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Effect of storage containers and additives on seedling health of rice

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Abstract: The storage experiments were conducted in the farmers' house of Rakudia, Barisal; health and quality tests were done at the Seed Pathology Centre, Bangladesh Rich Research Institute, and International Rice Research Institute (Philippines) following CRD. Four storage containers viz Motka, Painted motka, Plastic drum and Tin jar and four additives viz. chalk powder, dry leaves of neem (*Azardirachta indica*) and biskatali (*Polygonum hydropiper*) and tamarind seeds (*Tamarind indica*) were tested to preserve rice seeds in the farmers' houses for good quality seedlings. The highest percentage of healthy seedlings (88.50%) was recorded after one month of storage in Plastic drum with neem leaves that was significantly different from all other treatment combinations. *Aspergillus flavus and Aspergillus candidus* were the predominat storage fungi detected from the seeds after storage in different containers with additives. Its population was comparatively low in the seeds preserved in plastic drum with neem leaves additives. The infection of *Rhizopus spp* was higher than the infection of *Penicilium spp*. *Alternaria tenuis* infection was similar in all containers or additives. Similar results were observed in case of other minor seed-borne fungi. Therefore, rice seeds may be stored in plastic drum with neem leaves to sustain the potentiality of seeds for healthy seedling production.
Key words: Storage containers, Additives, Storage fungi, Seedling health, Rice

Introduction

Propagules of different pathogens of rice may contaminate the seeds in the field as well as in threshing floor and or storage. Seed borne pathogens such as *Bipolaris oryzae*, *Pyricularia grisea*, *Sarocladium oryzae*, *Bipolaris oryzae*, *Sclerotium rolfsii*, and *Fusarium* spp. *Curvularia lunata*, *Nigrospora oryzae*, *Phoma glumarum*, and *Cladosporium* sp. are associated with rice seed inflicting diseases in seedbed as well as in the field (Fakir, 2004). The storage fungi such as species of *Aspergillus* and *Penicillium* are dominant in storage. These pathogens may grow on rice seeds due to improper storage and may deteriorate seed quality (Miah and Fakir, 1989; Rahman and Mia, 1998). Improper preservation leads to deterioration of seed quality resulting low yield (Karim, 1999). Farmers saved seeds may badly infest with stored grain pests and moulds (Mia and Mathur 1983). Rice seeds are stored for several months before sowing. Good seeds may become bad due to storage in improper container. Storage insects and many storage fungi may cause discoloration, mustiness, and reduced viability of seeds, thereby drastically reduce the planting value of the seeds (Christensen and Kaufmann, 1965) Selection of proper storage container that can maintain the quality of farmer-saved seed in storage and preserving its viability and should be an important consideration to reduce seed loss and increase crop yield (Samajpati *et. al*., 1978). In view of the above facts, the present study was undertaken to select suitable container for storage of good seeds keeping good health under farmers' conditions for sustainable high yield.

Materials and Methods

Experiments were conducted in the farmer's house of the village Rakudia under Babugonj of Barisal district of Bangladesh. The laboratory experiments were conducted at the Seed Pathology Center, Bangladesh Rice Research Institute and International Rice Research Institute. Twenty farmers were selected. The seeds of BRRI Dhan-29 produced by the farmers were used in the study. Four types of containers viz. Motka, Painted motka, Plastic drum and Tin jar each with incorporated with four additives (eg. Chalk powder, Neem leaves, Biskatali leaves and Tamarind seed) along with a set of control were used for preservation of rice seed.From each treatment combination, 500 gm seeds were taken from the middle portion of each container. The samples were taken in brown paper bag, labeled, and preserved at 5-8°C in a refrigerator for seedling health test in the seed bed. Wet seed beds were prepared and seeds were sown in the experimental units following RCBD. Double diagonal line patterns technique of sampling were used for determination of seedling health. Fifty seedlings per line were randomly selected from each seedbed (Savary *et al*., 1997). Seedlings were sorted out into three categories viz. healthy, abnormal and diseased. The number of seedlings in each category was counted and expressed as percentage.

Results and Discussion

Effects of storage containers and additives on seedling health are presented in Table 1. The highest percentage of healthy seedlings (88.50%) was recorded after one month of storage in Plastic drum with neem leaves, which was significantly different from all other treatment combinations. The lowest percentage of healthy seedlings (55.00%) was recorded incase of Motka with no additives. Similar results were recorded after five months of storage. Tin jar and Painted Motka with neem leaves showed 82.75% and 81.75% healthy seedlings, respectively. The lowest percentage of healthy seedlings (52.50%) was recorded in Motka with no additives. The percentage of abnormal seedlings was 6.5 after one month of storage incase of motka with no additives. Additives had significant effect on the number of abnormal seedlings when the seeds were preserved in painted motka. The diseased seedlings was 11.75% after onemonth of storage in

Table1. Categories of seedlings yielded from seeds after 1 and 5 months of storage as influenced by storage containers and additives

Container/ Additives	Healthy		Abnormal		Diseased	
	1 month	5 month	1 month	5 month	1 month	5 month
Motka						
Chalkpowder	68.75	67.25	4.25	3.50	7.00	4.50
Neem leaf	77.00	76.50	3.25	2.75	4.00	3.00
Biskatali leaf	72.25	72.00	3.25	3.00	4.75	3.50
Tamarind seed	62.75	60.50	4.75	3.75	8.25	7.25
Control	55.00	52.50	6.50	5.00	11.75	9.00
PaintedMotka						
Chalkpowder	74.50	69.50	2.25	2.25	4.75	3.50
Neem leaf	82.75	81.75	2.00	1.25	2.75	1.75
Biskatali leaf	78.25	75.25	2.25	2.00	3.75	2.25
Tamarind seed	77.00	69.75	3.00	2.00	4.50	3.00
Control	62.50	66.25	6.00	3.25	8.00	5.00
Plastic drum						
Chalkpowder	78.25	74.75	5.75	2.50	4.50	3.50
Neem leaf	88.50	83.25	2.00	2.75	1.50	1.75
Biskatali leaf	79.00	76.00	2.00	2.25	3.00	2.50
Tamarind seed	75.25	71.75	2.50	2.50	4.50	3.75
Control	66.75	65.25	3.00	4.25	7.50	6.00
Tinjar						
Chalkpowder	71.50	71.00	2.75	3.50	5.25	4.25
Neem leaf	83.25	82.75	2.75	2.00	2.50	2.50
Biskatali leaf	75.75	73.75	3.00	2.25	4.00	3.75
Tamarind seed	71.25	69.00	5.00	3.00	6.50	4.00
Control	66.25	63.75	4.75	5.00	7.25	5.75
LSD (P>0.05)	4.11	4.11	0.59	0.58	0.96	0.95

Table 2. Effect of different storage containers and additives on the incidence of storage Fungi after 1 and 5 month of storage

Container/ Additives	Percent incidence of fungi					
	*Aspergillus**		*Penicillium**		*Rhizopous**	
	1 Month	5 month	1 month	5 month	1 month	5 month
Motka						
Chalkpowder	8.50	9.50	2.50	3.50	6.25	6.75
Neem leaf	6.00	6.75	1.25	2.25	2.50	3.75
Biskatali leaf	8.00	9.00	1.75	2.50	3.50	4.25
Tamarind seed	7.50	9.00	2.25	3.00	6.00	6.50
Control	9.00	10.25	3.25	4.75	7.25	8.00
PaintedMotka						
Chalkpowder	5.25	6.00	1.50	2.50	3.25	3.50
Neem leaf	5.50	6.25	1.00	1.75	2.25	3.00
Biskatali leaf	5.00	5.75	1.25	2.00	2.50	3.00
Tamarind seed	5.25	6.50	1.25	2.00	3.00	4.00
Control	6.75	8.50	2.00	2.75	3.75	5.25
Plastic drum						
Chalkpowder	4.75	5.75	1.00	2.25	3.75	4.50
Neem leaf	4.00	5.25	1.00	1.50	2.00	3.75
Biskatali leaf	4.25	5.25	1.25	2.25	2.25	3.00
Tamarind seed	5.00	6.00	1.00	1.75	2.50	3.00
Control	6.25	7.50	3.00	4.00	3.00	4.00
Tinjar						
Chalkpowder	5.75	6.50	1.25	2.00	3.00	3.50
Neem leaf	5.00	6.25	0.50	1.00	2.50	3.50
Biskatali leaf	5.00	6.50	1.50	2.50	3.00	3.75
Tamarind seed	5.50	5.25	1.50	2.25	3.50	4.00
Control	6.00	7.25	2.50	3.50	3.75	4.75
LSD =0.05	1.13	1.12	1.08	1.07	1.16	1.14

* Different species.

motka with no additives and (9.00%) after five months. The lowest percentage of diseased seedlings was recorded incase of plastic drum with neem leaves.

The incidence of storage fungi infested the seeds preserved in different storage containers with additives are shown in Table 2. *Aspergillus flavus and Aspergillus candidus* were the predominat storage fungi detected from the seeds after storage in different containers with additives. The infection of *Rhizopus spp* was higher than the infection of *Penicilium spp*. In case of 1 month of storage, the highest incidence of *Aspergillus* spp (9.00%), *Penicillium spp* (3.25%), and *Rhizopus sp* (7.25%) were recorded in motka with no additives, which were significantly different from all other containers and additives. The lowest incidences of *Aspergillus* spp (4.00%), *Penicillium spp* (1.00%), and *Rhizopus sp* (2.00%) were recorded after 1 month of storage in plastic drum with neem leaves additives**.** In case of 5 month of storage, the highest incidence of *Aspergillus* spp (10.25%), *Penicillium sp* (4.75%), and *Rhizopus sp* (8.00%) were recorded in motka with no additives. The incidences of *Aspergillus* spp was 5.25% in plastic drum with neem leaves.

Alternaria tenuis, Alternaria padwickii, Nigrospora oryzae, Cunninghamella sp,Cladosporium cladosporioides, Phoma glumarum were found to be associated with the seeds stored in different containers with additives (Table 3). The highest incidence of *Alternatria padwickii* (7.00%) was recorded in seeds of one month of storage in motka with chalk powder that was lowest in case of neem leaves. *Alternaria tenuis* infection was similar in all containers or additives. Similar results were observed in case of other minor seed-borne fungi.

The highest percentage of germination as well as healthy seedlings were recorded when seeds were stored in plastic drum with neem leaves. The lowest percentage of germination was recorded in motka with no additives. Earlier reports were in agreement with the present findings (Christensen, 1970; Kaur *et al*., 1990). The incidence of storage fungi (*Aspergillus spp, penicilium spp. Rhizopus sp. and Chaetomium sp*) were found to increase with the increase of storage time while the pathogenic fungi (*Bipolaris oryzae, Curvularia spp, Funsarium moniliforme, Microdochium oryzae and Altematria padwicki*) decreased with the increase of storage time. The highest incidence of the fungi was found in Motka with no additives, which was significantly higher from that of all other containers with additive. Nanda and Chaudhary (1972) reported reduction in seed germination and vigour of rice seeds where the predominant seed borne fungus was *Curvularia lunata.* Similar observation was also made by Imolehin (1983). Seed borne pathogens are also responsible for seedling abnormalities (Mendoza and Molina, 1980).

Table 3. Effect of different storage containers and additives on the incidence (%) of different field fungi on the seeds after 1 and 5 month of storage

Container/ Additives	Percent incidence					
	Alternaria padwicki		*Alternaria tenuis*		Others***	
	1 Month	5 month	1 month	5 month	1 month	5 month
Motka						
Chalkpowder	7.00	5.00	3.75	2.75	5.50	5.75
Neem leaf	3.50	3.50	2.75	2.00	4.75	3.75
Biskatali leaf	4.50	3.75	3.00	2.50	4.75	5.00
Tamarind seed	5.25	3.75	4.00	3.25	3.25	5.50
Control	6.50	5.25	4.00	3.50	5.50	6.50
PaintedMotka						
Chalkpowder	5.75	2.50	2.50	1.50	2.75	4.25
Neem leaf	2.75	2.25	2.00	1.25	1.75	2.25
Biskatali leaf	3.25	3.75	2.75	2.50	2.74	3.00
Tamarind seed	4.75	3.50	3.00	1.50	4.50	5.50
Control	4.00	3.75	2.25	2.00	4.75	5.00
Plastic drum						
Chalkpowder	4.00	3.50	2.25	2.00	3.25	4.50
Neem leaf	2.50	1.75	1.25	1.25	3.00	4.00
Biskatali leaf	3.25	3.25	1.50	1.25	3.25	4.00
Tamarind seed	5.25	4.00	3.75	3.30	3.75	6.25
Control	4.00	3.75	3.00	2.50	4.00	4.75
Tinjar						
Chalkpowder	3.50	2.50	2.00	1.50	3.50	2.75
Neem leaf	2.50	1.25	1.50	1.25	2.00	2.00
Biskatali leaf	3.25	3.50	2.25	2.00	3.50	4.00
Tamarind seed	5.00	3.00	3.00	1.75	5.75	4.50
Control	5.00	4.75	2.50	2.25	5.00	6.50
LSD =0.05	1.84	1.82	0.65	0.57	2.52	2.54

***(*Nigrospora oryzae, Cunninghamella sp, Cladosporium cladosporioides, Phoma sp).*

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