

## Effects of Packaging on Germination and Storability of Soybean Seed under Ambient Condition

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**ABSTRACT** An experiment was conducted to study the impact of packaging material on germination and storability of soybean seed variety JS-335 under ambient storage conditions at farmer's level during 2002-03 and 2003-04. All the parameters showed significant difference due to packaging and seed sources. Germination and field emergence from seed stored in Poly-lined Jute Canvas (PL-JC) bag were higher as compared to Jute Canvas (JC) bag during 8 months from storage. Moisture content in seeds stored in PL-JC bag was maintained, whereas, it increased in seeds stored in JC bag. Electrical conductivity of seed leachate increased steadily with increase in storage period. It increased sharply in the seeds stored in JC bag, whereas, seeds stored in PL-JC bag recorded much lower increment in the seed leachate. These results suggest that the PL-JC bags are superior to the JC bag for storage of soybean seed.

**Key words:** Packaging materials, germination, storability, soybean seeds

Soybean [*Glycine max* (L.)], an important pulse and oilseed crop, is a poor storer (Looses viability rapidly under warm and humid conditions). One of the major constraints in soybean cultivation is the non-availability of high vigour seeds at the time of sowing. Day by day, area and production of this crop is increasing, but productivity remains almost constant. Poor seed germination is a major constraint for increasing the productivity of soybean. Seed longevity is greatly influenced by storage conditions (The relative humidity and storage temperature), lowering of either of these factors significantly increases the storage life of the seeds [1]. However, another major factor responsible for seed deterioration during storage is the initial quality of seeds [2]. Storage of soybean seeds, in polythene bag retained viability and vigour for longer period than cloth bag [3-6]. An enhanced leakage of electrolytes and other solutes were found to be associated with the fall in germination of the seeds [7]. Peroxidation of unsaturated fatty acids leads to the production of free radicals is one of the main reasons for poor storability of soybean seeds, which results in the production of high level of volatile aldehydes during seed storage [8, 9]. Generally, farmers store

seeds in gunny bags or bins and use their own saved seeds for raising the crop. Hence, proper packaging material be used for minimizing seed deteriorations during storage.

### MATERIALS AND METHODS

In order to know the proper packaging material for safe storage of soybean seed at farmer's level, two types of packaging materials i.e., jute canvas and poly-lined jute canvas bag were supplied to ten farmers during 2002-03 and 12 farmer's during 2003-04. After drying the seeds to proper moisture level, the seeds from each farmer were packed in JC and PL-JC bags and stored under farmer's fields. Seed samples were collected, and observations on seed germination (%), moisture content (%), field emergence (%) and electrical conductivity from seed leachate were recorded at initial as well as final periods from seed storage. The initial samples were collected in the month of October and June, respectively during both the years. Germination tests were conducted by paper towel method in four replications as per ISTA rules [10]. Electrical conductivity from the seed leachate was measured in 25 seeds soaked in 50 ml of distilled water incubated at 25°C for 17-18 hrs. Moisture content

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was estimated by using hot air over method [10]. The data were analysed following procedures of Panse and Sukhatme [11].

## RESULTS AND DISCUSSION

Significant differences observed in all the parameters studied indicated important role of packaging materials for maintaining viability and longevity of seeds (Tables 1&2). The initial seed germination in seed samples collected from 10 farmers, during the year 2002-03, ranged from 72 to 90 per cent, whereas, final seed germination ranged from 63-76 and 70-81 per cent in JC bag and PL-JC bags, respectively (Table 1). The initial germination in seed samples collected from 12 farmers, during the year 2003-04, ranged from 80-98 per cent, whereas, final germination ranged from 71-85 and 77-92 per cent in JC bag and PL-JC bags, respectively (Table 2). The seed germination in all seed samples at the start of seed storage was above the Indian Minimum Seed Certification Standard (IMSCS-70%) during both the years. Final seed germination recorded in 8 months from storage was also above the IMSCS (70%) when stored in PL-JC bag. This indicated that the rate of deterioration of seed germination was slower in PL-JC bag than that of JC bag, during both the years. Germination of marginally standard seeds

could be maintained up to IMSCS stored in PL-JC bags, but deteriorated below the IMSCS, when stored in JC bag (Sample no. 1, 4 and 5 during 2002-03).

The initial moisture content of seed sample ranged from 8.2-10.2 per cent, whereas, final moisture content ranged from 8.0-9.2 and 10.8-13.3 per cent in PL-JC bags and JC bags, respectively, during 2002-03. Similar trend was observed in the second year i.e., 2003-04. The moisture content was maintained at similar level in PL-JC bags, whereas, it increased in JC bags. The PL-JC bag maintained seed moisture status due to its impervious nature, resulted in longer storability of seeds as compared to moisture pervious JC bags.

Field emergence percentage declined slowly in PL-JC bag as compared to JC bag, during both the years. The initial field emergence of all 10 samples was above IMSCS. It was maintained in 8 samples, when stored in PL-JC bags, and only in 6 samples, when stored in JC bag during 8 months from storage. Electrical conductivity from seed leachate increased rapidly in the seeds stored in JC bag, whereas, it increased slowly, in the seeds stored in PL-JC bag. Thus, loss of membrane integrity, which is one of the early symptom of seed ageing was faster in seeds stored in moisture pervious JC bag.

**Table 1. Performance of farmers saved soybean seed in different packaging material during the year 2002-2003**

Name of the village	Sample no.	Germination (%)			Moisture content (%)			Field emergence (%)			EC of seed leachate (dSm <sup>-1</sup> )		
		Initial	Final		Initial	Final		Initial	Final		Initial	Final	
			JC	PL-JC		JC	PL-JC		JC	PL-JC		JC	PL-JC
Tambhere	1	79	68	74	10.2	12.3	8.8	76	65	71	0.612	0.702	0.665
	2	85	74	80	9.6	11.4	8.0	80	70	78	0.534	0.652	0.600
	3	72	63	68	8.6	10.8	8.5	70	60	65	0.709	0.798	0.749
	4	81	69	75	8.4	12.4	9.2	79	66	72	0.693	0.765	0.725
	5	75	68	72	9.2	12.7	8.7	73	65	68	0.710	0.788	0.755
Rahuri	1	90	76	81	8.2	12.2	8.2	88	74	79	0.492	0.602	0.556
	2	86	74	78	8.8	12.8	8.9	84	70	75	0.513	0.601	0.563
Kolhar	1	83	74	80	9.2	13.3	8.7	80	70	76	0.590	0.682	0.734
	2	80	74	76	8.2	11.9	8.3	77	71	72	0.608	0.700	0.658
	3	84	75	79	8.9	11.9	9.0	79	71	73	0.595	0.684	0.630
CD at 5%		3.68	4.07	3.14	0.62	0.72	0.54	4.97	3.21	3.48	0.04	0.04	0.03

Initial - At the start from storage; Final - At the end from storage; JC - Jute canvas; PL-JC - Poly lined jute canvas

Table 2. Performance of farmers saved soybean seed in different packaging material during the year 2003-2004

Name of the village	Sample no.	Germination (%)			Moisture content (%)			Field emergence (%)			EC of seed leachate (dSm <sup>-1</sup> )		
		Initial	Final		Initial	Final		Initial	Final		Initial	Final	
			JC	PL-JC		JC	PL-JC		JC	PL-JC		JC	PL-JC
Tambhere	1	83	75	80	10.1	11.2	10.0	80	71	75	0.640	0.790	0.695
	2	95	83	90	8.7	9.8	9.1	90	79	85	0.650	0.816	0.705
	3	80	71	77	9.1	10.6	9.0	74	67	70	0.630	0.802	0.720
	4	98	85	92	9.0	10.2	8.9	90	80	85	0.620	0.840	0.724
	5	85	76	81	8.6	10.2	8.2	79	69	72	0.715	0.823	0.744
	6	91	81	86	10.4	11.9	9.9	88	77	82	0.640	0.820	0.749
	7	89	80	85	10.4	12.0	10.0	85	76	80	0.717	0.842	0.732
Kolhar	1	87	77	82	8.1	10.1	8.0	83	74	79	0.620	0.870	0.801
	2	87	79	83	9.4	11.2	9.1	80	71	75	0.630	0.840	0.799
Deolai	1	92	82	88	8.2	10.0	8.0	88	78	83	0.670	0.869	0.765
	2	91	83	88	10.0	12.0	10.0	87	78	82	0.633	0.875	0.815
Narsali	1	90	81	85	10.2	12.0	10.1	84	74	80	0.602	0.887	0.799
CD at	5%	4.17	3.97	3.80	0.67	0.75	0.72	4.10	4.05	3.92	0.04	0.04	0.04

Initial - At the start from storage; Final - At the end from storage; JC - Jute canvas; PL-JC - Poly lined jute canvas

Further, the estimate of critical difference for various parameters is lower in PL-JC bag than that of JC bag, indicated consistency of PL-JC bag in maintaining these parameters. The results obtained in this investigation are in agreement with the earlier findings reported by different workers [3-5]. They had also opined that poly-lined bags were superior to cloth bags for storing the seeds of soybean.

Maintenance of proper moisture content of seed during ambient storage in PL-JC bag, due to its impervious nature, be as a results of slow rate of lipid peroxidation, thereby release of minimum free radicals, leads to maintenance of membrane integrity. This results in slow leakage of intracellular substances (electrolytes and other solutes), which is responsible for maintenance of seed germination during storage. From this investigation, it is concluded that PL-JC bag is suitable for storing soybean seeds for longer period over the JC bag under ambient storage condition.

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