Progressive Agriculture
Journal homepage:http://www.banglajol.info/index.php/PA

Effect of seed treatment on seed borne fungi of rice

L Naher[1,*], MA Ali[2], S Sheheli[3]

[1]Seed Certification Agency, Gazipur-1701, Bangladesh, [2]Department of Plant Pathology, [3]Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh 2202, Bangladesh

Abstract

Farmers of our country are not aware about seed treatment for controlling seed borne fungi. Seeds of 3 rice varieties viz. BR11, BRRI dhan30 and BRRI dhan33 were collected from farmers houses of Gopalpur, Tangail. Three seed treating fungicides viz. vitavax 200 vitavax 200 (0.25%), thiovit (0.25%) and cupravit (0.25%) were used. Collected seed samples were tested by dry inspection and blotter method. The highest and the lowest germination were recorded in seed samples of BRRI dhan30 (90%) and BRRI dhan33 (75%). After seed treatment the highest and the lowest germination were recorded in seed samples of BRRIdhan30, BRRI dhan33 (100) treated by vitavax 200 (0.25%) and BR11 (80%) in control. Seed health test by blotter method revealed seed borne fungi belonging to six genera viz. *Bipolarisoryzae* (2.5 to 8.53%), *Alternariapadwickii* (5.3 to 13.35%), *Fusariummoniliforme* (11.66 to 21.67%), *Fusariumoxysporum* (1.25 to 4.35%), *Curvularialunata* (1.95 to 7.5%) and *Aspergillus*spp (1.75 to 6.54%) were encountered. Bur after seed treatment remarkable improvement *viz*. *Bipolarisoryzae* (0.15 to 3.75%), *Alternariapadwickii* (0.0 to 3.0%), *Fusariummoniliforme* (2.16 to 5.83%), *Fusariumoxysporum* (0.0 to 3.0%), *Curvulariaunata* (0.0 to 2.56%) and *Aspergillus*spp (0.0 to 1.5%) were encountered. Vitavax 200 was found most effective against the seed borne pathogens of rice. Nowadays, many botanical extracts such as neem, nishinda, garlic, alamonda and biological agent such as *Trichoderma* also using as seed treating agent and resulted significant higher germination and plant stand, less disease incidence and higher yield of different crops. So, the farmers should treat their seed before sowing in their field and through this technique they will be more benefited.

Key words: Dry inspection, blotter method, seed treatment, seed borne pathogen, vitavax 200.

 ***Corresponding Author:** lata_ln@yahoo.com

Introduction

Rice (*Oryza sativa L.*) is the staple food of Bangladeshi people and it constituted about 85% of the total food grain production. It covers about 75% of the total cultivable land in Bangladesh (Ahmed *et al.,* 2013). In Aman season, rice covers about 55,30,253 ha land in Bangladesh and the production is 1,30,23,312 tons which is 2.35 MT/ha (BBS, 2014).The average world yield of rice is 3.84 tons/ha (Ahmed *et al.,* 2013). But the average yield of rice in Bangladesh is only 2.98 tons/ha. The demand for rice is constantly rising in Bangladesh with nearly 1.56% people being added each year (CIA World Fact book, 2011). Nazrul *et al.,*(2010) reported lack of healthy rice seed is considered as one of the most important constraints to rice production and productivity in Bangladesh. Most seed borne diseases like brown leaf spot, rice blast, stem rot and bacterial leaf blight are caused by the pathogens like *Drechslera oryzae, Fusarium moniliforme, Pyricularia oryzae, Rhizoctonia solani, Sarocladium oryzae, Sclerotium oryzae, Trichoconiella padwickii* and *Xanthomonas compestris* pv *oryzae* (Bhutta and Hussain 1998; Khan *et al*., 1990; Wahid *et al*., 2001, Gill *et al*., 1999) are the main causes of rice yield reduction in our country. In Bangladesh, approximately 2.5 million tons of rice worth more than Tk. 1200

millions lost annually due to diseases caused by seed borne pathogens (Fakir *et al.,* 2003). (Bhuiyan *et al.,* 2013) reported that a total of seven seed-borne fungi were associated with 40 rice (*Oryza sativa)* seed samples (cv. BR11 and BRRI dhan28) collected from two upazilas (Narshingdi Sadar and Shibpur) of Narshingdi district in Bangladesh. The identified fungal species were *Bipolaris oryzae, Alternaria padwickii, Sarocladium oryzae, Curvularia lunata, Aspergillus niger* and *Fusarium* spp. These pathogens are known to cause damage at different stages like storage, seed germination, seedling establishment, vegetative growth and reproductive phase. A total of 153 seed-borne pathogens were detected from rice of which 18% are of quarantine importance, 65% are native and 17% are storage pathogens (IRRI, 1987). The infected seeds may fail to germinate, transmit disease from seed to seedling and from seedling to growing plants (Fakir *et al*., 2002). Seed health is a well recognized factor in the modern agricultural science for desired plant population and good harvest. Seed treatment by chemicals is the best, environmentally safe and economical way to keep good seed health condition, because in this management practice mostly a very low dose (1-1.5 g/kg) of chemicals were used as compared to foliar application. Bhuiyan *et al.* (2013) detected seed treating fungicides viz. vitavax-200, bavistin 50 WP and captan were tested to control seed-borne fungi. Seed treatment with vitavax-200 @ 0.3% of seed weight eliminated all the seed-borne fungi and increased seed germination by 25.70% over control. Musyimi *et al.,* (2012) conducted a study to evaluate the efficacy of fungicides, biological agents and host resistance in managing FHB and the associated T-2 toxin. Fungicides Pearl (500g/L carbendazim), Cotaf (50g/L hexaconacole), thiovit (micronized sulphur 80% w/w) and Folicur (430 g/L tebuconazole) were the standard checks. Fungicides resulted in 100% inhibition of pathogen radial growth in *in vitro* while microbial agents suppressed pathogen growth by up to 53%. Thiovit and *Trichoderma* were the most effective in reducing FHB (*Fusarium* Head Blight) severity in green house pot experiments. By keeping in view the above mentioned facts, the present study was carried out to determine the influence of different management practice on the prevalence of seed borne pathogens and to find out the most effective seed treating chemicals in reducing the pathogens.

Materials and Methods

The experiment pertaining to the present investigation was carried out in the Seed Pathology Centre (SPC), Bangladesh Agricultural University (BAU), Mymensingh and MS Laboratory of the Department of Plant Pathology, Bangladesh Agricultural University (BAU), Mymensingh during February -May 2009. 10 seed samples of each of viz. BR11, BRRI dhan30 and BRRI dhan33 were collected during T. Aman season from the farmer's houses of Gopalpur, Tangail. Seed samples were collected in polythene bags and after collection seed samples were placed in clean brown paper bag, labeled properly and preserved at 5-8^{0}c temperature in refrigerator for subsequent use.

Dry inspection of seed

For dry inspection from each sample 400 seeds were visually inspected. In a clean laboratory table, the seeds of each working sample were separated and 400 seeds were randomly separated first, and then graded them into five categories. The categories were a) Apparently healthy seeds, b) Discolored seeds, c) Spotted seeds, d) Unfilled seeds and e) Deformed seeds. The results were expressed in percentage.

Seed health test by blotter method

To detect the seed borne pathogens Blotter method was used by following international rules for seed testing (ISTA, 1996). In this method, three layers of blotting paper (Whatman filter No. 1) were soaked in sterilized water and placed at the bottom of 9 cm diameter plastic and thereafter 25 seeds were placed per plate. 16 replicates (Petri dishes) were used for each sample where 400 seeds were placed. The seeds in the Petri dishes were incubated at 20±2^{0}c under alternating cycles of 12 hours near ultraviolet (NUV) darkness for 7 days.

Inspection of incubated seed samples

Each individual incubated seed was observed under stereomicroscope at 16x and 25x magnifications in order to record the incidence of seed borne fungi. Most of the associated seed borne fungi were detected by observing their growth characters on the incubated seeds on blotter paper following the keys

outlines by Ramnath *et al.,* (1970). For proper identification of fungi temporary slides were prepared from the fungal colony and observed under compound microscope and identified with the help of keys suggested by Malone and Muskette (1964), Ellias (1971) and Neergaard (1979). The fungi from the incubated seeds were also transferred to PDA when needed. The culture was incubated at 25±1^{0}cfor 3-7 days. Temporary slides were prepared from the fungal colony and observed under compound microscope to identify the fungi (Ellias, 1971; Agarwal *et al.,* 1989). The results were presented as percent incidence of individual pathogen.

Preparation of fungicidal solutions and seed treatment with fungicides

Three different types of fungicides *viz*. vitavax 200 (0.25%), thiovit (0.25%) and cupravit (0.25%) were taken in three different conical flasks, then distilled water was poured in the conical flasks while it was shaken continuously and finally the volume of the solutions were made up to 100 ml. Thus 0.25% vitavax 200, thiovit and cupravit solutions were made and used for seed treatment. For seed treatment with fungicidal solutions the seeds were soaked in the solution for 1 hour. Khalequzzaman *et al.* (2008) reported the efficacy of two fungicides namely vitavax 200 and bavistin 50 WP, the best treatment was dipping seeds in 0.25% suspension of vitavax 200 for 3 hours, which was followed by dipping for 1 hour. After 1 hour the fungicidal solutions were drained out and the moistened seeds were kept in the blotter paper to remove excess moisture from the seed surface. Then the seeds were ready for plating in the blotter method. Treatments that are used for controlling seed borne fungi were as follows:

T_1: Vitavax 200 (0.25%),
T_2: Thiovit (0.25%)
T_3: Cupravit (0.25%)

Statistical analysis

The experiments were conducted following the Completely Randomized Design (CRD). The data collected from the experiment were analyzed for test of significance and compared the treatment means by using Least Significant Difference Test (LSD) as here less than 5 treatments were used.

Results and Discussions

Dry inspection

The results of dry inspection of collected seed samples of three rice varieties are presented in Table 1. Both the highest (83.35%) and the lowest (65.50%) apparently healthy seed were recorded in sample of BRRI dhan30. The highest (7.15%) and the lowest (2.16%) discolored seed was recorded in sample of BR11. The highest (18.93%) and the lowest (2.75%) spotted seed was recorded in sample of BRRI dhan30. The highest (8%) unfilled seed was recorded in BRRI dhan33 and the lowest (2.15%) was recorded in sample of BRRI dhan30. The highest (9.42%) deformed seed was recorded in BR11 and the lowest (1.18%) was recorded in sample of BRRI dhan33.Germination of the seeds varied from 75% to 90%. The highest germination (90%) was found in BRRI dhan30 and the lowest (75%) was in BRRI dhan33. Most of the seed samples had shown germination percentage between 75% to 85%.

Prevalence of seed borne fungi obtained through blotter incubation tests

The incidence of seed borne fungal pathogens from the seeds collected from Gopalpur, Tangailare presented in Table 2. The fungal species belonging to six genera that were found in seed samples are *Fusarium moniliforme, Bipolaris oryzae, Fusarium oxysporum, Curvularia lunata, Alternaria padwickii*, and *Aspergillus* spp. The highest incidence of *F. moniliforme* (20.87%) was found in variety BRRI dhan33 and the lowest (11.66%) incidence was found in variety BR11. The highest incidence of *B. oryzae* (8.53%) was found in variety BRRI dhan33 and the lowest (2.50%) incidence was found in variety BR11. The highest incidence of *F. oxysporum* (4.35%) was found in variety BRRI dhan33 and the lowest (1.25%) incidence was found in variety BRRI dhan33. The highest incidence of *C. lunata* (7.50%) was found in variety BRRI dhan30 and the lowest (1.95%) incidence was found in variety BRRI dhan33. The highest incidence of *A. padwickii* (12.85%) was found in variety BRRI dhan30 and the lowest (5.30%) incidence was found in variety BRRI dhan30. The highest incidence of *Aspergillus spp.* (6.54%) was found in variety BRRI dhan33 and the

lowest (1.75%) incidence was found in variety BRRI dhan30.

Effect of seed treatment

The effects of different treatments on % germination of collected seed samples of rice varieties are presented in Table-3. Germination ranged from 80% to 100%.The highest 100% germination was recorded in vitavax 200 treated seeds of BRRI dhan30 and BRRI dhan33 and the lowest 80% was found in control of BR11. But according to the gazette published by Seed Wing, Ministry of Agriculture, Government of the Peoples Republic of Bangladesh (2010) the minimum percent germination for seed standardize 96%.

Table 1. Dry inspection of farmers stored BR11, BRRI dhan30, BRRI dhan33 seed collected from Gopalpur, Tangail

Sample no.		Percent grain under different category				
		Healthy seed	Discolored seed	Spotted seed	Unfilled seed	Deformed seed
BR11	1	77.25	3.50	11.58	4.00	3.67
	2	80.58	2.58	10.35	4.33	2.16
	3	72.66	3.50	13.56	3.50	6.78
	4	75.50	3.58	8.75	2.75	9.42
	5	78.58	2.25	13.00	3.58	2.59
	6	78.66	3.00	12.62	3.41	2.31
	7	72.50	2.16	11.75	6.92	6.67
	8	68.82	7.15	15.25	7.50	1.28
	9	69.50	4.50	17.13	2.41	6.46
	10	75.25	6.20	7.92	3.62	7.01
CV(%)		**14.00**	**5.84**	**9.83**	**5.91**	**9.67**
BRRI dhan30	11	73.52	2.25	15.12	3.50	5.61
	12	68.35	6.35	18.80	4.75	1.75
	13	65.50	4.32	18.93	5.50	5.75
	14	75.36	6.35	10.35	2.15	5.79
	15	78.92	3.00	11.50	3.52	3.06
	16	79.25	3.35	10.32	5.16	1.92
	17	81.35	2.75	9.65	4.50	1.75
	18	77.85	2.82	12.70	5.32	1.31
	19	74.55	4.50	11.00	5.00	4.95
	20	83.35	6.00	2.75	3.58	4.32
CV(%)		**19.67**	**5.56**	**16.66**	**3.77**	**6.52**
BRRI dhan33	21	65.53	3.50	16.52	8.00	6.45
	22	68.75	2.75	14.00	7.25	7.25
	23	75.80	4.92	12.85	5.25	1.18
	24	72.83	4.33	11.25	6.50	5.09
	25	77.35	4.50	13.12	3.50	1.53
	26	69.35	4.92	16.52	3.50	5.71
	27	78.30	2.41	10.58	4.00	4.71
	28	80.00	3.00	9.66	4.30	3.04
	29	75.50	3.58	7.85	6.25	6.82
	30	78.00	4.00	11.75	3.85	2.40
CV(%)		**16.94**	**3.13**	**9.83**	**5.82**	**7.85**

*Data represent the mean of four replications. CV means co-efficient of variation

Table 2. Percent incidence of seed borne infection of BR11, BRRI dhan30, BRRI dhan33 (Blotter method)

Sample no.		Grmination (%)	% Prevalence of seed borne fungi						Total (%)
			Bipolar isoryzae	*Fusariumo xysporum*	*Fusariummon iliforme*	*Curvularial unata*	*Alternari apadwickii*	*Aspergillus sp.*	
BR11	1	75.83	3.50	1.94	15.50	2.50	7.50	2.50	33.44
	2	78.39	5.65	2.33	17.00	6.50	12.35	2.66	46.49
	3	80.35	7.30	3.16	13.50	3.00	11.00	2.83	40.79
	4	82.53	4.00	2.50	11.66	2.33	8.35	3.75	32.59
	5	85.65	5.65	3.00	15.00	4.50	6.35	4.50	39.00
	6	79.55	4.50	2.00	18.83	3.00	9.59	5.00	42.83
	7	80.53	6.70	3.50	13.56	2.16	12.25	4.66	42.83
	8	82.56	5.60	2.33	20.33	3.16	11.75	4.50	48.17
	9	78.65	6.50	2.50	14.75	4.16	8.30	4.16	40.37
	10	79.75	2.50	3.50	18.50	5.66	13.00	3.83	46.99
CV(%)		**9.51**	**5.37**	**2.03**	**9.63**	**5.17**	**8.20**	**3.14**	**18.71**
BRRI dhan30	11	76.63	3.00	2.00	16.00	3.25	8.50	1.75	34.50
	12	80.29	5.34	2.75	15.50	7.50	11.55	3.40	46.04
	13	78.45	6.30	3.28	13.25	2.50	12.25	4.00	41.58
	14	85.58	5.25	2.65	12.76	2.83	8.50	2.75	34.74
	15	82.75	6.75	3.50	14.00	5.40	5.30	3.50	38.45
	16	79.55	3.55	1.25	19.85	3.50	10.50	4.25	42.90
	17	78.50	7.00	4.25	15.50	3.25	11.35	5.66	47.01
	18	81.66	6.50	1.35	21.67	2.58	12.85	4.85	49.80
	19	78.00	5.60	3.50	14.55	3.25	9.50	5.86	42.26
	20	90.79	3.30	3.40	17.50	6.55	12.50	2.85	46.10
CV(%)		**14.97**	**5.22**	**3.48**	**10.06**	**6.22**	**8.28**	**4.60**	**18.16**
BRRI dhan33	21	78.50	7.67	2.15	17.00	4.00	9.89	2.00	42.71
	22	80.00	4.78	3.27	16.15	6.85	12.65	3.25	46.95
	23	75.25	6.38	4.20	14.28	1.95	13.35	4.50	44.66
	24	85.58	4.36	2.50	11.89	2.76	6.96	3.25	31.72
	25	82.75	5.45	4.00	13.00	4.50	7.30	4.25	38.50
	26	80.65	4.25	2.15	21.15	3.50	11.00	4.50	46.55
	27	81.50	5.15	3.85	14.75	3.76	12.35	6.54	46.40
	28	78.76	8.53	1.30	20.87	3.68	11.25	3.89	49.52
	29	82.65	6.50	4.35	15.00	4.15	10.26	4.89	45.15
	30	85.75	3.35	2.78	16.25	5.95	11.25	3.57	43.15
CV(%)		**11.41**	**5.69**	**3.64**	**10.65**	**5.00**	**7.46**	**4.24**	**17.93**

*Data represent the mean of four replications. CV means co-efficient of variation.

Table 3. Effect of fungicides on the prevalence major seed borne fungal pathogens of rice seeds (BR11, BRRI dhan30, BRRI dhan33) As treatments are less than 5 so here LSD is used.

Variety	Treatments	Germination (%)	% Prevalence of seed borne fungi					
			Bipolaris oryzae	*Fusariumoxysporum*	*Fusariummoniliforme*	*Curvularialunata*	*Alternaria padwickii*	*Aspergillus sp.*
BR11	Control	80.00d	6.00b	5.16a	20.00a	6.50a	7.00a	4.00
	Vitavax	99.00ab	0.15f	0.33e	4.50ef	0.00f	0.00e	0.00
	Cupravit	95.50ab	2.50d	1.50cd	2.16h	1.50e	0.00e	0.00
	Thiovit	96.00ab	3.00cd	1.20d	5.30de	0.00f	1.00d	0.00
BRRI dhan30	Control	85.00c	7.80a	4.50a	16.00b	3.50c	6.50a	4.00
	Vitavax	100.00a	1.38e	0.00e	2.25h	0.00f	1.30d	0.00
	Cupravit	97.50ab	3.75c	3.00b	2.50gh	0.00f	1.50d	1.50
	Thiovit	97.25ab	2.75d	1.50cd	5.83d	0.00f	1.30d	0.00
BRRI dhan33	Control	85.75c	6.50b	2.00cd	12.50c	5.00b	4.50b	3.00
	Vitavax	100.00a	1.30e	0.00e	2.50gh	0.00f	1.70d	0.00
	Cupravit	94.00b	1.55e	2.30bc	3.00gh	2.56d	3.00c	0.00
	Thiovit	95.00ab	2.75d	1.85cd	3.50fg	0.00f	2.95c	0.00
LSD		4.77	0.89	0.93	1.14	0.72	0.94	1.36

Means followed by the same letter did not differ significantly at the 5% level by LSD

So the germination percentage should be increased. The effects of different treatments on % infection by different seed borne fungi after seed treatment of seed samples are presented in Table 3. The maximum infection of *Fusarium moniliforme* (20%), *Bipolaris oryzae* (7.8%), *Fusarium oxysporum* (5.16%), *Curvularia lunata* (6.5%), *Alternaria padwickii* (7.0%), and *Aspergillus* spp (4.0%) were found in control and infection of *Fusarium oxysporum* (0%), *Curvularia lunata* (0%), *Alternaria padwickii* (0%), and *Aspergillus* spp. (0%), were not found and minimum infection of *Fusarium moniliforme* (2.16%), *Bipolaris oryzae* (0.15%), were found when seeds treated with vitavax 200, thiovit and cupravit (Table 3). Seed borne disease is one of the factors for substantial damages of rice. Apparently healthy seeds found in seed samples ranged from 65.50% to 83.35%. The highest (83.35%) pure seed was recorded in BRRI dhan30. It has been recorded that the collected seed samples contained 2.16% to 7.15% discolored, 2.75% to 18.93% spotted, 2.15% to 8.00% unfilled and 1.18% to 9.42% deformed. Fakir *et al*. (2002) recorded 91.20% to 98.89% pure seed, 0.06% to 2.73% unfilled, 14.43% to 24.44% discolored seed, 33.72% to 37.71% spotted seed and 8.46% to 15.50% deformed seeds of rice collected from Rajshahi, Rangpur and Bogra in Bangladesh. Islam *et al*. (2007) reported that maximum pure seed (99.01%) was found in seed samples of trained farmers and minimum (96.19%) in untrained farmers.

In the present investigation 3 different treatments including a control were tested in blotter method, where their effect on germination and seed borne fungi were evaluated. All the treatments showed superior influence on germination of seeds over control (Table 2 & 3). Percent seed germination was increased in treated seeds compared to untreated seeds. The seed treated with the vitavax 200 shown highest percentage of germination and the other two fungicides also found to increase the germinations over control. They were statistically similar with vitavax 200. This is also in agreement with the findings of Islam (2000), Rahman (2000), Parisi (2001), Rashid (2007), Ashok Gaur (2005), Kabir (2006), Islam (2007). They found that the fungicide

vitavax 200 shown excellent increase of germination. The percentage ranges of the seed borne fungi that were found in the seed samples after seed treatment were *Bipolaris oryzae* (0.15% to 3.75%), *Fusarium oxysporum*(0% to 3%), *Fusarium moniliforme* (2.16% to 5.83%), *Curvulari alunata* (0% to 2.56%), *Alternaria padwickii* (0% to 3%) and *Aspergillus* spp. (0% to 1.5%). The association of seed borne fungi of rice have also been reported by a good number of researchers (Mendoza and Molina, 1980; Mia and Mathur, 1983; Agarwal *et al*. 1990; Sisterna *et al*. 1994; Purushattam *et al*. 1996; Sharma *et al*. 1997; Bicca *et al*. 1998; Fakir, 2000; Naeem Khalid *et al*. 2001; Fakir *et al*. 2002, Rahman *et al.* 2002a, Rahman *et al.* 2002b, Fakir *et al*. 2003, Nahar 2003, Mathur *et al.* (2004), Portapuglia (2004) and Islam (2007). It was recorded from the study that all the fungicides appeared to be effective to control the growth of *Curvularia lunata*. The most effective result was found in inhibiting seed borne fungi *Aspergillus* sp. prevalence. All of the three fungicides could completely control the prevalence of seed borne fungi *Aspergillus* sp. Among the fungicides tested vitavax 200 was found the best and could completely controlled the prevalence of *Fusarium oxysporum* which is an observations made by Akanda and Fakir, 1985b. Vitavax 200 was found to be most effective for controlling *Bipolaris oryzae*, the most effective result was found in variety BR11 (0.15%). In killing *Fusarium moniliforme* cupravit was found to be most effective and the prevalence of the pathogen was ranged from 2.16% to 3.0%,the most effective result was found in variety BR11 (2.16%). *Alternaria padwickii* was found to be completely controlled when the seeds were treated with vitavax-200 (0.00% to 1.70%) and cupravit (0.00% to 3.00%). The most effective result was found in the variety BR11 (0%).Among the fungicides for controlling major seed borne fungi of rice, the fungicides vitavax 200 found to be most effective against the prevalence of seed borne pathogen. This is also in agreement with the findings of Islam (2000), Rahman (2000), Parisi (2001), Rashid (2007), Ashok Gaur (2005), Kabir (2006), Islam (2007). Jambhulkar *et al*. (2007) also found a lower performance of vitavax than others. Dayan (2005) revealed for cupravit, Rahman (2000) and Akter (2001) shown that thiovit gave satisfactory result over other fungicides.

The findings of the present studies revealed that vitavax 200 is the best for germination and also for controlling seed borne fungal pathogens but considering all other aspects performance of cupravit and thiovit were also satisfactory.

Conclusion

Based on the findings of the present study, it may be concluded that health and quality of rice seeds collected from farmer's houses were not good. So seeds should be treated before use. The result of the present investigation revealed that seed treatment with different chemicals will be helpful to prevent germination failure. Among different seed treating agents vitavax 200 has been proven as the best seed treating agent in controlling different seed borne fungi which is considered as effective disease management strategy.

References

Agarwal DC, Mortensen CN, Mathur SB (1990). Seed borne diseases and seed health testing of rice. Phytopath.30: p-106.

Agarwal DC, Mortensen CN, Mathur SB (1989). Seed borne diseases and seed health testing of rice. Danish Govt. Inst. Seed Path., Copenhagen, Denmark. P-14.

Ahmed M, Hossain M, Hassan K, Dash CK (2013). Efficacy of Different Plant Extract on Reducing Seed Borne Infection and Increasing Germination of Collected Rice Seed Sample. *Universal Journal of Plant Science* 1(3): 66-73.

Akanda MAM, Fakir GA (1985b). Effect of seed dressing chemicals for the control of major seed-borne pathogens of jute.Bangladesh J. PI.Pathol. 1 (1): 13-19.

Akter SMS, Mia MAT (2001). Chemical control of sheath blight disease of rice. Plant Pathology Division, Bangladesh Rice Research Institute, Gazipur, Bangladesh J. Pathology. 17(12):35-38.

Ashok G, HuynhVan N (2005). Efficacy of seed treatment in improving seed quality in rice (Oryza sativa L.). 13: 42-51.

BBS (2014). Year book of Agricultural statistics of Bangladesh, Planning Bangladesh Bureau of

Statistics, Planning Division, Ministry of Planning, Government of The Peoples Republic Of Bangladesh, Dhaka, Bangladesh.

Bhuiyan MR, Rashid MM, Khan MA, Hoque M, Nessa B, Rafi MY and Latif MA (2013). Ecofriendly Management of Seed Borne Fungi for Sustainable Crop Production.*Life Science Journal* 10 (4).

Bhutta AR (1998). Comparison of cotton seed health testing method and their economics Pakistan Cotton, 32(3): 146-153.

Bicca, Bandet FML, Zimmer GJ (1998). Separation of discoloured seed from rice seed lots using the gravity table and influence on seed health, Revista, Brasileria de Sementes, 20(1): 106-111.

CIA world fact book (October 14, 2011) Bangladesh Population growth rate. (c) Index Mundi. http://www.indexmundi.com/bangladesh/population growth rate.html.

Dayan MD (2005). Biological, chemical and cellular effects of fungi on forest tree seeds and measures for their control. Canopy-International. 31(1/6): 6-7.

Ellias MB (1971). DematiaceousHypomycetes. CMI, Kew Surrey, England.P.507.

Fakir GA, Hossain I, Ahmed MU, Doullah MAU and Alam M,(2002). Quality of farmers Boro and T. Aman rice seeds collected before sowing from Bogra, Rajshahi and Rangpur districts of Bangladesh. A paper presented in the review and planning meeting of the Rice Seed Health Improvement (SHIP), PETRRA project held on 17-18 April at BRRI, Gazipur, Bangladesh.

Fakir GA, Hossain I, Ahmed MU, Doullah MAU and Alam M (2003). Effect of ash, chalk powder and neem leaf on the quality of boro rice seed stored in gunny bag, motka, plastic drum and tin. Proceeding of review and planning meeting of the Rice Seed Health Improvement Sub-project held at BRRI, Gazipur, Bangladesh during 21-22 April. pp. 1-37.

Fakir GA (2000). An annotated list of seed borne diseases in Bangladesh. Seed Pathology Centre, Dept. of Plant Pathology, BAU, Mymensingh.

Gill MA, Wahid A, Javed MS, Khan TZ (1999). Major diseases of rice crop in the Punjab and their management strategies. In: Proc. 2nd Natl. Conf. Plant Pathol., Sept. 27-29, 1999, Univ. Agri. Faisalabad.

IRRI (1987). Standard Evaluation System of Rice.International Rice Testing Programme Los Banos, Phillipines.

Islam MK, Rahman AJMM, Mia MAT (2000). Significance of seed borne fungi pathogens of rice with emphasis on *Bipolarisoryzae*. *Bangladesh J. Plant Pathology,* 16(1-2): 27-30.

Islam MK, Rahman AJMM, Mia MAT (2007). Study of seed health, germination and seedling vigor of farmers produced rice seeds.*International Journal of Sustainable Crop Production*, 2(5): 34-39.

Jambhulkar PP, Kandhari J (2007). Effect of pre-storage treatment with bio-pesticides for the control of seed borne fungi in rice..*Indian Phytopathology,*60(2): 231-236.

Kabir MH, Islam SMA, Azad MAK, Alom MM, Fakir GA (2006). Effect of physical and chemical seed treatment on prevalence of seed borne fungi and seedling development of Boro rice. *International Journal of Sustainable Agricultural Technology,* 2(2): 40-44.

Khalequzzaman KM (2008). Effect of seed treating fungicides and biofertilizers in the incidence of foot and root rot disease of lentil and chickpea. *Annuals of Bangladesh Agriculture,* 12 (2) 39-44.

Khan SA, Anwar SA, Bhutta AB (1990). Studies on seed borne fungi, bacteria, and nematodes of rice in the Punjab. *Pak. J. Sci. Ind. Res.*, 33(11): 489-492.

Malone GP, Muskette AE (1964). Seed borne fungi. Description of 77 fungal species. Proc. *Int. Seed Test. Ass.,* 29(2): 180-183.

Mathur SB, Talukder MH, Veena MS, Mortensen CN (2004).Effect of manual cleaning on health and germination of rice.Seed Science and Technology. 32(2): 405-415.

Mendoza AM, Molina RP (1980). A study on seed borne fungi associated with rice seed and their effects on rice seedlings. *J. Araneta Res*. 27(1-4): 50-69.

Mia MAT, Mathur SB (1983). Study on seed mycoflora of rice in Bangladesh. Seed Res. 11 (2):254-257.

Musyimi LS, Muthomi WJ, Rama DN, John MW (2012). Efficacy of Biological Control and Cultivar Resistance on *Fusarium* Head Blight and T-2 Toxin Contamination in Wheat. Ministry of Agriculture, Nairobi, Kenya; Department of Plant Science and Crop Production, University of Nairobi,Nairobi, Kenya; School of Biological Sciences, University of Nairobi,Nairobi, Kenya. *American Journal Plant Sciences* 3 599-607.

Khalid N, Anwar SA, Hoque MI, Riaz A, Khan MSA (2001).Seed borne fungi and bacteria of rice and their impact on seed germination. *Pakistan J. of Phytopathology*. 13(1): 75-81.

Nahar K (2003). Seed quality and seedling health of farmers rice of Bogra district. MS thesis submitted to Department of Plant Pathology, BAU, Mymensingh.

Nazrul ASM, Fakhrul ISM (2010). Factor demand in the healthy rice seed use in Boro and T. Aman: A case study of Bangladesh. *Bangladesh Journal of Agricultural Research* . 35(2): 297-312.

Neergaard P (1979). Seed pathology. Vol.1. The Mac Millan Press Ltd.

Parisi JJD, Malavolta VMA Leonel FL (2001). Chemical control of seed-borne fungi in rice seeds (*Oryza sativa* L.). *Summa Phytopatho-logica*. 27(4): 403-409.

Porta Puglia A (2004). Major seed borne diseases of rice. Informatore-Fitopatologico. 54(3): 18-21.

Purushottam SP, Patkar KL, Prakash HS and Shetty HS (1996). Storage fungi and their influence on rice seed quality, Indian Phytopathology. 49(2):152-156.

Rahman AJMM, Islam MK, Mia MAT (2000). Evaluation of cleaning method of improve the quality of farmer's saved rice, Bangladesh J. Plant. Path. 16(1&2): 39-42.

Rahman MM (2002a). Effect of farmers storing processes in relation to seed quality and seed borne fungi of (BR11).*MS. Thesis*, Dept. of Plant Pathology, BAU, Mymensingh.

Rahman MM (2002). Effect of storage containers under farmer's condition on seed mycoflora and quality of Boro seed. MS. Thesis, Dept. of Plant Pathology, BAU, Mymensingh. pp. 25-40.

Rashid SMA, Mosaddeque HQM, Ali MS, Haque MH Polan MS (2007).Association of seed borne fungi with T. aman seed in relation to variety and farmers' seed processing activities. *International Journal of Sustainable Agricultural Technology*. 3(2): 7-10.

Seed wing (2010). Seed and Field Standard of Different Crops, Gazette No-159: published on 10 Oct 2010. Ministry of Agriculture, Government of the Peoples Republic of Bangladesh.

Sharma OP, Vaid A, Safi SC, Saxena J, Dubey RC (1997). Mycoflora of discoloured rice grains and its pathogenic potential in Himachal Pradesh. Himalayan Micro. Diver. Part 1: 273-281.

Sisterna MN, Lori GA, Marassi JJ (1994). Symptomatology and fungi associated with rice grain spotting in cultivar Igra 409. *Revista de la Faculta de Agronomia*. 70: 13-21.

Wahid A, Javed MS, Indrees M, Gill MA (2001). Association of F. solani to rice seeds in the Punjab, Pakistan, *Abstracts Published in 3rd Nat. Conf. Pl. Path.*1-3. October, 2001 at NARC, Islamabad. 41pp.