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## Effect of Seed Cleaning, Washing and Seed Treatment on Seedling Disease Incidence and Yield of Rice

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**Abstract:** Six treatments viz. farmer's seed (uncleaned and unwashed), farmer's clean seed, farmer's washed seed, farmer's clean and washed seed, garlic (1:10) and Vitavax-200 @ 0.3% treated seeds were used for studying their comparative effect on incidence of seedling diseases and grain yield of rice. Seed cleaning followed by washing decreased the seedling diseases viz. brown spot, blast, bakanae, foot rot and seedling blight as of seed treatment with garlic and Vitavax-200. Use of healthy seedling increased the grain yield up to 21.4% over the use of seedling as farmer's normally use. Use of healthy seedlings has increased the benefit of Tk.4132.28 ha<sup>-1</sup> over the use of normal seedling as farmers normally use.

**Key words:** Rice, seed cleaning, garlic extract, vitavax-200, seed treatment, seedling disease

### Introduction

In Bangladesh 14,076,000ha of land is under cultivation of different crops of which 72.50% is under rice cultivation (Fakir and Karim, 1999). Rice is known to be attacked by a large number of diseases of which forty five are seed borne (Richardson, 1990). Among the seed borne pathogen of rice, fungi are the most common. The pathogens may survive in seeds even with the healthy looking ones. Healthy looking seeds infected with pathogens are more dangerous. The badly infected seeds with expressed symptoms like spotting and discoloration can be recognized by visual observation. Detection of pathogens in healthy looking seeds is not easy at farmer's level due to lack of testing facilities. Seed treatment with chemicals is costly and it is not friendly to environment. Moreover the farmer's of Bangladesh do not get the chemicals easily. Further, they are not aware of the health of their seeds. According to Hasan (2000), physical sorting of seeds resulted in 8.33% increase of germination in rice seeds. Prevalence of seed borne fungal flora in physically sorted seeds was lower than farmer's saved seeds resulting in higher percent germination (Islam *et al.*, 2001). Therefore, the study was conducted in the farmer's field with the following objectives:

- 1) To create the awareness of farmer's on seed health and its impact on crop production.
- 2) To demonstrate the benefit of using healthy looking clean seed and washed seeds.
- 3) To make the farmer's confidence of using easy technique(s) for controlling selected seed borne diseases of rice.

### Materials and Methods

The present research work has been carried out in seed beds and fields of nine farmer's at four different locations, namely Mirzapur, Boira, Gowripur and Shikarikanda of Mymensingh district in Bangladesh, during 2000. The topography of the experimental fields was medium high land belonging to the Sonatola series of grey flood soil type under old Brahmaputra flood plain (Anonymous, 1988). The chemical composition of soil was as follows:

Soil properties	Contents
Texture	Silty loam
pH	6.5-7.1
Organic carbon	1.25-1.45%
Organic matter	2.10-2.16%
Total nitrogen	0.11-0.13%
Available phosphorus	36.2-36.5ppm
Available sulphur	18.1-18.3ppm

An area of 40m<sup>2</sup> was used in each farmer's field for seedbeds and was divided into six units giving 0.5m space between the units,

where each unit was used as a bed. Six different treatments viz. farmer's seed (unclean and unwashed), farmer's clean seed, farmer's washed seed, farmer's cleaned and washed seed, garlic extract at the ratio of 1:10 (garlic clove: water) and Vitavax-200 @ 0.3% treated seeds were used for raising the seedlings in the seed bed. For conducting field experiment, two groups of seedlings viz. seedlings, normally farmers use (with or without spot) and completely healthy looking seedlings were used. The seedlings of two groups have been transplanted in two different plots of each of the above mentioned farmer's field. The area of each plot was 60m<sup>2</sup>. Data on grain yield was evaluated for each plot after harvesting the crop. The cost of seed cleaning and seedling selection was measured by taking into account the extra labour cost. Five woman labours @ Tk. 30.00 were required for seed cleaning, while six extra laborers @ Tk. 50.00 required for seedling selection for each hectare of rice field.

### Results and Discussion

Seed cleaning, washing and seed treatment with garlic extract and Vitavax-200 showed significantly reduced seedling diseases of rice over the use of uncleaned and unwashed seeds as normally used by the farmers (Table 1). The 0.48 to 2.50% of seedlings showed brown spot symptom, while 0.27 to 1.71% of seedlings were recorded with blast disease symptom. Seedling showing bakanae, foot rot and seedling blight symptoms varied from 0.17 to 9.86%, 0.24 to 1.72% and 0.45 to 4.29%, respectively. Seed cleaning followed by washing showed statistically similar response in reducing the seedling diseases as of seed treatment with garlic extract (1:10) and Vitavax-200 (0.3%). Though the lowest seedling disease incidence was recorded with Vitavax-200 treated seeds, use of cleaned and washed seeds showed very good results as well (Table 1). Maximum reduction (86.07%) of seedling diseases was determined in case of using Vitavax-200, which was followed by garlic extract (74.82%). But seed cleaning and washing of farmer's seed reduced the seedling disease up to 53.87% over the farmer's uncleaned and unwashed seeds (Table 2).

The farmers of Bangladesh use about 94% required amount of seeds of their own stock or seeds of their neighbour by purchasing from the local hats or bazars (Fakir and Karim, 1999). The rest seed requirements (about 6% certified/quality seeds) are produced by Government, Semi-Government, organizations and NGO's. Lack of good quality certified seeds to the farmers compels them to use their own seeds without having choice of seed selection. Under the present study emphasis has been given for using the farmers seeds just by adding simple, easy and adaptive methods of controlling seeds born pathogens in order to produce disease free healthy seedlings. Seed cleaning and washing resulted significant reduction of seedling diseases as of chemical treatment (Vitavax-200) over the uncleaned and unwashed farmer's seeds. This practice has increased the production of disease free healthy

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Table 1: Effect of seed cleaning, washing and seed treatment on the incidence of seedling diseases of rice

Treatments	Percent seedlings showing				
	Brown spot	Blast	Bakanae	Foot rot	Seedling blight
Farmer's seed (uncleaned and unwashed)	2.50	1.71	6.56	1.72	4.29
Farmer's cleaned seed	1.84	1.81	9.86	1.06	2.53
Farmer's washed seed	1.29	1.09	0.50	1.13	1.92
Cleaned and washed farmer's seed	1.06	0.96	0.37	0.63	1.70
Garlic (1:10) treated farmer's seed	0.90	0.53	0.25	0.60	0.95
Vitavex-200(0.3%) treated farmers seed	0.48	0.27	0.17	0.24	0.45
LSD(p= 0.05)	0.72	0.39	0.16	0.61	1.15

Table 2: Comparative effect of seed cleaning, washing and treatment on the incidence of seedling diseases of rice over the uncleaned and unwashed seeds as normally farmer's use

Treatments	Percent seedling showing diseases*	Percent decrease in diseased seedlings over the farmer's seed used
Farmer's seed (uncleaned and unwashed)	10.48	-
Farmer's cleaned seeds	7.00	35.42
Farmer's washed seeds	5.48	50.00
Cleaned and washed farmer's seeds	5.00	53.87
Garlic (1:10) treated farmer's seeds	2.73	74.82
Vitavex-200 (0.3%) treated farmer's seeds	1.51	86.07

\* Disease: Brown spot, Blast, Bakanae, Foot rot and Seedling blight

Table 3: Performance of completely healthy looking seedling and seedlings normally farmer's use on the yield of rice

Farmers	Grain yield (Kg ha <sup>-1</sup> ) using		Yield increase over the use of seedling as normally farmer's use (Kg ha <sup>-1</sup> )	% yield increase
	Healthy seedling	Seedling as normally farmer's use		
F <sup>1</sup>	4375.00	4125.00	250.00	6.06
F <sup>2</sup>	3975.00	3375.00	600.00	17.78
F <sup>3</sup>	4070.00	3575.00	495.00	13.85
F <sup>4</sup>	4620.00	4065.00	555.00	13.65
F <sup>5</sup>	4815.00	4115.00	700.00	17.01
F <sup>6</sup>	4345.00	3715.00	630.00	16.96
F <sup>7</sup>	4945.00	4075.00	870.00	21.35
F <sup>8</sup>	4615.00	3985.00	630.00	15.80
F <sup>9</sup>	4480.00	4055.00	425.00	10.48
Mean	4471.11	3898.33	572.78	14.77

F= Farmer

Table 4: Benefit of seedling selection on income increase

Treatments	Grain yield (kg ha <sup>-1</sup> )	Gross return (Tk. ha <sup>-1</sup> )	Increase of gross return (Tk. ha <sup>-1</sup> )	Cost of cleaning, washing and seedling selection per hectare	Actual income increase ha <sup>-1</sup> (Tk. ha <sup>-1</sup> )
Healthy seedlings	4471.11	35768.88	4582.28	450.00	4132.28
Normal seedlings as farmer's use	3898.33	31,186.64	-	-	-

seedlings by 53.87% over the use of farmer's uncleaned and unwashed seeds. This reduction of seedling diseases may be due to use of healthy looking, clean, disease free seeds and avoidance of using discoloured, light and chaffy grains. The discoloured, light and chaffy grains of rice are the good sources of seed-borne pathogens of brown spot, blast, foot root, bakanae and seedling blight (Agarwal *et al.*, 1989; Fakir, 1999; Fakir, 1998). Siddiqui (1990) reported that certain diseases can be reduced by strict seed certification or avoidance of seed and soil infection. In the present study seed cleaning and washing helped in avoiding the use of light and chaffy grains. More over, seed cleaning and washing removed the infected plant debris, soil or other foreign materials from the seeds, thus resulting in the reduction of pathogens with the seeds.

Under present study the treatment of seeds with Garlic extract and Vitavex-200 caused 74.82 and 86.07% reduction in production of diseased seedlings respectively. This might be due to the control of seed-borne pathogens. The findings are supported by Hossain *et al.* (1997), Mia (1998) and Hossain *et al.*

(1998). Hossain and Ashrafuzzaman (1994), Fakir and Jahan (1998), Ashrafuzzaman and Hossain (1995) and Hossain *et al.* (1997) reported that the crude extract of garlic (*Allium sativum*) showed marked effect in inhibition of spore germination, mycelial growth and pathogenicity of *Bipolaris sorokiniana*. Use of Vitavex-200 for controlling seed born pathogens in the present study showed an excellent result which is evident from the seedling stand reduction in seedling disease prevalence. This finding is also supported by the results of Islam *et al.* (1992), Mia (1998), Hossain *et al.* (1998), Hossain and Asad-ud-Doullah (1998), Fakir and Jahan (1998).

It was found that transplanting healthy looking disease free seedlings resulted in 4471.11kg ha<sup>-1</sup> grain yield, while the normal seedlings as used by the farmers yielded 3898.33kg ha<sup>-1</sup> grains (Table 3). This indicates that use of healthy looking seedlings increased the yield (250-870 kg ha<sup>-1</sup>) over the use of seedlings as normally farmer's use. The results of the present study clearly show that use of healthy looking seedlings gave an average increase in rice yield of 14.77% (572.78 kg ha<sup>-1</sup>) giving an income

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increase of 4132.28 Bangladeshi Tk. ha<sup>-1</sup> (US \$ 86.01 ha<sup>-1</sup>, Table 4). According to Mathur *et al.* (1998) manual seed cleaning by farmers resulted in better looking, healthier crops and produced more grain yield and average increase in rice yield by 510kg ha<sup>-1</sup>, giving an income increase of Tk. 3060 ha<sup>-1</sup> to each farmer. In conclusion the present study showed an excellent direction of disease management without the use of chemicals. The farmers can clean and wash their seeds easily and after washing they can sow their seeds in the seedbed for growing healthy seedlings. This practice is environment friendly and help in avoiding the use of costly chemicals. Moreover, the poor farmers of the country can use this practice with little training and they can increase their income. So farmers can transplant the healthy seedlings for better yield by using the clean seeds without treating chemicals.

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