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Effect of Commercial Cold Storage Conditions and Packaging Materials on Seed Quality of Chickpea (Cicer *Arietinum.L*)

By Basavegowda, Gururaj Sunkad & Arunkumar Hosamani
University of Agricultural Sciences, Raichur

Abstract - An experiment was conducted to know the effect of commercial storage conditions and packaging material on seed quality of chickpea Cv.JG11. The graded seeds were packed in three containers viz. gunny bag, polylined gunny bag (PLGB) and high density polythene bag (HDPE) and stored under two different storage conditions viz., ambient and commercial cold storage condition(temperature of 5-7 ^{0}C and 65-70 % RH) with initial seed moisture content less than eight percent and seeds were treated with thiram@ 2g/kg seed before storage. The different observations viz seed moisture content, germination (%), vigour index, electrical conductivity of the seed leachets, insect damage (%), incidence of seed borne diseases were recorded by following procedures prescribed by ISTA.

The results revealed that the seeds stored in commercial cold storage (5-7 0 c + 65-70% RH) and packed in polylined gunny bag recorded higher seed germination (88.7%), vigour index (2799), seedling dry weight (430 mg), lower insect damage (1.7%), seed infection (4.5%), Electrical conductivity (0.25micromohs/ cm) after 22 months of storage. Hence commercial cold storage structures can be effectively used for maintaining seed quality of chickpea during storage.

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I. Introduction

Chickpea (*Cicer arietinum.L)* is one of the most extensively grown rabi pulse crop in India. The Maintenance of seed quality during storage is most important and challenging in the crop due to problem of stored pests and quick loss of seed quality. In recent days several private organizations established the commercial cold storage with temperature of 5-7 ^{0}C and 65-70 per cent relative humidity for storage of dry chilli, chickpea and other pulses to preserve commercial marketable colour of the produce and it was observed that these storage conditions are better in controlling stored insects and incidence of diseases but regarding the status of seed quality, not much research work was carried out. With the view to evaluate these commercial cold storage structures with respect to seed storage and its effect on seed quality the present studies were under taken.

Author α : Special Officer (seeds), UAS, Raichur, Seed Unit, University of Agricultural Sciences, RAICHUR-584 102.
Author σ : Senior Scientist (plant pathology).
Author ρ : Senior Scientist (entomology), MARS, UAS, Raichur-584 102.

II. Material and Methods

Freshly harvested seeds of chickpea Cv JG11 were graded and packed in three different storage containers viz. C_1- Gunny bag, C_2-High density polythene C_3- Polylined gunny bag (PLGB, 700 gauge),and stored in two storage conditions viz. S_1-Commercial cold storage (5-7^0 C and 65-70% RH) and S2-Ambient storage. The seeds were treated with thiram @ 2g/kg of seeds before storage.

The different observations on seed moisture, germination, vigour index (germination % x seedling length(cm), electrical conductivity of seed leachets, insect damage and seed infection were taken at bi-monthly interval by following the procedure prescribed by ISTA (Anon 1999) and presented only four monthly data for convenience. The data obtained from the experiment was statistically analyzed by using factorial CRD the critical differences between the treatments were worked out at five per cent significance (Snedecor and Corchran, 1967).

III. Results and Discussion

The data on percent seed moisture content observed during the studies in different treatment combinations was presented in Table1.It was observed that the values of seed moisture content varies with the storage conditions and packaging materials during the storage period. The initial seed moisture was less than eight percent in all the treatments. In general the extent of variation in seed moisture content was less in polylined gunny bag due to its impervious nature of pores followed by high density polythene bag and gunny bag over the storage period. Among the two storage conditions, there were not much significant differences were observed.

The results on the effect on the effect of storage condition and container and their interaction effect at different months of storage are presented in the (Table 2-7). The seed quality in terms of germination %, seedling vigour index, seedling dry weight were differed significantly between the storage conditions and containers during storage higher seed germination (88.7%), vigour index (2799), seedling dry weight (430 mg), lower insect damage(1.7%), seed infection(4.5%),

electrical conductivity (0.25 micromohs/cm) after 22 months of storage.

It was observed that the chickpea seeds stored in different storage conditions and containers significantly varied in respect of germination percent, vigour index and seedling dry weight It was observed that the seeds stored in commercial cold storage condition recorded highest values (87% germination, 2551 vigour indexz and 423 seedling dry weight as compared to ambient condition (14.5% germination, 144 vigour index and 163 seedling dry weight) after 22 months of storage. Among the different storage containers, the seeds stored in polylined gunny bag recorded highest values of seed germination, vigour index and seedling dry weight as compared to HDPE and gunny bag.

Further the seeds stored in commercial cold storage recorded lower insect damage (2.4%), seed infection (5.08%) and electrical conductivity (0.28 m .mohs/cm) and higher values in ambient storage (100 % insect damage, 39.67% seed infection and 0.49 m.mohs/cm of electrical conductivity. Among the storage containers studied, the seeds stored in poly lined gunny bag recorded lower insect damage, seed infection and electrical conductivity.

With respect to interaction, after 22 months of storage, the seeds stored in commercial cold storage along with poly lined gunny bag recorded higher values for seed germination, seed vigour index and seedling dry weight and lower insect damage, seed infection and electrical conductivity

There was gradual reduction in seed quality parameters during storage in both the storage condition, but reduction process was relatively slower in commercial cold storage condition compared to ambient storage condition. This might be due to storage environmental conditions. The effect of storage longevity is negative on level of seed vigour varied between storage conditions. It could be correlated with difference amongst crops in expression of protective system of enzymatic processes which influence on intensity of seed deterioration. Longevity of stored seeds of any crops considerably depends upon the storage condition, primarily in terms of air temperature and relative humidity in storage. The results of this investigation regarding the use of different storage conditions were in conformity to those of Arulnandy and Senanayake (1991), Singh and Maurya (1972), Gupta and Shakya (1976) in Soyabean seeds. The probable reason for slow rate of reduction in germination and vigour in cold storage condition is due reduced rate of respiration and metabolic changes occurring in seeds as reported by Das *et al* (1998) in Rajmah seeds. Under ambient storage condition excessive leaching of electrolytes, soluble sugars and free amino acids occur as revealed by Doijode (1990) in onion seeds. With passing of storage period vigour seeds decline due to catabolic activity going on seed and thus seed though viable reduction in length of shoot and root observed,

The main reason behind this is at low temperature (5-7 ^{0}c) there wont be any incidence of either insects and diseases, which in turn results in maintaining the higher seed quality parameters during storage and the observation of superiority of impervious container (polythene lined gunny bag) in seed quality maintenance in soybean is observed by Sharma et al of (1998) and Alan et al 2010 in Bean. Dwivedi and Shukla, 1990 in chickpea.

Finally from the present study the results clearly indicated that the commercial cold storage (5-7 o c temperature and 65-70 % relative humidity) can be effectively used for storing the chickpea seeds for 22 months of storage and among the different storage containers, the polylined gunny bag found better in maintaining the seed quality compared to either HDPE or gunny bag.

References Références Referencias

1. Alam,M.M, M.H. Ali, A.K.M.R. Amin, Mirza Hassanuzzaman, 2010, Seed Quality of Green Gram Stored in Different Storage Environment, *Journal of phytology 2010, 2(1) : 018-021.*
2. Sharma, S.N., Goyal K.C., Gupta, I.J., H.C., Karkralya, B.L., Sharma, S.K., Mehta, S.M. and Rathore, A.K.S., 1998, Packaging material and soybean seed quality during storage. *Seed Res.,* **26** (1): 89-91.
3. Singh, J.N. and Maurya, M.L., 1972, Effect of storage conditions on germination of soybean seed. *Bull. Grain Tech.,* **10**: 158-167.
4. Anononymous, 1999, International rules for seed testing, *Seed Sci. and Technol.*, *Supplement Rules,* **27:** 25-30.
5. Arunlandhy, V. and Senanayake, Y. O. A., 1991, Charges in viability, vigour and chemical composition of soybean seeds stored under the humid tropical conditions. *Legume Res.,* **14**(3): 135-144.
6. Das, B. K., Barua, I. C. and Dey, S. C., 1998, Effect of packing material, storage condition and duration of storage on seed viability, vigour and seedling survivability in Rajmah (*Phaseolus vulgaris* L.). *Legume Res.,* **21**(2): 91-95
7. Doijode, S. D., 1990, The influence of storage conditions on germination of onion seeds. *J. Maharashtra Agric. Univ.,* 15(1): 34-35.
8. Dwivedi, S. N. and Shukla, T. N., 1990, Effect of methods of storage on germinability and mycoflora of gram (*Cicer arietinum*). *Seed Res.,* 18: 82-85.
9. Gupta, D. K. and Shakya, B. R., 1976, Design and development of storage for low temperature

preservation of foundation seeds. Soybean research at Panthnagar. Exp. Station GBPUAT, Panthnagar, pp. 56-65.

10. Snedecor, G. and Cochran, W. G., 1967, *Statistical Methods*, Oxford and IBH Publishing Company, Bombay, pp. 135-197.

Table 1 : Effect of storage conditions and containers on seed moisture(%) in Bengal gram / JG – 11 seeds during storage

Treatments	Storage period in months					
	2 MAS	6 MAS	10MAS	14MAS	18MAS	22MAS
S_1	10.1 (18.5) a	9.6 (18.0)	10.0 (18.4) a	10.1 (18.5) a	10.3 (18.7) a	10.3 (18.7) a
S_2	9.5 (17.9) a	10.5 (18.9) a	10.50 (18.9) a	9.90 (18.3) a	10.1 (18.5) a	10.1 (18.5) a
CD (0.01)	0.645	0.588	0.628	0.564	0.693	0.693
C_1	10.2 (18.6) a	11.1 (19.4) a	11.0 (19.3) a	10.80 (19.1)	11.1 (19.4) a	11.1 (19.4) a
C_2	9. 9 (18.3) a	10.2 (18.6) a	10.1 (18.4) a	10.1 (18.5)	10.1 (18.5) a	10.1 (18.5) a
C_3	9.4 (17.8)	8.8 (17.2)	9.7 (18.1)	9.20 (17.6) a	9.5 (17.9)	9.5 (17.9)
CD (0.01)	0.790	0.720	1.088	0.978	0.849	0.849
S_1 C_1	10.6 (19.0) a	10.7 (19.0) a	10.4 (18.8) a	11.0 (19.3)	11.2 (19.5)	11.2 (19.5)
S_1 C_2	10.2 (18.6) a	9.6 (18.0)	9.9 (18.3)	10.0 (18.4)	10.3 (18.72) a	10.3 (18.72) a
S_1 C_3	9.5 (17.9) a	8.4 (16.8)	9.7 (18.1)	9.50 (17.9)	9.6 (18.0) a	9.6 (18.0) a
S_2 C_1	9.8 (18.2) a	11.4 (19.7) a	11.6 (19.9) a	10.7 (19.0)	11.0 (19.3)	11.0 (19.3)
S_2 C_2	9.5 (17.9) a	10.8 (19.1) a	10.5 (18.9) a	10.1 (18.5)	10.0 (18.4) a	10.0 (18.4) a
S_2 C_3	9.3 (17.7)	9.3 (17.7)	9.6 (18.0)	9.0 (17.4) a	9.5 (17.9) a	9.5 (17.9) a
CD (0.01)	1.117	1.018	1.088	0.978	1.200	1.200

MAS-months after storage

Figures in parenthesis indicate arc sin values.

Table 2 : Effect of storage conditions and containers on seed germination(%) in cram Chickpea/ JG – 11 seeds during storage

Treatments	2 MAS	6 MAS	10MAS	14MAS	18MAS	22MAS
S_1	96.1 (78.6)	95.0 (77.0)	95.1 (77.2)	92.5 (74.1)	90.4 (71.9)	87.0 (68.8)
S_2	93.5 (75.2)	90.7 (72.2)	85.7 (67.7)	71.0 (57.4)	50.1 (45.0)	14.5 (22.3)
CD (0.01)	1.430	1.168	1.326	1.373	2.601	1.271
C_1	93.8 (75.5)	92.1 (73.6)	89.2 (70.2)	76.1 (60.7)	64.8 (53.6)	49.1 (44.4)

C_2	95.0 (77.0)	92.2 (73.7)	89.0 (70.6)	80.5 (63.7)	69.5 (56.4)	49.7 (44.8)
C_3	95.7 (78.0)	94.3 (76.10	93.0 (75.0)	88.7 (70.3)	61.0 (76.5)	53.6 (47.0)
CD (0.01)	1.760	1.047	1.624	0.588	4.506	1.557
S_1 C_1	95.5 (77.7)	94.7 (76.6)	95.0 (77.7)	90.7 (72.2)	89.0 (70.6)	86.5 (68.4)
S_1 C_2	96.0 (78.4)	94.2 (76.0)	94.5 (76.4)	92.2 (73.7)	90.7 (72.2)	86.0 (68.0)
S_1 C_3	97.0 (80.0)	96.2 (78.7)	95.7 (78.0)	94.5 (76.40	91.5 (73.0)	88.7 (70.3)
S_2 C_1	92.2 (73.7)	89.5 (71.0)	83.5 (66.0)	61.5 (51.6)	40.7 (39.6)	11.7 (20.0)
S_2 C_2	94.0 (75.8)	90.2 (71.7)	83.5 (66.0)	68.7 (55.9)	48.2 (43.9)	13.0 (21.13)
S_2 C_3	94.5 (76.4)	92.5 (74.1	90.2 (71.7)	83.0 (65.6)	61.5 (51.6)	18.5 (25.4)
CD (0.01)	2.488	2.023	2.297	2.378	4.506	2.201

MAS-months after storage

Figures in parenthesis indicate arc sin values.

Table 3 : Effect of storage conditions and containers on seed vigour index in Chickpea/ JG – 11 seeds during storage

Treatments	2 MAS	6 MAS	10MAS	14MAS	18MAS	22MAS
S_1	4135	4022	3897	3667	3041	2551
S_2	4017	3088	3338	2157	719	144
CD (0.01)	166.66	177.01	239.699	74.785	84.79	124.705
C_1	4036	3761	3487	2668	1685	1266
C_2	4084	3802	3549	2830	1794	1275
C_3	4109	4002	3816	3238	2161	1500
CD (0.01)	288.66	306.595	293.57	91.593	103.85	152.731
S_1 C_1	4032	3979	3809	3482	2825	2424
S_1 C_2	4162	3939	3879	3667	2970	2431
S_1 C_3	4212	4148	4003	3851	3328	2799
S_2 C_1	4040	3543	3166	1853	546	109
S_2 C_2	4005	3664	3221	1993	618	120
S_2 C_3	4005	3857	3628	2624	995	201
CD (0.01)	288.665	306.59	415.17	129.532	146.8	215.995

MAS-months after storage

Figures in parenthesis indicate arc sin values.

Table 4 : Effect of storage conditions and containers on seedling dry weight(mg/5 seedlings) in Chickpea/ JG – 11 seeds during storage

Treatments	2 MAS	6 MAS	10MAS	14MAS	18MAS	22MAS
S_1	449	448	445	432	428	423
S_2	445	442	427	397	245	163
CD (0.01)	2.663	3.037	3.679	2.791	2.848	2.189
C_1	448	441	434	411	321	289

C_2	446	444	430	409	326	291
C_3	449	450	446	423	362	299
CD (0.01)	3.261	3.720	4.506	3.418	3.489	2.681
S_1 C_1	449	445	444	431	423	420
S_1 C_2	448	447	442	428	423	419
S_1 C_3	451	454	449	438	433	430
S_2 C_1	447	438	424	390	215	158
S_2 C_2	447	441	418	391	230	162
S_2 C_3	447	445	442	409	290	168
CD (0.01)	4.612	5.261	6.372	4.834	4.934	3.792

MAS-months after storage

Figures in parenthesis indicate arc sin values.

Table 5 : Effect of storage conditions and containers on electrical conductivity(micromohs/cm) in Chickpea/ JG – 11 seeds during storage

Treatments	2 MAS	6 MAS	10MAS	14MAS	18MAS	22MAS
S_1	0.15	0.18	0.23	0.24	0.25	0.28
S_2	0.17	0.22	0.28	0.34	0.36	0.49
CD (0.01)	0.010	0.080	0.044	0.014	0,016	0.036
C_1	0.16	0.22	0.28	0.30	0.31	0.44
C_2	0.17	0.20	0.26	0.30	0.31	0.39
C_3	0.16	0.18	0.22	0.28	0.30	0.33
CD (0.01)	0.010	0.098	0.054	0.018	0.020	0.062
S_1 C_1	0.15	0.21	0.24	0.25	0.26	0.29
S_1 C_2	0.16	0.20	0.24	0.24	0.24	0.29
S_1 C_3	0.15	0.17	0.21	0.23	0.24	0.25
S_2 C_1	0.17	0.28	0.31	0.35	0.36	0.59
S_2 C_2	0.17	0.28	0.28	0.36	0.37	0.49
S_2 C_3	0.16	0.19	0.24	0.32	0.36	0.41
CD (0.01)	0.017	0.139	0.077	0.025	0.028	0.062

MAS-months after storage

Figures in parenthesis indicate arc sin values.

Table 6 : Effect of storage conditions and containers on insect damage(%) in Chickpea JG – 11 seeds during storage

Treatments	2 MAS	6 MAS	10MAS	14MAS	18MAS	22MAS
S_1	0.0	0.0 (0.5)	0.5 (4.05)	0.9 (5.4) a	1.33 (6.5.)	2.4 (8.9) a
S_2	0.0	11.8 (20.09)	40.8 (39.7)	54.6 (47.6)	73.0 (58.6)	100.0 (90.0)
CD (0.01)	0.0	0.947	2.608	2.400	2.160	0.746
C_1	0.0	14.1 (22.06)	25.25 (30.13)	31.5 (34.1)	40.2 (39.3)	51.5 (45.8) a
C_2	0.0	3.8 (11.24)	36.13 (36.93)	38.8 (38.5)	40.8 (39.7)	51.2 (45.6) a
C_3	0.0	0.5 (4.05)	0.75 (5.1)	13.0 (21.1) a	30.3 (33.4)	50.8 (45.4) a

CD (0.01)	0.0	1.16	3.194	2.940	2.646	0.914
S_1 C_1	0.0	0.0 (0.5)	0.2 (2.5)	0.7 (4.8) a	1.2 (6.2)	3.0 (9.9)
S_1 C_2	0.0	0.0 (0.5)	0.7 (4.8)	1.0 (5.74) a	1.5 (7.0)	2.5 (9.1)
S_1 C_3	0.0	0.0 (0.5)	0.7 (4.8)	1.0 (5.74) a	1.2 (6.2)	1.7 (7.4) a
S_2 C_1	0.0	27.7 (31.7)	50.2 (45.1)	62.2 (52.0)	79.2 (62.8)	100.0 (90.0)
S_2 C_2	0.0	7.2 (15.5)	71.5 (57.7)	76.7 (61.14)	80.2 (63.5)	100.0 (90.0)
S_2 C_3	0.0	7.2 (15.5)	0.7 (4.8)	25.0 (30.0)	59.2 (50.30)	100.0 (90.0)
CD (0.01)	0.0	1.641	4.518	4.158		1.292

MAS-months after storage

Figures in parenthesis indicate arc sin values.

Table 7 : Effect of storage conditions and containers on seed infection(%) in Chickpea JG – 11 seeds during storage

Treatments	2 MAS	6 MAS	10MAS	14MAS	18MAS	22MAS
S_1	0.0	1.5 (7.04)	0.33 (3.14)	4.4 (12.1) a	4.92 (12.9)	5.08 (13.0) a
S_2	0.0	5.25 (13.31)	5.67 (13.6)	20.9 (27.20)	34.1 (35.70)	39.67 (39.0)
CD (0.01)	0.0	1.58	1.153	2.492	2.700	2.285
C_1	0.0	3.63 (10.9)	3.63 (10.9)	15.0 (22.7)	21.88 (27.8)	23.6 (29.0) a
C_2	0.0	3.75 (11.09)	3.5 (10.7)	13.7 (21.7)	20.63 (26.9)	22.7 (28.4) a
C_3	0.0	2.75 (9.46)	1.88 (7.7)	9.2 (17.6) a	16.0 (23.5)	20.7 (12.50) a
CD (0.01)	0.0	1.035	1.412	4.316	3.306	2.799
S_1 C_1	0.0	2.0 (8.1)	0.5 (4.0)	4.0 (11.5) a	5.25 (13.1)	5.2 (13.1) a
S_1 C_2	0.0	2.0 (8.1)	0.5 (4.0)	5.25 (13.1) a	5.5 (13.5)	5.5 (13.1) a
S_1 C_3	0.0	0.5 (4.05)	0.00 (0.50)	3.0 (9.9) a	4.0 (12.1)	4.5 (12.2) a
S_2 C_1	0.0	5.25 (13.18)	6.75 (15.0)	26.0 (30.6)	38.5	42.0 (40.4)
S_2 C_2	0.0	5.0 (12.9)	6.50 (14.7)	21.2 (27.4)	35.7	40.0 (39.2)
S_2 C_3	0.0	5.0 (12.9)	3.75 (9.6)	15.5 (23.19)	28.0	37.0 (37.4)
CD (0.01)	0.0	2.736	1.996	4.316	4.676	3.959

MAS-months after storage

Figures in parenthesis indicate arc sin values.

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