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Effect of Farmentation on the Production and Nutritional Composition of Cassava *(Manihot Esculenta Crantz)* Flour Samples

Karimu Olajubu Ayotunde[1], Seyifunmi Oyedele Elliot, Ph.D.[2]

[1]Senior lecturer at the Department of Pharmaceutical Technology Rufus Giwa Polytechnic, Owo

Email- karimuayotunde01@gmail.com

[2]Principal lecturer at the Department of Science Laboratory Technology (Biochemistry unit) Rufus Giwa Polytechnic, Owo

Email- seyielliot2015@gmail.com

ABSTRACT

Cassava (*Manihot esculenta crantz*) is a common, accessable and affordable food source, that is highly rated and has been providing different kinds of food across the globe with required carbohydrate dietary. In this research, the cassava tubers used were gotten from Isuada Marked Owo Local Government Area Of Ondo State Nigeria. It was washed before peeling and after. They were cut into smaller pieces and were divided into two portions. One part was fermented under room temperature for 72hrs and then brought out, drain and sundried while the second portion was sundried without fermentation. The resultant products were milled separately into powder and were kept in an airtight container in preparation for the analysis. The two cassava flour samples (Fermented cassava flour FCF and unfermented cassava flour UCF), were used. This study evaluated the proximate, some mineral compositions and phytochemical properties of cassava flour samples produced from cassava tubers. Investigations showed that both cassava flour samples contained about 10 % FCF and 9% UCF moisture, 2–3 % crude protein, approximately 1% crude fat, 2–3% crude fibre, 5 and 4% ash, 77 and 78% carbohydrate. Alkaloids, protein and carbohydrate were very much present in the two samples while saponnis, flavornoids ete were absent, the study also reveal that the both samples contained appreciable amount of magnesium, sodium and calcium.

Keywords: cassava, farmented, unfamented, flour, proximate analysis, mineral composition

INTRODUCTION

The tubber part of cassava (Manihot esculenta crantz) is one of the most utilized source of starch asides rice and maize (Wanapat and Kang, 2015). Globally, the use of cassava root is highly adopted because of divergent product lines which are starch, animal feed, chips and flour (Abong et al 2016). The increase in uses of cassava root is a major concern with the aim of ensuring sufficient distribution of carbohydrates and increase standards of living. (Abong et al 2016).

The associated cyanogenic glucosides limited the spread of cassava root especially among educated consumers (Olapade et al 2014). Cassava products are few of the major staple food in africa especially in Nigeria. Cassava is recently gainning more popularity from its subsistent form to a commercial form in Nigeria. This commercial popularity is due to the fact that it has been dicovered as a cheap source of dietary carbohydrate which could be transformed into various forms of foods. Cassava is a drought-tolerant crop cultivated in tropicals and subtropical regions (El-Sharkawy, 2007).

In nigeria and other developing countries, cassava serves a major role in agriculture, mostly in sub-Saharan Africa. Its ability to be available for longer period in the year enables it to be usefull in fightin food insurficiency. Cassava can be resoursefull for farmers because of its production for both subsistent and commercial purpose (Stone, 2002). Moreover, cassava is one of the sources of raw materials for diferent production companies such as starch, flour and ethanol industries.

Nigeria produces above 50 million (MT) of cassava yearly, which makes nigeria one of the highest producer globally (FAO, 2013). Cassava (Manihot esculenta Crantz) product has been considered as instant foods in saveral countries. It originated from Latin America, about 4000 years ago (Akinpelu et al 2011). And it was brought to Africa through European traders who came to Central America for food security purposes and for the extraction of starch (Akinpelu et al 2011). Its tubers are the most popular part for consumption, sometimes the leaves can be consumed as herbs. Because of its high water content, Freshly harvested cassava root is bound to deteriorate almost immediately after harvest. hence, the best way to increase the shelf life of cassava is by drying and milling into powder (Falade and Akingbala, 2010).

The aim of the study is to evaluate the nutritional composition of fermented and unfermented cassava flour samples.

MATERIALS AND METHOD

SAMPLE AUTHENTICATION.

Matured cassava roots were identify and bought from Isuada market in Owo Local Government Area Of Ondo State Nigeria. It was taken to environmental unit of Science Laboratory Technology Department Rufus Giwa Polytechninc Owo for authentication.

MATERIALS

The materials used in this study were : cassava tubbers, glasswares, mortal and pestle, laboratory oven, mulfle furnance, soxhlet apparatus, and all chemical used are of analytical grade.

SAMPLE PREPARATION

In this study, the cassava tubers used were gotten from Isuada Marked Owo Local Government Area Of Ondo State Nigeria. It was washed before peeling and after. They were cut into smaller pieces and were divided into two portions. One part was fermented under room temperature for 72hrs and then brought out, drain and sundried while the second portion was sundried without fermentation. The resultant products were crushed with mortal and pestle before beeing milled separately into powder and were kept in an airtight container in preparation for the analysis. The two cassava flour samples (Fermented cassava flour FCF and unfermented cassava flour UCF), were used for proximale analysis, mineral analysis and phytochemical screaning

METHODS

Protein, fats, crude fiber and ash were determined according to the AOAC (1990) procedures. Total carbohydrates were calculated by differences. The moisture content in this work was carried out in line with AOAC (2000). The protein content was done by calculating the nitrogen content using micro-Kjeldahl method (N=6.25). Ash content was determined by ashing in a mufle furnace at 600 ^{0}C for 4hrs. Crude lipid analysis was done with Soxhlet apparatus as described by (AOAC, 2000), and crude fibre was determined by using deffarted samples as described by (AOAC. 2000,). And lastly the carbohydrate content was calculated.

The mineral elements Na, Mg, Ca, K, Fe of the two samples (FCF & UCF) using Perkin-Elmer Atomic absorption spectrophotometer 2380 were determined according to AOAC (2000).

The phytochemical screaning was carried out in the laboratory according to the methods described by sofowora 1980 and Harbone, 1973.

RESULTS

TABLE 1

RESULTS OF PROXIMATE ANALYSIS OF FARMENTED AND UNFERMENTED CASSAVA FLOUR (%)

S/N	NUTRIENTS	FCF	UCF
1	MOISTURE	10.530±0.04	9.524±0.03
2	ASH	5.455±0.02	4.478±0.04
3	CRUDE FAT	0.996±0.002	0.993±0.001
4	CRUDE FIBRE	2.777±0.01	3.011±0.05
5	CRUDE PROTEIN	2.320±0.01	3.050±0.03
6	CARBOHYDRATE	77.992±0.42	78.944±0.07

TABLE 2

RESSULTS OF THE MINERAL ELEMENTS OF FARMENTED AND UNFARMENTED CASSAVA FLOUR (PPM

S/N	NUTRIENTS	FCF	UCF
1	Na	71.500±0.03	68.500±0.001
2	Ca	32.800±0.01	38.400±0.05
3	Mg	71.00±0.05	68.500±0.009
4	Fe	2.120±0.01	2.645±0.01
5	Mn	0.642 ±0.03	0.695±0.01

RESULT OF PHYTOCHEMICAL SCREENING OF FERMENTED AND UNFERMENTED CASSAVA FLOUR

S/N	NUTRIENTS	FCF	UCF
1	ALKALOIDS	++	++
2	CARBOHYDRATES	++	++
3	PROTEIN	++	++
4	PHYTOSTEROLS	-	-

5	GLYCOSIDES	-	+
6	SAPONNINS	-	-
7	TANNINS	-	-
8	PHLOBATANNINS	-	-
9	TERPENOIDS	-	-
10	FLAVONOIDS	-	-
11	STEROIDS	-	-

++ (Very present), +(present), - (Absent).

PROXIMATE COMPOSITION

CARBOHYDRATE CONTENT

The above table represents the results of nutritional composition of studied cassava flour samples (FCF and UCF). The total carbohydrates was the major component in the two examined cassava flour samples (77% and 78%) as shown in the results. These two results are different from the results reported by (Tambo et al. 2019) 96% and (Dudu et al. 2020) 83%. The carbohydrate content of fermented cassava flour (77.992 FCF) is slightly lower than that of unfermented cassava flour (78.944 UCF). The both samples could be regarded as carbohydrates rich food and could be recommended for fortification of foods that intend to improve energy in consumer's health. Also due to high amount of carbohydrate contents (above 70%) in studied cassava samples, it can be utilized in formulating composite flour blends, in the food manufacturing. Essentially, food sources that have high carbohydrate content makes the resultant food products (snacks, paster, noodles pastries, garri fufu, etc) cheaper because of their easy accessibility and availability. (Dada etal., 2018) and (Maziya-Dixon etal 2917)

WATER CONTENT

The results of the proximate analysis revealed that the moisture contents of both flour samples (approximately 11%. FCF and 10%. UCF) were closer to the result of moisture content (13%) reported by (CODEX STAN 176-1989) for edible cassava flour. These low moisture contents of flour samples enable shelf life stability when stored. This works by preventing mould and fungal growth (Singh et al., 2005) which determines why they could posses longer shelf life and suitable in pastries products (Ocheme et al., 2018). The water content of fermented cassava flour is just a bit higher than that of unfermented flour sample.

Samples with high moisture implies lower shelf life because the high moisture content will influence the growth of microorganisms which will lead to spoillage, due to a convenient medium for microbial growth. (Remi O. 2023).

The both samples could be used interchangeably where applicable on the basis of its water contents.

ASH CONTENT

The ash content in this work reflects the level of inorganic mineral content of the two flour samples. As shown in Table 1, ash contents in both samples (5% FCF and 4% UCF) are comparatively similar. The little differences observed could be due to the sample processing method used. These results are different from the findings of (Dudu et al., 2020) who discovered about 2% for ash.

CRUDE PROTEIN CONTENT

Protein is one of the important macronutrients needed for proper functioning of the body and it is also a part of the functional ingredients in formulations of food. The protein contents of the two flour samples 2% FCF and 3% UCF) respectively were similar to the result reported by (Klang et al., 2020).1.6%.

According to the findings of Oyeyinka et al.,2020) and Abiodun et al.,2020), the contents of protein, essential amino acids, and protein quality of cassava flour can be enhanced by the fermentation. Asides fermentation, fortiying foods with protein rich sources and composite flour in combination with legume and cereal can be thought to improve the protein content and nutritional level of cassava flour.

CRUDE FAT CONTENT

Crude fat contents of examined cassava flour samples were lower than 1%, this indicates that cassava flour cannot be recommended to give the required fat needed for proper functioning of the body. According to the results, the highest fat contents were observed in FCF (0.996) as against the UCF (0.993%). the two result can be compared with the result reported by (Tambo et al.) who observed 0.63% fat content from a cassava flour research in Cameroon. Due to these low fat contents (approximately 1%), cassava flour may have very low susceptibility to form a starch lipid complex, which causes low swelling capacity, solubility, and granule disruption (Wheatley et al., 2003).

In addition, these low fat contents maybe suitably accompanied by soups (which has fats and oil). The two results can be compared to the findings of Remi, O. 2023 who reported that the fat content for oven dried, air dried and sundried plantain flour samples were approximately (1%).

CRUDE FIBRE CONTENT

The results of the proximate analysis of the examined samples shows that the fermented and Unfermented cassava flour samples have low crude fiber (2% and 3%) respectively. Fiber is the indigestible portion of food samples otherwise known as roughages. Food sources that are rich in fiber can be recommended for patients with issues of insulin resistance, and obesity.

The fiber content of fermented cassava flour 2.777 was slightly lower than that of unfermented sample. 3.011

MINERAL COMPOSITION

The **r**esults of the mineral analysis in table 2 showed that the fermented cassava flour sample (71.00 mg/100gm) is higher in magnesium, when compared with UCF (68.500 mg/100gm). It was reported in this present study that FCF has higher value of Sodium (71.500 mg/100gm) than the UCF (68.500 mg/100gm), this results confirms that farmented and unfarmentedcassava flour are good sources of sodium. Meanwhile UC flour sample has higher amount of calcium (38.400 mg/100gm) than FC flour (32.800 mg/100gm) respectively. The amount of iron and manganese supplied by FCF (2.120 and 0.642 mg/100gm) are slioghtly lower than that of UCF (2.645 and 0.695 mg/100gm) respectively. The both samples could be regarded as a good source of magnesium, calcium and sodium. The iron contents (2.120 FCF, 2.645 UCF) were higher than the values reported on a fresh cassava sample by (Bradbury and Holloway (1988) (0.2) and (Okigbo, 1980) 0.7 mg g^1

PHYTOCHEMICAL SCREENING

However the result of phytochemical screening as shown in table 3 above indicated that alkaloids, carbohydrates, protein were very much present in both cassava samples.(++). The glycoside was also present in unfermented cassava sample but absent in the fermented sample. Meanwhile other parameters such as phytosterols, saponnins, tannins, phlobatannins, terpenoids, flavornoids and steroids were completely absent (-) in both fermented and unfermented cassava flour samples.

CONCLUSION AND RECOMMENDATION

Cassava has an appreciable amount of carbohydrate. The study attempted to identify the manners in which fermentation affect the nutritional quality of cassava flour. This study revealed that proximate composition and phytochemical and mineral properties of tested cassava flour samples were considerably affected by the differences in the methods of processing adopted. These cassava samples can be combined with the flours from other grains and legumes to develop composite flours for appropriate supply of the examined nutrients.however, having concluded that the cassava flour samples were significantly affected by the two processing methods adopted, it can therefore be recommended that both flour samples should be regarded as a good source of carbohydrate, protein, ash, mineral and fiber. More researches should be carried out on the fortification of these flours.

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