



## NUT STORAGE PERIODS AND NUT SIZES EFFECTS ON CASHEW (*Anacardium occidentale* L.) SEEDLING EMERGENCE AND GROWTH

Adeyemi E. A.<sup>1</sup>, H. Tijani-Eniola<sup>2</sup> and A. O. Famaye<sup>1</sup>

<sup>1</sup>Cocoa Research Institute of Nigeria, Ibadan, Nigeria

<sup>2</sup>Department of Agronomy, University of Ibadan, Nigeria

E-Mail: [adevemice@yahoo.com](mailto:adevemice@yahoo.com)

### ABSTRACT

Investigation into the appropriate storage period before sowing of cashew nut was conducted at Ibadan using jumbo ( $\geq 16$  g) and medium (6-8 g) - size nuts. Nuts stored at 0 (within 7 days of harvest), 1 - 12 month periods were sown at monthly interval into polythene pots containing 2 kg soil pot<sup>-1</sup> at 2.5 cm depth in four replicates in the nursery for two sowing seasons. Data on days to seedling emergence and % emergence were monitored. Growth parameters of height (cm), stem girth (mm) and biomass (g) were taken at 12 weeks after sowing. Data were analyzed using descriptive statistics and ANOVA at 5% level of significance. Storage periods had significant effects on days to seedling emergence, percent emergence, seedling height and biomass. Days to emergence of nuts stored for 0, 1, 2, 7, 9, 11, and 12 months were similar but significantly higher than other storage periods for both nut sizes. Percent emergence was higher in medium nut than in jumbo. Nut stored for 0, 1, 4, 5, 6, 7, 8, 9, and 11 months had similar % emergence significantly higher than other storage periods. Growth parameters and dry matter yield were higher for jumbo size. Cashew nuts retained viability and would emerge up to 11 months in storage. Jumbo size may be preferred to medium in terms of growth performance.

**Keywords:** cashew nuts, storage periods, viability, growth performance.

### INTRODUCTION

Cashew plant (*Anacardium occidentale* L.) is native to the northern part of South America and presently cultivated in many tropical areas where its growth is not limited by cold weather (Deckers, *et al.*, 2001; Opeke, 2005). In the last five to ten years, Nigeria has emerged as a leading producer of cashew nuts in Africa and the second world producer (Azam-Ali and Judge, 2001; FAO, 2007). It is grown from the arid to coastal regions (Akinwale, 1996).

All parts of cashew plant are of importance to man. It is useful in the food, pharmaceutical, building, automobile industries as well as for erosion control. (Ohler, 1979; Adeyemo and Okelana, 1989; Akinwale and Esan, 1989; Akinwale, 1996; Deckers *et al.*, and 2001 Opeke, 2005).

Cashew is mainly propagated by its nut. Seeds are harvested in the dry season (January-April) and are stored prior to sowing in the rainy season. The length of nut storage affects viability but the desirable length of nut storage for optimum germination and seedling performance need be reviewed. Hence this study aims to assess the effect of cashew nut storage periods at ambient temperature and nut sizes on its emergence and seedling performance.

### MATERIALS AND METHODS

The study was carried out in Ibadan (7° 10N; 3° 52E) at the headquarters of Cocoa Research Institute of Nigeria (CRIN). Soil used for the experiment was obtained on CRIN estate. The soil was processed, filled into polythene bags of size 30 x 15 x 25cm and arranged under

light shade of live *Gliricidia sepium* trees in the nursery. Soil sample was analyzed for soil physical and chemical properties.

Freshly harvested cashew nuts of jumbo (>16g) and medium (6-8g) sizes were used for the study. Each nut size was grouped into thirteen of twelve nuts each. Nuts in each group were placed on laboratory bench at ambient temperature of 28 - 32°C. The thirteen groups represent storage periods of 0-12 months before sowing. The experiment was factorial consisting of two factors, namely: cashew nut sizes at 2 levels and storage periods at 13 levels. There were 26 treatment combinations in a randomized complete block design with four replications. Cashew nuts were sown at seed rate of one nut per pot at 2.5cm depth. There were 312 experimental units. Watering and hand weeding were done monthly. Data on days to seedling emergence and % emergence were taken daily by visual counting. Plant height was measured with meter rule; stem girth using vernier caliper. At 12 WAS, cashew seedlings were up-rooted and oven-dried at 80°C to a constant weight for dry matter yield determination. Data were analyzed using ANOVA and LSD for means separation.

### RESULTS AND DISCUSSIONS

Result of the soil analysis showed that it could support the growth of cashew seedlings in the nursery as reported by Obatolu, (1996).

Nut storage periods and nut sizes had significant ( $p \leq 0.05$ ) effect on days to seedling emergence in both growing seasons (Table-1).



**Table-1.** Days to emergence of cashew nuts as affected by length of nut storage/storage periods and nut sizes in 2005 and 2006.

Storage periods (Month)	Days to emergence in 2005			Days to emergence in 2006		
	Jumbo	Medium	Means	Jumbo	Medium	Means
0	18.25	17.75	18.00	24.00	20.25	21.86
1	18.00	17.00	17.50	19.25	17.00	18.13
2	24.67	19.67	22.17	19.25	18.00	18.63
3	28.75	22.50	25.63	14.75	13.75	14.25
4	22.00	20.75	21.38	22.50	18.33	20.71
5	25.00	23.75	24.38	24.67	21.33	23.00
6	21.25	22.25	21.75	20.00	19.33	19.50
7	19.75	19.75	18.63	15.00	17.00	15.67
8	21.00	19.50	20.25	18.00	17.50	17.67
9	19.33	17.75	18.43	36.00	-	36.00
10	28.75	24.75	26.75	36.00	-	36.00
11	21.25	18.00	19.63	19.00	20.00	14.33
12	21.67	18.00	19.57	-	-	-
Means	22.31	19.94		20.90	18.10	
LSD:						
Storage periods (P)		1.88			3.45	
Nut sizes (S)		0.74			1.09	
P x S		2.67			4.22	
Storage periods (P)		***			***	
Nut sizes (S)		***			*	
P x S		*			n.s	

n.s - non significant; \*Significant at  $p \leq 0.05$ ; \*\*\*Significant at  $p \leq 0.001$

Emergence of cashew seedlings was longer in the jumbo - size cashew nuts compared to medium. The longer number of days to emergence observed for jumbo cashew may be due to the difference in the sizes of the nuts. The advantage in medium nuts to get soak in water faster might have led to hasten biochemical reactions that might have culminated to earlier seedling emergence compared to jumbo nuts. Freshly harvested cashew nuts (0 month storage) and those stored for 1, 2, 7, 9, 11 and 12 months showed earlier emergence (18 - 20 days) which were not significantly different from one another.

This is contrary to the findings of Aliyu and Akintaro, (2007) who reported that current season/freshly harvested nuts germinated earlier than 12-month old nuts. The significant interaction observed between nut storage periods and nut sizes which are an indication of the importance of these factors to seedling emergence

corroborated the earlier findings of Aliyu and Akintaro, (2007). Days to emergence in 2006 were earlier than in 2005 experiment, but the trend was similar (Table-1).

There was no interaction between nut storage periods and nut sizes in 2006 contrary to the observation in 2005 experiment. This could be due to the defective nature of nuts produced that year as reflected in the low percent emergence (Table-2).

Storage periods and nut sizes had significant effect on percent emergence in 2005. Emergence of cashew nuts expressed in percent was significantly ( $p \leq 0.05$ ) higher in medium compared to jumbo in 2005. Nuts stored for 0, 1, 4, 5, 6, 7, 8, 9, 11 had emergence range of 79 - 96% which were not significantly different among themselves. This indicated that nuts stored for 11 months compared favourably with freshly harvested nuts in terms of percent emergence. There was no interaction between



storage periods and sizes in both years (Table-2). This implied that both jumbo and medium - sizes had similar

percent emergence with respect to the various storage periods.

**Table-2.** Percent emergence of cashew nuts as affected by length of nut storage/storage periods and nut sizes in 2005 and 2006.

Storage Period (Month)	Percent emergence in 2005			Percent emergence in 2006		
	Jumbo	Medium	Means	Jumbo	Medium	Means
0	75.00	100.00	87.50	66.67	49.98	57.13
1	75.03	100.00	87.51	66.68	41.65	54.16
2	55.57	68.70	61.13	66.68	66.68	66.68
3.	58.35	58.33	58.34	58.35	58.33	58.34
4	75.00	91.68	83.34	41.65	33.30	38.07
5	91.68	100.00	95.84	44.43	44.43	44.43
6	83.35	83.33	83.34	66.70	33.30	41.65
7	58.35	100.00	79.18	33.30	33.30	33.30
8	83.35	100.00	91.68	33.30	33.30	33.30
9	88.90	83.35	85.73	33.30	-	33.30
10	66.65	66.68	66.66	33.30	-	33.30
11	75.03	75.03	87.57	33.30	33.30	33.30
12	55.53	75.03	66.67	-	-	-
Means	72.80	86.93		52.22	46.00	
LSD:						
Storage periods (P)		21.47			38.14	
Nut sizes (S)		8.39			12.05	
P x S		30.41			4.62	
Storage periods (P)		**			n.s	
Nut sizes (S)		**			n.s	
P x S		n.s			n.s	

n.s - non significant; \*\*Significant at  $p \leq 0.01$

There was a significant difference ( $p \leq 0.05$ ) in the effect of storage periods and nut sizes on plant height in 2005 (Table-3). Heights of seedling from jumbo nuts were consistently significantly higher than from medium. There was no interaction between the nut size and storage

periods in both seasons. Nuts stored for 0, 11 and 12 months were significantly higher than other storage periods in plant height. In 2006, plant height from jumbo size nuts were significantly ( $p \leq 0.05$ ) higher than from medium.



**Table-3.** Heights of cashew seedlings as affected by length of nut storage/storage periods and nut sizes in 2005 and 2006.

Storage Period (Month)	Seedling heights (cm) in 2005			Seedling heights (cm) in 2006		
	Jumbo	Medium	Means	Jumbo	Medium	Means
0	38.43	29.20	33.81	31.23	20.20	24.93
1	31.38	27.58	29.48	36.13	32.10	34.11
2	24.17	12.13	18.15	30.95	26.83	27.80
3.	20.88	20.88	19.96	28.78	21.85	26.31
4	26.35	19.80	23.08	29.38	26.90	28.31
5	27.35	20.13	23.69	25.20	18.73	21.97
6	26.43	20.58	23.50	32.00	24.73	26.55
7	28.08	23.70	25.89	28.35	30.00	28.90
8	24.70	18.60	21.65	32.30	27.80	29.30
9	21.50	21.35	21.41	25.00		25.00
10	29.45	22.20	25.83	42.0		42.00
11	37.50	30.98	34.24	29.00	26.00	28.00
12	41.13	33.25	36.71	-	-	-
Means	29.03	23.18		30.54	25.06	
LSD:						
Storage periods (P)		5.03			10.54	
Nut sizes (S)		1.97			3.33	
P x S		7.13			12.88	
Storage periods (P)		***			n.s	
Nut sizes (S)		***			*	
P x S		n.s			n.s	

n.s – non significant; \*Significant at  $p \leq 0.05$ ; \*\*\*Significant at  $p \leq 0.001$

In 2005, storage periods and nut sizes significantly affected seedling girth while in 2006, only storage periods affected girth. The stem girth of seedlings raised from jumbo - size nuts were significantly ( $p \leq 0.05$ ) higher than from medium in 2005 (Table-4). The higher

girth values for jumbo cashew seedlings might be due to sufficient food reserves in its bigger cotyledons with its attendant advantage of supporting rapid growth (Adebola *et al.*, 1999).



**Table-4.** Girth of cashew seedlings as affected by length of nut storage/storage periods and nut sizes in 2005 and 2006.

Storage Period (Month)	Seedling girth (cm) in 2005			Seedling girth (cm) in 2006		
	Jumbo	Medium	Means	Jumbo	Medium	Means
0	7.63	7.48	7.55	6.50	5.63	6.00
1	7.35	6.60	6.98	6.95	6.23	6.58
2	7.03	6.90	6.97	7.35	5.05	6.20
3.	7.03	5.83	6.11	7.15	6.75	6.90
4	6.40	5.20	5.76	5.75	6.03	5.87
5	6.33	5.83	6.30	5.67	5.47	5.57
6	7.10	5.60	6.35	5.20	5.23	5.23
7	6.95	6.15	6.55	4.90	6.50	5.43
8	6.30	5.80	6.05	4.80	4.70	4.73
9	5.63	5.35	5.47	5.20		5.20
10	5.33	4.83	5.08	5.10		4.50
11	7.10	6.30	6.70	4.50	5.00	5.07
12	7.53	6.75	7.09	-	-	-
Means	6.73	6.03		6.16	5.71	
LSD:						
Storage periods (P)		0.58			1.46	
Nut sizes (S)		0.23			0.46	
P x S		0.83			1.79	
Storage periods (P)		***			*	
Nut sizes (S)		***			n.s	
P x S		n.s			n.s	

n.s - non significant; \*Significant at  $p \leq 0.05$ ; \*\*\*Significant at  $p \leq 0.001$

The dry matter yield was significantly ( $p \leq 0.05$ ) higher for jumbo than medium in 2005 but not in

2006. Storage period was significant in both seasons but there was no interaction (Table-5).



**Table-5.** Cashew seedling dry matter yield as affected by length of nut storage/storage periods and nut sizes in years 2004 and 2005.

Storage Period (Month)	Dry matter in 2005			Dry matter in 2006		
	Jumbo	Medium	Means	Jumbo	Medium	Means
0	3.70	3.30	3.50	3.07	1.83	2.36
1	3.30	1.80	2.55	2.53	2.08	2.30
2	3.17	1.90	3.26	4.33	3.05	3.06
3.	3.70	2.83	2.53	3.45	2.68	3.39
4	5.50	3.33	4.41	3.73	2.93	2.15
5	3.35	1.80	2.58	2.50	1.80	2.75
6	5.30	1.50	3.40	4.70	2.10	1.60
7	7.03	4.18	5.60	0.90	3.00	1.10
8	3.90	2.20	3.05	0.90	1.20	1.10
9	5.07	3.43	4.13	1.10	-	1.20
10	3.80	2.53	3.16	1.20	-	.50
11	8.18	6.43	7.30	1.65	1.20	
12	670	3.88	5.09	-	-	
Means	4.81	3.03		2.86	2.26	
LSD:						
Storage periods (P)		1.67			2.10	
Nut sizes (S)		0.65			0.66	
P x S		2.37			2.57	
Storage periods (P)		***			*	
Nut size (s)		***			n.s	
P x S			n.s			n.s

n.s - non significant; \*Significant at  $p \leq 0.05$ ; \*\*\*Significant at  $p \leq 0.001$

Conclusively, jumbo - size nuts had the tendency of faster growth as evidenced in the larger dry matter yield generation. The period from the time of harvest to 11 months after harvest were most favoured for high seedling emergence and optimal growth performance in cashew. This implies that cashew nuts retain viability up to 11 months.

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