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Mycoflora associated with soybean seeds and their management in Madhya Pradesh

M. S. BHALE
Department of Plant Pathology, JNKVV, Jabalpur 482004, Madhya Pradesh

Soybean is primarily grown for oil and protein in Madhya Pradesh. Seeds of 24 soybean varieties were collected from experimental field and tested. In all, four major pathogens, *Colletotrichum dematium, Macrophomina phaseolina, Fusarium oxysporum, Phoma medicaginis* were found responsible for seed rot, seedling decay and diseases at various stages. Seed samples of a popular variety JS 335 collected from seven major soyabean growing districts were analysed for associated mycoflora by standard blotter method. The spectrum of the associated pathogenic fungi was almost the same. Efficacy of various fungicide and bio-pesticides on a pre-tested seed sample of PK 416 having maximum natural infection of the target fungi was used. Thiram plus carbendazim (0.3%) was the best to eliminate the seed borne mycoflora. Seed dressing with *Pesudomonas fluorescence* (0.4%) and *Trichoderma viridi* (0.4%) was less effective under Madhya Pradesh conditions.

Key words : *Colletotrichum dematium, Macrophomina phaseolina, Fusarium oxysporum, Phoma medicaginis, Pesudomonas fluorescence, Trichoderma viridi,* soybean, fungicide

INTRODUCTION

Soyabean *(Glycine max* (L.) Merrill) is primarily grown for oil and protein. It contains 42-45% protein and 20-22 % oil. Madhya Pradesh occupies the highest area under cultivation (4.4 million ha) with an annual production of 4.0 million tones. Susceptibility of the crop to diseases is the major constraint in increasing productivity and good seed quality (Tiwari, 2001). In India, about 40 fungal pathogen have been identified with 6-8 damage by these pathogens (Khare *et. al.,* 2000 ; Sarbhoy and Agrawal, 1983). Many of the pathogens are seed borne (Vishunavat, 2002 ; Hartman *et. al.,* 1999 ; Khare *et. al.*, 2000). Investigations were undertaken to determine the extent of association of mycoflora with soybean seeds and their management in the state involving the bio-pesticides as seed dresser.

MATERIALS AND METHODS

Seeds of 24 soybean varieties, which are under active seed multiplication at national level were obtained from Seed Technology Research Unit, Department of Plant Breeding and Genetics, JNKVV, Jabalpur 482004 (Madhya Pradesh). The seeds were tested by standard blotter method (Agarwal and Sinclair, 1997 ; Khare, 1996). Association of mycoflora was also recorded on the seed sample of the most popular variety JS 335 collected from seven districts of Madhya Pradesh. The seed sample having maximum natural infection of the target fungi was subjected to dressing with Thiram (0.25%), Carbendazim (0.2%), Mancozeb (0.25%), Thiram plus Carbendazim (0.3%). Thiram plus Mancozeb (0.3%), *Pesudomonas fluorescence* (0.4%) and *Trichoderma viridi* (0.4%). The treated seeds were tested by standard blotter method for the associated mycoflora after incubation of 7 days under ambient conditions in growth chamber, with alternate cycles of 12 hr light and 12 hr dark periods.

RESULTS AND DISCUSSION

Association of mycoflora with different varieties of soybean seeds

In all four major pathogens were found responsible for various diseases. Practically none of the seed

sample was free from the infection. *Colletotrichum dematium,* responsible for seed rot, pod blight and anthracnose was found associated in the range of 2.0 to 10.0% whereas infection of *Macrophomina phaseolina* ranged upto 11.0%. The pathogen is responsible for seed rot and charcoal root rot. The association of *Fusarium oxysporum* ranged from 3.0 to 11.0%. Association of *Phoma medicaginis* was recorded upto 11.0%. Maximum infection of *Colletorichum dematium* was recorded in JS 80-21, *Macrophomina phaseolina* in MACS 58, *Fusarium oxysporum* in JS 2, *Phoma medicaginis* JS 90-12. The old varieties Bragg, Monetta, Cocker Stuart were equally susceptible (Table 1). *C. dematium* and *M. phaseolina* have been found responsible for causing diseases in soybean (Bhale *et. al.,* 1999a, b). Association of *F. oxysporum* and *P. medicaginis* with seeds of soybean have been demonstrated (Khare *et. al.,* 2000). Agarwal and Sinclair (1997) and Hartman *et. al.*, (1999) have reported the association of these pathogens from different parts of the world.

Table 1 : Association of mycoflora with seeds of 24 varieties of soybean

Variety	Percentage of disease incidence			
	C. dematium	*M. phaseolina*	*F. oxysporum*	*P. medicaginis*
JS 71-5	04	08	07	03
JS 75-46	07	08	03	07
JS 90-41	02	05	10	03
JS 335	05	07	10	00
JS 72-44	03	09	05	00
JS 2	07	08	11	00
JS 80-21	10	02	03	11
JS 72-280	03	05	05	09
MACS 13	09	02	03	02
MACS 57	08	09	03	03
MACS 58	07	11	02	05
MACS 124	05	05	01	02
MACS 450	05	03	10	02
Monetta	05	03	05	05
Bragg	05	07	06	03
KB 79	02	05	05	05
KH Sb 2	02	05	05	05
Pb 1	02	06	03	05
Cocker Stuart	07	02	10	03
PK 416	10	07	03	05
PK 472	10	07	05	10
PK 1024	02	07	05	10
PK 1029	02	05	10	05
PK 1042	02	05	05	05

Table 2 : Association of mycoflora with farmers own of soybean

Location	Variety	Mycoflora	Range of association	Average Seed germination	Other crop seed
Betul	JS 335	*M. phaseolina*	2.0-3.0	93.00	Nil
		C. dematium	2.0-4.0		
		F. oxysporum	1.0-4.0		
		P. medicaginis	1.0-3.0		
		M. roridum	0.0-0.0		
		A. alternata	0.0-0.0		
		C. kikuchii	3.0-5.0		
		Aspergillus spp.	11.0-17.0		
Seoni	JS 335	*M. phaseolina*	3.0-5.0	93.00	Nil
		C. dematium	3.0-5.0		
		F. oxysporum	5.0-10.0		
		P. medicaginis	1.0-3.0		
		M. roridum	0.0-0.0		
		A. alternata	2.0-4.0		
		C. kikuchii	4.0-9.0		
		Aspergillus spp.	10.0-15.0		
Chhindwara	JS 335	*M. phaseolina*	5.0-7.0	95.00	Nil
		C. dematium	5.0-9.0		
		F. oxysporum	10.0-11.0		
		P. medicaginis	7.0-10.0		
		M. roridum	0.0-0.0		
		A. alternata	0.0-0.0		
		C. kikuchii	3.0-9.0		
		Aspergillus spp.	10.0-11.0		
Jabalpur	JS 335	*M. phaseolina*	4.0-9.0	85.00	Nil
		C. dematium	3.0-11.0		
		F. oxysporum	3.0-15.0		
		P. medicaginis	2.0-11.0		
		M. roridum	2.0-4.0		
		A. alternata	1.0-3.0		
		C. kikuchii	3.0-5.0		
		Aspergillus spp.	10.0-12.0		
Sehore	JS 335	*M. phaseolina*	2.0-4.0	89.00	Nil
		C. dematium	2.0-5.0		
		F. oxysporum	1.0-3.0		
		P. medicaginis	2.0-3.0		
		M. roridum	7.0-11.0		
		A. alternata	3.0-9.0		
		C. kikuchii	3.0-5.0		
		Aspergillus spp.	2.0-10.0		
Indore	JS 335	*M. phaseolina*	5.0-9.0	91.00	Nil
		C. dematium	3.0-9.0		
		F. oxysporum	2.0-11.0		
		P. medicaginis	2.0-10.0		
		M. roridum	2.0-11.0		
		A. alternata	2.0-5.0		
		C. kikuchii	1.0-3.0		
		Aspergillus spp.	5.0-17.0		
Ujjain	JS 335	*M. phaseolina*	2.0-7.0	87.00	Nil
		C. dematium	2.0-5.0		
		F. oxysporum	2.0-5.0		
		P. medicaginis	2.0-6.0		
		M. roridum	1.0-5.0		
		A. alternata	1.0-5.0		
		C. kikuchii	2.0-5.0		
		Aspergillus spp.	10.0-12.0		

Association of mycoflora with seed samples from different lications

The soybean seed samples of variety (JS 335) obtained from seven major districts were analyzed by standard blotter method. Association of eight major fungi revealed the presence. Maximum association of *M. phaseolina* (4-9%), *C. dematium* (3-11%), *F. oxysporum* (3-15%), *P. medicaginis* (2-11%) was recorded from the samples from the farmers of Jabalpur. While *M. roridum* (7-11%) and *A. alternata* (3-15%) from Sehore, *C. kikuchii* (4-9%) from Seoni, *Aspergillus niger, Aspergillus flavus* (11-17%) from Betul district (Table 2).

Table 3 : Efficacy of seed dressers for the control of seed borne mycoflora of soybean

Fungicide	Percent conc.	Percentage of association			
		C. dematium	*M. phaseolina*	*F. oxysporum*	*P. medicaginis*
Thiram	0.25	00	00	00	00
Carbendazim	0.20	01	02	00	01
Mancozeb	0.25	02	02	01	01
Thiram + Mancozeb	0.30	00	00	00	00
Thiram + Carbendazim	0.30	00	00	00	00
Pseudomonas fluorescence	0.40	04	04	02	00
Trichoderma viride	0.40	06	05	02	01
Control	0.00	10	07	10	03

Effcacy of chemicals and bio-pesticide seed dresser for the management of seed borne mycoflora

Pre-tested seed sample of PK 416 having maximum natural infection of the target mycoflora was used for the experimentation. Seeds were treated with chemical and bio-pesticide prior to plating and observed after 7 days of incubation. Practically no fungal infection was found associated with seeds treated with Thiram plus carbendazim (0.3%) and Thiram plus mancozeb (0.3%) as compared to control where no fungicide was used. Combination of a contact fungicide (Thiram) and a systemic fungicide (Bavistin) offers a wide effective range of the management (Bhale *et. al.*, 1997) Treatment with bio-pesticide was not effective as compared to chemical fungicides under Jabalpur conditions. (Table 3). Efficacy of thiram and bavistin has been reported by Nene and Thaplial (1982). Similar results were found in the present investigation.

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