ha), sunflower (24.10 q/ha), urd bean (22.12 q/ha), moong bean (19.86 q/ha), pearl millet (16.43 q/ha), sorghum (15.68 q/ha) and maize (14.85 q/ha).

The lowest yield was obtained in soybean as a sole crop *i.e.* 10.84 q/ha. Although incidence of foot and collar rot in intercrops such as cotton (21.44), groundnut (18.44)

Table 1 : Incidence of foot and collar rot on soybean and different crops employed as intercroops

St. No.	Treatments	Incidence of disease in soybean (%)	Incidence of disease in different intercroops
1.	Soybean sole	11.67 (19.91)*	11.67 (19.91)*
2.	Soybean + Maize	4.33 (11.97)	0.00 (0.00)
3.	Soybean + Sorghum	7.00 (15.34)	0.00 (0.00)
4.	Soybean + Pearl millet	7.33 (15.68)	0.00 (0.00)
5.	Soybean + Pigeonpea	8.66 (17.05)	7.80 (16.22)
6.	Soybean + Mcong bean	8.33 (15.74)	8.98 (17.36)
7.	Soybean + Urd bean	9.66 (18.04)	9.67 (18.05)
8.	Soybean + Groundnut	9.67 (18.05)	10.00 (18.44)
9.	Soybean + Sunflower	10.00 (18.44)	12.33 (8.70)
10.	Soybean + Cotton	10.50 (18.91)	13.67 (21.44)

* Figures in parentheses indicate angular transformed values.

SE (m) \pm 0.23

C.D. (P=0.05) 0.67

Table 2 : Effect of different intercroops on the yield of soybean

St. No.	Treatments	Yield of main crop (q/ha)	Yield of different intercroops (q/ha)	Cost price (Rs.)	Soybean equivalent yield (SEY) (q/ha)
1.	Soybean sole	10.84	.	1280	10.84
2.	Soybean +Maize	10.69	9.69	(550)	14.85
3.	Soybean +Sorghum	11.99	10.50	450	15.68
4.	Soybean +Pearl millet	12.65	9.70	500	16.43
5.	Soybean + Pogeonpea	12.32	12.50	1500	26.90
6.	Soybean+ Moong bean	12.54	7.50	1250	19.86
7.	Soybean + Urd bean	14.25	8.00	1260	22.12
8.	Soybean + Groundnut	13.75	12.50	2000	33.28
9.	Soybean + Sunflower	12.50	9.00	1650	24.10
10.	Soybean + Cotton	13.53	12.00	2000	32.50

SE (m) \pm 0.01

CD (P=0.05) 0.03

and urd bean (18.05) was high their higher market price has been reported for the SEY.

Intercropping of maize, sorghum and pearl millet in soybean reduced the incidence of foot and collar rot in the later. However, the figures on soybean equivalent yield (SEY) for different intercrops tend to be higher in case of oilseeds and pulse crops, which supported lesser foot and collar, rot incidence in soybean.

Although wheat has been reported as a host of *S. rolfsii* (Farr *et al.*, 1989), (Toory *et al.*, 2001) and (Avizohar and Palti, 1962) have been reported as non-hosts for this pathogen all these crops have effectively been shown to reduce the collar rot incidence in groundnut and presently in soybean. Hence, use of cultural practices like crop rotation, mixed cropping and intercropping with non-hosts/hosts with lesser preference holds promise for management of damaging soil-borne pathogens especially *S. rolfsii* (Hedge *et al.*, 2013; Agarwal *et al.*, 1977 and Singh and Singh, 1994).

Conclusion:

Studies on effect of intercropping on the incidence of foot and collar rot in Soybean showed that the disease incidence was reduced by employing maize, sorghum and pearl millet as inter crops.

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