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EFFECT OF SEED PRIMING BY SEED-BORNE MYCOFLORA ON PLANT VIGOUR OF PIGEONPEA (*CAJANUS CAJAN* (L.) MILLSP.)

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KEYWORDS

Pigeonpea
Mycoflora
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ABSTRACT

Eight fungal flora *viz*., *Aspergillus flavus*, *Aspergillus niger*, *Aspergillus fumigatus*, *Aspergillus* sp., *Mucor* sp., Mycelia sterilia, *Fusarium udum* and *Penicillium* sp. were detected and isolated from five pigeonpea varieties by four incubation methods.The culture filtrates of these eight seed mycoflora were primed individually to assess their effect on seed germination and seedling vigour on pigeonpea. Maximum reduction in vigour index was observed when seeds were treated with *Aspergillus flavus* (72.93%) followed by *Aspergillus niger* (66.02%) and *Fusarium udum* (61.12%) in Rajeev Lochan, where as in UPAS-120 and JKM-189 varieties the maximum reduction was observed when seeds were treated with *Aspergillus flavus* (72.38% and 73.73%) followed by *Aspergillus niger* (67.79% and 70.90%) respectively. In ICPL-87119 and farmer's variety, maximum reduction was recorded by *Aspergillus flavus* (74.17% and 71.15%) followed by *Fusarium udum* (60.35% and 68.43%). In all the varieties, least reduction was recorded by seeds treated with mycelia sterilia.

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INTRODUCTION

Seed is the most important input for crop production. Pathogen free healthy seed is urgently needed for desired plant populations and good harvest. Seeds are the efficient carriers for survival, large scale and long distance spread of pathogenic organisms both externally and internally and pigeonpea seeds are not an exception. Pigeonpea seeds are the great sources of protein, amino acids, carbohydrates and a variety of minerals which make the seed liable to attack by a range of seed born mycoflora (Agrawal, 2003). Seed deterioration is an irreversible process and the physiology of seed deterioration is not well understood (McDonald, 1999). Infected or contaminated seeds prove hazardous for the seeds as they cause pre and post emergence losses and finally resulting in reduced germination of seeds, reduction of yield and also spoiled the quality of seeds during storage. Pigeonpea seeds as in other crops, serves as a source of perpetuation of the organisms. Seed health in general and particularly became federal concern due to vast exchange of seed materials within states and beyond the boundaries. The architect of pigeonpea plant is very sturdy yet it attracts 69 fungal, 3 bacterial and 19 viral pathogens causing various diseases (Nene et al. 1996). Detection of mycoflora associated with pigeonpea seeds by virtue of infection, revived the attention of several workers actively engaged in seed health evaluation. Seed health needs to the examined from two angles: First qualitatively, whether seed is infected with micro-organism or otherwise contaminated with such organisms and second to work out the level of such infections or contamination. The present study deals with the work done on detection, identification, estimation of mycoflora associated with pigeonpea seeds and their effect on seed germination and seedling vigour.

MATERIALS AND METHODS

Collection of seed samples

Seeds of four popular varieties of pigeonpea in Chhattisgarh namely Rajeev Lochan, UPAS-120, JKM-189, ICPL-87119 and a variety collected from local farmer named Farmer's variety were taken for the present study.

Detection of seed borne mycoflora

Four incubation methods viz. standard blotter (ISTA, 1976), agar plate (Muskett and Malone, 1941), roll towel (ISTA, 1985) and 2,4-D (Neergaard, 1973) method were used for detection of seed mycoflora and observation were recorded in the mean of three replication as percent incidence of seed borne mycoflora associated with unsterilized seeds. The associated mycoflora were recorded and identified under microscope (Fig.1) on the basis of their special characteristics and with the help of standard guides and manuals. The fungi were isolated, purified and maintained on potato dextrose agar (PDA) slants for further studies

Effect of associated mycoflora on seed germination and seedling vigour

To evaluate the effect of associated mycoflora on seed germination and seedling vigour these five varieties were taken and grown in rectangular pots of sized 18"×6"×12" and filled with sterilized soil and for each treatment, three replications

were maintained and kept in glass house. The germination percentage, root length and shoot length were recorded 21 days after sowing for each treatment and vigour index was calculated by using the following formula given by AbulBaki and Anderson (1973)

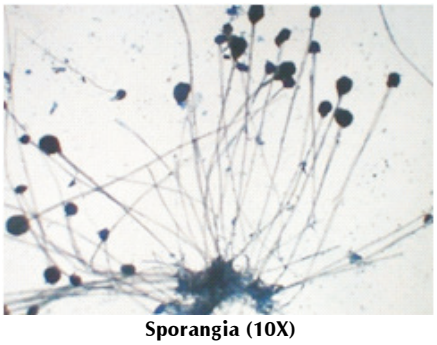
Seedling vigour index = (Mean shoot length + Mean root length) × Germination percentage

The culture filtrate of eight isolated seed borne mycoflora *viz. Aspergillus flavus, A. niger, A. fumigatus, A. sp,* Mycelia sterilia, *Mucor* sp., *Penicillium* sp. and *Fusarium udum* were primed individually to assess their effect on seed germination and seedling vigour of pigeonpea seeds. The culture filtrate of these mycoflora was obtained by culturing these on PDA media at room temperature followed by incubation for 10 days at 27 ± 1°C temperature in BOD incubator. The healthy delineated seeds of five pigeonpea varieties were surface sterilized with 0.1% mercuric chloride ($HgCl_2$) followed by three rinses with distilled water and soaked in the respective culture filtrate for 3 h. and grown in sterilized soil in pots by maintaining three replications of each fungal species and kept in glass house along with control of all five varieties which is untreated with mycoflora. Observations were recorded 21 days after sowing on seed germination, root length and shoot length of each pigeonpea variety and calculate seedling vigour index as described by formula of Abul Baki and Anderson (1973).

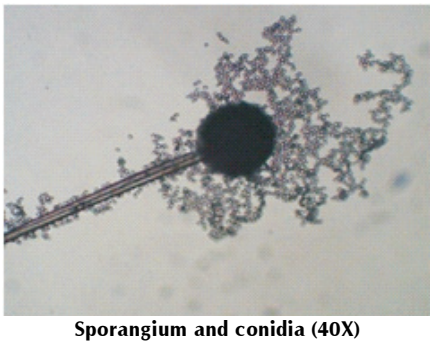
RESULTS AND DISCUSSION

The results presented in Table 1 revealed that eight fungal

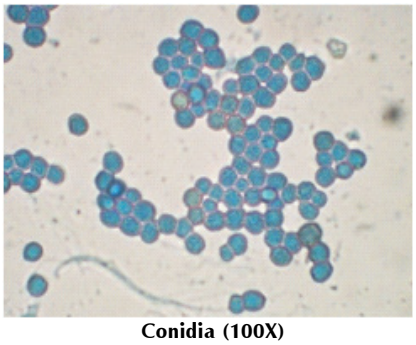
A: Sporangia and conidia of *Aspergillus flavus*



Sporangia (10X)

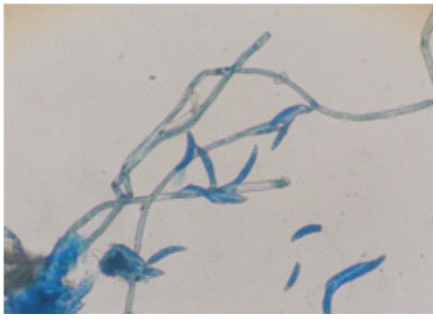


Sporangium and conidia (40X)



Conidia (100X)

B: Conidiophore and macroconidia of *Fusarium udum*

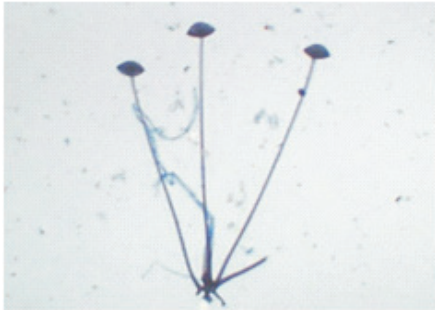


Conidiophore (10X)

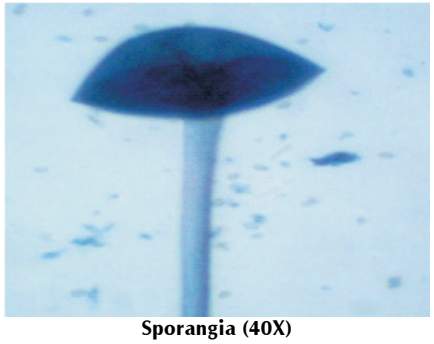
Conidiophore and Macroconidia (40X)

Macroconidia (100X)

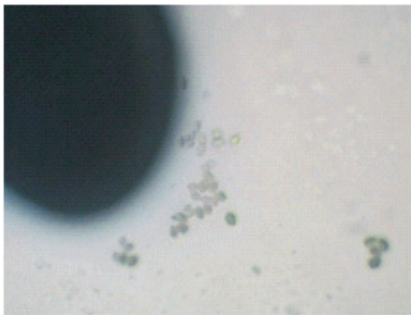
C: Stolen, sporangia and sporangiospore of *Mucor* sp.



Stolen and sporangiophore (10X)



Sporangia (40X)



Sporangiospore

Figure 1: Microscopic view of seed mycoflora of A. *Aspergillus flavus* B. *Fusarium udum* C. *Mucor* sp. at different magnification.

Table 1: Effect of seed priming with different seed borne mycoflora on plant vigour of pigeonpea varieties

Mycoflora	Rajeev Lochan		UPAS-120		JKM-189		ICPL-87119		Farmer's variety	
	Vigour index	% Decrease over control	Vigour index	% Decrease over control	Vigour index	% Decrease over control	Vigour index	% Decrease over control	Vigour index	% Decrease over control
Aspergillus flavus	430.3	72.93	490.1	72.38	528.6	73.73	357.84	74.17	279	71.15
Aspergillus niger	540.02	66.02	571.52	67.79	585.6	70.9	590.4	57.34	384.7	60.23
A. fumigatus	709.92	55.34	758.48	57.26	820.2	59.25	573.3	58.58	452.5	53.22
Aspergillus sp.	632.1	60.23	709.29	60.03	723.1	64.07	587.7	57.54	516.9	46.56
*Mucor*sp.	783.9	50.68	861	51.48	921.4	54.22	657.28	52.51	471.4	51.26
*Penicillum*sp.	645.15	59.41	770.26	56.6	737	63.38	554.77	59.91	405.7	58.05
Fusarium udum	617.92	61.12	691.86	61.01	648.4	67.78	548.8	60.35	305.4	68.43
Mycelia sterilia	1106.9	30.37	1006	43.31	963.8	52.11	872	37	577.5	40.3
Control	1589.7		1774.8		2013		1384.1		967.4	

flora *viz.*, *Aspergillus flavus*, *Aspergillus niger*, *Aspergillus fumigatus*, *Aspergillus* sp., *Mucor* sp., Mycelia sterilia, *Fusarium udum* and *Penicillium* sp. were detected and isolated from five pigeonpea varieties *viz.* Rajeev Lochan, UPAS-120, JKM-189, ICPL-87119 and a variety collected from local farmer of Chhattisgarh named Farmer's variety by four incubation methods. Data presented in table-1showed that least seedling vigour index (in control) was recorded in farmer's variety (967.38) and maximum in JKM-189 (2012.80). It seems that there was definite role of seed borne mycoflora on seedling vigour. As the highest mycoflora detected in farmer's variety resulting in lowest shoot and root length and germination percentage and thereby lowest seedling vigour index was observed while in variety JKM-189, lower mycoflora were detected and highest seedling vigour index was recorded. The trend was similar for other pigeonpea varieties also.

Finding of earlier researchers like Verma (1979), Pannu (1984), Arya *et al.* (1991), Biradarpatil *et al.* (1998), Kumar and Singh (2011), Jalander and Gachande (2011) Harees *et al.* (2014) and Singh *et al.* (2014) were corroborating with finding of present study that higher percentage of mycoflora reduced the seedling vigour index of pigeonpea.

The culture filtrate of these eight isolated seed mycoflora were primed individually to assess their effect on seed germination and seedling vigour which revealed that all the mycoflora were able to reduce the vigour index of all pigeonpea varieties over that of control. Maximum reduction in vigour index was observed when seeds were treated with *Aspergillus flavus*(72.93%) followed by *Aspergillus niger* (66.02%) and *Fusarium udum* (61.12%) in Rajeev Lochan, where as in UPAS-120 and JKM-189 varieties the maximum reduction was observed when seeds were treated with *Aspergillus flavus*(72.38% and 73.73%)followed by *Aspergillus niger* (67.79% and 70.90%) respectively. In ICPL-87119 and farmer's variety, maximum reduction was recorded by *Aspergillus flavus* (74.17% and 71.15%) followed by *Fusarium udum* (60.35% and 68.43%). In all the varieties, least reduction was recorded by seeds treated with mycelia sterilia.

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