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Comparative Study on Some Selected Garri Samples Sold in Lagos Metropolis

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Abstract

Three samples of different kinds of white garri were purchased from, Mushin, Shomolu and Yaba market in Lagos. A reference sample of garri was produced in Yaba College of Technology processing Laboratory. The samples were coded as AOU, BRT, CBN and REF (for the reference). Proximate analysis showed that moisture content ranged between 8-10%, carbohydrate 87-85%, protein 1-3%, fats content 0.5-0.7%, crude fibre 0.5-0.8%, ash content 1-3%. The physiochemical properties of the samples showed that bulk density varied between 0.5glml-0.69glml, pH values 6.4-6.6. A significant differences in the swelling behaviour of the garri sample was observed at room temperature (28 ± 2^0C) particularly in the first 30 minutes of exposure to water. Water absorption varied between 10-13.7%. The sensory evaluation studies revealed preference for Ijebu garri (BRT) over others in terms of desirable attributes of taste, aroma, mouth feel and over all acceptability. While the Cotonou garri

(CBN) was preferred in terms of yield and pasting quality alone. The hydrogen cyanide content of all these sample were found to be below (5.4-10.2mg/kgHCN) and fell within the tolerable limits of (10 -15mg/kg HCN) as stipulate by National Agency for food Drug Administration and control (NAFDAC) in Nigeria.

Keywords: Cassava, Garri, Proximate analysis, Organoleptic, Bulk density

1. Introduction

Cassava ***(****Manihot esculenta crantz)* is a major food crop in Nigeria, supplying about 70% of the daily calorie of over 50million people in Nigeria (Oluwole *et al.*, 2004). At 93 million tons, cassava accounted for the largest share of root crop consumed as food in Tropical Africa in 1996 (Scott *et al.*, 2000). It has also been estimated that cassava provides food for over 500million people in the world (Abu *et al.*, 2006). Edible part of fresh cassava root contains 32-35% carbohydrate, 2-3% protein, 75-80% moisture, 0.1% fat, 1.0% fiber and 0.70-2.50% -Ash (Oluwole *et al.*, 2004) .

A wide variety of foods are produced from cassava by fermentation, viz *Garri, Fufu, Lafun, Attieke, Farinha de rnadioca,* to mention a few (Adesina, 2001).

Cassava plants are of two (2) varieties namely; sweet cassava *(Manihot utilisima)* also known as the oko-yawo variety and bitter cassava *(Manihot Palmata).* Both variety are known to contain cyanogenic glycosides. The two major cyanogenic glycosides: linamarin and lotaustralin are hydrolysed to produce hydrocyanic or prussic acid (HCN) a poison, when it comes in to contact with the enzyme *linamarase*, which is released when the cells of cassava roots are ruptured (Marcus and Adesina, 2001). The principal cyanogenic glucoside is linamarin (95% of the total) while the remainder is lotaustralin. It was observed that the roots rapidly develop toxicity after grinding unless the pulp is heated immediately. (Adesina, 2001). Therefore, all forms of cassava processing decreases levels of cyanogenic glycoside and prussic acid in the final product (Marcus and Adesina, 2001).

Garri is a product, obtained by fermenting peeled, washed and grated fresh cassava roots (for about 72 hours), dewatering and toasting (Ekwu and Ugwuona 2007). In Nigeria up to 70% of harvested cassava roots are processed into garri. Garri is normally consumed by adding water and sugar to taste and eaten as a refreshing snack drink or by pouring sufficient quantities in hot water to obtain a stiffen pudden (eba) (Onabolu *et al*, 2002,) which may be eaten with soup or stew. Garri is usually processed using manual processing method and mechanical processing method.

Manual processing method involves the following distinct steps: peeling, grating, pressing and fermenting for 48-72 hours, sieving, toasting and separation into various particle sizes.

Mechanical processing method involves washing peeling, grating pressing, sieving, toasting and receiving without the involvement of manual operation. The liquor from the previous fermentation is used as a starter thereby reducing the fermentation period to about 6-8hours. The heating of the cassava during processing was presumed to inactivate linamarase and prevent the release of cyanide as linamarase decomposes at 72'% (Ekwu and Ehirim, 2008).

The three major draw backs that has made the utilization of cassava to be reduced include the following; High level of perishability, critical storage condition and high level of toxic substance called Cyanogenic glucosides.

The last which has formed the basis of this work has led to the following aims and objectives; to produce garri using a well monitored procedure, to collect different samples of garri commonly sold in Lagos markets, to compare the physiochemical qualities of the garri selected with the sample produced and to carry out sensory evaluation on all the samples.

2. Materials and Methods

2.1 Source of Materials

Fresh cassava from 10-12 months old was harvested from Kusimo farm, Sango Otta in Ogun State. While the other materials or equipment were obtained from Food Technology processing laboratory, Yaba College of Technology, Yaba, Lagos. The physiochemical analysis was carried out in food chemistry Laboratory also in Yaba College of Technology. Three (3) different samples of garri (bendel, Ijebu and Cotonou) were purchased in markets around Lagos (Mushin, Shomolu and Yaba market)

2.2 Preparation of the samples

The harvested cassava was cleaned and sorted to remove contaminants. This was carried out in the food processing laboratory so as to ensure wholesomeness of the sample before further processing. The cleaned and sorted cassava was peeled and grated manually. The grated cassava was packed in a jute bag, tied and a heavy load was placed on the bag to remove excess water and to initiate the process of fermentation for 3 days (72 hours) at room temperature (28^0C).The excess water was removed totally from the permeated cassava to ensure easy toasting of the garri.

About 5kg of cassava mass was obtained after sieving .This was then toasted in a shallow pan of about 25cm deep for 30 minutes under controlled temperature to produce a fresh white garri.

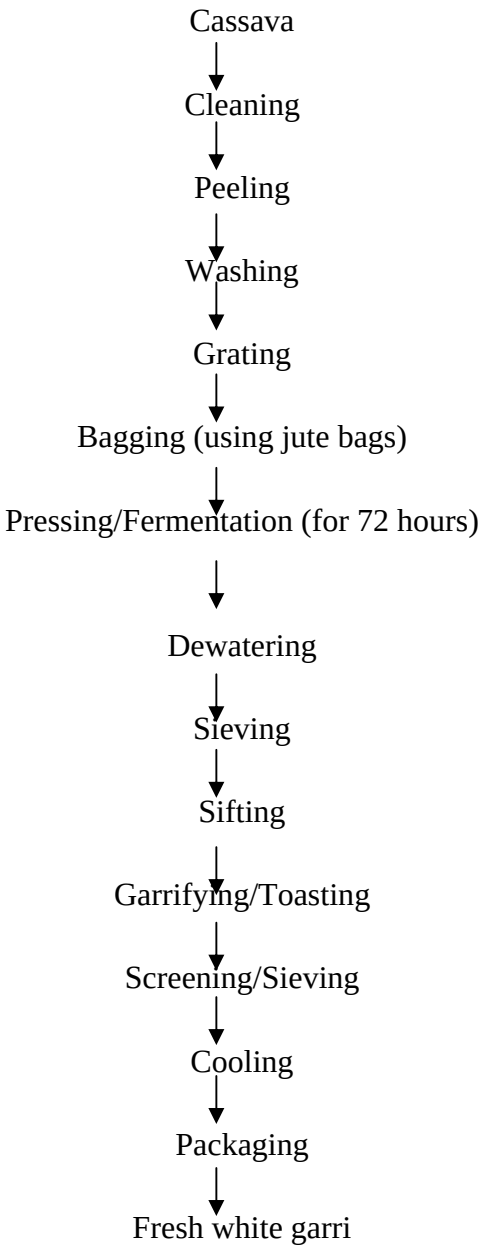

Figure 1. processing of "garri" from cassava roots.

2.3 Physicochemical analyses of garri

Loose density was calculated after gentling weighing 10 g of garri into a measuring cylinder (without tapping) and noting the volume occupied. Bulk density was determined after tapping the cylinder containing 10g of garri samples on a table (ca 5min) and noting the final volume using the method described by Yusuf, (2004) .Swelling index was determined using the method described by Oduro *et al* .,(2000).

Water absorption capacity, moisture content, protein, fat content, fibre, ash content, pH and total titratable acidity was determined using the method of Owoso *et al* .,(2000).

The hydrogen cyanide content was determined by the titrimetry distillation method [AOAC, 2004].

2.4 Sensory Evaluation

All the samples were coded as; AOU, BRT, CBN and REF. The sample was made to form garri dough (Eba), presented to 30 panelists. The panelists were given questionnaire to determine some parameters such as colour, taste, flavour, and overall acceptability. 9 point Hedonic scale was used for sensory evaluation of the above parameters .Cracker biscuit and water were served after sampling to minimize the carry over effects. (Akinjayeju, 2001).

3. Result and Discussion

The result of proximate composition of garri (Table I) showed variations in each nutrient. The protein content of the garri sample ranged from 1.77-2.27% in which sample CBN has the highest percentage 2.2%. The protein content of these samples was lower than in raw cassava as reported by Oluwole *et al* (2004). This reduction was as a result of processing method which has significantly affected the protein content of the garri.

The carbohydrate content of AOU was the highest while it ranged between 85.07-85.8 % in BRT and CBN. The variation could probably be due to an initial loss of soluble carbohydrate in preceding unit operations. The moisture content of the samples ranged 8-15%. Sample AOU which has the highest moisture content of 15% implies that the garri samples will not have a good storage potential.

The functional properties of the garri purchased showed that the swelling capacity, loose and bulk density (Table II and IV) were significantly higher than the reference sample.

The statistical analysis of the samples indicate that the fat content of AOU and CBN were 0.66 ± 0.01 and 0.65 ± 0.05% respectively, while that of BRT was 0.54 ± 0.17%; and these was as a result of effect of different processing techniques employed. Sample REF was seen to have the lowest percentage of ash 1.72 ± 0.05, while AOU and CBN were about the same value of 2.23 ± 0.01 and 2.23 ± 0.10 respectively.

It was observed that the pH, total titratable acidity of sample BRT correlated with reference sample (REF) with values of 6.6 ± 0.05 against 0.66 ± 0.01 and 0.18 ± 0.02 against 0.18 ± 0.02 respectively. Sample CBN has the highest value of 14.10 ± 0.02 water absorption. The water absorption capacity was significantly different from reference sample (Table III).

This value helps in contributing to the yielding and pasting characteristics of garri in dough making.

The reduction in pH values of garri were due to the activities of microoganism such as C*ornebacterium manihot, Geotriucm candida Lactobacillus spp,* which hydrolyzes starch to organic acids (mainly lactic acid) known to be responsible for the acidic nature of garri.

The cyanide content of CBN (8.9mgHCN/kg) was higher than AOU (6.9mg HCN/kg) but BRT has the lowest cyanide content of (5.4mgHCN/kg). However, the cyanide values were generally lower than the safe level (10mgHCN/kg) recommended by Food and Agricultural

Organization (FAO) and World Health Organization (WHO) according to Adindu *et al*, (2003)

The colour, taste and mouthfeel (Table V) values of garri showed that all test sample were significantly different from the reference sample. Also the Flavour value showed significant different for samples AOU & BRT. NO significant difference for sample CBN. However, the general acceptability was not significantly differ from the other two test samples, of which sample BRT was most preferred.

4. Sample Designation

Sample name	***Sample code***
Reference	REF
Bendel Garri	AOU
Ijebu Garri	BRT
Cotonou Garri	CBN

Table 1. Result of Proximate Composition of the Garri Samples

Samples	Percentage composition (%)					
	Protein	**CHO**	**Fats**	**MC**	**Ash**	**Fibre**
AOU	1.77 ± 0.02	86.75± 0.00	0.66 ± 0.01	15.10± 0.01	2.3± 0.02	0.71± 0.05
BRT	2.15± 0.05	85.07± 0.13	0.54± 0.17	10.15± 0.17	1.96± 0.11	0.55± 0.17
CBN	2.27± 0.01	85.80± 0.02	0.65± 0.05	8.01± 0.05	2.23± 0.10	0.61± 0.01
REF	1.46± 0.00	85.20± 0.02	0.65± 0.05	9.82± 0.13	1.72± 0.05	0.68± 0.05

KEY: *CHO=Carbohydrate, MC=Moisture conten**t***

5. Results of Functional Physicochemical Analysis of The Garri Samples

Table 2. Loose and Bulk density values for the garri sample

Samples	Loose density (g/ml)	Bulk density (g/ml)
AOU	0.58± 0.05	0.61± 0.05
BRT	0.53± 0.05	0.54± 0.05
CBN	0.59± 0.05	0.61± 0.05
REF	0.50± 0.01	0.53± 0.05

Table 3. Result of chemical properties of the garri samples

Samples	pH	WAC %	TTA %	HCN (mg/kg)
AOU	6.5± 0.05	13.7± 0.05	0.13± 0.02	6.9± 0.05
BRT	6.6± 0.05	13.5± 0.05	0.18± 0.02	5.4± 0.05
CBN	6.4± 0.01	14.1± 0.02	0.23± 0.01	8.9± 0.02
REF	6.6± 0.01	10.2± 0.02	0.18± 0.02	10.2± 0.02

KEY: WAC=Water Absorption Capacity,TTA=Total Titratable Acidity, HCN=Hydrogen cyanide

Table 4. Swelling profile of garri samples at room temperature (30± 2^0C)

Time (mins)	SAMPLES (VOL/ML)			
	BRT	AOU	CBN	REF
0	45.0± 0.01	39.5± 0.02	42.0± 0.02	-
5	51.0± 0.01	70.0± 0.02	67.0± 0.02	-
10	54.0± 0.01	85.0± 0.02	68.0± 0.02	-
15	06.0± 0.01	96.0± 0.02	90.0± 0.02	-
20	58.0± 0.01	96.6± 0.02	116.0± 0.02	-
25	59.0± 0.00	96.0± 0.02	116.0± 0.02	-
30	60.0± 0.00	99.0± 0.02	117.0± 0.02	-
35	61.5± 0.02	99.5± 0.02	117.0± 0.02	-
40	61.3± 0.02	98.1± 0.02	117.0± 0.02	23.0 ± 0.02
45	61.5± 0.02	98.3± 0.02	117.0± 0.02	23.0 ± 0.02
50	60.9± 0.02	99.9± 0.02	116.9± 0.02	20.0 ± 0.02
55	60.0± 0.02	100.5± 0.02	116.0± 0.02	20.0 ± 0.02
60	60.0± 0.02	105.7± 0.02	116.5± 0.02	19.0 ± 0.02

Table 5. Result of mean values for the Sensory Scores of samples

Samples				
Attributes	AOU	CBN	BRT	REF
Colour/ Appearance	7.80± 0.01	7.80± 0.01	8.20± 0.02	5.00± 0.01
Taste	7.00± 0.01	8.00± 0.02	7.20± 0.02	4.90± 0.01
Flavour	4.10± 0.02	7.30± 0.02	4.80± 0.00	7.20± 0.00
Mouth feel/texture	5.65± 0.02	6.75± 0.02	6.80± 0.00	4.95± 0.00
General acceptability	7.50± 0.02	8.20± 0.02	7.80± 0.00	7.20± 0.00
Total score	32.05	38.05	34.80	29.25
Mean score	3.205	3.805	3.480	2.925

6. Conclusion

From this study sample CBN compared favourably with reference sample in terms of the proximate and chemical properties. It also produce the most preferred (garri dough) and even when soaked in cold water and taken as a snack by consumers (panelist). The increased shelf life is also enhanced by thick polyethylene bags used for packaging which hinders oxygen entrance into the product thereby inhibiting growth of micro-organism which promotes spoilages. The polythene bag package also reduces the rate of moisture absorption from the environment by the garri samples which also helps to increase their shelf stability.

From the overall analysis the garri sample obtained are safe for human consumption considering their cyanide level.

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