

Postharvest Storage Characteristics of Bitter kola (*Garcinia kola* Heckel.) in Imo State, Nigeria

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Abstract: Storage of Bitter kola (*Garcinia kola*) as carried out by peasant farmers cum traders in Imo State, Nigeria, was studied to evaluate the most appropriate storage material relative to the extension of its shelf life. Five storage material namely: Polyethylene Bags (PB), Cement Bag Paper (CBP), Dry Plantain Leaves (DPL), Fresh Plantain Leaves (FPL) and Sawdust were utilized in a laboratory trial, based on results of a market pathology survey using questionnaires. The storage materials were significantly different at 5% level of probability. Questionnaire survey showed storage with polyethylene bags to be the most popular. Palatability tests also showed storage with polyethylene bags to be the most acceptable. [New York Science Journal 2010;3(3):6-9]. (ISSN: 1554-0200).

Keywords: *Garcinia kola*, postharvest, storage material, South-eastern Nigeria.

Introduction

Garcinia kola Heckel. is a medicinal plant which is exclusively tropical in distribution (Gill, 1978). Traditionally, African medicine regards the plant in high esteem. It is cultivated throughout West Africa for its edible fruit and seeds which are used as a rejuvenating agent for masticatory purposes and as a general antidote (Ibiblio, 1983). Many pharmacological effects have been demonstrated for the biflavonoids in *Garcinia kola* extractives. Amongst them are anti-viral, anti-inflammatory, anti-diabetic and bronchodilatory properties (Iwu, 1993; Okoro, 1993). Some proprietary dietary supplements containing *G. kola* extractives already exist in the USA and African markets (Okoro, 1993). The exploration of *Garcinia kola*, alongside other antimicrobials in the fight deadly human diseases like HIV is presently on (Iwu *et al.* 1999).

Experimentations using *Garcinia kola* kernels as hop substitutes in several indigenous alcoholic drinks, as well as a flavour enhancer in the beverage industry also exist (FDA, 1999). Ofor *et al.* (2004) identified several ethno-botanical uses to which the indigenes of Imo State, in South-eastern Nigeria, put the *Garcinia kola* seeds. These include as an antidote to snake bites, poison and overdose. They are used as snake repellents, for cough, vomiting etc.

Garcinia kola fruits and seeds are normally harvested annually between July – October, which makes it a highly seasonal produce. Considering the massive deforestations and urbanization activities which are actively depleting the forest reserves in this part of the African

continent, it becomes imperative to study the most appropriate storage method for these highly valued seeds. There is evidence of mounting pressure on most non-wood forest products (NWFP's) which includes *Garcinia kola* (Ruiz-Perez, 1999). The predominantly traditional subsistence land use system in South-eastern Nigeria, coupled with the fast depleting reserves of important NWFP's like *Garcinia kola* (Bitter kola) in our forests, makes it imperative to increase the search for good preservation methods for these valuable seeds.

This study was therefore carried out to assess the various storage methods used and available locally to the peasant farmers cum traders in the study area, and validate their reasons for adopting such methods.

Materials and Methods

A market pathology survey was carried out using questionnaires. The questionnaires were distributed; ten each to Bitter kola traders in two markets each of the three Agricultural Zones of the State namely- Okigwe, Orlu and Owerri. Based on the responses from the sixty (60) respondents, five storage materials were chosen for the laboratory trial. The questionnaires were analyzed using means and percentages.

Five storage materials namely, Polyethylene Bags (PB), Cement Bag Paper (CBP), Dry Plantain Leaves (DPL), Fresh Plantain Leaves (FPL) and Sawdust (SD) were obtained from the local markets, homesteads and sawmills. These storage materials were utilized in the storage of *Garcinia kola* seeds for eight (8) weeks. The seeds were obtained at random from markets in the three

agricultural zones (Okigwe, Orlu and Owerri) of the state and bulked together.

Using a Completely Randomized Design (CRD), thirty seeds were wrapped up in the various storage materials, with that of the control being exposed to ambient environmental conditions. The experiment was replicated three times. An initial assessment of their fresh weight was taken. Subsequently, weekly assessments of their fresh weight (moisture content) were carried out on ten seeds each, weighing approximately 150g for each replicate, for eight weeks. During the storage period, palatability tests were carried out after every four weeks to assess the quality of the seeds using five independent volunteers. The fresh weight results were analyzed using one-way analysis of variance using Genstat (2005). Palatability tests were represented in a subjective scale according to Aharoni and Yehoshua (1973), grading the quality of the seeds according to taste and marketability. The test was based on freshness and lack of shrinkage after every four weeks.

Results and Discussion

The result of the fresh weight (moisture content) assessment for eight weeks is presented in Table 1. The results show that the storage with fresh plantain leaves, polyethene bags were significantly different at 5% level of probability. There was a general decrease in fresh weight with all the storage materials and the control. However, the fresh weight of the seeds stored with the moisture content of the fresh leaves which attracted the growth of molds.

Similar studies carried out by Korie (1996), on the effect of packaging materials on *Cola nitida*, confirmed the keeping ability of polyethelene bags over other methods of packaging, as is upheld in this study. According to Opeke (1987), various parasitic fungi developed during the storage of kola nuts, as a result of high transpiration rate within the storage baskets with dry plantain leaves. However, this study projects the suitability of dry plantain leaves over fresh plantain leaves, contrary to the claims by Opeke (1987). This is as a result of the development of mold in the fresh plantain leaves. However, CRIN (1971a) projected the use of polyethene bags and leaves of *Cordifolia cola* over dry and fresh plantain leaves. These materials were found to affect the quality of kolanuts in terms of colour, crispness and marketable quality.

The frequency distributions of the sixty respondents, on the storage materials used for the observed shelf-life of *Garcinia kola* seeds across Imo State, are shown in Table 2 above. The use of

polyethylene bags was most favoured (62%), while dry banana leaves followed by a wide margin (15%). Fresh Plantain Leaves and Cement Bag Paper scored 8% usage respectively, while Sawdust was least with 7%. The frequency distribution for the observed shelf-life of the *Garcinia kola* seeds by the respondents showed that the average shelf-life was two weeks (47%). Twenty per cent of the respondents claimed that the seeds could stay up to one month, while ten per cent claimed one week and above two months respectively. Thirteen per cent of the respondents claimed that the seeds could stay up to a maximum of two months in storage.

The results of the palatability tests are presented in Table 3. The results show that after four weeks of storage, the acceptability of the *Garcinia kola* seeds stored with fresh plantain leaves declined due to the growth of mold on the seeds. This was attributed to the presence of moisture on the leaves due to its fresh nature. The acceptability of the seeds stored with polyethylene bags, right up to the eight week substantiates the high usage level shown in Table 2.

Some of the essential chewing qualities required for kolanuts are that they should neither be slimy nor be astringently bitter in taste; quick in salivation when chewed, palatable and crispy (CRIN, 1971b). Stored kolanuts tend to loss some of the above qualities when not properly stored. Korie (1996) noted that kolanuts stored in polyethylene bags rated first, followed closely by those stored with *Cordifolia cola* leaves in terms of firmness, freshness and crunchiness during chewing. Results from this experiment also rated polyethylene bag storage first, followed by storage with Dry Plantain leaves and Sawdust.

Further studies by Austin (1972) attributed the loss of viability of kola nut seeds to reduction in moisture content, which can be traced to failed storage materials. Future studies need to be carried out on the seed viability of *Garcinia kola* seeds with respect to moisture content.

Conclusion

In conclusion, this research has projected the benefits inherent in the use of polyethylene bags, amongst other methods, as practiced by the peasant farmers cum traders. The exploration of various grades of polyethylene as storage materials can be used as the focal point of future research. Also, due to the unawareness about the nutrients present in some of our non wood forest products (NWFP's), their uses are limited. Future research should also be geared towards evaluating *Garcinia kola* seeds for their nutrient qualities.

Table 1: Fresh weight of *Garcinia kola* seeds during Eight weeks storage using different storage materials

Duration	Dry Plantain	Polyethelene	Sawdust	Cement Bag	Fresh Plantain	Control
	Leaves (DPL)	Bags (PB)	(SD)	Paper (CBP)	Leaves (FPL)	(C)
Week 1	128	127	134	122	146	129
Week 2	128	127	133	120	144	122
Week 3	126	126	131	118	144	120
Week 4	125	126	130	116	144	118
Week 5	121	126	129	112	139	113
Week 6	114	125	110	100	139	97
Week 7	109	125	103	94	119	90
Week 8	102	124	98	89	138	85
Mean	119.1	125.7	121.0	108.9	139.1	109.2

L.S.D. (5%) = 11.79

Note: All values for each week are means for the triplicates for each treatment.

Table 2: Frequency distribution of respondents on the Postharvest storage characteristics of *Garcinia kola* in Imo State (N=60).

Storage Materials	Frequency (%)
Dry Plantain Leaves	15
Fresh Plantain Leaves	8
Polyethylene Bags	62
Cement bag Paper	8
Sawdust	7
Total	100
Observed Shelf-life	Frequency (%)
One Week	10
Two Week	47
One Month	20
Two Months	13
Above Two months	10
Total	100

Table 3: Palatability Scale for *Garcinia kola* seeds based on freshness and lack of shrinkage during eight (8) weeks of storage

Storage Materials	After Four Weeks			After eight Weeks		
	Poor	Fair	Good	Poor	Fair	Good
Dry Plantain Leaves			*****	***	**	
Sawdust			*****		***	**
Cement bag Paper			*****		****	*
Fresh Plantain Leaves			*****	*****		
Polyethylene Bags			*****			*****
Control			*****		*****	

Where number of asterisks (*****) = No of volunteers.

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