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Effect of Seed Treatment on the Incidence of Seed-borne Diseases of Okra

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Abstract: The experiment was conducted to know the effect of seed treatment on the incidence of seed-borne fungal diseases and on production of seed yield of okra. The lowest germination (95.0%) was recorded in unclean farmer's seeds; while highest germination (99.0%) was recorded in Vitavax-200 treated seeds followed by clean apparently healthy seeds (98.5%). Seed-borne fungal diseases of okra in the field, five diseases viz. Foot and root rot, Anthracnose and die-back, Cercospora leaf spot, Corynespora leaf spot and leaf blight, respectively caused by *Fusarium oxysporum, Colletotrichum dematium, Cercospora abelmoschi, Corynespora cassiicola* and *Macrophonina phaseolina* were recorded. The incidence of five seed-borne diseases have been found to be reduced by the use of seeds treated with Vitavax-200 and clean apparently healthy seeds. Vitavax–200 treated seeds as well as clean apparently healthy seeds increased the seed yield by 21.62 and 15.31%, respectively, over the unclean farmers' seeds.

Key words: Okra, seed treatment, seed-born fungal

Introduction

Okra (*Abelmoschus esculentus* L.) is a nutritious and delicious annual vegetable crop grown in the tropics and sub-tropics. Tender green fruits of okra used as vegetable are fairly rich in vitamins and minerals. It is an important vegetable crop of Bangladesh grown commonly in the Kharip season. Various factors responsible for low yield of the crop, diseases play a vital role. Sixteen diseases are known to attack the crop in the country. Of all these diseases, 10 are seed-borne and caused by at least 14 different seed-borne fungal pathogens (Fakir, 2000). Among the seed-borne diseases, seedling blight, stem rot, anthracnose and die-back are considered as major ones. *Colletotrichum dematium, Fusarium* spp. (*F. oxysporum, F. moniliforme*) are mainly responsible for causing seed-rots (Fakir, 1976). Seed-borne inocula of *Macrophomina phaseolina* and *Colletotrichum dematium* can cause seed rot and seedling blight (Fakir *et al.*, 1977). *M. phaseolina* and *C. dematium* are responsible for die-back. *M. phaseolina* alone can also cause stem rot (Fakir and Mridha, 1985). All these fungal pathogens have been found to be seed-borne frequently in okra seeds (Fakir, 1976; Richardson, 1990; Fakir, 2000). As such, health quality of okra seed is quite poor in the country.

Seed-borne diseases of okra may be controlled by cultural and chemical means. Use of clean apparently healthy seeds is a new appropriated seed health technology for controlling seed-borne diseases. In this technique best/clean healthy looking seeds are taken out by removing abnormal seeds (deformed, spotted, shriveled, discoloured, half-filled etc.) and seed contaminants (insects varital mixture, weed seeds, inert meter etc.). It has been found that by using clean apparently healthy seeds disease incidence of wheat and rice, can be reduced to 83.1 and 53.87%, respectively. At the same time 24.08 and 19.77%, increased yield of wheat and rice have been obtained by using this simple technology (Ali *et al.*, 2001; Hossain and Doullah, 1998). In view of the above facts, the present investigation has been designed to study the effect of seed treatment on the incidence of seed-borne fungal diseases and on production of seed yield of okra.

Materials and Methods

The investigation was conducted in the Field Laboratory and Seeds Pathology Laboratory (SPL) of the Department of Plant Pathology, Bangladesh Agricultural University (BAU), Mymensingh during May-October 2000. A local variety of okra called "Pusa Sawami" was used for this study. The field experiment was carried out in randomized complete block design (RCBD). The treatments were T_1-(uclean farmer's seeds), T_2-(clean apparently healthy seeds) and T_3-(vitavax-200 (0.2%) treated seeds). The size of the unit plot was 2× 1m^2. Fertilizers were applied at the rate of 150 Kg urea, 100 kg TSP and 150 Kg MP per hectare. Weeding and other intercultural operations were done time-to-time. The fungal organisms were isolated from the diseased plant parts on PDA. The fungal organisms grown out from the plated diseased plant parts, were sub-cultured, purified and preserved. The fungal isolates were then identified to species level with the help of relevant keys (Begum, 1989). Data were recorded on germination, percentage of foot and root rot, percentage of infected plants, percentage of leaf infection, disease severity and seed yield. Percent disease severity was estimated following the procedure and formula of Singh (1984).

$$\% \text{ Disease severity} = \frac{\text{Total sum of ratings}}{\text{Number of observation x Maximum grade}} \times 100$$

The collected data were subjected to statistical analysis using analysis of variance to find out the variation resulting from experimental treatments. Treatment means were compared by Duncan's multiple range test with least significant difference (LSD).

Results and Discussion

The lowest germination (95.0%) was recorded in unclean farmer's seeds; while highest germination (99.0%) was recorded in Vitavax-200 treated seeds followed by clean apparently healthy seeds (98.5%) in the field. Germination obtained in clean apparently healthy and Vitavix-200 treated seeds were statistically similar,

Table 1: Germination percentage of okra seeds in the field

Treatment	% germination
Unclean farmer's seeds	95.00b
Clean apparently healthy seeds	98.66a
Vitavax-200 treated seeds	99.00a
LSD (0.05)	2.88

Table 2: Prevalence of foot and root rot of okra

Treatment	% Foot and root rot
Unclean farmer's seeds	35.0a
Clean apparently healthy seeds	30.0b
Vitavax-200 treated seeds	07.0c
LSD (0.05)	3.85

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Table 3: Prevalence of anthracnose and die back in okra raised from three types of treated seeds

Treatment	Infected plants (%)	Infected plants (%) distributed in different disease severity grade		
		Low	Medium	High
Unclean farmer's seeds	51.4a	4.20a	12.00a	1.80a
Clean apparently healthy seeds	36.5b	3.30ab	10.50b	1.20a
Vitavax-200 treated seeds	29.3c	2.70b	5.30c	1.00a
LSD (0.05)	4.02	1.03	2.56	0.99

Value with same letters(s) are not significantly different at $p< 0.05$

Table 4: Prevalence of cercospora leaf spot corynespora leaf spot and leaf blight in okra raised from three types of treated seeds

Treatments	Cercospora leaf spot		Corynespora leaf spot		Leaf blight	
	% leaf infection	Disease severity (%)	% leaf infection	Disease severity (%)	% leaf infection	Disease severity (%)
Unclean farmer's seeds	22.0a	38.0a	4.2a	8.5a	42.0a	61.0a
Clean apparently healthy seeds	18.0b	30.0b	3.0b	7.2ab	30.0b	44.0b
Vitavax-200 treated seeds	12.0c	12.0c	2.3b	2.0c	21.0c	14.0c
LSD (0.05)	3.89	4.02	1.11	2.02	4.59	03.92

Table 5: Effect of seed treatment on the seed yield of okra

Treatments	Seed yield (kg ha^{-1})	Yield increase over unclean farmer seeds (kg ha^{-1})	% increased yield
Vitavax- 200 treated seeds	1350	240	21.62
Clean apparently healthy seeds	1280	170	15.31
Unclean farmer's seeds	1110	-	-
LSD (0.05)	-	-	-

while these two treatments differed significantly from the germination obtained in farmer's unclean seeds (Table 1).

Highest incidence of foot and root rot caused by *Fusarium oxysporum* was recorded in plants grown from unclean farmer's seeds (35.0%), followed by clean apparently healthy seeds (30.0%); while the lowest was observed in plants raised from Vitavax-200 treated seeds (7.0%). Prevalence of the disease differed significantly with respect to treatments (Table 2).

Prevalence of anthracnose and die-back of okra caused by *Colletotrichum dematium* (Table 3). Percent plant infected by the disease and the disease severity varied significantly depending on the three treatments used. Plants grown from Vitavax-200 treated seeds had the lowest percentage (29.3%) of plants infected by anthracnose and die-back, followed by clean apparently healthy seeds (36.5%) and unclean farmer's seeds (51.4%).

Cercospora leaf spot caused by *Cercospora abelmoschi* had moderates incidence in the experimental plots. Percent leaf infection and percent disease severity due to the disease varied from 12.0-22.0 and 12.0-38.0%, respectively depending the on the treatment used prior to sowing. Both lowest percent leaf infection and disease severity were recorded in case of Vitavax-200 treated seeds, followed by clean apparently healthy seeds and unclean farmer's seeds. Prevalence of the disease varied significantly with respect to treatments (Table 4).

Prevalence of Corynespora leaf spot on okra caused by *Corynespora cassiicola* (Table 5). The disease had relatively low prevalence in all the treatments. Incidence of leaf infection and disease severity due to Corynespora attack varied from 2.3-4.2 and 2.0-8.5 %, respectively depending on the treatments. Highest percent leaf infection (4.2%) and disease severity (8.5%) were recorded in plants grown from unclean farmer's seeds, followed by clean apparently healthy seeds, while the lowest records of the same were obtained from Vitavax-200 treated seeds. Leaf infection obtained in unclean farmer's seeds differed significantly both from clean apparently healthy seeds and Vitavax-200 treated seeds. On the contrary, Vitavax-200 treated seeds resulted significantly lower percent of leaf area diseased compared to unclean farmers' seeds and clean apparently healthy seeds.

Leaf blight caused by *Macrophomina phaseolina* had moderate to heavy prevalence in the experimental plots. Percent leaf infection and percent disease severity due to the disease varied from 21.0–42.0 and 14.0–61.0%, respectively with respect to treatments. Highest prevalence of the disease was observed with unclean farmer's seeds; while the lowest was encountered with Vitavax-200 treated seeds. Both percent leaf infection and disease severity differed significantly and independently of each other with respect to treatments.

Maximum seed yield (1350 kgha^{-1}) was obtained in Vitavax-200 treated seeds, followed by clean apparently healthy seeds (1280 kg ha^{-1}), while the minimum yield (1110 kg ha^{-1}) was encountered in unclean farmer's seeds. Significantly higher seed yield was recorded with the use of both clean apparently healthy seeds and Vitavax-200 treated seeds over unclean farmer's seeds. Vitavax-200 treated seeds and clean apparently healthy seeds gave respectively 21.65 and 15.31% increased yield over unclean farmer's seeds.

In the present study, germination percentage was high in Vitavax-200 due to any fungi did not attack the okra seeds. Seed-borne fungal diseases of okra in the field, five diseases viz. Foot and root rot, Anthracnose and die-back, Cercospora leaf spot, Corynespora leaf spot and leaf blight respectively caused by *Fusarium oxysporum, Colletotrichum dematium, Cercospora abelmoschi, Corynespora cassiicola* and *Macrophonina phaseolina* were recorded. All these diseases, except Corynespora leaf spot caused by *C. cassiicola,* have been reported as seed borne in okra (Narayan, 1978; Fakir and Mridha, 1985). The incidence of five seed-borne diseases have been found to be reduced by the use of seeds treated with Vitavax-200 and clean apparently healthy seeds. Reduction of incidence of seed-borne diseases in a number of crops by seed treatment with Vitavax-200 have been reported by many workers (Dey *et al.,* 1992; Shah *et al.,* 1992). Similarly, reduction of diseases incidence by the use of clean apparently healthy seeds over unclean farmer's seeds in wheat, rice and mustard have been observed (Hossain and Doullah, 1998; Fakir *et al.,* 2000; Hasan, 2000; Rahman, 2000). Vitavax–200 treated seeds as well as clean apparently healthy seeds increased the seed yield by 21.62 and 15.31%, respectively, over the unclean farmer's seeds. Such yield increased due to use of clean healthy seeds and seed treatment with Vitavax-200, this has not been previously reported in okra. Similar results were found in rice and wheat by Hossain and Doullah, 1998; Ali *et al.,* 2000; Fakir *et al.,* 2000;

Hasan, 2000.

From this study, it may be therefore concluded that clean apparently healthy seeds and Vitavax-200 treated seeds gave better results in case of disease reduction and gave higher seed yield. So, clean apparently healthy seeds or Vitavax-200 (0.2%) treated seeds may be sown to reduce seed-borne diseases and to increase seed yield production of okra.

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