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Effect of Seed Mycoflora on Seed Health of Brinjal Cultivars

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A B S T R A C T

All the tested fungi showed pronounced inhibitory effects on seed germination of brinjal cultivars as compared to control. All the five cultivars were inoculated with the *Fusarium oxysporum*, *Phoma* sp., *Penicillium* sp., *Curvularia lunata*, *Alternaria tenuis*, *Aspergillus flavus* and *A. niger*. Lowest seed germination was found in cultivar ABH-1 (56.63%). Significantly highest seed germination was observed in cultivar Doli-5 (72.13%). *F. oxysporum*, *Phoma* sp., *Penicillium* sp., *C. lunata*, *A. tenuis*, *A. flavus*, *A. niger* and control (uninoculated) showed average germination per cent 66.4, 70.3, 61.3, 62.5, 53.5, 62.1, 56.9 and 86.9, respectively. Among all the fungi, the seed germination was observed minimum in the seeds inoculated with *A. tenuis* (53.5%) followed by *A. niger* (56.9%). Maximum seed germination per cent was observed in *Phoma* sp. (70.3%) as compared to control (86.9%). Highest seedling vigour index was observed in cultivar Doli-5 (411) followed by GAOB-2 (403). The lowest seedling vigour index was found in cultivar ABH-1 (313) followed by cultivar GABH-3 (318) and GOB-1 (390).

Introduction

Seed Infection adversely affects the seed quality, causing seed discoloration, reduced seed weight and density, poor germinability and reduced viability. Most of the fungal diseases such as anthracnose, leaf spots, leaf blights and root rot causing severe losses are seed-borne in nature. Various mycoflora were associated with brinjal seed *viz. F. oxysporum*, *Phoma* sp., *Penicillium* sp., *C. lunata*, *A. tenuis*, *A. flavus* and *A. niger*. The association of various fungi with vegetable seeds has been reported all over the world (Summiaya and Dawar, 2015). It has been documented that much of the vegetable seeds failed to germinate and rotted because it was attacked by various seed-borne fungi (Ismail *et al.*, 2012).

Health of seeds can be affected by direct infection by pathogens or through contamination of seeds by pathogenic propagules as contamination in, on or with the seeds or as concomitant contamination (Rashid *et al.*, 2000). Hamim (2014) conducted an experiment on effect of seed-borne pathogens on germination of some

vegetable seeds and reported that germination per cent of brinjal seed was 79.5% and vigour index was 564. Normal seedlings recorded in eggplant were 71% at 7 days after sowing, 75% at 14 days after sowing and 75% at 21 days after sowing. Srinivas *et al.,* (2005) studied on incidence of seed-borne *Phomopsis vexans* in five cultivars of brinjal and reported that mean germination per cent was 63.61% and vigour index was 695. Infection of seed by a pathogenic organism and the presence of propagules of pathogens in a seed lot is vitally important because infected seeds/seed lot may fail to germinate, cause infection to seedlings and growing plants. So, healthy seed is considered as an important factor for successful crop production. The objective of the present investigation was to study the effect of different seed mycoflora on seed germination and seedling vigour of brinjal ciltivars.

Materials and Methods

In vitro evaluation of seed germination and seedling vigour index of brinjal cultivars GOB-1, Doli-5, GAOB-2, GABH-3 and ABH-1 was carried out by paper towel method at the Department of Plant Pathology, B. A. College of Agriculture, Anand Agricultural University, Anand durig 2018. Total seven fungi (*A. tenuis, F. oxysporum, A. niger, A. flavus, C. lunata, Penicillium* sp. and *Phoma* sp.) were found associated with all the cultivars.

The experiment was carried out in factorial completely randomized design with eight treatments. Seeds of all cultivar were inoculated with the seven fungi and one uninoculated control, with four repetition each.

Seed inoculation with seed mycoflora

Brinjal seeds of five cultivars were artificially inoculated with each of the seed mycoflora (*F. oxysporum, Phoma* sp., *Penicillium* sp., *C. lunata, A. tenuis, A. flavus* and *A. niger*), separately. Seeds moistened by sterilized water were mixed thoroughly with 10 days old respective fungal culture obtained on PDA at 25 ± 2˚C. Such treated seeds were kept in Petri plates for overnight at 25 ± 2˚C and then these seeds were used for seed germination and seedling vigour index study.

Effect on seed germinability

Effect of seed mycoflora on seed germination was tested by rolled paper towel method. One sheet of germination paper was wetted by distilled water. Fifty seeds of respective brinjal cultivars were inoculated with respective seed mycoflora and placed on first sheet evenly. Second sheet of germination paper was placed on first sheet. Second sheet was wetted carefully. Both sheets were rolled along with wax coated paper.

The rolled paper was incubated in seed germinator at 25^0C for 7 days. At the end of incubation, rolled towel papers were carefully opened. Germinated and ungerminated seeds were counted treatment-wise and cultivar wise. Seeds without inoculation of seed mycoflora were considered as control. Four repetitions of each of 100 seeds were maintained for each of the treatments. Seedling length of germinated seeds was recorded.

Seedling vigour index

Seedling vigour index was calculated on the basis of seed germination and seedling length after seven days of incubation described as below.

Seedling Vigour Index (SVI) = (Mean root length + Mean shoot length) × Percent Seed germination (Abdul-Baki and Anderson, 1973).

Results and Discussion

The seed germination was influenced by seed mycoflora revealed significant differences (Table 1). The result showed that the lowest seed germination was found in cultivar ABH-1 (56.63%) which was at par with cultivar GABH-3 (57.81%). Significantly highest seed germination was observed in cultivar Doli-5 (72.13%). Seed germination in GAOB-2 was (69.50%), which was at par with GOB-1 (68.88%).

All the tested fungus showed pronounced inhibitory effects on seed germination of brinjal cultivars as evident from reduced germination per cent as compared to control. *F. oxysporum, Phoma sp., Penicillium sp., C. lunata, A. tenuis, A. flavus, A. niger* and control (uninoculated) showed average germination per cent 66.4, 70.3, 61.3, 62.5, 53.5, 62.1, 56.9 and 86.9, respectively.

Among all the fungi, the seed germination was observed minimum in the seed inoculated with *A. tenuis* (53.5%) followed by *A. niger* (56.9%). *Penicillium sp.* (61.3%) which was at par with *A. flavus* (62.1%) and *C. lunata* (62.5%). Maximum seed germination per cent was observed in *Phoma* sp. (70.3%) as compared to control (86.9%).

Results showed that per cent germination of brinjal seed was decreased due to seed inoculation with selected dominant mycoflora. Similar results were also found by Kumar *et al.,* (1981) they reported that seed infected with *F. oxysporum, F. moniliforme, Macrophomina phaseolina* and *Plenodomus* spp. failed to germinate. Seeds infected by *A. flavus, A. niger* and *A. fumigatus* showed decline in germination to an extent of 75%, whereas those infected with *A. tenuis, Curvularia* spp. and *Drehslera* spp. had reduction in germination up to 40%.

Effect of seed mycoflora on seedling length

Assessment of five different brinjal cultivars for seedling length influenced by seed mycoflora were also recorded. The data are presented in Table 2. Results showed that all the tested fungi significantly reduced seedling length as compared to control (without inoculation of fungi).

Significantly lowest seedling length was observed in cultivar GABH-3 (5.40 cm) followed by cultivar ABH-1 (5.44 cm), cultivar GOB-1 (5.60 cm) and Doli-5 (5.65 cm). The highest seedling length was observed in cultivar GAOB-2 (5.80 cm).

Inoculation of seven fungi significantly affected on seedling length during assessment on paper towel method. Among them, lowest seedling length (5.01 cm) was observed with *A. tenuis* followed by *A. flavus* (5.28 cm), *C. lunata* (5.41 cm) and *A. niger* (5.42 cm). The seedling length was least affected by *Fusarium* spp. (5.74 cm) as compared to control. The finding was supported by Chaudhari (2018) who studied eight fungus significantly affected on seedling length during assessment on paper towel method. Among them, lowest seedling length was observed in *Macrophomina phaseolina* (3.95 cm) followed by *A. flavus* (4.88 cm), *F. oxysporum* (4.96 cm) and *A. niger* (5.05 cm). The seedling length was least affected by *Phoma* sp. (7.11 cm).

Effect of seed mycoflora on seedling vigour

Seedling vigour index (SVI) was influenced by individual seed mycoflora associated with different cultivars of brinjal are presented in Table 3. Results showed that each of seed mycoflora significantly reduced SVI of all cultivars over the control.

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Table.1 Seed germination of brinjal cultivars as influenced by seed mycoflora

Cultivars	Seed germination (%)								Mean (C)
	Mycoflora								
	Fusarium oxysporum	*Phoma* sp.	*Penicillium* sp.	*Curvularia lunata*	*Alternaria tenuis*	*Aspergillus flavus*	*Aspergillus niger*	Control	
GOB-1	69.00	68.50	76.00	70.00	63.00	66.00	53.00	85.50	68.88
Doli-5	70.00	75.00	74.50	67.50	54.00	69.50	79.50	87.00	72.13
GAOB-2	73.50	73.00	72.50	72.00	58.00	54.00	65.50	87.50	69.50
GABH-3	67.00	61.50	39.50	44.00	57.50	57.50	47.00	88.50	57.81
ABH-1	52.50	73.50	44.00	59.00	35.00	63.50	39.50	86.00	56.63
Mean (F)	66.40	70.30	61.30	62.50	53.50	62.10	56.90	86.90	
	C	**F**	**C x F**						
S. Em.±	0.69	0.87	1.94						
C. D. at 5 %	1.92	2.43	5.43						
C. V. %	5.96								

Note: C = Cultivar, **F** = Fungi

Table.2 Seedling length of brinjal cultivars as influenced by seed mycoflora

Cultivars	Seedling length (cm)								Mean (C)
	Mycoflora								
	Fusarium oxysporum	*Phoma* sp.	*Penicillium* sp.	*Curvularia lunata*	*Alternaria tenuis*	*Aspergillus flavus*	*Aspergillus niger*	Control	
GOB-1	6.05	5.93	5.80	5.20	4.68	4.93	5.45	6.78	5.60
Doli-5	5.60	5.70	5.88	5.80	5.00	5.18	5.50	6.53	5.65
GAOB-2	6.15	6.15	5.30	5.50	5.35	5.70	5.65	6.58	5.80
GABH-3	5.48	5.28	5.15	5.03	4.80	5.33	5.53	6.63	5.40
ABH-1	5.43	5.35	5.58	5.50	5.20	5.25	4.95	6.28	5.44
Mean (F)	5.74	5.68	5.54	5.41	5.01	5.28	5.42	6.56	
	C	**F**	**C x F**						
S. Em.±	0.06	0.07	0.17						
C. D. at 5 %	0.16	0.21	0.47						
C. V. %	5.98								

Note: C = Cultivar, **F** = Fung

Table.3 Seedling vigour index of brinjal cultivars as influenced by seed mycoflora

Cultivars	Seedling Vigour Index (SVI)								Mean (C)
	Mycoflora								
	Fusarium oxysporum	*Phoma* sp.	*Penicillium* sp.	*Curvularia lunata*	*Alternaria tenuis*	*Aspergillus flavus*	*Aspergillus niger*	Control	
GOB-1	418	406	442	365	295	325	289	580	390
Doli-5	393	428	438	392	270	360	437	568	411
GAOB-2	452	449	384	379	310	308	370	576	404
GABH-3	367	325	204	221	276	306	260	587	318
ABH-1	285	394	246	325	182	333	196	540	312
Mean (F)	383	400	343	336	267	326	310	570	
	C	**F**	**C x F**						
S. Em.±	3.79	4.79	10.72						
C. D. at 5 %	10.61	13.42	30.01						
C. V. %	5.84								

Note: C = Cultivar, **F** = Fungi

Highest seedling vigour index was observed in cultivar Doli-5 (411) followed by GAOB-2 (403). The lowest seedling vigour index was found in cultivar ABH-1 (313) followed by cultivar GABH-3 (318) and GOB-1 (390).

Among all tested fungi, seedling vigour index was highly influenced by *A. tenuis* (267) followed by *A. niger* (310), *A. flavus* (327) and *C. lunata* (336). Seedling vigour index was least affected by *Phoma* sp. (400) as compared to control (570). The finding was supported by Habib *et al.*, (2007) they reported that *A. flavus*, *A. niger*, *Curvularia* spp., *Phomopsis vexans* and *Fusarium* spp., were associated with the tested brinjal seed samples significantly reduced per cent seed germination and seedling vigour index.

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