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PROXIMATE COMPOSITION AND CYANOGENIC CONTENT OF *GARRI* MADE FROM DIFFERENT FERMENTATION TIME

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Abstract
A popular and familiar food product made from cassava is garri, which is eaten in almost every household in Nigeria and West Africa but must be consumed with other foods which supply missing nutrients to the diet. Cassava tuber was harvested, peeled, washed, and ground to form a mash/pulp which was later bagged, tightened and subjected to fermentation (1-day batch, and 5 days batch). Standard procedures were employed to produce Garri samples, which were divided into two samples (samples A and B) and later analyzed for macro-nutrient and cyanogenic content. Sample A was garri that underwent 1 day of fermentation, while sample B underwent 5 days of fermentation. Results of the laboratory analysis showed a moisture amount of 9.81% and 10.68%, although lower values are desired to ensure longer quality. The fat present in the two samples was low, being 0.53%, and 0.40% respectively. Carbohydrate amounts were almost the same (84.02% and 82.50%) in both samples. The hydrocyanic acid was higher (106.25mg/kg) in sample A than in sample B (90.00mg/kg), owing to the difference in the period of fermentation. Cyanide poisoning is not common in Nigeria.

Keywords: *Garri*, Cyanide, Proximate Composition, Fermentation

Introduction

Foods (like *fufu*, and *garri*) made from cassava are found on almost every table in Nigerian households. The study investigates the effect of fermentation time on the proximate composition and cyanogenic content of *garri*, being a main source of energy, but has low amounts of protein and other nutrients (Edem *et al.*, 2001), a reason behind its constant supplementation with other nutrient-dense foods.

Garri, in a limited sense, is known to be a good source of calories for daily workouts (Edem *et al.*, 2001). When supplemented with milk, sugar, and groundnut mixed with water, it contains minerals and vitamins (Edem *et al.*, 2001). Another cassava product that stands out is *Abacha*, an indigenous Igbo delicacy, prepared by grating cooked cassava, mixing and serving it with fish, garden egg leaves, '*ponmo*', '*ukpaka*', and native broth. This improves the nutrient content to include iron, manganese, zinc, potassium, vitamin A, vitamin C, thiamine, etc (Edem *et al.*, 2001).

Several health benefits accompany the consumption of garri, including:

- **A boost to Digestion Process**: The fibre content prevents constipation, and a feeling of satiety guards against frequent eating, and reduces the incidence of obesity. It can pass for a weight control diet (Finelib Technologies, 2017).
- **Improves Heart Health**: The complete absence of unhealthy fat in *garri* makes it ideal for heart health, and reduces the risk factor for diabetes, cancer and other cardiovascular diseases (Finelib Technologies, 2017).
- **Presence of Resistant Starch**: This special starch does not get fully

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absorbed in the digestive tract. It is a unique starch that benefits the body by removing some cholesterol particles (by sticking to them and eliminating them) from the body. It acts like soluble fibre and helps to regulate blood glucose (Finelib Technologies, 2017).

- **Control Measure for Celiac disease**: The complete absence of gluten in *garri* makes it ideal or suitable for patients with celiac disease, and those who are intolerant to gluten (Finelib Technologies, 2017).
- **Nutrient Composition**: According to Finelib Technologies, (2017) *garri* (100g portion) is composed of nutrients, distributed as follows: fibre (48g), protein (1.1g), fat (1.0g), energy (330 kcal), carbohydrate (80g), calcium (40mg), and iron (1.5mg). An added advantage is that cholesterol and sodium are completely absent in garri (Finelib Technologies, 2017).
- **Nutrient Supplementation**: Garri is combined with a variety of foods like *kulikuli*, sugar, milk, and groundnut (all mixed with water), making it a balanced diet. It can also be prepared with hot water to produce *eba* (a thick sticky paste), which is eaten with different soups (e.g. *efo riro, egusi, ofe onugbu*, *Edikaikong*) enriched with fish, meat, crayfish, vegetables, etc (Finelib Technologies, 2017).

The points above are highlighted to encourage families to continue to use this food product.

Some chemical compounds that contain a carbon-nitrogen (CN) bond are called cyanide. It is a poisonous substance found in unsuspecting plant foods (in small amounts), foods like lima beans, spinach, soy and almonds. In Africa, it is a significant component of cassava, but after processing it into different products (e.g. *garri*), the cyanide content is reduced drastically. As such, it is very rare to hear of cyanide poisoning cases in Nigeria. (Citroner, 2018)

Some harmful variations of cyanide are listed: hydrogen cyanide (HCN), potassium cyanide (KCN), cyanogen chloride (CNCl) and sodium cyanide (NaCN). Non-dietary poisoning of this substance occurs during a building fire. (Citroner, 2018)

Cyanide is of importance to this study, to make people aware that they should be safety conscious of what they eat and what they inhale.

Materials and Methods

Cassava tubers used for the study were bought from Emure- Ile market, Owo, Ondo State and were processed at *garri* processing mill, Isinkaye, Owo, Ondo State.

Methods

Based on the local cassava processing method, fresh cassava tubers were peeled, washed properly to remove all dirt and then milled. The milled pulp was put in a sack and the sack was pressed with a hydraulic jack between a wooden platform. It was done for a day and 5 days to express excess liquid from the pulp while it was fermenting. The fermented lumps were crumbled by hand, and it was sieved. After sieving, the fine pulp was then roasted in an iron pan over the fire and the *garri* product was packed into a sack bag after cooling.

Proximate Analysis

The proximate composition of the *garri* samples was determined by AOAC (2000) procedure. Moisture was determined by oven drying set at 105ºC for 24 hours. A Muffle furnace was used to achieve ashing. The crude fibre was done by the Weende method (AOAC 2005). Fat was determined by Soxhlet extraction (AOAC, 2000). Protein was estimated by the micro-

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Kjeldahl procedure. Carbohydrate was estimated by difference (100 - x), where x is the sum of other nutrients. Cyanide was determined by titration (Breuer et al., 2011).

Result

Table 1 presents the result of the proximate analysis of two *garri* samples (A and B), fermented for 1 day and 5 days respectively. The moisture content was between 9.81% and 10.68%. Ash contained in the samples ranged from 0.66% and 0.20%. Fibre was up to 2.88% and 3.42%. Fat was as low as 0.53% and 0.4%, in that order of samples. Carbohydrate content was pegged at 84.02% and 82.50%. Sample A was noticed to contain more cyanide (106.25mg/kg) than sample B (90mg/kg).

Table 1: Cyanide and Proximate Composition of *Garri* Sample

Parameters	Sample A	Sample B
Moisture (%)	9.81±0.01[b]	10.68±0.01[a]
Ash (%)	0.66±0.01[a]	0.20±0.01[b]
Fibre (%)	2.88±0.01[b]	3.42±0.01[a]
Fat (%)	0.53±0.01[a]	0.40±0.01[b]
Protein (%)	2.10±0.02[b]	2.80±0.01[a]
Carbohydrate (%)	84.02±0.01[a]	82.50±0.02[b]
Cyanide (mg/kg)	106.25±0.03[a]	90±0.01[b]

Values are significantly different (P<0.05) in each row

KEY:

A: represent 1-day fermentation
B: represent 5 days of fermentation

Discussion

The study looked at how fermentation duration will affect the nutrient value and cyanide content of *garri*. The moisture content was similar, less than 11% for both samples. Ukpabi and Ndimele (1990) reported that higher moisture content will make *garri* samples unable to store for up to 6 months, and mould infection will likely occur.

Ash content available in the samples was very low (0.66% and 0.22%), an indication that minerals are in short supply. The fat and carbohydrate contents were almost the same when compared side by side. Ekwu and Ehirin (2008) mentioned that the addition of palm oil during the processing of *garri* will enhance the flavour, and colour and add vitamin A to the product.
Longer fermentation time (5 days) resulted in a little increase in fibre (3.42%) and protein (2.80%) for sample B. Although many important nutrients are lacking in garri, and where they exist, it is in little quantity. This emphasizes the point that *garri* must always be supplemented with other nutrient-dense foods.

Cyanide found in the samples was in the range of 106 and 90mg/kg, decreasing with a longer fermentation time frame. Cyanide is known to be poisonous and may have a deleterious effect on cassava consumers, especially when eaten raw or improperly processed. Low concentrations of cyanide can cause acute intoxication with symptoms like stomach pain, dizziness, vomiting, diarrhoea and headaches (CCDN, 2006).

Conclusion

The study analyzed the cyanide and proximate composition of *garri*, noting that a moderate amount of carbohydrate was present, and the samples contained low amounts of ash, fat, carbohydrate, cyanide and protein. Cyanide toxicity could arise from the consumption of improperly processed *garri*. The food product is ideal for consumption and it is always supplemented with other foods with high nutrient profiles.

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Recommendation

Food fortification should be employed to produce new varieties of garri, with improved flavor, appearance, and nutrient composition.

References

AOAC (2000). Official Methods of Analysis, Association of Official Analytical Chemists, Washington, DC, USA, 17th edition.

AOAC (2005)., Fiber (Crude) in Animal Feed and Pet Food, Official Methods of Analysis of AOAC International, 18th edition (2005), Chapter 4, pp. 46-47, Gaithersburg, MD.

Breuer, P.L., Sutcliffe, C.A., Meakin, R.L. (2011). Cyanide measurement by silver nitrate titration: Comparison of rhodanine and potentiometric endpoints. *Hydrometallurgy*, 106(3):135-140

Citroner, G. (2018). What is Cyanide Poisoning? Medically reviewed by Elaine K. Luo, M.D., https://www.healthline.com/health/cyanide-poisoning

CCDN. (2006). Cassava cyanide disease network (CCDN)

Edem, D.O., Ayatse, J.O.I. and Itam, E.H. (2001). Effect of Soy Protein Supplementation on the Nutritive Value of *Gari* (*farina*) from *Manihot esculenta*. Elsevier Science Ltd. Food Chemistry, 75(1): 57-62

Ekwu, F. C. and Ehirim, C. (2009). Comparative evaluation of *garri* samples produced from fresh cassava roots and dried cassava chips. *Nigerian Food Journal*, 26(2): 47

Finelib Technologies (2017). https://www.finelib.com/about/Nigeria-food-produce/health-benefits-of-processed-cassava--garri/202

Ukpabi, U.J. and Ndimele, C. (1990). Evaluation of the quality of *Gari* produced in Imo State. *Nigerian Food Journal*, 8:105-110.