



## Performance of storage materials, bio agents and chemicals on health in paddy (*Oryza sativa* L.)

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### Abstract

The experiment was conducted in Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Science, Allahabad, Uttar Pradesh, India during October 2014 to March 2015. The present study was carried out with the objective was to find out suitable storage materials for health of paddy. Three different types of packaging material viz. vacuum polythene bag, non vacuum polythene bag and jute bag used for storage with three different chemical/bioagent viz. Castor oil, Neem cake and Thiram for six month. According to this experiment after six month health condition of seeds was also superior compared to other storage materials. The percentage infections of *Aspergillus* were recorded maximum in variety of Pusa basmati-1, with neem cake and jute bag (14.04%, 10.88 %, 11.67 %) blotter paper method respectively, compared with other seed borne fungi.

**Keywords:** packaging material, storage, aspergillus, seed borne pathogen, castor oil

### Introduction

The health of seed is very important for the crop production because seeds are considered as highly effective means for transporting plant pathogens over long distances. There are many factors which are responsible for low yield but a major constraint to production is the infectious diseases e. g rice blast (*Pyricularia oryzae* Cav.) brown leaf spot (*Bipolaris oryzae* spp.) stem rot (*Sclerotium oryzaedod*) and foot rot disease (*Fusarium moniliforme*). Most of these infectious problems are seed-borne in nature which causes enormous losses both in storage as well as in the field. These pathogens are known to cause damage at different stages like storage, seed germination, seedling establishment, vegetative growth and reproductive phase. The infected seeds may fail to germinate, transmit disease from seed to seedling and from seedling to growing plants (Faki *et al.* 2002) [10]. Pathogen free healthy seeds are required to reduce enormous crop losses. Seed-borne fungi are significant slayers of grains during storage. It has also been confirmed that seed-borne fungi are responsible for the reduction of health of seeds (Neergaard, 1979) [22] and cause reduction in plant growth and productivity of crops (Williams and McDonald, 1983; Kubiak and Korbas, 1999; Dawson and Bateman, 2001) [25, 18]. The seed borne pathogens associated with seeds externally or internally may cause various infection viz., seed rot, seed necrosis, reduction or elimination of germination capacity, as well as seedling damage resulting in development of disease at later stages of plant growth by systemic infection (Bateman and Kwasna, 1999; Asif *et al.*, 2001, Ijaz, *et al.*, 2001, Khanzada *et al.*,

2002) [2, 1, 14, 17]. Richardson (1990) [23] recorded about 40 seed-borne fungal pathogens responsible for the low yield of the crop. Galvano *et al.*, 2001) [12] reported that more than 25% of the world cereals are contaminated with more than 300 fungal metabolites and cause toxic effect to man and animals. In human various diseases like hepatotoxicity, carcinogenicity, genotoxicity, terratogenicity, nephrotoxicity, reproductive disorders and immunosuppression are caused (Lacey, 1988; Desjardins *et al.*, 2000) [19, 7]. Various synthetic chemical fungicides available commercially can be used to effective and efficient control of seed borne fungi, but due to their pesticide toxicity they cannot be applied to grains (Ferrer and Cabral, 1991; Harris *et al.*, 2001; Dukic *et al.*, 2004) [11, 13, 8]. Hence, there is a need of alternative eco-friendly approaches to store grains for human consumption without toxicity problems that are not capital intensive. The present study was conducted to identify and investigate the suitable storage material, organic and bio agent treatment for decreases the seed borne disease during storage in paddy (*Oryza sativa* L.).

### Methodology

The experiment was conducted at the Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Science, Allahabad, Uttar Pradesh, India during October 2014 to March 2015. Experiment was laid down in a Factorial Complete Randomized Design (FCRD), with four replications. The seed of (Pusa basmati-1, Jaya) were sun dried to a uniform moisture content of 15% before proceeding for storage. Seed

to each variety were treated with castor oil 5 gm/kg, neem cake 10 gm/kg and Thiram 3gm/kg and the last portion was kept as untreated control and stored in three different types of packaging materials *viz.* vacuum polythene bags, non vacuum polythene bags and Jute bags and at room temperature in seed store house for different period of time and recorded the seed pathogen with blotter method.

### Procedure

Seed samples of rice were analyzed for the presence of major seed borne fungal pathogens by blotter method following the International rules for Seed Testing. Two hundred seeds were tested for each variety maintaining four replications. Twenty-five seeds were placed on three layers of moist blotting paper (Whatsman No.1) in each glass petridish. The petridishes were incubated at  $25\pm 1^\circ\text{C}$  under 12/12 hours light and darkness cycle for 7 days. Each seed was observed under stereomicroscope in order to record the presence of fungal colony and bacterial ooze 7 days after incubation based on growth habit. Each individual incubated seed was observed under stereomicroscope at 16x and 25x magnification in order to record the incidence of seed borne fungi. Most of the associated pathogens were detected by observing their growth characters on the incubated seeds on blotter paper following the keys outlined by Mathur and Kongsdal, (2003) [21]. The fungal morphological studies consisted of mycelium growth, colour, cellular contents and characters of fruiting bodies of fungi. Macroscopic characters like fungal colony growth, size, colour, texture, shape, reverse colour, exudates, and margin of the colony were noted for fungal identification following the Barnett & Hunter. Microscopic characterization of all the fungal isolates was done by making the slides of different fungal species. The documentation of isolates *i.e.* size of head, vesicle shape, phalides, matulae, conidiophores and conidia characters like: conidial diameter, wall, shape, surface. conidia attachment with conidiophores was done microscopically. Identification was done by comparing the data with the synoptic keys published by Barnett & Hunter.

### Result Discussion

The maximum seed borne fungi was found maximum in (Pusa basmati-1, 12.08 %) followed by V<sub>2</sub> (Jaya, 7.29 %) after 24

weeks. The seed borne fungi percentage after 24 weeks of storage as affected by the fungicidal seed treatment revealed that (castor oil 7.55%) scored significantly superior values than (Neem cake, 9.77 %), (Thiram, 9.70 %) and (control, 11.70 %). According to this experiment seed borne fungi (*Aspergillus*, *Penicillium* sp. *Fusarium moniliforme*, *Curvularia*) found in 24 weeks of storage in rice. The packaging materials, (non vacuum polythene, 9.29 %) were found to minimum followed by (vacuum polythene, 9.43 %) and (Jute bag, 10.32 %) being least after 24 weeks of storage in seed borne fungi.



**Fig 1:** Identification of seed borne pathogen- *Aspergillus* spp. in stored rice seed.

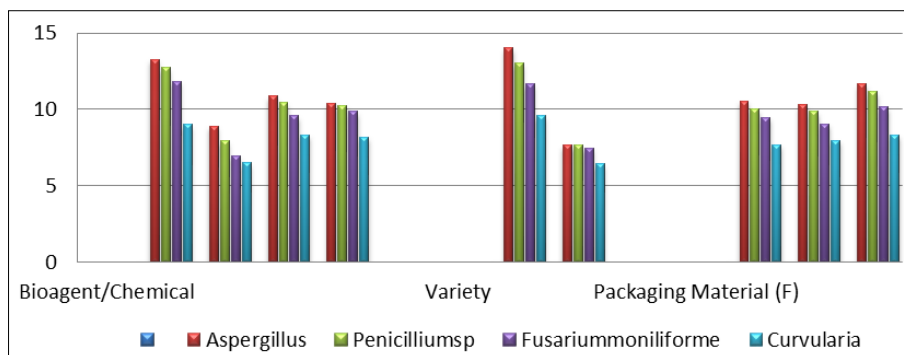
According to this experiment castor oil is best treatment then other treatment (Neem cake, and Thiram) for protecting the paddy during storage. castor oil is not a drying oil, meaning that it has a low reactivity toward air compared to other treatment such as neem cake and Thiram. Castor oil has dihydroxystearic acid which is protect with a thin layer on seed surface. This layer worked as a plaster which has equilibrium condition and disease growth is decreased during storage.

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**Table 1:** Performance of different genotypes, seed treatments and packaging materials on seed health of rice during storage.

	<i>Aspergillus</i>	<i>Penicillium</i> sp	<i>Fusarium moniliforme</i>	<i>Curvularia</i>
Bioagent/Chemical				
Control	13.26	12.72	11.84	9.01
Castor oil	8.89	7.94	6.96	6.50
Neem cake	10.88	10.44	9.59	8.31
Thiram	10.39	10.25	9.87	8.17
CD at 5%	0.237	0.153	0.111	0.096
Variety				
Pusa basmati-1	14.04	13.02	11.66	9.58
Jaya	7.64	7.65	7.47	6.41
CD at 5%	0.206	0.132	0.096	0.083
Packaging Material (F)				
Polythene bag (vacuum)	10.56	10.00	9.48	7.69
polythene bag (non vacuum)	10.29	9.85	9.06	7.98
Jute bag	11.67	11.15	10.15	8.32
CD at 5%	0.237	0.153	0.111	0.096



**Fig 2:** Performance of different packaging material, chemical and bioagent on seed health during storage.

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