Available online at www.pelagiaresearchlibrary.com

Pelagia Research Library

Advances in Applied Science Research, 2012, 3 (3):1239-1243

Pelagia Research Library

ISSN: 0976-8610
CODEN (USA): AASRFC

Feasibility of using sealed polyethylene film in prolonged storage of gari

Ukpabi, U. J., Omodamiro R. M. * and Oti, E

National Root Crops Research Institute, Umudike Abia State, Nigeria

---

ABSTRACT

Ten varieties of cassava (NR87184, NR930061, NR84292, NR930255, NR84292, NR930255, TMS96-0304, TMS71762, NR8212, TMS92-0326, NR930199 and NR930127), were used to product gari samples (palm-oiled and non palm-oiled types). High density polyethylene film (food grade, 75-80 microns thick) was used to produce experimental storage bags and 100g gari per bag were heat sealed and kept in woody cupboard. Some physico-chemical analyses such as swelling index, pH and moisture content which are main indicators quality attribute of gari were monitored periodically for the period of 12 months. The moisture content ranged from 6.54-6.80 and 6.53-6.75% for palm-oiled and non- palm-oiled respectively. From the results obtained, it could be seen that the polyethylene film is a good barrier against moisture; as none of the gari sample has up to 7.50% moisture content from the pre-storage moisture content of 6.10-7.38%. There was variation in the pH, 3.76-4.05 was observed in the palm-oiled and for non palm-oiled gari types. The changes in pH were slight and did not get up to pH of 4.5 (which ensures the absence of botulism in the packaged product) throughout the storage period. While the swelling index ranged from 3.18-3.03 and 3.10-3.03 for palm-oiled and non palm-oiled gari. The results of the swelling index tend to confirm the observed non-degradation of the gari granules to mouldy powders throughout the storage period. Oiled gari made from four cultivars (TMS9292/0326, NR930255, NR930127 and TMS96/0304) lost their yellow colour during the storage period. Sensory evaluation of eba made from the experimental gari samples after 12 months of storage was conducted, they were still generally acceptable. It may be said that polyethylene film (food grade, 75-80 microns) may be used to store non-oiled gari for up to 12 months.

Key words: Cassava, gari, Sensory evaluation, Physico- chemical properties and Polyethylene.

INTRODUCTION

Gari is a dry, free flowing, granular, fermented, acidic (pH <4.5) product, made from peeled fresh cassava roots, grated, left to ferment (24hrs or 48hrs or more depending on the type of *gari* and end use), the dried grated and fermented cassava is then sieved to remove large particles and fibres, the smaller grain-like bits are collected and toasted either with palm oil or without palm oil to obtain gari. [1]. Gari serves as a major staple food in West Africa. It is a popular West African food that constitutes daily meal for over 150 million people world wide. The product is a major food staple among Nigerians (in and outside the country). It is traditionally made at home in Africa some years back but now commercially produce using mechanized means. [2]. It is largely eaten with a soup or sauce.

There are many types of *gari*, ranging from extra fine grain (where more than 80% of the grain passes through a sieve of less than 350 micro meter aperture), fine grain (more than 80 % of the grains pass through a sieve of less than 1000 micro meter aperture) and coarse grain over 80% of grains passes through a seive of 1400 micro meter

and extra coarse grain (more than 20 % of grain is retained on a sieve of 1400 micro meter aperture). These are classified into two major groups in Nigeria – those with palm oil added during reconstitution with boiling water into the viscous paste to form *eba*. In combination, this constitutes a very balanced diet. It can be eaten as a snack in cold water on a very hot processing and those without added palm oil. Storability of *gari* for more than three months in homesteads has been a major problem in the country. This low shelf-life has been attributed to relatively high moisture content (> 10%) of traditionally processed *gari*, and the attendant microbial infestation (largely moulds) of the product. *Gari* spoilage is marked by its consumer's rejection, and the conversion of its cold water swellable granules to powders by the microscopic moulds. Ukpabi and Ndimele [3] found that gari with more than 10% moisture content may be mouldy before 4 months of storage. Food security is critical. Three element keys to food security are: production, availability and accessibility. A nation like Nigeria drawing on its vast national resource endowment can be self sufficient in food production and yet remain food insecure because the production can not be stored for the appropriate time [4].

Research results have shown that *gari* with low moisture content (about 9%) could store for more than three months, if appropriately packaged. High-density polythene film, which is a good barrier against micro-organisms water and air, is available in Nigeria. However there is dearth of information on the use of this cheap high-density polyethylene film in the prolonged storage of these acidic starchy products. This work, therefore, aims to monitor the relevant chemical and physical indices of stored *gari* packaged with polyethylene film and stored under out hot humid conditions.

MATERIALS AND MEHODS

Experimental materials:
Ten varieties of cassava (NR87184, NR930061, NR84292, NR930255, NR84292, NR930255, TMS96-0304, TMS71762, NR8212, TMS92-0326, NR930199 and NR930127), were harvested at 12months after planting from experimental field of the Cassava Programme of the National Root Crops Research Institute (NRCRI) Umudike. The freshly harvested cassava variety roots were used to product *gari* samples (palm-oiled and no palm-oiled types) at the *Gari* Processing Unit of the Institute. The unit and subunit operations used in the production of the gari samples are shown in Figure 1. High density polyethylene film (food grade, 75-80 microns thick) was used to produce the experimental storage bags. Heat sealing was used not only to produce the bag but also to seal-in the *gari* (100g *gari* per bag).

Storage environment
The experimental packaged *gari* sample were kept inside a wooden cupboard in a room at NRCRI, Umudike. The storage temperature inside the cupboard in a room at NRCRI, Umudike. The storage temperature inside the cupboard ranged from 25^{o}C to 32^{o}C.

Physico-chemical analysis
Infra red moisture meter (FS II model) was used to monitor the moisture content of the *gari* samples (bi-monthly) for 12 months. The pH of *gari* samples was also monitored at this period with a pH-meter (Prazision E510 model). Ukpabi and Dafe method [5] was used to determine the swelling index of the experimental *gari* samples during the storage periods.

Sensory Evaluation
A 7-point hedonic scale was used by randomly selected 20 trained food assessors drawn from National Root Crops Research Institute, Umudike staffs and Michael Okpara University of Agriculture, Umudike, Abia State to undertake sensory evaluation of the *eba* made from the experimental *gari* samples after 12 months of storage.

Where 6 = like extremely; 3 = neither like nor dislike; 0 = dislike extremely [6].

Table 1: Changes in the quality of packaged *gari* samples with time
(Mean of all 10 varieties)

Quality attribute	Storage Period (months)						
	0	2	4	6	8	10	12
Moisture content*							
NOG	6.54 (0.31)	6.66 (0.36)	6.67 (0.36)	6.79 (0.41)	6.87 (0.36)	6.73 (0.34)	6.80 (0.39)
POG	6.53 (0.32)	6.63 (0.36)	(6.54) (0.31)	(6.78) (0.33)	6.76 (0.33)	6.70 (0.33)	6.75 (0.35)
Acidity (pH)							
NOG	3.76 (0.11)	3.94 (0.11)	3.98 (0.10)	4.03 (0.14)	4.09 (0.12)	4.08 (0.13)	4.05 (0.09)
POG	3.79 (0.14)	3.94 (0.05)	4.01 (0.05)	4.14 (0.09)	4.20 (0.09)	4.08 (0.10)	4.09 (0.10)
Swelling Index							
NOG	3.18 (0.12)	3.22 (0.40)	3.28 (0.30)	3.09 (0.35)	3.06 (0.39)	3.05 (0.38)	3.03 (0.39)
POG	3.10 (0.36)	3.23 (0.37)	3.27 (0.38)	3.25 (0.46)	3.20 (0.45)	3.07 (0.37)	3.03 (0.4)

**NOG =Non oiled gari: POG = Palm oiled gar Numbers in bracket are standard deviation of the means*

Table 2: Sensory evaluation scores* of the eba prepared with the packaged gari samples at 12 months

	Sensory parameters			
	Colour	**Flavour**	**Handfeel**	**General Acceptability**
NR87184 (NOG)	4.60abc	4.80ab	4.80abc	5.20ab
NR87184 (POG)	4.80ab	3.60ad	4.80abc	4.40bcd
NR930061 (NOG)	4.800ab	4.40ab	5.20abc	5.20ab
NR930061(POG)	4.40abcd	4.60ab	4.60abcd	5.00abc
NR84292 (NOG)	3.40cd	4.60ab	4.60abcd	4.20cd
NR84292 (POG)	3.60dfd	4.60ab	4.80abc	4.20cd
NR930255 (NOG)	5.20a	4.00ab	5.20abc	5.00abc
NR930255 (POG)	5.20a	4.20ab	5.00abc	4.60abcd
TMS96/0304 (NOG)	3.20d	4.80ab	4.40abcd	4.60abcd
TMS96/0304 (POG)	4.40abcd	4.60ab	4.00cd	4.60abcd
TMS71762 (NOG)	4.20abcd	4.80ab	5.20abc	5.00abc
TMS71762 (POG)	4.60abc	5.00a	4.80abc	4.80abcd
NR8212 (NOG)	4.60abc	4.60ab	4.20bcd	4.40bcd
NR8212 (POG)	4.00abcd	4.40ab	3.60d	4.20cd
TMS96-0326 (NOG)	4.60abc	4.20ab	4.60abcd	4.80abcd
TMS96-0326 (POG)	5.20a	4.60ab	5.60a	5.40a
NR930199 (NOG)	5.20a	4.60ab	5.40ab	5.20abc
NR930199 (POG)	5.20a	4.60ab	5.60a	4.60abcd
NR930127 (NOG)	3.68cd	3.80ab	4.40abcd	4.00d
NR930127 (POG)	5.00a	3.80ab	4.00cd	4.80abcd

**NOG = Non oiled gari: POG = Palm oil gari*
*[a,b,c], value in a column with the same letter do not differ significantly (P = 0.05) using DMRT.*Where 6 = like extremely; 3 = neither like nor dislike; 0 = dislike extremely.*

RESULTS AND DISCUSSION

Table 1 shows the moisture *content*, *pH* and *swelling index* of the experimental *gari* samples (in the polyethylene bags) during the 12 months of storage. From the results obtained, it could be seen that the polyethylene film is a good barrier against moisture; as none of the *gari* sample has up to 7.50% moisture content from the pre-storage moisture content of 6.10-7.38%. The changes in pH were slight and did not get up to pH of 4.5 (which ensures the absence of botulism in the packaged product) throughout the storage period. The pH reading indicates minimal biochemical/chemical reactions in the storage *gari* samples. The results of the swelling index experiment tend to confirm the observed non-degradation of the *gari* granules to mouldy powders throughout the storage period.

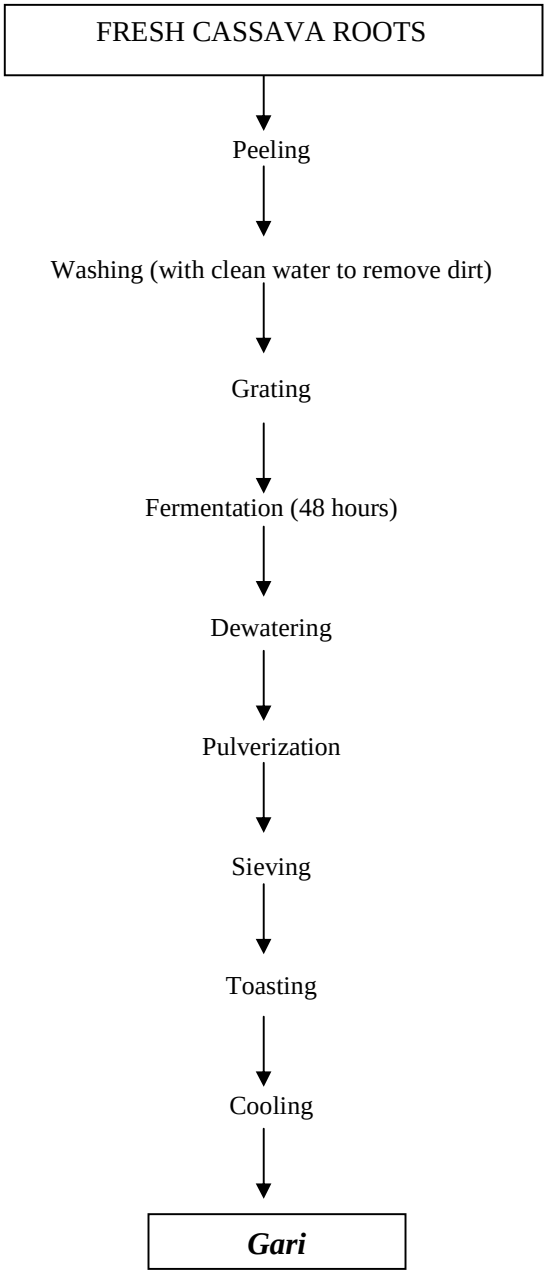

Figure 1: Flow chart for the production of *Gari*.

The sensory evaluation results in Table 2 show that the *eba* made from the stored *gari* samples were still generally acceptable after 12 months of storage. However, comments from the sensory assessors showed that the oiled *gari* made from four cultivars (TMS9292/0326, NR930255, NR930127 and TMS96/0304) lost their yellow colour during the storage period. Fellow and Axtell [7] had earlier indicated that plasticizers in polyethylene can react with fats in foods.

CONCLUSION

In conclusion, it may be said that polyethylene film (food grade, 75-80 microns) may be used to store non-oiled *gari* for up to 12 months.

REFERENCES

[1] Ihekereonye, A.I. (**1999**). Manual on small-scale food processing - A Guide to opportunities in small scale processing. The Academic publishers, Nsukka, Nigeria.
[2] Fellows, P. (**1997**). Traditional food, Processomng for profit, Internediate Technology Publications, London. pp 124-125.
[3] Ukpabi, U.J. and Ndimele, C. (**1990**). *Nig. Food J.* Vol. 8, 105-110.
[4] Nwosu K.I, Udealor, A. and Ezuluike, T.O (**2004**). Strengthening Research and Extension Towards Achieving Nutritional Food Security. Federal Ministry of Agriculture and Rural Development. Proceedings of the 19th Annual zonal REFILDS workshops, S.E. Agro-ecological zone of Nigeria.pp 30.
[5] Ukpabi, U.J and Dafe, M (**1999**). *African J. Root and Tuber Crops*, 3 (2): 11-13.
[6] Iwe, M.O. (**2002**). Handbook of Sensory Methods and Analysis. Rojoint Communication Services Ltd, 65 Adelabu St. Uwani-Enugu.
[7] Fellows P. and Axtell, B. (**1993**). Appropriate food packaging. Tool Publications Amsterdam.