

Evaluation of different packaging materials for safe storage of paddy seeds in coastal areas

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ABSTRACT

Four different types of containers viz., cloth bag, high density polyethylene (HDPE) bag, polylined cloth bag and super bag were evaluated to identify a suitable container for safe storage of paddy seeds (cv. ADT 38). The results revealed that moisture content of seeds increased with the advancement of storage period irrespective of containers. However, the rate of increase was significantly higher in cloth bag followed by HDPE bag than poly-lined cloth bag and super bags. The results on per cent seed germination indicated that a decline in seed germination was noticed during storage. Initial mean germination level of 98 per cent was reduced to 79 per cent at the end of six months of storage. The rate of reduction in germination was significantly influenced by initial moisture content and type of storage containers. Insect and pathogen incidences also varied due to initial seed moisture level, type of storage containers and period of storage. Irrespective of containers, the pest incidence was significantly higher in high moisture containing seeds. Super bags recorded significantly lesser incidence of insects and pathogens followed by poly lined cloth bags. Thus, the seed quality declined with storage period, the rate of seed deterioration was higher at high moisture level and the storability differed with type of storage container. Seeds with low moisture content stored in super bags or poly-lined cloth bags performed better in storability under coastal area with high relative humidity.

Key words: Paddy, seed storage, containers, coastal area

Seed deterioration starts after physiological maturity and continue during storage period. The rate of deterioration can only be slowed down by providing optimal storage conditions (Verma *et al.*, 1993). About 80 per cent of the certified seeds produced in India require storage for one planting season (6-7 months) and 20 per cent of the seed is carried over for subsequent sowings (Bal, 1976). Out of several factors affecting the seeds in storage, seed moisture, relative humidity and storage temperature are the most important (Agrawal, 1976). These two environmental factors are always high in the coastal areas and beyond the control of seed suppliers or farmers. Since storage containers greatly influence the storability of seeds, use of suitable packaging material becomes essential for reducing the deterioration of seed quality during storage. Saibabu *et al.* (1983) reported that viability of paddy seed was maintained for longer periods when stored with initial seed moisture of 11 per cent in moisture proof containers like polyethylene bags (600 gauge) and metal containers, under ambient conditions. Rice seeds stored

in cloth bag deteriorated more with higher electrical conductivity than those stored in paper aluminium foil-polythene laminated bags (Sivasubramanian and Karivaratharaju, 1990). Storage studies in hybrid rice and their parental lines revealed that polythene bag proved better in maintaining viability and vigour compared to cloth bag (Yogalakshmi, 1995). Keeping in view the importance of storage containers, the present study was undertaken to evaluate different packaging material for safe storage of paddy seeds in the coastal area of Karaikal district of Puducherry (UT).

MATERIALS AND METHODS

A study was conducted under National seeds Project (Crops) at Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal, Puducherry using four different types of containers viz., cloth bag (C₁), high density polyethylene bag (C₂), poly-lined cloth bag (C₃) and super grain bag (Grain Pro, IncTM - which is made up of two fused layers of 0.078

mm Poly ethylene with a gas barrier – C₄). Seeds of paddy cv. ADT 38 at three different moisture levels viz., M₁: below 10 per cent (9.5), M₂: 10-12 per cent (10.9) and M₃: above 12 per cent (13.2) were packed in the above said containers and stored at room temperature. Observations on seed moisture content, percentage germination, insect and pathogen incidence were recorded following International Seed Testing Association Rules (Anon, 1985) at bimonthly intervals upto six months. The statistical analysis was done as per the procedure described by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

The results of present investigation revealed that the seed moisture content increased with the advancement of storage period (Table 1). However, the rate of increase was significantly higher in cloth bag followed by HDPE bag than in polylined cloth bag and super bag. The reduced rate of increase in super bags and polylined cloth bags might be due to moisture resistance capacity of polythene containers. The results on seed germination indicated that a decline in seed germination was noticed during storage. An initial mean germination level of 98 per cent was reduced to 79 per cent at the end of six months of storage (Table 2). However, the rate of reduction was significantly influenced by initial moisture content and type of storage containers. Irrespective of containers used for storage, the seeds with high moisture content registered low germination than optimum and low moisture seeds and the rate of reduction in germination due to storage were also significantly higher in high moisture containing seeds. Among the containers, seeds stored in super bags were on par with polylined cloth bags registered higher germination at all moisture levels and storage periods. The results on seed health test indicated that insect and pathogen incidences were also varied due to initial seed moisture level, type of storage containers and period of storage. The seed samples were totally free from insect pests and diseases during initial storage period of two months and subsequently a gradual increase was observed. Irrespective of containers, the incidence was significantly higher in high moisture containing seeds. *Rhizopertha dominica* was the major insect pest found in the stored seed samples. *Aspergillus*, *Curvularia*, *Helminthosporium* and *Penicillium* were the pathogens predominantly found

Table 1. Influence of containers and period of storage on seed moisture content (%) in paddy cv. ADT 38

Containers (C)	Months after storage (P)																	
	0			2			4			6								
	9.5 (%)	10.9 (%)	13.2 (%)	Mean	9.5 (%)	10.9 (%)	13.2 (%)	Mean	9.5 (%)	10.9 (%)	13.2 (%)	Mean	9.5 (%)	10.9 (%)	13.2 (%)	Mean		
Cloth bag	9.5	10.9	13.2	11.2	10.7	12.0	13.5	12.1	12.6	12.8	13.8	13.1	13.1	13.5	14.0	13.5		
HDPE bag	9.5	10.9	13.2	11.2	10.2	11.8	13.4	11.8	11.8	12.4	13.4	12.5	12.8	13.2	13.8	13.3		
Poly-lined cloth bag	9.5	10.9	13.2	11.2	9.8	11.6	13.2	11.5	10.5	12.0	13.4	12.0	11.4	12.6	13.5	12.5		
Super grain bag	9.5	10.9	13.2	11.2	9.6	11.2	13.2	11.3	9.9	11.5	13.4	11.6	10.5	11.8	13.4	11.9		
Mean	9.5	10.9	13.2		10.1	11.7	13.3		11.2	12.2	13.5		12.0	12.8	13.7			
CD (P=0.05)	C	0.19		P	M	0.17		CxP		PxM		CxM		CxPxM		NS		
				0.19		0.38		0.33		0.33		0.33						

Table 2. Influence of containers and period of storage on seed germination content (%) in paddy cv. ADT 38

Containers (C)	Months after storage (P)											
	0			2			4			6		
	9.5 (%)	10.9 (%)	13.2 (%)	Mean	9.5 (%)	10.9 (%)	13.2 (%)	Mean	9.5 (%)	10.9 (%)	13.2 (%)	Mean
Cloth bag	98	98	98	98	92	86	82	87	84	80	72	79
HDPE bag	98	98	98	98	95	90	86	90	90	82	78	83
Poly-lined cloth bag	98	98	98	98	96	92	88	92	92	84	82	86
Super grain bag	98	98	98	98	96	95	90	94	92	90	88	90
Mean	98	98	98	98	95	91	87	87	90	84	80	85
	C	P	P	M	M	CxP	CxP	PxM	PxM	CxM	CxM	CxPxM
CD (P=0.05)	2.45	2.47	2.47	2.14	2.14	4.94	4.94	4.28	4.28	NS	NS	NS

Table 3. Influence of containers and period of storage on insect incidence and pathogen infection (%) in paddy cv. ADT 38

Containers (C)	Months after storage (P)											
	4			6			4			6		
	9.5 (%)	10.9 (%)	13.2 (%)	Mean	9.5 (%)	10.9 (%)	13.2 (%)	Mean	9.5 (%)	10.9 (%)	13.2 (%)	Mean
Cloth bag	0.9	1.3	2.8	1.7	1.0	1.8	3.5	2.1	2.5	3.4	5.8	3.9
HDPE bag	0.6	1.0	2.2	1.3	0.9	1.2	2.8	1.6	2.0	2.9	4.6	3.2
Poly-lined cloth bag	0.2	0.8	1.4	0.8	0.8	1.1	1.7	1.2	1.4	1.8	2.9	2.0
Super grain bag	0.0	0.5	0.9	0.5	0.5	0.8	1.2	0.8	1.0	1.1	2.0	1.4
Mean	0.4	0.9	1.8	1.0	0.8	1.2	2.3	1.7	1.7	2.3	3.8	2.1
	C	P	M	CxP	PxM	CxM	CxPxM	C	P	P	M	CxP
CD (P=0.05)	0.10	0.10	0.09	0.20	0.17	0.17	NS	0.17	0.17	0.17	0.15	0.34

Containers (C)	Months after storage (P)											
	4			6			4			6		
	9.5 (%)	10.9 (%)	13.2 (%)	Mean	9.5 (%)	10.9 (%)	13.2 (%)	Mean	9.5 (%)	10.9 (%)	13.2 (%)	Mean
Cloth bag	0.9	1.3	2.8	1.7	1.0	1.8	3.5	2.1	2.5	3.4	5.8	3.9
HDPE bag	0.6	1.0	2.2	1.3	0.9	1.2	2.8	1.6	2.0	2.9	4.6	3.2
Poly-lined cloth bag	0.2	0.8	1.4	0.8	0.8	1.1	1.7	1.2	1.4	1.8	2.9	2.0
Super grain bag	0.0	0.5	0.9	0.5	0.5	0.8	1.2	0.8	1.0	1.1	2.0	1.4
Mean	0.4	0.9	1.8	1.0	0.8	1.2	2.3	1.7	1.7	2.3	3.8	2.1
	C	P	M	CxP	PxM	CxM	CxPxM	C	P	P	M	CxP
CD (P=0.05)	0.10	0.10	0.09	0.20	0.17	0.17	NS	0.17	0.17	0.17	0.15	0.34

in seed samples. Among the containers, the super bags followed by polylined cloth bags recorded significantly lesser incidence of insects and pathogens than other containers (Table 3). The reason for such variation in seed deterioration might be due to the nature of containers used for storage. In general, super bags and polylined cloth bags are vapour resistant containers and cloth bag is moisture pervious. HDPE bag is not moisture penetration as cloth bag and also not moisture vapour resistant and so its performance was intermediate. The superiority of super bags for safe storage of soybean seeds was already reported by Malavika-Dadlani and Veena-Vashisht (2006). Polylined jute canvas bag was found to be the most suitable container for bulk seed packaging, followed by HDPE non-laminated inter woven bag and jute canvas bag (Anon, 2000). However, care must be taken to dry the seed to about nine per cent moisture before packaging. Selvarasu and Krishnasamy (2005) also observed the superiority of polylined gunny bag over cloth bag for storing of rice seeds.

Thus, it could be concluded that the seed quality declined with advancement of storage period, the rate of seed deterioration was higher at high moisture level and the storability of seeds differed with type of storage container. Seeds with low moisture content stored in super bag or polylined cloth bag performed better in storability under coastal area and were suitable for storage of paddy seeds in high relative humidity areas.

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