Research Paper Botany

Seed Quality Parameters of Soybean *(Glycine Max. L.)* As Influenced by Seed Treating Fungicides and Botanicals and Packing Materials

*** Jaya Joshi**	Ph.D Scholar Govt. Madhav Science P.G. College Ujjain (M.P) 456010, Corresponding Author
Azad Ahmad Wani	Ph.D Scholar Govt. Madhav Science P.G. College Ujjain (M.P) 456010
Dr. Anurag Titov	Assistant Professor, Govt. Madhav Science P.G. College Ujjain (M.P) 456010
Dr D.S Tomar	Scientist, Krishi Vigyan Kendra,RVSKVV, Ujjain (M.P) 456010

ABSTRACT

The cultivated species "Glycine max. L". belongs to family Leguminosae. It is one of the largest and most useful plant families consisting of 17,000 species and 650 genera distributed throughout the world. Soybean is an important oil seed crop is listed in poor stores. It loses viability rapidly under warm and humid storage conditions. The quality of soybean seed is easily decreased so that it is difficult to keep them for a long time. In the present study, freshly harvested Soybean seeds of variety "JS-9560" were collected from Krishi Vigyan Kendra Ujjain. The seeds were treated with Castor oil (5ml/kg), Captan (3g/kg), Vitavex (3g/kg) and Control (Untreated) stored in Cloth bags and high density perforated polybags (To allow respiration to seeds) for 3-6 months under ambient conditions at MVM Ujjain. The results indicated that the seeds treated with Captan recorded significantly higher germination (80.41%) and lower moisture content (8.84%). Data also revealed that Cloth bags recorded maximum germination (78.55%), Vigour index (2600) and moisture content (10.06%) at the end of 6-month storage period.

KEYWORDS Soybean (Glycine max. L.), Seed treatments – Castor oil, Captan, Vitavex, Packing materials, Moisture content, germination %, Vigour index.

INTRODUCTION

Soybean is a major oil and protein crop important in both human and animal nutrition. India is the fifth major soybean growing country in the world. Soybean seed is usually not carried-over to the next planting season because it deteriorates rapidly in storage, resulting in poor growth when planted. The short shelf life of soybean seed is the result of its high lipid content and high levels of polyunsaturated linolenic and linoleic acids. There is a need for prolonging storage life of carry-over treated seeds to minimize seed disposal costs,Gladys Y. Mbofung 2012.

One of the major constraints in Soybean cultivation is the non-availability of high vigour seeds at the time of sowing. Rising demand for oil and protein has stimulated soybean production mainly by increasing land use. Nowadays area and production of the crop is increasing gradually but productivity remains almost constant. Soybean covers an area of about 98.8 million hectares (ha) worldwide, of which 90 percent is concentrated in the US, Brazil, Argentina, China and India. The latter contributes 8 percent of the world area (7.8 million ha). India's figures show the lowest productivity (1,064 kg ha-1) compared to a world average of 2,249 kg ha-1 (FAOSTAT, 2011) Dixit et al, 2011. Poor seed germination is a major constraint for increasing the productivity of Soybean. Seed longevity is greatly influenced by the relative humidity a storage- temperature. Storage condition and duration are important factors affecting germination. Seed vigour is used as a measure of accumulated damage in seed as viability declines. Preservation of seed viability depends on storage condition and duration. The decline of germination is much more acute under tropical conditions. These environmental conditions make very difficult to maintain its viability during storage. Seed deteriorated during storage is one of the basic reasons for low productivity in Soybean. Changes that occur in seed during ageing are significant in terms of seed quality among other things also implies seed longevity. Different periods of seed storage as well as ageing conditions adversely affected the seed vigour.

Good storage is a basic requirement in seed production programme as the maintenance of high seed viability and vigour from the harvest to planting is of utmost important in a seed production programme. In storage, the seed are to be protected against the pests and pathogens. The seeds can be treated with different fungicides to prevent the growth of microorganisms_and insect infestation. Seed treatments with fungicides not only controls seed born diseases but also improves seed health, plant stand, germination and crop yield. Fungicide treatments are required for to be stored for several months and stability of fungicides affects without affecting the seed health adversely. Off late, attempts have been made to replace synthetic (inorganic) seed treatment chemicals with organic materials of plant origin which are cheaper, safer and eco-friendly Parashivamurthy, 1994. Among the various methods followed, use of botanicals has been a traditional method and is being given much attention particularly in the Indian context where the farmers have a rich heritage of Indigenous Technical Knowledge (ITK) inherited from their ancestors.

Keeping in view these facts, the aim of the study was to determine the effects of different seed treatments and packing materials on germination, moisture content, chlorophyll content and vigour index during different storage periods. This study aims at investigating various chemical treatments and storage materials that could ensure good quality of seeds of soybean crop.

MATERIALS AND METHODS

➢ COLLECTION OF SAMPLE

Samples of freshly harvested grains of Soybean variety "JS-9560" were obtained from Krishi Vigyan Kendra (KVK) Ujjain (M.P.).

➢ SEED TREATMENTS

Freshly harvested grains of soybean were treated with Castor oil T_1(3g/kg), captan T_2(5ml/kg), Vitavex T_3(3g/kg) and Control T_4 packed in different packing materials like Cloth bags(C_1) and Polybags(C_2) stored for 3-6 month storage period under ambient condition at KVK Ujjain. Observations on various parameters were taken at an interval of three months.

➢ SEED MOISTURE CONTENT

The moisture content of seed samples were determined by using low constant oven method following the guidelines of International Seed Testing Association (ISTA). The moisture was measured just after collection of seed from the KVK Ujjain. For each treatment 15 g seed was taken into a crucible and weighed. Then the crucible was kept in an electric oven maintained at a temperature of 75^{0}C for a period of 24 hours for proper drying of the seed sample. After cooling the weight of dish plus its cover and contents were taken. Then the moisture content of the seed sample was calculated with the help of the following formula.

$$\textbf{Seed moisture content} = \frac{M1 - M2}{M1} \; X \; 100$$

Where,
M1 = Fresh weight of the Seeds
M2 = Dry weight of the Seeds

➢ GERMINATION TEST .

For germination test, it was done on field performance evaluation procedure i.e.; plastic trays were filled with compost and cocopit and about 100 seeds were planted at 1cm depth at an equal spacing. They were arranged in a completely randomized design with three replicates for each treatment. No other fertilizers were added but adequately moisture was maintained.

➢ VIGOUR INDEX (VI)

Vigour index was calculated as per Abdul-baki and Anderson (1973)by using the formula;

VI = Germination percentage (%) x Total seedling length (cm)

➢ DATA ANALYSIS

The mean values of data obtained were statistically analyzed by two way ANOVA using RBD design for parameters like moisture content, germination percentage and vigour index.

RESULT AND DISCUSSION

The results of the moisture content, germination percentage and vigour index of seeds of Soybean during 3 and 6 months of storage as influenced by various seed treatments and different packing materials are presented in tables 1 to 4.

MOISTURE CONTENT

The result of the present study indicates that the moisture content of Soybean seeds during storage differed significantly among packing materials from 3-6 month storage period. The results indicated that the seeds stored in Cloth bag (C_1) recorded highest moisture content (10.1%) at the end of 6-month storage period as compared to seeds stored in Polybags which shows slightly lower moisture content ((9.5%). Difference in moisture content due to seed treatments and their interaction were significant during the entire storage period from 3-6 months as shown in (Table 1.fig 1). Seeds stored in Cloth bags shows significantly higher moisture content at the end of 6 month storage, may be due to humid environmental conditions during the rainy season. The change in moisture content in cloth bags at a interval of three months was 55 percent higher than what it was during the pre-rainy season, whereas in poly bags the change in moisture was 46 percent higher giving a net proofing of moisture by 9 percent. Therefore, Cloth bags acts as moisture pervious containers while on the other hand high density perforated polybags acts as moisture semi-impervious container.

SEED GERMINATION

Seed treatment showed significant influence on germination percentage. Germination was maximum (80.4%) with Captan treated seeds followed by seeds treated with Vitavex (80.2%). The seed germination was minimum (74.3%) with Castor oil treated seeds at the end of 6-month. The germination percentage is significant due to containers and their interaction effect during 3 and 6 month of storage. A significant higher germination percentage may be due to effective control of storage disease, insect and pest. Whereas the chemicals acts as antioxidants to counteract the release of free radicals during storage. The lower germination percentage were recorded with Castor oil treated seeds may be due to deleterious effect on seed. The coating of oil around the seeds may inhibit the metabolic process such as respiration and it is also a reason for reduced germination. (Table 2. fig.2)

VIGOUR INDEX (VI)

Seed treatment and packing materials shows significant influence on vigour index at the end of 3-6 month storage periods (table 3. Fig.3). The data obtained at the end of 3-month storage period shows that highest vigour index (1285) was recorded in Vitavex T_3 treated seeds followed .And lower vigour index was recorded in Captan T_2 (567). Results also shows that seeds stored in Cloth bags shows highest vigour index (1081) and seeds stored in high density perforated polybags shows lower vigour index (741). Difference in vigour index due to seed treatment and their interaction were significant.

For 6-month storage period the data obtained indicates that the highest vigour index (2694) was recorded in Castor oil (T_1) treated seeds. The lower vigour index (1976) was recorded in Captan (T_2) treated seeds. The results also show that seeds stored in Cloth bags recorded highest vigour index (2600) and lower vigour index was recorded in high density perforated polybags (2189). Interaction of packing material and seed treatment showed significant difference during the initial period but after six months the differences were non-significant during period of storage.

Table 1. Influence of seed treatment and packing materials on moisture content (%) in Soybean during storage

Treatment (T)	Storage Period					
	3 Month			6 Month		
	C_1 Mean		C_2	C_1 Mean		C_2
T_1	6.5	7.3	7.0	11.0	9.6	10.2
T_2	5.9	5.0	5.5	8.4	9.3	8.8
T_3	7.6	7.0	7.2	11.0	9.4	10.2
T_4	6.3	6.7	6.5	10.0	9.8	9.8
Mean	6.5	6.5		10.1	9.5	

For comparing	S.Em ±	C.D	S.Em ±	C.D
C	0.022	0.068	0.021	0.063
T	0.016	0.048	0.015	0.044
C x T	0.031	0.096	0.029	0.089

Where,
C_1= Cloth bag; C_2 = Polybags; C = Packing material

T_1= Castor oil (5ml/kg); T2 =Captan (3g/kg); T_3 =Vitavex (3g/kg); T_4 =Control;

Table 2. Influence of seed treatment and packing materials on germination (%) in Soybean during storage

Treatment (T)	Storage Period					
	3 Month			6 Month		
	C_1 Mean		C_2	C_1 Mean		C_2
T_1	14.6 (33.8)	46.3 (62.5)	30.4 (48.1)	77.3 (76.8)	64.6 (71.8)	71 (74.3)
T_2	84.6 (79.5)	42.6 (60.7)	63.6 (70.1)	82 (78.6)	93 (82.2)	87.5 (80.4)
T_3	90.6 (81.4)	29.4 (49.8)	60 (65.6)	90.6 (81.4)	83.3 (79.1)	86.9 (80.2)
T_4	82 (78.6)	35.3 (56.0)	58.6 (67.3)	78.4 (77.4)	75.2 (76.1)	76.8 (76.7)
Mean	68 (73.4)	38.4 (57.2)		82 (78.5)	79 (77.3)	

- Data in parenthesis are transformed values

For comparing	S.Em ±	C.D	S.Em ±	C.D
C	3.682	11.276	1.093	3.347
T	2.603	7.973	0.773	N/A
C x T	5.207	15.946	1.545	N/A

Where,
C_1= Cloth bag; C_2 = Polybags; C = Packing material

T_1= Castor oil (5ml/kg); T2 =Captan (3g/kg); T_3 =Vitavex (3g/kg); T_4 =Control;

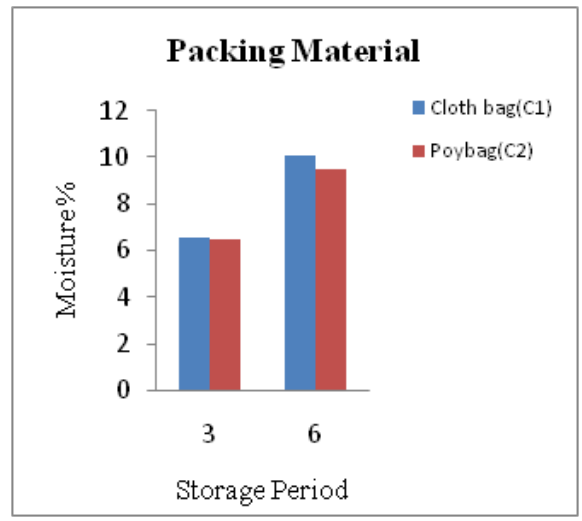
Table 3. Influence of seed treatment and packing materials on vigour index in Soybean during storage

Treatment (T)	Storage Period					
	3 Month			6 Month		
	C_1 Mean		C_2	C_1 Mean		C_2
T_1	1045	621	833	2797	2590	2694
T_2	274	861	568	2169	1783	1976
T_3	1944	626	1285	2880	2098	2489
T_4	1060	855	957	2555	2285	2420
Mean	1081	741		2600	2189	

For comparing	S.Em ±	C.D	S.Em ±	C.D
C	95.047	291.087	214.785	N/A
T	67.208	205.830	151.876	N/A
C x T	134.416	411.660	303.752	N/A

Where,
C_1= Cloth bag; C_2 = Polybags; C = Packing material

T_1= Castor oil (5ml/kg); T2 =Captan (3g/kg); T_3 =Vitavex (3g/kg); T_4 =Control;



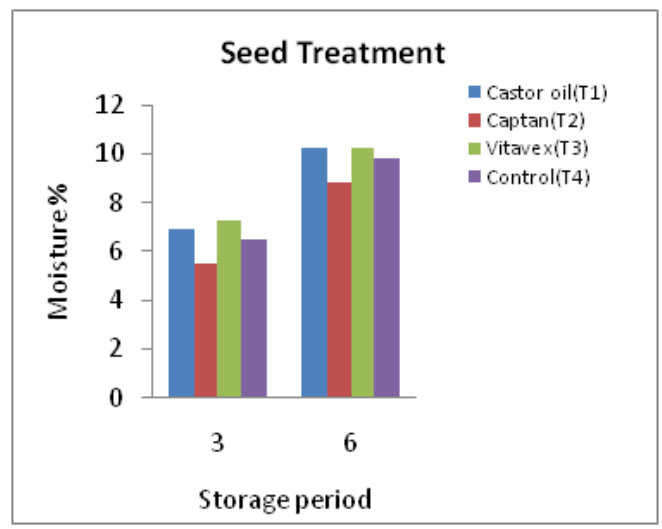
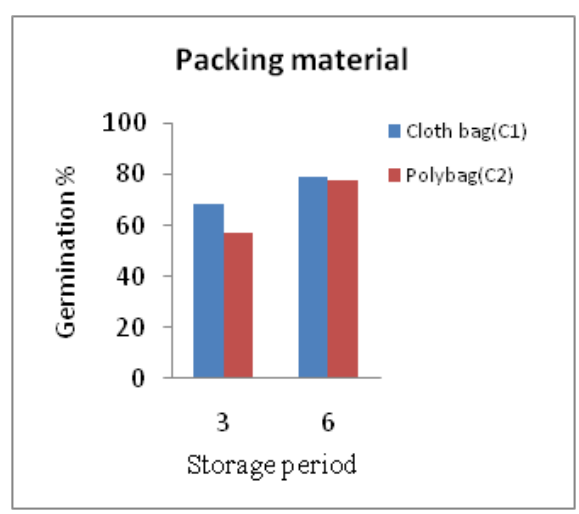


Fig. 1: Effect of packing material and seed treatment on Moisture % of Soybean seeds during storage.



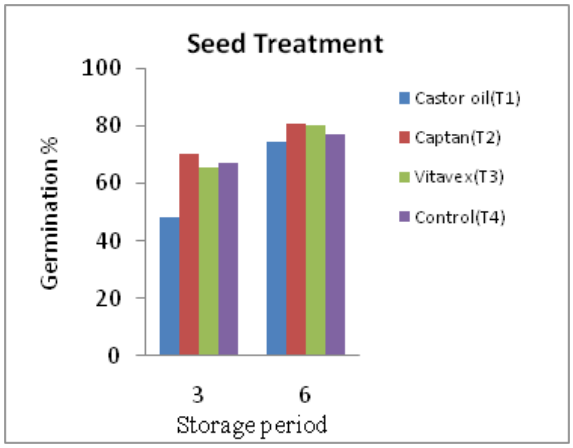
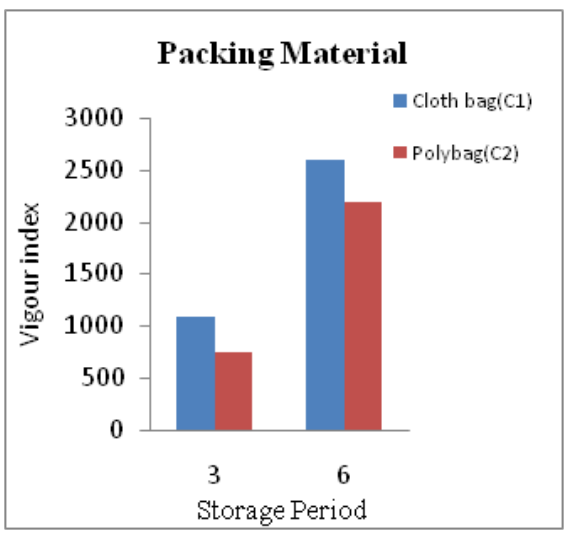


Fig. 2: Effect of packing material and seed treatment on germination % of Soybean seeds during storage.



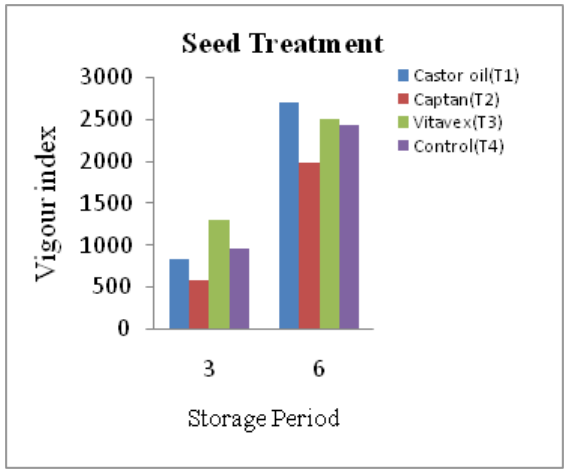


Fig. 3: Effect of packing material sand seed treatment on Vigour index of Soybean seeds during storage.

CONCLUSION

The present study reiterated the importance of proper storage techniques and their impact on seed quality parameters of Soybean seeds. Seed treatments have a major role in protecting the seeds during storage and can also play an important role in achieving uniform seedling emergence under certain conditions.

The present study revealed that the seeds of Soybean were treated with Captan(3g/kg) stored in Cloth bags shows lower moisture content at the end of 6 month storage period. Because Captan treated seeds shows highest germination percentage. It is also showed that the seeds stored in Cloth bags maintained their Vigour index at the end of 3-6 months storage period. The seeds treated with Castor oil and Vitavex stored in Polybags lost their viability more as compared to seeds treated with Captan and stored in Cloth bags. Thus, overall results shows that Captan treated seeds stored in Cloth bags maintained maximum seed quality parameters.

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