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Evaluation of Different Desiccants for Groundnut (*Arachis hypogaea*) Pod Storage

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ABSTRACT: Drying of seeds plays a major role in extending the storability of seeds especially for oilseeds. Drying of Rabi harvested Groundnut pods is a very big challenge for the Groundnut farmers, because the pods are exposed to very hot sun, which leads to cracking of seed coat that will cause poor germination. Hence, to avoid exposing the groundnut pods to very high temperature, proper seed drying method is to be standardized . The desiccants are used to reduce the moisture content of the pods and seeds under laboratory conditions. Since various desiccants are available, suitable one with concentration has to be standardized foe extending the groundnut pod storability. Laboratory experiments were conducted to study the effect of different desiccants viz., anhydrous calcium chloride (14g/kg), silica gel (8.5g/kg) and zeolite beads (300g/kg) on the storability of groundnut pods cv. VRI 8 when stored in poly lined gunny bag under ambient condition .The result revealed that the performance of stored pods was decreased with advancement in storage period. Among all the treatments, storage of pods with zeolite beads (300g/kg) was found to be superior in maintaining low moisture content of 6.24% after six months of storage followed by silica gel (8.5g/kg) and anhydrous calcium chloride (14g/kg). The pods stored with zeolite beads (300g/kg) recorded higher germination per cent (78 per cent) and vigour index (2480), whereas lower values were recorded in lipid peroxidase activity (0.743 OD), electrical conductivity of seed leachate (0.174 dS/m), insect infestation (8 per cent) and pathogen infection (5 per cent) after six months of storage. Hence, storage of groundnut pods with zeolite beads (300g/kg) can be practised to extend the storability of groundnut pods with minimum deterioration in seed quality.

Keywords: Groundnut pod , desiccants , zeolite beads, poly lined gunny bag, storability

Groundnut (*Arachis hypogaea* L,) is an essential oilseed crop and it is the 13th most important food crop in the world and first crucial oilseed crop in India. It is a major source of edible oil and vegetable protein hence it is often known as King of oilseeds [1]. The obstacle in attaining the sound yield in groundnut is owing to unavailability of quality seeds and improper storage practices .The utmost issue in groundnut is the rapid decline in seed viability during storage, since the groundnut kernels are very sensitive to deterioration because of its chemical composition i.e. high fat and protein content. In addition to that, the longevity of seeds is mostly influenced by storage conditions viz., seed moisture content, storage temperature and relative humidity. However, the longevity of seeds can be increased, when they are stored with low moisture content in cool temperature [2]. But maintaining the cold storage unit for low temperature storage is expensive and difficult to adopt at farm level. Under this situation, maintaining the low moisture content of the kernels can be a suitable one to extend the storability of ground nut pods. So, the aim of this investigation was to find out suitable desiccant to reduce the moisture content of kernels and pods in order to maintain seed quality under ambient storage condition rather than outlaying on cold storage system.

MATERIALS AND METHODS

The freshly harvested and graded genetically pure groundnut pods of cv. VRI 8 were stored in poly lined gunny bag along with following desiccants under ambient condition (27.4ºC and 48% Relative humidity) for six months. The groundnut pods stored without any desiccants served as control. The treatments were: T_1 – Control; T_2 - Anhydrous $CaCl_2$ @ 14g/kg; T_3-Silica gel @ 8.5 g/kg ; T_4-Zeolite beads @300g/kg. The above concentrations was fixed based on the previous experiments. Initially, the moisture content of groundnut pods was reduced to 8.15 per cent. Since anhydrous calcium chloride (14g/kg of pods) is a liquid desiccator, it was tied in a muslin cloth and hung from the lid inside a

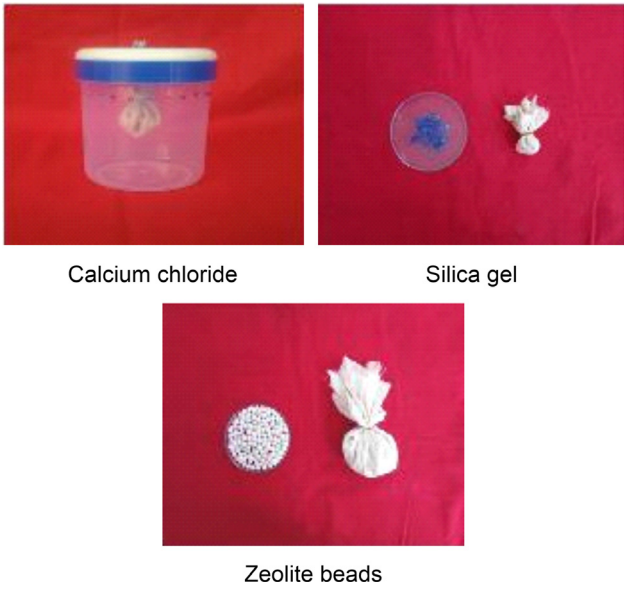


Plate 1. Desiccants used for groundnut pod storage

small perforated plastic container using a nylon twine and positioned vertically in the core of the poly lined gunny bag. The silica gel (8.5g/kg of pods) and zeolite beads (300g/kg of pods) were packed in a muslin cloth and placed in the hub of the packaging material (Plate 1). The samples were drawn at monthly intervals and evaluated for the physical, physiological and biochemical parameters for kernels under laboratory condition. The experiment was laid out in Factorial Complete Randomized Design with four replicates. Standard error of difference was calculated at 5 per cent probability level to compare the mean difference among the treatments.

RESULTS AND DISCUSSION

In the present study of storage of groundnut pods with different desiccants, a declining trend in seed moisture content was perceived as the storage period extends except control i.e., pods stored without desiccant. There was a sudden decrease of moisture content after first month of storage which was maintained for six months in the treatments stored with desiccants. A maximum decrease in moisture content was observed in pods stored with zeolite beads (6.24%) when compared with other desiccants (Table 1) (Figure 1). This high adsorption capacity of zeolite beads is due to their micropores with

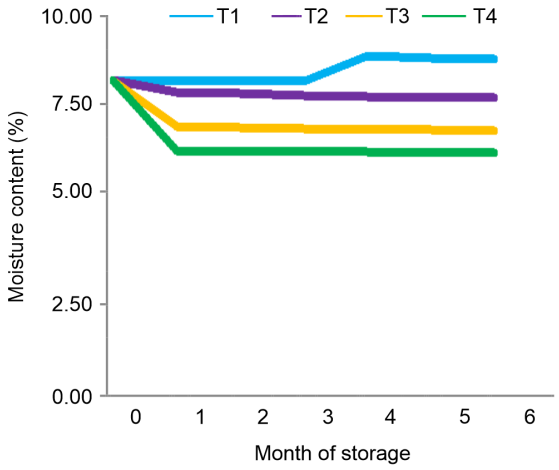


Figure 1. Effect of different desiccants on moisture content (%) of groundnut cv. VRI 8 during storage

Table 1. Effect of different desiccants on moisture content (%) of groundnut cv. VRI 8 during storage

Treatments	Period of storage							
	P0	P1	P2	P3	P4	P5	P6	Mean
T1	8.15 (16.53)	8.13 (16.53)	8.11 (16.53)	8.11 (16.53)	8.80 (17.25)	8.75 (17.15)	8.72 (17.15)	8.40 (16.43)
T2	8.15 (16.53)	7.83 (16.21)	7.80 (16.21)	7.76 (16.11)	7.72 (16.11)	7.69 (16.00)	7.69 (16.00)	7.81 (15.34
T3	8.15 (16.53)	6.93 (15.22)	6.90 (15.22)	6.88 (15.11)	6.84 (15.11)	6.83 (15.11)	6.81 (15.11)	7.05 (15.34
T4	8.15 (16.53)	6.29 (14.41)	6.27 (14.41)	6.25 (14.41)	6.25 (14.41)	6.24 (14.41)	6.24 (14.41)	6.53 (14.17)
Mean	8.15 (16.43)	7.30 (15.34)	7.27 (15.34)	7.25 (15.34)	7.40 (15.34)	7.38 (15.34)	7.37 (15.34)	7.44 (15.34
	T	P	TxP					
SEd	0.072	0.096	0.192					
CD (P=0.05)	0.145	0.193	0.386					

(Values in parenthesis are transformed values)

Treatments

T1 – Control; T2 – Anhydrous calcium chloride (14g/kg); T3 – Silica gel (8.5g/kg); T4 – Zeolite beads (300g/kg)

high internal surface area. The similar result was reported [3] in storage of green gram seeds with different desiccants.

The initial germination of groundnut was 58%. The low germination per cent might be due to the occurrence of fresh seed dormancy which is present in almost all groundnut cultivars whether they are dormant or non-dormant during the initial period of storage immediately after harvest. However, after one month of storage more than 90% of germination per cent was recorded in all the treatments including control due to the release of fresh seed dormancy in groundnut cv. VRI 8. The experimental result revealed that the groundnut pods stored with zeolite beads retained their germination (78%) upto six months of storage period, followed by silica gel and calcium chloride. Whereas, pods stored without desiccants (control) recorded 70% (Table 2). The percentage increase of germination due to the effect of zeolite bead was 14%. The above mentioned results are in agreement with [4] in tomato seeds and [5] in paddy. The high germination per cent in pods stored with zeolite beads was due to low moisture content (6.24%) which maintained the lower respiration rate and retained vigour and viability during the storage period. The same trend was observed in vigour index also (Table 3).

The electrical conductivity of seed leachate was low in pods stored with zeolite beads. The occurrence of lipid peroxidation in the seed weakens the membrane integrity and leads to high leakage of seed leachate [6]. Thus the pods stored with zeolite beads recorded low lipid peroxidation activity, eventually the electrical conductivity of seed leachate also found to be low (Figure 2). The disturbance in seed membrane is inversely proportional to the germination potential of stored seeds [7]. The

Table 2. Effect of different desiccants on germination (%) of groundnut cv.VRI 8 during storage

Treatments	Period of storage							
	P0	P1	P2	P3	P4	P5	P6	Mean
T1	58	90	87	80	76	72	70	76
	(49.6)	(71.54)	(68.86)	(63.43)	(60.66)	(58.05)	(56.79)	(60.66)
T2	58	91	86	83	79	75	72	78
	(49.6)	(72.54)	(68.02)	(65.65)	(62.72)	(60.00)	(58.05)	(62.02)
T3	58	91	88	84	80	76	73	79
	(49.6)	(72.54)	(69.73)	(66.42)	(63.43)	(60.66)	(58.69)	(62.72)
T4	58	93	90	86	83	80	78	81
	(49.6)	(74.66)	(71.56)	(68.02)	(65.65)	(63.43)	(62.02)	(64.15)
Mean	58	91	88	83	80	76	73	78
	(49.6)	(72.54)	(69.73)	(65.65)	(63.43)	(60.66)	(58.69)	(62.02)
	T	P	TxP					
SEd	0.52	0.68	1.37					
CD (P=0.05)	1.04	1.37	NS					

(Values in parenthesis are transformed values)

Treatments

T1 – Control; T2 – Anhydrous calcium chloride (14g/kg); T3 – Silica gel (8.5g/kg); T4 – Zeolite beads (300g/kg)

Table 3. Effect of different desiccants on vigour index of groundnut cv. VRI 8 during storage

Treatments	Period of storage							
	P0	P1	P2	P3	P4	P5	P6	Mean
T1	1682	3087	2945	2559	2402	2210	1951	2405
T2	1682	3167	2965	2778	2583	2360	2131	2524
T3	1682	3194	3034	2850	2664	2470	2234	2590
T4	1682	3339	3168	2982	2813	2640	2480	2729
Mean	1682	3197	3028	2792	2616	2420	2199	2562
	T	P	TxP					
SEd	24.01	31.77	63.5					
CD (P=0.05)	48.11	63.65	127.3					

experimental results are in accordance with [8] in groundnut and [3] in green gram seeds.

In the present study, the insect infestation was minimum in pods stored with desiccants i.e., 9%, 6% and 4% in anhydrous calcium chloride, silica gel and zeolite beads respectively at end of the storage period (Table 4). This might be due to the maintenance of low moisture content and relative humidity in the poly lined gunny bag which made unfavourable condition for insect growth [9]. However, in pods stored without desiccants exhibited higher activity of insect (11%) due to the prevalence of high moisture content (above 8%) which provided suitable hospitability for insects. In addition to that, zeolite beads effectively controlled the insect activity by adsorbing the moisture from epicuticular lipids which paves to desiccation of insects [10].

The occurrence of storage fungi is usually accompanied with insect infestation[11,12]. The evaluation of seed pathogen test in the current study disclosed that there was continuous rise in infection with Aspergillus niger, *A. flavus* and *Rhizopus* spp. The infection pattern of fungi was in accordance with the insect infestation. The least infection was noticed in pods stored with zeolite beads (5%) because of low moisture content which had become unfavourable environment for growth of fungal colonies (Table 5).

Table 4. Effect of different desiccants on insect infestation (%) of groundnut cv. VRI 8 during storage

Treatments	Period of storage							
	P0	P1	P2	P3	P4	P5	P6	Mean
T1	0.00	0.00	3.00	5.00	7.00	8.00	11.00	5.00
	(0.71)	(0.71)	(1.87)	(2.35)	(2.74)	(2.92)	(3.39)	(2.35)
T2	0.00	0.00	3.00	3.00	5.00	7.00	9.00	4.00
	(0.71)	(0.71)	(1.87)	(1.87)	(2.35)	(2.74)	(3.08)	(2.12)
T3	0.00	0.00	0.00	2.00	3.00	4.00	6.00	2.00
	(0.71)	(0.71)	(0.71)	(1.58)	(1.87)	(2.12)	(2.55)	(1.58)
T4	0.00	0.00	0.00	0.00	2.00	3.00	4.00	1.00
	(0.71)	(0.71)	(0.71)	(0.71)	(1.58)	(1.87)	(2.12)	(1.22)
Mean	0.00	0.00	2.00	3.00	4.00	6.00	8.00	3.00
	(0.71)	(0.71)	(1.58)	(1.87)	(2.12)	(2.55)	(2.92)	(1.87)
	T	P	TxP					
SEd	0.091	0.132	0.301					
CD (P=0.05)	0.183	0.264	0.603					

(Values in parenthesis are transformed values)

TTreatments

T1 – Control; T2 – Anhydrous calcium chloride (14g/kg); T3 – Silica gel (8.5g/kg); T4 – Zeolite beads (300g/kg)

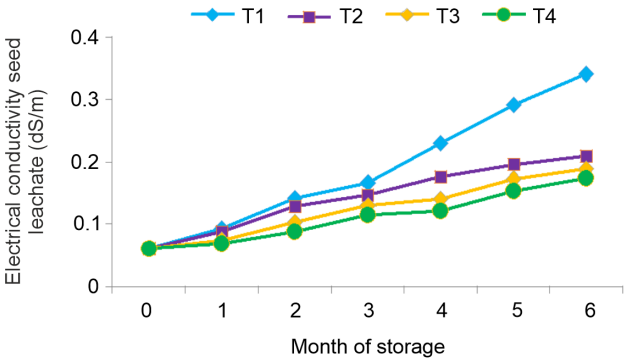
Table 5. Effect of different desiccants on pathogen infection (%) of groundnut cv. VRI 8 during storage

Treatments	Period of storage							
	P0	P1	P2	P3	P4	P5	P6	Mean
T1	0.00	0.00	5.00	9.00	10.00	11.00	13.00	7.00
	(0.71)	(0.71)	(2.35)	(3.08)	(3.24)	(3.39)	(3.67)	(2.74)
T2	0.00	0.00	0.00	3.00	5.00	6.00	10.00	4.00
	(0.71)	(0.71)	(0.71)	(1.87)	(2.35)	(2.55)	(3.24)	(2.12)
T3	0.00	0.00	0.00	0.00	3.00	4.00	7.00	2.00
	(0.71)	(0.71)	(0.71)	(0.71)	(1.87)	(2.12)	(2.74)	(1.58)
T4	0.00	0.00	0.00	0.00	2.00	2.00	5.00	1.00
	(0.71)	(0.71)	(0.71)	(0.71)	(1.58)	(1.58)	(2.35)	(1.22)
Mean	0.00	0.00	1.00	3.00	5.00	6.00	9.00	3.00
	(0.71)	(0.71)	(1.22)	(1.87)	(2.35)	(2.55)	(3.08)	(1.87)
	T	P	TxP					
SEd	0.087	0.116	0.232					
CD (P=0.05)	0.176	0.232	0.465					

(Values in parenthesis are transformed values)

TTreatments

T1 – Control; T2 – Anhydrous calcium chloride (14g/kg); T3 – Silica gel (8.5g/kg); T4 – Zeolite beads (300g/kg)



T1 – Control; T2 – Anhydrous calcium chloride (14g/kg); T3 – Silica gel (8.5g/kg); T4 – Zeolite beads (300g/kg)

Figure 2. Effect of different desiccants on electrical conductivity of seed leachate of groundnut cv. VRI 8 during storage

The study on storage of groundnut pods with different desiccants expressed its superiority of zeolite beads (300g/kg) in extending the storability with maximum seed quality characters with minimum deterioration in seed quality.

REFERENCES

1. BEGUM A J, R JERLIN AND M JAYANTHI (2013). Seed quality changes during storage of oil seeds-a review. *International Journal of Scientific Research* **2(10)** :1-2.
2. BARTON LV (1961). *Seed preservation and longevity*. pp216-217, London: Leonard Hill Inter science Publishers, N.Y.
3. LAKSHMI PRASAD A (2013). Effect of desiccants on seed storability and pulse beetle infestation in greengram (*Vigna radiata* (L.) Wilczek). M.Sc., (Ag.) Thesis, Acharya N.G. Ranga Agricultural University, Hyderabad.
4. NASSARI PJ, KESHAVULU K, RAO M, REDDY KCS AND RAHEEM AI (2014). Post harvest drying of tomato (*Lycopersicon esculentum* Mill) seeds to ultra low moisture safe for storage using desiccant (zeolite) beads and their effects on seed quality. *American Journal of Research Communication* **2 (4):**74-83.
5. PRAMOD RP (2013). Studies on impact of packaging materials and desiccants on seed quality and storability of hybrid paddy (*Oryza sativa* L.)." M.Sc., (Ag.) Thesis, University of Agricultural Sciences, Dharwad.
6. CHANG SM AND JM SUNG (1998). Deteriorative changes in primed sweet corn seeds during storage. *Seed Science and Technology* **26 (3):** 613-625.
7. BELUR BV (2009). Effect of seed treatment with calcium salts on crop growth, seed yield, quality and storability of soybean cv. JS-355 under ambient condition. M.Sc., (Ag.) Thesis, University of Agricultural Sciences, Dharwad.
8. NAUTIYAL PC, A BANDYOPADHYAY AND R C MISRA. (2004). Drying and storage methods to prolong seed viability of summer groundnut (*Arachis hypogaea*) in Orissa. *Indian Journal of Agricultural Science* **74 (2):**316-320.
9. VIJAYALAKSHMI N, TJ RAJU AND TA MALABASARI (2020). Influence of storage containers, desiccant on physiology of summer groundnut (*Arachis hypogaea* L.) cv. G2-52 stored both in the form of pod and kernel during storage. *IJCS*, **8(5)**: 1926-1931.
10. EROGLU N, M EMEKCI AND CG ATHANASSIOU. (2017). Applications of natural zeolites on agriculture and food production. *Journal of the Science of Food and Agriculture* **97 (11)**:3487-3499.
11. SINGH R AND PR MISHRA (2022). Effect of Desiccant Beads on Groundnut Bruchid, Caryedon serratus (Olivier) Infestation in Stored Groundnut. *International Journal of Environment and Climate Change*, **12(11):** 1086-1100.
12. SINHA RN (1961). Insects and mites associated with hot spots in farm stored grain. *The Canadian Entomologist* **93 (8):**609-621.