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Evaluation of seed mycoflora of pigeonpea and their fungicidal management

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Seed sample of Bahar cultivar of pigeonpea was categorized in three categories on the basis of visible abnormalities, such as healthy looking seeds, discolored and shriveled seeds. These categories were categorized further into two sub categories as under and normal sized. Among the categories shriveled under size seeds showed high incidence of mycoflora than other categories. Mycoflora isolated from seed samples, in which *Alternaria alternata* showed high incidence (8-22%) than other mycoflora, while *Aspergillus* niger found to be in low incidence. Eleven fungicides were evaluated for seed treatment, out of them Bavistin-50wp was found most effective in seed germination (88.14% in lab and 86.21% in pot conditions) and seedling vigour index (7671.44 in lab and 7333.46 in pot conditions). There was a significant difference in treated and untreated seeds.

Key words: Disease management, incubated, pathogens, seed borne and viability

INTRODUCTION

Amongst the different pulses grown in India pigeonpea (*Cajanus cajan* L.) Millsp. is the most important *Kharif* pulse crop with much higher productivity (Gade *et al.* , 2007), this is the second important legume crop of India, occupying an area of 2.76 million hectares (Annonymous, 1995). The crop suffers from several diseases e.g. wilt *(Fusarium oxysporum),* Phytophthora blight (*Phytophthora drechsleri* Tucker *f.* sp. *cajani)* (Pal *et al.*, 1970). The yield losses vary from 2.6 to 6.3% of the total production (Kannaiyan *et al.,* 1984). The seeds are passive carriers of pathogens that are transmitted when sown seeds germinated under suitable environmental conditions. It is held that progressive reduction in the number of plants over time is associated with the concomitant loss of viability due to seed borne fungal spores. Seed deterioration by fungi is accompanied by an increase in fatty acid values, loss in protein contents and grain storage ability (Rizvi, 2006). Seed treatment for controlling plant diseases has been termed as the "pain less method" for farmers. In under devoloping country like India, it is all the more important since we cannot pay the heavy costs of spraying and dusting. Therefore, keeping in view the above facts the present studies have been conducted to evaluate the seed mycoflora and effect of seed treatment with eleven fungicides on protection and vigour of pigeonpea seedlings.

MATERIALS AND METHODS

Pigeonpea seeds of Bahar cultivar were collected from local farmer of Tahsil Soram, Dist. Allahabad for detecting the seed mycoflora. Four hundred randomly selected seed samples were categorized in three categories on the basis of visible abnormality as healthy looking seeds normal sized seed from sample, each was suspended in 10 ml sterlized distilled water in the conical flasks separately. The flasks were shaken by hand for 10 minutes. After shaking equal volume of this suspension was transferred into two centrifugal tubes, and rotated at 2000-2500 rpm for 10 minutes. The supernatant liquid was decant - off from each tube and then the sediment from respective tube was thoroughly mixed in 2 ml lactophenol and examined under compound microscope for the presence of fungal spores fructifications and mycelial fragments. The viability tests of fungal spore, frutification and hyphal fragments present in the sediment was carried out

by plating them in Petridishes. The dishes were incubated at 27 ± 1°C for 7 days.

In order to record the internally seed borne fungi, the seeds were studied adopting ISTA rules (Anonymous, 2003) in which, seed sample (fifty seeds) was carried out in four replications. These seeds were surface disinfected in 1% solution of mercuric chloride for 3 minutes and all the seeds were then plated directly on three layer moist blotter paper in the Petridishes and were incubated at 27 ± 1°C for 7 days under 12 hrs light and darkness conditions (ISTA, 1999). On the 8th day of incubation the seeds were observed stereoscopically for the occurence of mycoflora and the per cent incidence of the mycoflora was recorded.

The seeds were dressed separately with Brassical, Kavach, Captafal, Agroson GN, Dithan M-45, Vitavax, Bavistin (Carbendazim 50 wp) Bavstin 25 sd, Bavistin 25 sd + Thiram. Seed germination per cent was calculated in both laboratory and pot conditions. Seedlings emergence was also counted in pot. The root and shoot length of each of the five seedlings were measured. Vigour index was calculated by multiplying the germination and seedling length (root length + shoot length) as suggested by Abdul-Baki and Anderson (1973). Seed emergence was studied by sowing 100 seeds of each treatment in three replications in the well prepared soil in pot. Seedlings emerged were counted in each replication. Statistical analysis was performed as per standard proceduree of Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Statistical analysis of data showed significant differences in incidence of mycoflora (Table 1). Among all categories, shriveled under sized seed showed a high incidence (22%) of mycoflora compare to other categories of seed samples, followed by normal size and shriveled seeds. *Alternaria alternata* showed high incidence (8-22%) in all categories of seeds. However, *Mucor* sp. showed least incidence (0-4%) in all categories of samples in all mycoflora. while *Fusarium semitectum,*

Table 1 : Per cent incidence of fungal species associated with different categories of pigeonpea seeds

Fungal species	Categories					
	Apparently healthy looking		Discolored seeds		Shrivelled seeds	
	Under sized	Normal	Under sized	Normal	Under sized	Normal
Alternaria alternata	8	6	13	11	22	20
Aspergillus flavus	6	3	6	4	11	9
A. niger	4	2	6	5	10	6
Botrytis cinerea	2	0	4	3	6	5
Cladosporium cladosporides	0	0	3	0	8	5
Collectotrichum dematium	4	2	4	3	6	5
Curvularia lunata	2	0	3	0	4	6
Drechslera tetramera	0	0	4	3	10	6
Fusarium moniliforme	7	4	6	4	14	12
F. semitectum	8	4	6	5	11	10
Mucor sp.	0	0	0	0	4	2
Penicillium oxalicum	0	0	2	1	2	3
Phoma sp.	0	0	4	2	6	3
Phyllosticta cajani	5	2	7	6	10	9
Rhizoctonia bataticola	4	3	10	7	10	8
R. solani	8	5	8	6	10	8
Rhizopus arrhizus	1	1	4	3	5	4
R. nigricans	0	0	3	2	4	2
Trichothecium roseum	0	0	3	2	6	2
Total no. of fungal sp.	12	10	18	16	19	19
Total no. of fungal colonies	59	32	96	67	159	126
CD at 5% level of significance	1.44	1.6	2.04	1.61	2.82	2.01

Table 2 : Per cent seed infection of different pathogens found associated with treated and untreated pigeonea seeds

Fungi	A	B	C	D	E	F	G	H	I	J	K	L
Alternaria alternata	16	6	8	3	2	0	1	0	0	0	0	0
A. longissima	6	3	4	0	0	0	1	0	0	0	0	0
Aspergillus flavus	12	9	1	0	0	0	0	0	0	0	0	0
A. niger	6	5	0	0	0	0	0	0	0	0	0	0
Botrytis cinerea	2	1	0	0	0	0	0	0	0	0	0	0
Cladosporium cladosporides	5	0	0	0	0	0	0	0	0	0	0	0
Colletotrichum dematium	6	4	3	1	0	1	0	0	0	0	0	0
Curvularia lunata	5	3	3	2	0	0	0	0	0	0	0	0
Fusarium moniliforme	11	4	6	6	5	4	3	0	0	0	0	4
F.semitectum	8	5	5	4	3	2	2	1	0	0	0	3
Phyllosticta cajani	7	3	0	1	0	0	0	0	0	0	0	0
Rhizoctonia bataticola	9	0	5	0	1	4	1	1	0	0	0	2
R. solani	6	0	3	0	1	1	0	0	0	0	0	1
Trichothecium roseum	8	1	3	0	0	0	0	0	0	0	0	0
Total no. of fungal colonies	107	44	41	17	12	12	8	2	0	0	0	10
Total no. of pathogen detected	14	11	10	6	5	5	5	2	0	0	0	4
CD at 5% level of significant	2.76	1.82	1.4	1.44	0.72	0.78	0.78	0.77	0	0	0	0.78

A - Control ; B - Brassicol; C - Kavach ; D - Captafal; E - Agrosan GN; F - Dithane N - 45; G - Thiram; H - Vitavax; I - Bavistin 50 WP; J - Bavistin 25 SD; K - Bavistin 25 SD + Thiram; L - Captan

Table 3 : Effect of fungicidal seed treatment on seed germination, seedling emergence and vigour of pigeonpea

Fungicides	Doses (g/kg seed)	Seed germination		Seedling vigour				
		Laboratory	In pot	Seedling emergence	Shoot length(mm)	Root length(mm)	Vigour index in lab	Vigour index in pot
Bavistin 25SD+Thiram	1+1	85.19 (67.37)	80.86 (63.48)	79.19 (62.86)	94.1	73.8	6381.122	6002.528
Captan	2	81.09 (64.23)	78.08 (62.09)	75.06 (60.04)	88.5	90.9	7459.581	7185.972
Bavistin 25SD	2	82.08 (64.96)	78.04 (62.06)	77.17 (61.46)	94.3	85.1	7079.308	6735.504
Kavach	2	76.12 (60.75)	72.10 (58.12)	70.07 (56.82)	74.5	68.3	5273. 496	4998.93
Captafol	2	80.10 (63.51)	76.08 (60.72)	74.06 (59.38)	83.5	81.2	6587.62	6261.196
Thiram	2	77.08 (61.40)	74.13 (59.43)	70.07 (56.83)	99.5	77.2	6050.076	5822.336
Dithane M 45	2	79.05 (62.77)	76.06 (60.71)	73.99 (59.34)	93.8	75	6022.55	5798.3
Agroson GN	3	75.25 (60.82)	74.11 (59.42)	69.05 (56.20)	81.9	86.1	6560.925	6462.771
Vitavax	2	80.06 (63.48)	77.07 (61.39)	74.10 (59.14)	83.3	76.2	6183.872	5956.034
Brassicol	2	74.05 (59.38)	72.04 (58.08)	67.10 (55.00)	62	24.1	1846.605	1798.164
Bavistin 50 WP	2	88.14 (69.86)	84.21 (66.59)	81.11 (54.24)	91.4	86	7671.44	7333.46
Control	0	71.07 (57.46)	69.12 (56.24)	62.08 (51.99)	59.6	58.9	4245.623	4130.768
CD at 5% level of significant		4.08	4.23	5.11	5.61	5.98	243.31	523.06

Figures in parentheses are angular transformed values

Aspergillus flavus, Rhizoctonia solani, Fusarium moniliforme, Rhizoctonia bataticola, Phylosticta cajani and *Aspergillus niger* exhibited moderate incidence of mycoflora in all categories of seed samples. Fourteen species of *Aspergillus* isolated from pigeonpea seeds were reported throughout the world (Husain and Ahmad, 1971; Ellis *et al.*, 1978 and Shukla and Bhargava, 1977). *Fusarium oxysporum* was detected from seeds and considered as a dominant fungus caused pod spot or seed rot, seedling rot and leaf blight (Singh, 1988). Pandey *et al.* (2007) reported that ten fungal species viz., *Alternaria alternata, Aspergillus flavus, A. niger, A. ochraceous, A. terreus, Culvularia lunata, Fusarium nivale, F. oxysporum, Penicillium chrysogenum, Phizopus arrhizus* were associated with seeds of pigeonpea.

The data in Table 2 revealed that out of eleven fungicides evaluated Bavistn 50wp, Bavistin 25sd+Thiram, Bavistin 25sd and Vitavax were found to eliminate the entire mycoflora associated with pigeonpea seeds followed by Captan in which all the fungal species were eliminated except few colonies of *Fusarium* sp. the remaining fungicides viz. Thiram, Agrosan GN, Dithane M-45, Captafal and Kavach were listed in descending order so far their effectiveness in elimination of pathogens is considered. Similar findings were observed by Kumawat and Jain (2003).

Results revealed from Table 3 that Bavistin 50 WP was found highest effective in seed germination (88.14% in lab and 86.21% in pot conditions) and seedling vigour (7671.44 in lab and 7333.46 in pot conditions) followed by Bavistin 25 sd + Thiram (85.19% in lab and 80.06% in pot) seed germination and seedling vigour index (6381.12 in lab and 6002.53 in pot). While Kavach was least effective among all fungicides with 76.12% in lab and 72. 10% in pot conditions during seed germination and 5273.5 in lab and 4998.93 in pot conditions of vigour index. But all fungicides were some effective as compare to control. Rizvi (2006) found that the low value of vigour index was dependent on the number of fungi associated with seed. Berti *et al* (2008) observed that all fungicides (captan, mefenoxam, fludioxonil + mefenoxam, azoxystrobin, and azoxystrobin + mefenoxam) seed treatments improved seed emergence and vigour index and reduced damping-off compared to the untreated check in cuphea.

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