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Effect of Physical Seed Sorting, Seed Treatment with Garlic Extract and Vitavax 200 on Seed Borne Fungal Flora and Seed Yield of Jute (*Corchorus capsularis* L.)

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Abstract: Effects of physical seed sorting, seed treatment with garlic extract (1:2) and Vitavax 200 (0.4%) were investigated for controlling seed borne fungal flora and seed yield of jute (*Corchorus capsularis* L.). Seed health test of jute revealed that farmer's saved seed (control) yielded all together 13 different fungi of 11 genera. Prevalence of *Colletotrichum corchori, Macrophomina phaseolina, Botryodiplodia theobromae, Fusarium* spp., *Penicillium* spp., *Aspergillus niger* and *A. flavus* were by 4.25, 10.75, 2.00, 4.25, 27.20, 8.00 and 22.50%, respectively. *Septonema secedens* Corda. was recorded as seed borne for the first time in jute. Garlic extract and Vitavax 200 increased the yield of jute by 47.38% and 46.05%, respectively over farmer's saved seed (control) when grown in the net house. Under field conditions seed treatment with garlic extract and Vitavax 200 increased seed yield by 77.50 and 82.50%, respectively over farmer's saved seed.

Key words: Jute(*Corchorus capsularis* L.), seed borne fungal flora, seed sorting, garlic extract, Vitavax-200, control

Introduction

Jute (*Corchorus capsularis* L.) is one of the most important fibre and cash crop of Bangladesh and thus plays an important role in national economy. The crop suffers from more than 12 different diseases of which 10 are known to be seed borne (Fakir, 2000). Among the seed borne diseases except jute mosaic, all are caused by fungi. Of the fungal seed borne diseases, black band, anthracnose and stem rot caused by *Botryodiplodia theobromae, Colletotrichum corchori* and *Macrophomina phaseolina*, respectively are serious (Fakir *et al.*, 1990). Stem rot caused by *M. phaseolina* alone can cause 10% yield loss annually (Ahmed, 1968). It is unquestionable that proper disease control measures can substantially improve the quality of jute (*C. capsularis*) and significantly increase the yield. An appreciable amount of work has been done on the control of seed borne pathogens of jute (*C. capsularis*) by fungicidal treatment (Khan and Fakir, 1995; Akanda and Fakir, 1985). The control of disease through the use of chemicals is discouraged for health hazards and environmental pollution. In Bangladesh, very few attempts have been made to evaluate the effects of plant extracts against plant diseases (Ahmed and Sultana, 1984; Fakir and Khan, 1992). Effect of seed sorting has never been tested on the prevalence of seed borne diseases under natural epiphytotics. Among the practice use, seed treatment with garlic extract or physical seed sorting might be the cheapest and safest method of direct plant disease control. In view of the above facts, the present research work was designed to evaluate the comparative effect of physical seed sorting, garlic extract and Vitavax 200 on seed borne fungal flora and seed yield of jute (*Corchorus capsularis* L.).

Materials and Methods

The experiments were conducted in Seed Pathology Laboratory (SPL) and net house of the Department of Plant Pathology, Bangladesh Agricultural University (BAU), Mymensingh and in the farmer's field of Boyra, Sadar Upazila of Mymensingh district during the period from 12 March, 2000 to 31 January, 2001. Farmer's seed sample of jute (*Corchorus capsularis)* was collected through the Mymensingh seed store, 61 Rambabu Road, Natun Bazar, Mymensingh. The experiments were conducted by employing four treatments viz. (I) Farmer's saved seed (controlled sample), (ii) Physically sorted seed, (iii) Garlic extract treated seed (1:2 weight/volume; g/ml.) and (iv) Vitavax-200 treated seed (0.4% of seed weight). Seed health test was carried out by blotter method to detect the seed borne fungal flora associated with the seed sample following ISTA rules (1996). In case of net house (pot) experiment, pots (25cm. dia.) were used by maintaining eight replications per treatment. Seeds (25/pot) were sown by maintaining equal distance. Thinning was done after four weeks of sowing and five plants per pot were kept at equal distance. The ripened pods were collected and seeds were extracted treatment wise and stored in refrigerator for health analysis. Seed health test was done following ISTA rules (1996).

The field experiment, was conducted following the randomized complete block design (RCBD) with three replications for each treatment. Each unit plot size was 12x12 m^2 and plot to plot and block to block distances were 1 and 2 m, respectively. The fertilizers were applied at the rate of 112 kg urea ha^{-1}, 54 kg TSP ha^{-1} and 98 kg MP ha^{-1}. Cow-dung, 5 ton ha^{-1} was applied to enrich the soil during land preparation. Full dose of TSP and MP and half dose of Urea were applied at the time of final land preparation. The rest half dose of Urea was applied as top dressing after two months of sowing. Seeds (10 kg ha^{-1}.) were sown by broadcast method. First, second and third weeding plus thinning was done after 20, 45 and 65 days of sowing. Diazinon 60-EC (0.3%) was applied to control *Spilosoma obliqua* after 65 and 87 days of sowing. The ripened pods were collected and seeds were extracted treatment wise and stored in refrigerator for health analysis as per ISTA rules (1996).

Results and Discussion

Health analysis of seeds prior to sowing was done (Table 1). Thirteen different fungal flora were identified in seeds of jute (*C. capsularis*) under different treatments. The identified fungal flora were *Alternaria tenuis* CG Nees, *Aspergillus flavus* LK., *Aspergillus niger, Botryodiplodia theobromae* Pat., *Chaetonium indicum* Corda, *Colletotrichum corchori* Ikata & Yoshida, *Corynespora cassiicola* (Berk. & Crut.) Wel., *Curvularia lunata* (Wakker) Beed.,*Fusarium* spp. (*Fusarium moniliforme* Sheldom and *Fusarium oxysporum*), *Macrophomina phaseolina* (Tossi.) Goid., *Penicillium* spp. and *Septonema secedens* Corda. The association of these seed borne fungal flora of jute (*C. capsularis*) except *Septonema secedens* Corda has also been observed by good number of researchers (Agarwal and Singh,

Table 1: Effect of physical seed sorting, seed treatment with garlic extract and Vitavax 200 on the prevalence of seed borne fungal flora in *Corchorus capsularis* L. before sowing

Treatments	% seed borne infection						
	Colletotrichum corchori	*Macrophomina phaseolina*	*Botryodipiodia theobromae*	*Fusarium* spp.[1]	*Penicillium* spp.	*Aspergillus niger*	*Aspergillus flavus*
Farmer's saved Seed (control)	4.25	10.75	2.00	4.25	27.20	8.00	22.50
Physically sorted seed	2.50 (41.18)	8.00 (25.58)	1.75 (12.50)	2.75 (35.29)	25.05 (7.91)	3.75 (53.13)	10.75(52.22)
Garlic extract (1:2) treated seed	1.25 (70.59)	6.25 (41.86)	0.00 (100.00)	2.25 (47.06)	22.00 (19.12)	4.50 (43.75)	14.50(35.56)
Vitavax 200 treated seed (0.4%)	0.00 (100.00)	3.75 (65.12)	0.00 (100.00)	2.25 (47.06)	22.25 (18.20)	0.25 (96.88)	16.00(28.89)

400 seeds were tested per treatment by blotter method
Data in parentheses indicate decrease over use of farmer's saved seed (control) [1]*Fusarium moniliforme* and *F. oxysporum*

Table 2: Effect of physical seed sorting, seed treatment with garlic extract and Vitavax 200 on the prevalence of seed borne fungal flora in *Corchorus capsularis* L. grown in the net house

Treatments	% seed borne infection					
	Colletotrichum corchori	*Macrophomina phaseolina*	*Botryodiplodia theobromae*	*Fusarium* spp.[1]	*Aspergillus flavus*	*Curvularia lunata*
Farmer's saved seed (control)	19.50 a	3.17	2.33	5.17	6.00	0.50
Physically sorted seed	13.83 b	2.33	1.83	5.50	6.17	0.33
Garlic extract (1:2) treated seed	8.17 c	1.83	1.33	5.17	5.33	0.33
Vitavax 200 treated seed (0.4%)	7.50 c	1.33	1.00	3.33	6.00	0.17
$LSD_{(0.05)}$	4.31	NS	NS	NS	NS	NS

NS = Non significant
400 seeds were tested per replication by blotter method [1]*Fusarium moniliforme* and *F. oxysporum*

Table 3: Effect of physical seed sorting, seed treatment with garlic extract and Vitavax 200 on the prevalence of seed borne fungal flora in *Corchorus capsularis* L. when plants grown in the field

Treatments	% seed borne infection					
	Colletotrichum corchori	*Macrophomina phaseolina*	*Botryodiplodia theobromae*	*Fusarium* spp.[1]	*Aspergillus flavus*	*Curvularia lunata*
Farmer's saved seed (control)	37.83 a	4.50 a	2.33	8.33 a	6.17	3.83
Physically sorted seed	38.33 a	2.67 ab	1.33	3.67 b	4.00	1.17
Garlic extract (1:2) treated seed	25.50 ab	1.67 b	1.00	4.33 b	4.67	1.67
Vitavax 200 treated seed (0.4%)	18.33 b	2.00 b	0.67	3.67 b	5.00	1.50
$LSD_{(0.05)}$	15.09	1.85	NS	3.62	NS	NS

NS = Non significant
400 seeds were tested per replication by blotter method [1]*Fusarium moniliforme* and *F. oxysporum*

Table 4: Effect of physical seed sorting, seed treatment with garlic extract and Vitavax-200 on seed yield of *Corchorus capsularis* L. grown in the net house (pot experiment)

Treatments	Average seed yield (g/pot)
Farmer's saved seed (control)	7.47 b
Physically sorted seed	9.05 ab (21.15)
Garlic extract (1:2) treated seed	11.01 a (47.38)
Vitavax 200 treated seed (0.4%)	10.91 a (46.05)
$LSD_{(0.05)}$	2.45

Data in parentheses indicate per cent seed yield increase over the use of farmer's saved seed (control)
Data represents the mean of eight replications.

Table 5: Effect of physical seed sorting, seed treatment with garlic extract and Vitavax 200 on the seed yield of *Corchorus capsularis* L. grown in the field

Treatments	Average seed yield (g/m^2)	Average seed yield ($t\ ha^{-1}$)
Farmer's saved seed (control)	39.48 b	0.40
Physically sorted seed	43.20 b	0.43 (7.50)
Garlic extract (1:2) treated seed	70.84 a	0.71 (77.50)
Vitavax 200 treated seed (0.4%)	73.39 a	0.73 (82.50)
$LSD_{(0.05)}$	9.61	

Data in parentheses indicate per cent increase over use of farmer's saved seed (control)
Data represents the mean of three replications.

1974; Miah, 1974; Rangaswami, 1984; Halder and Anwar, 1988; Begum, 1989; Fakir *et al.*, 1990; Sahu and Behera, 1996 and Haque *et al.*, 1999). *Septonema secedens* corda is reported for the first time as seed borne fungus in jute (*C. capsularis*). Prevalence of those fungal flora were more frequent in farmer's saved seed (control) followed by physically sorted seed, garlic extract (1:2) treated seed and Vitavax 200 treated seed (0.4%). Dust, gravels and unfilled seeds were associated with the farmer's saved seed (control) that might be one of the best carriers of the fungal flora. As a result the highest prevalence of fungal flora had been recorded in case of farmer's saved seed (control) and the prevalence of fungal flora was the lowest in Vitavax-200 (0.4%) treated seeds followed by garlic extract (1:2) treated seed. Use of Vitavax-200 as a good seed treating fungicide had also been supported by Akanda and Fakir (1985) and Islam *et al.* (1978). Fungitoxic effect of garlic in case of jute had also been reported by Ahmed and Sultana (1984). They found inhibition of spore germination and mycelial growth of some important fungal flora of jute (*Macrophomina phaseolina*, *Botryodiplodia theobromae* and *Colletotrichum corchori*). The fungitoxic effects of garlic has also been reported by other scientists (Assadi and Behroozin, 1987; Chalfoun and Carvalho, 1987; Dubey and Dwivedi, 1991; Fakir and Khan, 1992; Hossain *et al.*, 1993).

The effect of physical seed sorting and seed treatments on the prevalence of seed borne fungal flora in jute (*C. capsularis*) seeds collected from plants grown in the net house were tested following blotter method and results are summarized in Table 2. Per cent seed borne infection of *Colletotrichum corchori* varied significantly from one treatment to another and ranged from 7.50 to 19.50%, where the highest infection was recorded in case of farmer's saved seed (control) and the lowest infection was recorded in case of Vitavax-200 treated seeds, which is statistically similar to the use of garlic extract

treated seed. The treatments did not result any significant influence on seed borne infection of *Macrophomina phaseolina, Botryodiplodia theobromae, Fusarium* spp., *Aspergillus flavus* and *Curvularia lunata*.

The effect of physical seed sorting and seed treatments on the prevalence of seed borne fungal flora recorded in jute (*C. capsularis*) grown in field was determined. Per cent seed borne infection of *Colletotrichum corchori, Macrophomina phaseolina* and *Fusarium* spp. varied significantly from one treatment to another (Table 3). Per cent seed borne infection of *Colletotrichum corchori* ranged from 18.33 to 38.33, where the highest seed borne infection of *Colletotrichum corchori* was recorded in case of physically sorted seed and the lowest seed born infection was recorded in case of Vitavax-200 treated seed which is statistically similar to the use of garlic extract. Per cent seed borne infection of *Macrophomina phaseolina* ranged from 1.67 to 4.50, where the highest seed borne infection was recorded in case of farmer's saved seed (control) and the lowest was in plots of garlic extract treated seed, which is statistically similar to use of Vitavax-200. Per cent seed borne infection of *Fusarium* spp. ranged from 3.67 to 8.33, where the highest and lowest seed borne infection were recorded in case of 'farmer's saved seed (control) and Vitavax-200 treated seed as well as use of physically sorted seed. Use of physically sorted seed and treatment of seeds with garlic extract and Vitavax 200 exerted similar effect on *Fusarium* spp.

Average seed yield (g/pot) of jute (*C. capsularis*) grown in the net house varied significantly from one treatment to another (Table 4). Average seed yield per pot ranged from 7.47g to 11.01g, where the highest seed yield was recorded in case of garlic extract treated seeds, which is statistically similar to that of Vitavax-200 treated seed and physically sorted seed. The lowest seed yield was recorded in case of farmer's saved seed (control). The increase in seed yield by 47.38% and 46.05% was obtained by treating seeds with garlic extract and Vitavax 200, respectively where seed sorting resulted 21.15% yield increase over the use of farmer's saved seed (control). Seed yield of jute (*C. capsularis*) significantly varied from one treatment to another (Table 5) and ranged from 39.48 to 73.39 g per m^2. The highest seed yield was recorded in plots where Vitavax-200 treated seeds were used that resulted 82.50% increase in seed yield over the use of farmer's saved seed (control). The lowest seed yield was recorded in plots where farmer's saved seed (control) was used. Use of garlic extract and Vitavax-200 for seed treatment resulted statistically similar influence on increase in seed yield. Therefore, it may be suggested to use garlic extract for seed treatment of jute (*C. capsularis*), instead of using chemicals like Vitavax-200 in order to avoid health hazards and environmental pollution.

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