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Effect of Methods of Preparation on the Nutrient Composition of Some Cassava Products—Garri (Eba), 'Lafun' and 'Fufu'

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ABSTRACT

Changes in the nutrient composition of three cassava products, Garri, Lafun and Fufu, as affected by preparation methods, were studied. Proximate analysis was carried out on the raw sample and sample of the cooked foods for moisture content crude protein, energy, sugar, iron, calcium and phosphorus. There was a slight and variable decrease in protein content of the products with Garri having the lowest amount of protein. The gross energy values of Garri, Lafun and Fufu were found to be 381·5 kcal, 357·7 kcal and 180 kcal, respectively, compared with 174·0 kcal for the raw sample.

INTRODUCTION

Cassava (*Manihot utilissama*) belongs to the genus manihot of the natural order *Euphorbiaceae*. It is said to have been introduced from Brazil, its original home, to West Africa by the early Portuguese explorers. It is a predominant crop of Southern Nigeria. Cassava is one of the tropical root crops with the very high yield per acre of from 4 to 12 tons or more (Oyenuga, 1968).

The cultivation and use of cassava has assumed considerable importance in many parts of West Africa, particularly as food for man and as a feeding

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stuff for farm livestock. Cassava is a cheap source of carbohydrate and it forms one of the stable foods for Nigeria. It can be processed into a number of acceptable foods. Notable among the food-forms into which cassava is processed are:

(a) *Fufu*
This is a product of peeled cassava which is soaked and allowed to ferment for about 5 days. The fermented cassava is then mashed and sieved and allowed to settle. The paste is known as 'Fufu'. The paste is then thinned down and put on a low fire with constant stirring, to prevent burning, until it is cooked to a thick jel.

(b) *Garri*
This is another form which involves the grinding of cassava and which is allowed to ferment for about 3 days before the water is squeezed out. The product is then roasted into dry flour. This flour is known as garri which can be eaten in this form or made into 'Eba'. 'Eba' is derived from the mixture of boiling water and garri to form a soft paste.

(c) *Lafun*
Lafun is also from cassava which is soaked for 3 days and grated and allowed to dry in the sun. The product is then ground into a very fine powder form. An estimated amount of boiling water is mixed into an estimated amount of Lafun flour. It is allowed to cook and turned constantly to prevent any lump formation and burning.

The residues or waste produced from cassava are utilized for feeding livestock in many parts of the producer countries. Products of cassava are low in protein, oil, ash, crude fibre, but are valuable sources of carbohydrate (Oyenuga, 1968).

The undesirable aspect of cassava is that cyanogenic glucosides—Linamarin and Lotanstralin—occur in variable proportions in it. These cause toxicity through hydrolytic breakdown and the release of hydrocyanic acid. Cyanide has been implicated in many disease conditions, such as tropical ataxic neuropathy (Oshuntokun, 1973), endemic goitre, (Ekpechi, 1973) and diabetes (Davidson, 1979) of which incidence is high in an area standing on the Zaire/Zambian border (a predominantly cassava-eating zone). Also, injuries to the central nervous system (CNS) have been reported by Mouzas *et al.* (1983) through cyanide toxicity. Ortega & Creek (1983) reported nausea, hypertension, cyanosis, shock, stupor, coma and respiratory failure as being associated with cyanide toxicity.

However, the glucosides are reduced to safe levels by the traditional methods of processing and preparation of cassava for consumption. Such methods include peeling, grating, fermentation, frying, sundrying and

boiling. Cooking methods have been reported to bring about highly complex reactions which have direct effects on the nutrient composition of food (Oke, 1969).

MATERIALS AND METHODS

Materials

Freshly harvested sweet cassava roots were purchased from various stalls in Sango Market which is the principal cassava depot. This raw cassava was used to prepare Garri, Lafun and Fufu using the traditional Yoruba methods as illustrated in Fig. 1.

The cassava was peeled and cut into smaller pieces which were thoroughly and evenly mixed together. The diced cassava was divided into three, each portion going into the making of Garri, Lafun and Fufu, respectively.

Triplicate samples of each of these cassava products were dried in the oven at about 100°C. After drying, each sample was milled into a smooth-textured powder and stored in screw capped bottles ready for analysis. Each of the products was cooked and samples were oven-dried ready for analysis.

Method

Proximate analyses of the samples were carried out using the official methods of analysis as prescribed by the Association of Official Analytical

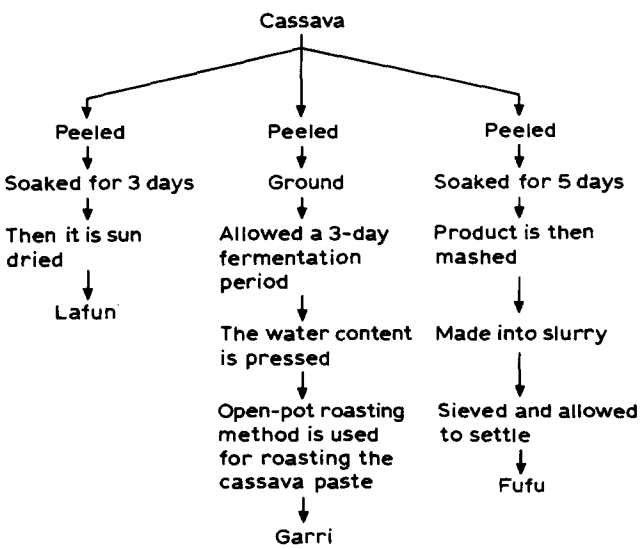

Fig. 1. Stages showing the production of Lafun, Garri and Fufu from Cassava.

TABLE 1
Nutrient Quality of Cassava and its Products

Nutrients	*Raw cassava*	*Garri*	*Cassava flour (Lafun)*	*Fermented cassava (Fufu)*
% Moisture	63·0 ± 2·4	10·9 ± 0·5	12·9 ± 1·5	55·5 ± 3·9
% Ash	1·0 ± 0·0	1·3 ± 0·0	1·7 ± 0·0	0·9 ± 0·0
Total starch (g/100 g)	4·1 ± 2·5	4·1 ± 7·1	1·9 ± 6·3	39·0 ± 5·0
Sugars (mg/100 g)	3·4 ± 0·0	3·9 ± 0·1	3·4 ± 0·2	1·9 ± 0·0
Crude protein (g/100 g)	1·2 ± 0·0	0·9 ± 0·0	1·1 ± 0·0	1·0 ± 0·0
Energy (kcal/100 g)	174·0 ± 5·0	381·5 ± 10·0	357·7 ± 6·0	180·0 ± 6·6
Iron (mg/100 g)	2·5 ± 0·0	1·6 ± 0·0	1·4 ± 0·0	1·2 ± 0·0
Calcium (mg/100 g)	70·0 ± 2·0	48·0 ± 3·0	44·4 ± 3·0	21·1 ± 2·0
Phosphorus (mg/100 g)	48·0 ± 4·0	82·0 ± 5·0	40·6 ± 5·0	26·3 ± 1·9

± Mean Standard Deviation.

Chemists (AOAC) procedures (1980). All samples were analyzed in duplicate, giving an overall record of six readings each for Garri, Lafun and Fufu (that is, two analyses on each of the triplicate samples of Garri, Lafun and Fufu).

The samples were analyzed for energy by bomb calorimetry, total nitrogen using the micro Kjeldahl method, for sugar content using the modified method of Dubois *et al.* (1956) and for starch (Kent *et al.*, 1967). The analyses of iron, calcium and phosphorus were done using the absorption spectroscopy method of AOAC (1980). Recovery tests were done on the minerals to evaluate the dependency of the analytical method which was rated at 92%. The mean and standard deviations were calculated.

RESULTS

A summary of the results is presented in Table 1. The raw cassava and the fermented cassava (Fufu) had low starch because of the water volume while Garri and Lafun had high starch values because they had either been fried, dried or sun-dried. Garri, which is already fried, is now edible and could still be used to produce other meals. Lafun is sun-dried but has to be cooked into a paste before consumption. However, the elimination of the water content during sun-drying accounts for the higher starch level as compared to Fufu which contains a high water level.

Table 2 illustrates the nutrient quality of the cooked cassava products. The low levels of all the nutrient values of Fufu could be attributed to the much longer soaking period of 5 days compared to Garri and Lafun

TABLE 2
Nutrient Content of Eba (Garri), Lafun and Fufu

Nutrient	*Eba (Garri)*	*Cooked Lafun*	*Cooked Fufu*
% Moisture	72·2 ± 5·9	73·3 ± 4·4	78·9 ± 3·8
Carbohydrate (g/100 g)	25·2 ± 3·1	24·3 ± 0·0	13·7 ± 1·1
Protein (g/100 g)	0·03 ± 0·0	0·03 ± 0·0	0·03 ± 0·0
Energy (kcal/100 g)	125	120	49
Iron (mg/100 g)	0·5 ± 0·0	0·5 ± 0·0	0·3 ± 0·0
Calcium (mg/100 g)	17·1 ± 2·0	16·0 ± 2·3	6·6 ± 0·9
Phosphorus (mg/100 g)	28·1 ± 4·4	13·9 ± 1·2	10·0 ± 1·3

± Mean Standard Deviation.

which were soaked for 3 days. This is also coupled with the loss of nutrients from the discarded water of Fufu. If an average adult Nigerian man could consume about 700 g of each of these meals (Ajileye, 1985), then Eba, Lafun and Fufu would contribute 29·2%, 28·0% and 11·5%, respectively, of the recommended energy requirement of 3000 calories (Passmore *et al.*, 1974). The protein contribution is negligible while the iron contribution is 54·5% for Eba and Lafun, respectively, while Fufu will contribute 32·7% of the recommendation of the 5–9 mg iron per day (Passmore *et al.*, 1974).

DISCUSSION

The soaking, pressing and straining accounts for the appreciable loss of minerals and the high starch content of Garri and Lafun is a result of the elimination of water. Nevertheless, these culinary preparatory procedures have the value of reducing hydrocyanic acid to a safe level as this substance, if consumed as a large dose, has been proved by Oshuntokun (1973) to be responsible for the situation known as ataxia-neuropathy—a degeneration of the central nervous system. Also, because of its very poor protein value, protein supplementation of cassava should be encouraged.

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