

Full Length Research Paper

Chemical and sensory qualities of gari fortified with groundnut flour

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The effect of fortification of gari with different quantities of dehulled groundnut flour (19%, 15%, and 20%) on the sensory characteristics of gari was studied. Result showed that the chemical characteristics of the cassava mash started to change even after dewatering and fermentation (66.35% to 44.87% moisture for raw, dewatered and fermented cassava mash respectively). The ash content of the dewatered and fermented mash was also significantly higher (0.690%) than the raw sample (0.066%) at 0.05 significant level. The addition of the different levels of groundnuts also led to products with significant increase in the percentage fat content of the the gari samples (6.65% for 10% groundnut fortified), slight increase in protein and ash contents, but reduction in percentage carbohydrates (91.65% for unfortified gari and 87.44% for 10% fortified one). However the increase in the level of substitution resulted in gradual reduction of crude fibre content of the gari (0.650% for 10% fortification and 0.360% for 20% level of fortification). The carbohydrate content of the products was also reduced.

Keyword: Cassava, Gari, Groundnut Fortification, Sensory Qualities

INTRODUCTION

The starchy roots of cassava (*Manihot esculenta* Crantz) is a major staple root crop consumed in many sub-Saharan African countries, Asia and Latin America (FAO, 1998). Cassava tubers are traditionally processed by a wide range of methods which reduce their toxicity, improve palatability and convert the perishable fresh root into stable products. These methods consist of different combinations of operations such as peeling, chopping, grating, soaking, drying, boiling and fermenting. While all these methods reduce the cyanide level, the reported loss in cyanide content differs considerably due to type of analytical methods, the combination of methods and extent to which the processes are carried out (Tewe 1983).

Cassava tubers are processed into many products. These include garri, fermented (fufu) and unfermented starch, Lafun, Tapioca, Pupuru, alcohols, Citric acid, Chips, Lactic acid maltose, Malto-dextrin, Modified and acetylated starches (Balagopelan, 2002, Okaka, 2005).

Garri is free flowing creamy white or yellow granular partially gelatinised flour produced from cassava (Cardoso, et al., 1998). Gari is a creamy-white, granular flour with a slightly fermented flavor and a slightly sour taste made from fermented, gelatinized fresh cassava tubers. Gari is widely known in Nigeria and other West African countries. (IITA, 2005) it is produced through the process of peeling, washing, grating bagging and pressing or dewatering, (by the use of hydraulic press), fermentation, sieving, garification (frying), cooling and packaging. It is widely consumed because of its long shelf as well as its ease of preparation when compared to other foods products from cassava (Sanni et al., 2008).

Gari is usually consumed by mixing with boiling water to form a stiff paste and eaten with stews, soups as accompaniment. It may also be eaten with fried or roasted fish, coconuts, palm kernel, groundnuts when mixed with cold water with or without the addition of sugar or salt. Sometimes gari is eaten dry as snack by children.

It is therefore necessary to improve the nutritional content and flavour of gari and produce a single product which will have an improved nutritional content and also

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Table 1. Effect of dewatering and fermentation on grated cassava mash

Treatments	Moisture Content (%)	Protein content	Crude fibre content (%)	Fat content (%)	Ash content (%)	Carbohydrate content (%)	pH
R CM	66.350 ^a	0.019 ^{cd}	0.483 ^e	0.000 ^d	0.066 ^b	33.600 ^f	7.820 ^b
DFCM	44.870 ^b	0.016 ^d	0.560 ^c	0.0160 ^d	0.690 ^a	54.420 ^e	5.070 ^c

RCM: Raw cassava mash

DFCM: Dewatered/ fermented cassava mash

the flavour which ordinarily would have been obtained from the consumption of two different food items.

MATERIALS AND METHODS

Fresh Cassava roots (10,000g) obtained from Lusaida market in Ogun State Ngeria were washed, peeled and washed to remove sand and pieces of unwanted materials. They were grated using a locally fabricated Sahara cassava grater to reduce their particle size. The grated cassava mash was scooped into a porous polyethylene bag tightly tied and placed in a hydraulic press to dewater. The dewatered mash was left to ferment for 48 hours under ambient conditions. The fermented mash was sieved and stored for subsequent processing.

2000g of cleaned and sorted raw groundnuts were also dehulled and milled using electric blender into flour and stored separately. A batch of 2000g of the dewatered fermented cassava mash was garified at a time with the addition of 10%, 15%, 20% of the milled raw groundnut flour respectively. Another batch of 4000g dewatered and fermented cassava mash was garified and used as control.

CHEMICAL ANALYSES:

The Moisture Content was determined using procedure described by AOAC, (1990).with an AND-MF-50 moisture analyzer at 105°C. The moisture content of each sample was determined by weighing 5g of the sample into a pre-weighed aluminium drying dish. The sample was then dried to constant weight in moisture analyzer at 105°C for about 45minutes after which the moisture content was read off and recorded.

The pH of the Gari samples were determined using the methods described by Kirk and Sawyer, 1991). After standardizing with buffer solutions at pH 4 and 7, the pH of the gari samples was determined carefully measuring out 10g of each gari sample into a clean beaker and the pH measured by placing the electrode into the samples to read the ion concentrations.

The Protein Content was determined using a Foss Tecator™ protein digester and KJECTEC 2200 distillation apparatus (Kjeldahl method) according to the procedure of AOAC, (1990). Concentrated H₂SO₄ (12cm³) and 2 tablets of catalyst were put into a Kjeldahl digestion flask containing 5g of the sample. The flask was placed in the digester in a fume cupboard and switched on and digestion was done for 45 minutes to obtain a clear light green coloured solution. The digest was distilled after 4% boric acid, 20% Sodium hydroxide solutions were automatically metered into it in the KJECTEC 2200 distillation equipment until distillation was completed. The distillate was then titrated with 0.1M HCl.

Fat, Fibre and Ash contents were also determined using standard methods has described by Kirk and Sawyer, 1991.

Sensory evaluation of the samples of gari was carried out by 20 trained panelists using a nine point hedonic scale (9 -Like extremely; 8 -Like very much; 7 -Like moderately; 6 -Like slightly; 5 - Neither Like nor Dislike; 4 - Dislike slightly; 3 - Dislike moderately; 2 - Dislike very much and 1 - Dislike extremely) and Duncan multiple comparison test as described by Weaver and James, (2003) to determine the preference and acceptability of the garri samples in terms of Aroma, Taste, Flavour, Colour and Overall acceptability.

RESULTS AND DISCUSSION

The effect of dewatering and fermentation on grated cassava mash is shown in Table 1. As expected dewatering and fermentation resulted in reduction in the moisture content of the mash (66.35% for raw mash to 44.87% for dewatered and fermented cassava mash). The protein content of the dewatered and fermented mash (although insignificant) was also lower than that of the raw mash probably due to leaching of the nutrient into the water during the dewatering process. This is in line with (Okaka, 2005) who reported reduction in nutrient content of some roots and tubers products during processing. On the other hand the treatment resulted in slight increase in the crude fibre content (0.48 to 0.56 percent for raw cassava mash and dewatered and fermented mash respectively). The ash and carbohydrate

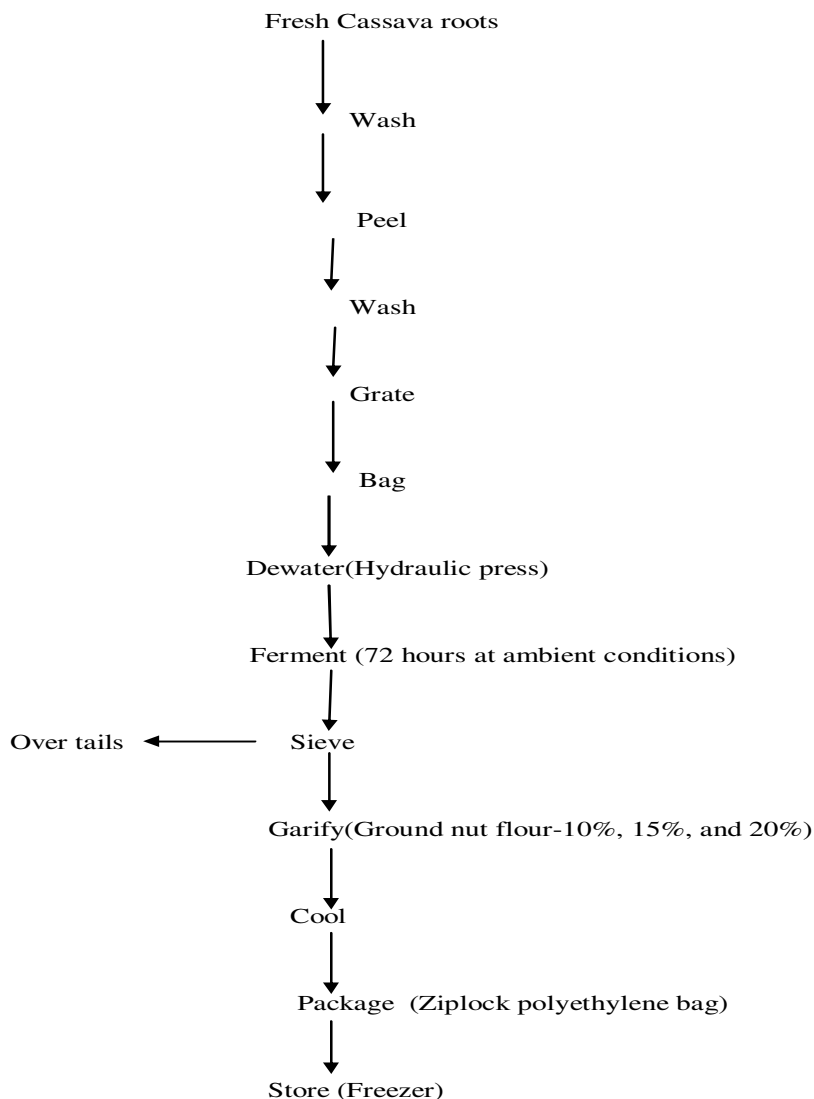


Figure 1. Production of gari fortified with groundnut flour

contents of the mash also increased significantly from 0.06 to 0.69 percent and 33.60 to 54.42 respectively, as a result of the increase in the total solids in the dewatered mash.

Table 2 shows the effect of fortification on the chemical composition of the cassava samples. Results showed that there was significant difference between the fat content of the unfortified (0.024%) and the fortified gari (6.20% for 10% groundnut fortified gari). This trend was also observed for the 15% and 20% levels of substitution. This could have been due to the fact that groundnut has a high percentage of fat as it is an oil bearing seed (Srilakshmi, 2006); Okaka, 2005). There was however no significant difference in the protein content of the garri as a result of fortification (0.021% for unfortified garri and 0.024% for 10% fortified gari). Fortification also resulted

in decrease in the crude fibre and carbohydrate content of the gari as the level of fortification increased. The carbohydrate content showed a gradual reduction as the level of substitution increased (87.48% for 10% substitution to 83.24% for 20% substitution). These reductions could have been due to the fact that as the cassava mash was reduced and replaced with groundnut mash (which had lower fibre and carbohydrate contents than the cassava mash), the percentage of these nutrients in the resultant product became lower. These reductions are in accordance with Uzopeters et al., (2008) who reported a reduction in the crude fibre and carbohydrate content of kokoro substituted with different levels of defatted groundnuts and soybean cake flours.

The result of the Duncan multiple range test (Table 3) carried out to determine the variability of some of the

Table 2. effect of fortification on the chemical characteristics of gari

Treatment	Moisture Content (%)	Protein Content (%)	Crude Fibre Content (%)	Fat Content (%)	Ash Content (%)	CHO Content (%)	pH
Unfortified Gari	8.18 ±0.20c	0.021 ±0.001cd	0.704 ±0.001a	0.024 ±0.002d	0.015±0.01c	91.65±0.140a	8.59 ±0.001a
10% G.nut Gari	6.32±0.020e	0.024±0.005c	0.650±0.002b	6.200±0.010c	0.029±0.040c	87.440±0.000b	6.65±0.010c
15% G.nut Gari	4.930±0.030f	0.029±0.001b	0.560±0.020d	8.540±0.020b	0.065±0.050b	86.450±0.040c	6.60±0.010d
20% G.nut Gari	6.660±0.010d	0.042±0.020a	0.36±0.020f	10.530±0.050a	0.490±0.002b	83.240±0.490d	6.68±0.005c

Table 3. effect of fortification on the sensory characteristics of gari

Treatments	Aroma	Colour	Taste	Overall acceptability
Unfortified Gari	7.4±0.3a	7.4±0.3a	7.4±0.2a	7.6±0.2a
10% G.nut Gari	7.6±0.2a	7.5±0.3b	7.0±0.3b	7.7±0.2a
15% G.nut Gari	7.2±0.2a	6.9±0.3a	7.1±0.3a	7.2±0.4a
20% G.nut Gari	7.9±0.2a	7.4±0.3b	7.9±0.4a	8.1±0.2a

sensory characteristics of both the unfortified and fortified gari showed that in terms of aroma and taste, 20% groundnut fortified gari was preferred, 10% groundnut fortified gari was the most preferred in terms of colour. However there was no significant difference in the overall acceptability of the various samples.

CONCLUSION

The addition of groundnuts to cassava mash in gari fortification yielded products (10%, 15% and 20% substitution levels) which had better nutritional and sensory characteristics than the unfortified. The commercial production of the product may also be embarked on to further add to the variety of snack drinks available.

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