



Research Article

EFFECT OF PACKAGING MATERIALS ON SEED QUALITY OF SOYBEAN SEED DURING STORAGE

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Abstract: The seeds of soybean were stored in HDPE, gunny and cloth bags used for the storage study at 0, 30, 60, 90, 120, 150, 180 and 210 days for evaluation of seed quality. The observations on different seed quality parameters were recorded at monthly interval. The soybean seed stored in HDPE bags exhibited highest seed germination, seedling length, seedling dry weight, vigour index-I and II than gunny and cloth bags at 210 days of storage period and also found less electrical conductivity in HDPE bags. The retention of better seed storability in HDPE bags was probably attributed to its impervious nature of pores. The seed stored in cloth bags found lower in all seed quality parameters during all the storage periods. There was a minimum reduction observed in all seed quality characters at 210 days of storage when seed stored in HDPE bags as compared to gunny and cloth bags.

Keywords: Soybean, Packaging materials, Storage period, Seed quality characters

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Introduction

Soybean [*Glycine max* L Merill] is important oilseed crops belonging to family Leguminosae, sub family *Papilionaceae* and the genus *Glycine* L. Soybeans have the special significance in this age of energy crisis to play a pivotal role in agriculture, industry and export trade of India. Soybean has become a miracle crop of the twenty century and is often designated as 'Golden bean'. Packaging material plays a major role in maintaining the safe limits of seed moisture during storage period. The storage life in soybean seed prolong without chemical using is different kind of packaging materials and packaging material could be preventing the main cause seed deterioration such as moisture content and oxygen concentration. Packaging material may be porous, airtight, moisture resistant, moisture proof which use for storage of seed. Packaging materials use to prevent absorption of water from the atmosphere after drying, to keep each accession separate and prevent contamination of the seeds from insects and diseases. Seed storage is the main problem in seed production of soybean, since storage of seed after harvest leads to seed deterioration and reduction in seed quality due to biochemical activities. A germination capacity has been reported to drop sharply after two months of storage at ambient conditions. Thin seed coat and exposure of embryo outside is the main cause of seed deterioration.

Materials and Methods

The experimental material consisted of soybean seeds were stored in HDPE, gunny and cloth bags used for the storage study at 0, 30, 60, 90, 120, 150, 180 and 210 days for seed quality. The observations on different seed quality parameters were recorded at monthly interval.

Germination percentage (%)

Germination percentage was recorded by using rolled towel paper method. The 100 seeds were placed in four replications on moist towel paper, rolled properly and kept in seed germinator at constant temperature (25°C) and relative humidity (80%). Final germination recorded on 8th day and germination expressed in percentage [1].

Seedling vigour index-I (SVI-I)

Seedling vigour index-I was calculated as per formula given [2]

SVI-I = Germination percentage (%) x Mean seedling length (cm)

Seedling length (cm)

Ten normal seedlings from each of the replication of germination test were selected randomly and seedling length was recorded in centimetre. The average of ten normal seedlings was calculated and recorded.

Seedling vigour index-II (SVI-II)

Seedling vigour index-II was calculated as per formula given [2].

SVI-II = Germination percentage (%) x Mean seedling dry weight (g)

Seedling dry weight (g)

The same samples used for seedling length were dried in oven at 80°C for 24 hrs and allowed to cool for 30 minutes. The mean dry weight of the seedlings was recorded and expressed in grams.

Electrical conductivity (µS/cm)

Fifty seeds in three replications of each treatment were soaked in 75 ml of distilled water at 25°C for 24 hours. The solution and seeds were gently swirled for 10 to 15 seconds prior to evaluation. The electrical conductivity of soaked water was determined by using conductivity meter having cell constant one and expressed as µS/cm [3]. The statistical analysis of data was carried out as per the standard method suggested by Panse and Sukhatme, (1989) [4].

Results and Discussion

The soybean seed stored in HDPE bags exhibited highest germination percentage than gunny and cloth bags at 210 days of storage period. The retention of better seed storability in HDPE bags was probably attributed to its impervious nature of pores. The seed stored in cloth bags reported low germination percentage during all storage periods. There was a minimum reduction observed in germination percentage at 210 days of storage when seed stored in HDPE bags as compared to gunny and cloth bags.

Effect of Packaging Materials on Seed Quality of Soybean Seed During Storage

Table-1 Effect of packaging materials on seed germination (%) of soybean seed during storage

Treatment		Storage period (days)						
	Initial	30	60	90	120	150	180	210
Packaging material (P)								
P ₁ -HDPE bag	86.77(68.77)	86.25(68.51)	83.22(66.02)	79.75(63.56)	74.94(60.36)	70.25(56.15)	62.44(52.45)	55.83(47.93)
P ₂ -Gunny bag	86.77(68.77)	85.33(67.66)	82.08(65.18)	78.30(62.53)	72.97(59.04)	66.36(54.95)	60.69(51.32)	53.91(46.57)
P ₃ -Cloth bag	86.77(68.77)	84.94(67.42)	81.38(64.66)	78.02(62.31)	71.66(58.20)	64.41(53.68)	58.97(50.24)	52.58(45.60)
SE ±	0.19	0.30	0.23	0.28	0.29	0.19	0.24	0.21
CD at 5%	NS	0.60	0.46	0.57	0.59	0.39	0.49	0.42

(Figures in parenthesis transformed arcsin value)

Table-2 Effect of packaging materials on seedling length (cm) of soybean seed during storage

Treatment		Storage period (days)						
	Initial	30	60	90	120	150	180	210
Packaging material (P)								
P ₁ -HDPE bag	28.29	27.61	26.43	25.27	23.78	22.13	20.62	18.7
P ₂ -Gunny bag	28.29	27.79	25.66	25.1	23.56	22.41	20.29	18.64
P ₃ -Cloth bag	28.29	27.15	25.71	24.55	23.06	21.78	19.97	18.13
SE ±	0.068	0.186	0.212	0.107	0.13	0.126	0.181	0.071
CD at 5%	NS	0.525	0.598	0.301	0.367	0.357	0.361	0.199

Table-3 Effect of packaging materials on seedling dry weight (g) of soybean seed during storage

Treatment		Storage period (days)						
	Initial	30	60	90	120	150	180	210
Packaging material (P)								
P ₁ -HDPE bag	1.35	1.34	1.31	1.23	1.17	1.09	1.03	0.93
P ₂ -Gunny bag	1.35	1.33	1.28	1.2	1.25	1.08	1.02	0.91
P ₃ -Cloth bag	1.35	1.31	1.29	1.2	1.23	1.07	0.99	0.88
SE ±	0.002	0.007	0.005	0.007	0.005	0.004	0.005	0.005
CD at 5%	NS	0.02	0.015	0.021	0.015	0.012	0.015	0.014

Table-4 Effect of packaging materials on vigour index-I of soybean seed during storage

Treatment		Storage period (days)						
	Initial	30	60	90	120	150	180	210
Packaging material (P)								
P ₁ -HDPE bag	2461.07	2394.25	2211.85	2043.42	1831.94	1589.86	1384.71	1181.71
P ₂ -Gunny bag	2461.07	2380.73	2122.57	1997	1772.48	1570.46	1324.89	1147.07
P ₃ -Cloth bag	2461.07	2321.11	2111.54	1946.54	1709.02	1483.42	1268.48	1090.42
SE ±	5.85	16.55	18.45	11.91	10.45	9.33	9.75	5.51
CD at 5%	NS	46.69	52.04	33.58	29.48	26.31	27.51	15.53

Table-5 Effect of packaging materials on vigour index-II of soybean seed during storage

Treatment		Storage period (days)						
	Initial	30	60	90	120	150	180	210
Packaging material (P)								
P ₁ -HDPE bag	117.55	116.08	109.39	99.01	89.16	77.97	69.73	60.42
P ₂ -Gunny bag	117.55	113.81	106.61	95.44	86.36	75.72	67.25	58.31
P ₃ -Cloth bag	117.55	112.23	105.506	95.22	84.292	72.89	63.83	55.13
SE ±	0.273	0.709	0.564	0.636	0.42	0.375	0.398	0.388
CD at 5%	NS	2	1.591	1.793	NS	1.057	1.122	1.093

Table-6 Effect of packaging materials on electrical conductivity (us/cm) of soybean seed during storage

Treatment		Storage period (days)						
	Initial	30	60	90	120	150	180	210
Packaging material (P)								
P ₁ -HDPE bag	0.24	0.33	0.5	0.72	0.88	1.11	1.5	1.83
P ₂ -Gunny bag	0.24	0.34	0.5	0.72	0.88	1.11	1.52	1.84
P ₃ -Cloth bag	0.24	0.36	0.51	0.73	0.95	1.2	1.53	1.89
SE ±	0.002	0.002	0.002	0.002	0.005	0.006	0.001	0.003
CD at 5%	NS	0.005	0.005	0.005	0.014	0.017	0.004	0.008

Seed stored in HDPE bags showed higher in germination percent as compare to gunny and cloth bags storage, similar results reported by [5,6]. Soybean seed stored in HDPE found superior followed by gunny bags in respect of seedling length as compared with cloth bags. Similar results were observed by Akter, *et al.*, (2014) [7] in soybean and reported that storage container had significant effect on root length and shoot length which decreased with the increase in storage period. Seeds in tin container gave the highest seedling length than cloth bags. Razia Sultana, *et al.*, (2016) [8] Also reported that the okra seed stored in plastic container showed the maximum long shoot and root at 4 months of storage. At the end of storage period *i.e.*, 210 days, comparatively, higher seedling dry weight was observed in seed stored in HDPE bags followed by gunny bags. The seedling dry weight decreases with the subsequent increase in storage period when the seed stored in cloth bags. Bhullarker, *et al.*, (2018) reported that lowest seedling dry weight was observed in seed stored in cloth bags. Similar results were observed by Akter, *et al.*, (2014). Higher vigour index-I and II was observed in seed stored in HDPE bags followed by gunny bags at the end of 210 days of storage period. Arulnandhy and Senanayaka, (1988) [9] reported that, soybean seeds stored in HDPE bags had significantly higher viability and vigour index as compare to other containers. The electrical conductivity of seed stored in HDPE bags was observed lower as compared to gunny and cloth bags. Singh and Dadlani, (2003) [10] reported that, decrease in electrical conductivity might be due to moisture proof container, which prevent fluctuation in moisture content of seed and maintained high membrane integrity finally reduces lipid peroxidation and prevents release of free radical as compared to cloth bags [11,12].

Conclusion

In present investigation, it was found that, seed stored in HDPE bags showed in all seed quality characters than cloth and gunny bags during all the storage periods

Application of research: Study shows electrical conductivity of seeds stored in cloth bags was highest as compare to gunny bags whereas, lower electrical conductivity exhibited by seed stored in HDPE bags

Research Category: Packaging materials

Abbreviations

HDPE: High-density polyethylene

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References

- [1] ISTA (1999) *Seed Sci. Tech.*, 27, supplement 2, 132.
- [2] ISTA (1976) *Annexure Seed Science and Technology, supplement 4*, 180.
- [3] Loeffler T.M., Tekrony D.M. and Egli D.B. (1988) *J. Seed Tech.*, 12, 37-53.
- [4] Panse V.G. and Sukhatme P. V. (1989) *Statistical methods for agricultural workers, fourth Edition, ICAR Publication, New Delhi*.
- [5] Bhullarker S.B., Harshika N.N. and Dalvi D.G. (2018) *International Journal of Current Microbiology and Applied Sciences*, Special Issue-6, 1836-1851.
- [6] Singh S.N., Srivastava S.K. and Agrawal S.C. (1988) *Tropical Agric.*, 65(2), 106-108.
- [7] Akter N., Haque M.M., Islam M.R. and Alam K.M. (2014) *The Agriculturist, Scientific Journal of Krishi Foundation*, 12(1), 85-95.
- [8] Razia Sultana, Salahudda M., Choudhury M, RafiqueIslam M. D, and Khadija Akhter. (2016) *Agriculturists*, 14(1) 63-72.
- [9] Arulnandhy V. and Senanayaka D.A. (1988) *Seed Res.*, 16 (2), 183-192.
- [10] Singh K.K. and Dadlani M. (2003) *Seed Res.*, 31(1), 27-32.
- [11] Ali M.R., Rahman M.M., Ahmmad K.U. (2014) *Bangladesh Journal on Agriculture Res.*, 39(3), 462-469.
- [12] Shelar V.R., Shaikh R. S. and Nikam A. S. (2008) *Agricultural Review*, 29(2), 125 -131.