Sub-Sahara African Academic Research Publications
September, 2020, Editions

JPAS
Journal of Pure and Applied Science
Vol..16, No.9, ISSN 2318-9315

NUTRIENT INPROVEMENT OF CASSAVA BASED SNACK ("BAMBARA EFA") USING SOYABEANS FLOUR

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ABSTRACT
"Bambara Efa" is a cassava based snack produced mainly from cassava starch. It is commonly eaten in northern part of Nigeria as a snack or main meal. The aim of the study was to produce enriched "Bambara Efa" and evaluate its proximate, mineral and sensory qualities. "Bambara Efa" was produced from cassava starch and soya bean blends at different propotions (100:0, 95:5, 90:10, 85:15 and 80:20). Proximate and minerals analysis was carried out using standard laboratory procedures and sensory evaluation was conducted using the nine point hedionic scale where 1 represented extremely dislike and 9 represented extremely liked. Findings showed formulated snacks had crude protein value of (7.87% to 15.58%), ash (2.50 to 3.01%), moisture content (4.27% to 5.61%), crude fat (15.01% to 20.55%), and nitrogen free extract (NFE) (67.35% to 55.65%), on mineral contents (Mg/100g) i.e calcium had value of (120.53 to 143.77). phosphorus (28.97 to 52.10) iron (104.07 to 137.77) and magnesium (72.93 to 96.22). sensory evaluation showed no statistically significant difference(P>0.05) among all the samples and parameters evaluated. The research work recommends sample E because it produced the best product in terms of nutritional quality and sensory acceptance.

Keywords: Inprovement, Cassava, Based, Snack, Soyabeans Flour.

INTRODUCTION
Food security remains an unfulfilled dream for more than 800 million people who are unable to live healthy and active lives because they lack access to safe and nutritious food (Anuonye, 2011).More than 840 million

people lack access to enough food to meet their daily basic needs, while more than one third of the world's children are stunted due to diets inadequate in quantity and quality (WHO, 2001). Cassava (Manihot esculanta spp.) Is one of the perennial crops grown throughout the low land tropics. It is a major staple food crop in Nigeria supplying about 70% of the daily calorie to over 50 million Nigerians. In Africa about 70% of cassava products are ''garri", lafun, ''fufu" and "kpokpogari" (Sanni, et.al., 2001). Processing of cassava to flour is one of the means of utilizing this important food crop.

Aside processing the cassava to ''lafun" its root can be cooked and eaten while the fermented and ground tubers could be baked into different processes. ''Bambara efa" is the local name given snack made from cassava in Nigeria. It is produced through the submerged soaking of cassava roots in water for about 2-3 days in order for fermentation process to take place. The product is then sundried before milling into flour. It is then mixed with other spices. The major limitation in "bambara efa" like other cassava products includes low protein content, low mineral, and vitamins. Cassava is protein deficient, and contains low amount of methionine, lysine and tyrosine (Akubor and Ukwuru, 2003). Efforts have been made to address the protein deficiencies of cassava products. The incorporation of soybeans, groundnut and other seed protein into cassava meal has been shown to yield fortified products of high protein values. Jishaa, Sheriff and Padmajaa (2010) revealed that low protein and poor functionality limit the use of cassava flour in snack foods, which were modified using blends with cereals and/or legumes flours. Some food products have been incorporated with soybeans; like traditional fermented maize foods with soybean., Daniel and Osho (2005) revealed that fortification increases the nutritive value of consumers that takes in the food. This study thus seeks to examine the possibility of developing "bambara Efa" from varied ratios of cassava and soybeans flour blends to improve on the nutritional quality and determine the effect of soybean flour inclusion in the formulations on the proximate, minerals and sensory qualities of the snack.

Statement of Problem

"Bambara efa" is a cassava based product which is widely or largely consumed among the dwellers of rural settlements and low income earners in northern regions of Nigeria. "bambara efa" is a purely carbohydrate rich food item with an insignificant protein content, as cassava is protein deficient (1-2%). Therefore, excessive consumption of this snack without fortification could result into different health problems such as kwashiorkor, especially among the children and pile in adults and children like wise.

JUSTIFICATION

Development of the soybean variant of the snack "bambara efa" may provide a more nutritious alternative to the cassava variant of the snack. The issue of malnutrition associated without proper fortification with legumes such as soybean flour will be reduced to minimum level.

AIM AND OBJECTIVES

Aim

The aim was to evaluate the nutrients of a cassava based snack (bambara efa) enriched using soybean flour.

Objectives

1. To produce enriched "Bambara efa"
2. To determine the proximate and minerals (calcium, iron and zinc) composition of "Bambara Efa" fortified with soybean.
3. To evaluate the sensory qualities of "Bambara efa" fortified with soybean.

Materials and Methods

Cassava 500g
Soybeans 5, 10, 15, 20, ratios to cassava flour.
Groundnut oil 100ML
Spices
Frying mold

Sample Production

The cassava was washed, peeled and diced then the cassava was soaked for about 2-3 hours and wet using attrition mill. The milled cassava was sieved and allowed to settle then exchanged of water for about 2 to 3 times after settling and sun dried. Cassava starch was then obtained.

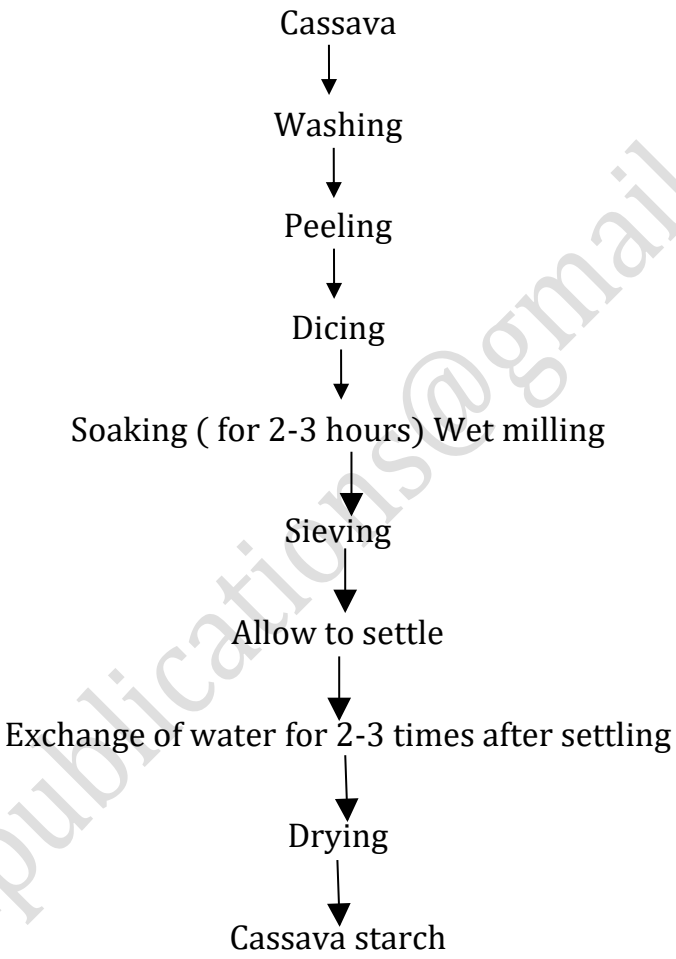

Fig 1 flow chart for production of cassava starch

Soybeans was sorted to remove dirt and soaked for six hours after which it was dehulled. The dehulled grains were drained and oven dried at 100^0c for 30 minutes. The dried soybeans was milled using attrition mill and sieved using a 0.5mm sieve to obtained soybean flour.

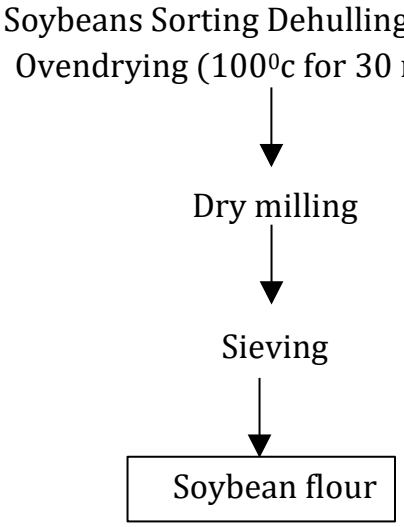

Fig2: flow chart for production of soybean flour

Production of Bambara efa

Cassava starch was mixed with water and ingredient such as maggi, onion, pepper will added. Stir together and fried in mold to obtained Bambara efa.
Cassava starch Mix with water Addition of spices Frying (mold frying) "Bambara Efa"
Figure 3: flow chart for production of ''Bambara efa".

Formulation of Ratios

Samples	Cassava starch (%)	Soybeans flour (%)
A	100	-
B	95	5
C	90	10
D	85	15
E	80	20

Sample Analysis

Proximate Composition

Moisture content, crude protein, crude fat and ash contents of the snacks was determined using the standard procedures as described by Association of official Analytical Chemist (AOAC) (2005). Carbohydrate

content was determined by difference, that is addition of all the percentages of moisture, fat crude protein, ash and crude fiber was subtracted from 100%. This gives the amount of nitrogen free extract otherwise known as carbohydrate. % carbohydrate =100-(% moisture % fat + % Ash + % crude fiber + % crude protein). The energy value of the sample was estimated (Kcal/g) by multiplying the percentages of crude, protein, lipid and carbohydrate with the recommended factors. (3.44, 8.37 and 3.57 respectively) as proposed by (Lombor et al., 2009)

Mineral Analysis

Calcium (ca), iron (fe), zinc (zn), was determined by using Atomic Absorption Spectrophotometer (AAS model sp9). As described by AOAC (2005). All values wre expressed in mg /100g.

Sensory Evaluation

Sensory characteristics was evaluated using nine point's hedionic scale as described by Iwe (2002) where one represented extremely dislike and 9 represented extremely liked.

Statistical Analysis

Data obtained was subjected to analysis of variance (ANOVA) using statistical package
version 19.0 acid means separated using Ducan Multiple Range Text (DMRT)

RESULTS AND DISCUSSION

Table 1 show the proximate composition of Bambara efa samples
The moisture content of the control of the (sample A) was (4.27%) while the formulated samples (B,C,D and E) ranged between 4.42% and 5.16% there were significant difference ($P<0.05$) among the moisture content of the samples. The ash content samples B,C,D,E ranged between 2.50% and 3.01% significant difference ($P>0.05$) were observed among the samples. The protein content of the samples ranged from 7.87% to 15.58% with the control sample A having the lowest

value(7.87%) however, significant difference (P>0.05) was observed among all the samples. The crude fibre sample ranged between 0.26% and 0.36% for sample B,C,D and E while sample A had 0.01% there were significant different of (P>0.05) among all samples, the oil extract of the samples ranged between 15.01% and 20.55% and significant differences (p>0.05) were observed among the samples. The nitrogen free extract in samples B,C,D and E decreased significantly (p>0.05) and the highest value (67.35%) was the control sample A).

TABLE 1: Proximate Composition of Samples

Parameter	Samples				
	A	B	C	D	E
Moisture	$4.27^{a}\pm0.06$	$4.42^{b}\pm0.02$	$4.62^{c}\pm0.02$	$5.81^{d}\pm0.01$	$5.61^{e}\pm0.01$
Ash	$5.51^{e}\pm0.01$	$2.50^{a}\pm0.00$	$2.73^{b}\pm0.02$	$2.91^{c}\pm0.02$	$3.01^{d}\pm0.17$
Crude protein	$7.87^{a}\pm0.01$	$13.03^{b}\pm0.30$	$14.65^{c}\pm0.11$	$14.87^{c}\pm0.01$	$15.58^{d}\pm0.07$
Crude fibre	$0.01^{a}\pm0.00$	$0.26^{b}\pm0.00$	$0.31^{c}\pm0.01$	$0.43^{c}\pm0.03$	$0.63^{d}\pm0.03$
Oil extract	$15.01^{a}\pm0.01$	$16.02^{b}\pm0.02$	$17.51^{c}\pm0.01$	$15.53^{d}\pm0.03$	$20.55^{e}\pm0.05$
NFE	$67.35^{e}\pm0.01$	$65.51^{d}\pm0.01$	$62.67^{c}\pm0.13$	$59.81^{b}\pm0.02$	$55.65^{a}\pm0.03$

Values are means $\pm$ standard error (SE) of duplicate determinations means along the row not follow by the same superscript as significantly different (P<0.05)

KEY
A 100% cassava starch
B 95% cassava starch and 5% Soybeans flour
C 90% cassava starch and 10% soybeans flour
D 85% cassava starch and 15% soybeans flour
E 80% cassava starch and 20% soybeans flour

Table 4.2 showed the mineral content of the sample the calcium content ranged from 120.53 to 143.77 mg/g and significant difference (P<0.05)

were observed among the sample, the magnesium content of the samples increased significantly ($P<0.05$) among the sample range between 72.93 and 96.22 mg/g per gram of the samples. The phosphorus (p) and iron (fe) also increased significantly among the samples. Values range from 28.97 to 52.10 mg/g per gram and 104.07 to 137.77 mg/g respectively among the samples. However, significant difference were observed among the all samples.

TABLE 2: Mineral Content Of The Samples (Mg/100g)

Parameters	A	B	C	D	E
Ca	$120.53^{a}\pm0.53$	$125.03^{b}\pm0.03$	$132.06^{c}\pm0.04$	$138.83^{d}\pm0.58$	$143.77^{e}\pm0.77$
Mg	$72.93^{a}\pm0.37$	$78.37^{b}\pm0.03$	$85.76^{c}\pm0.03$	$90.72^{d}\pm0.64$	$96.22^{e}\pm0.54$
P	$28.97^{a}\pm0.09$	$32.77^{b}\pm0.76$	$40.32^{c}\pm0.03$	$46.77^{d}\pm0.046$	$52.10^{e}\pm0.30$
Fe	$104.07^{a}\pm0.57$	$112.72^{c}\pm0.03$	$122.76^{c}\pm0.23$	$130.17^{d}\pm0.57$	$137.77^{e}\pm0.03$

Values are means $\pm$ standard error (SE) of duplicate determinations. Means not followed by the same superscript are significant different ($P<0.05$).

KEY

A 100% cassava starch
B 95% cassava starch and 5% Soybeans flour
C 90% cassava starch and 10% soybeans flour
D 85% cassava starch and 15% soybeans flour
E 80% cassava starch and 20% soybeans flour

Table 4-3 show the sensory evaluation result. There was no statistically significant different, ($P>0.05$) observed among all simples. And parameter evaluated. Values for taste ranged between 7.5 and 8-5. The appearance, texture and general acceptability among samples increased texture and general acceptability increased without significant difference ($P>0.05$) and ranged range from 7.0 to 7.9, 7.01 to 7.9 to and 7.8- 8.4 respectively.

TABLE 3: Sensory Evaluation of the Samples

Parameter	A	B	C	D	E
Taste	7.5[a]±0.35	7.6[a]±0.31	7.8[a]±0.63	8.0[a]±0.29	8.5[a]±0.27
Appearance	7.0[a]±0.49	7.2[a]±0.33	7.5[a]±0.37	7.7[a]±0.46	7.9[a]±0.37
Texture	7.21[a]±0.33	7.3[a]±0.42	7.7[a]±0.34	7.8[a]±0.23	7.9[a]±0.33
General acceptability	7.9[a]±0.46	8.0[a]±0.29	8.0[a]±0.29	8.1[a]±0.28	8.4[a]±0.22

Values means ± standard error (SE) od duplicate determinations. Means along the row not followed by the same superscript are significantly different ($P<0.05$)

KEY
A 100% cassava starch
B 95% cassava starch and 5% Soybeans flour
C 90% cassava starch and 10% soybeans flour
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E 80% cassava starch and 20% soybeans flour

Discussion

The significantly higher moisture content of the formulated "Bambara Efa" snack as compared to the control could be attributed to the addition of soybeans. This indicates that the control snack will store longer period when compared to the formulated snacks.

Scientific investigation have reported that the amount of moisture content of food product will determine the shelf life of the products, for instance, low moisture content in foods would reduce the activities of micro-organism and thereby increase the storage period of the food product (Olitino et al., Alozie et al 2009). The formulated snack obtained significantly higher levels of protein than the control samples. This is no

surprise as soybeans have higher protein contents than other legumes. Ramadan (2012) reported higher protein content of 38.38% and 37.50% in varieties of soybeans. Nevertheless, findings of this study was consistent with the report of Kolapo and Sanni (2005). Protein is an important nutrient useful for repair and replacement of worn out tissues in the body (Ekpo, 2011). Increase in the level of soybeans flour resulted in decreased in carbohydrate content progressively from 67.33% to 55.60%. This could be attributable to carbohydrate content been diluted by the protein content of soybean flour added. Carbohydrate is an important nutrient that helps in supplying energy to the body (Popkin 2008). The crude fibre content increased with addition of soybean flour from 0.25 in the control sample to 0.5 percent. This could be because soybeans is a diet that includes high fibre content. Fibre aids digestion and prevent constipation. (Owusu- Kwart et al., 2010) The oil extract content of the "Bambara Efa" increase from 15.00% to 20.50% in the sample with addition of soybeans. Increase might be because soybean flour is an oilseed. (Babayeju et al, 2017) Fat is an important nutrient that gives energy to the body. Eke (2010).

The result of the mineral composition of the formulated blends shows that the amount of calcium found in formulated blends meets up to half of Recommended Dietary allowance (260mg/day) for children 6-12 months (NIH, 2010). A significant amount of calcium in our diet help to maintain bones and teeth in both infant and adults. (Oladele and Aina 2007)

Phosphorus is necessary for teeth and bones and plays an important role in metabolism of other nutrients like carbohydrate and fats. It is also needed for the body to metabolize protein useful for cell maintenance and repair. Whereas magnesium help in maintaining normal muscle and nerve functions, support a healthy immune system and also aids in the production of energy and protein. Iron helps in the transportation of oxygen from lungs throughout the entire body. (Ohimain 2014). The result from mineral analysis showed that the formulated snack would contribute substantially to the Recommended Dietary Rrequirements for minerals on daily basis.

All the formulated "Bambara Efa" snacks gave finished products with acceptable sensory properties although Soybean gave a finished product with more acceptable sensory attributes. However, in taste sample E was rated highest by the panelist while D and C respectively, were rated next. The values obtained were slightly higher than the findings of Ogunmodimu et al. (2015). In evaluation of nutrient properties of high protein-fibre based snacks formulated from soybeans concentrate and cassava fibre.

Conclusion and Recommendation

Conclusion

Nutritious and acceptable of Bambara Efa was successfully produced. The proximate analysis showed that were significant difference ($P<0.5$) in the moisture, ash, crude fibre, oil extract and NFE content of the formulated snacks. The same trend was observed for the mineral content as significant difference ($P<0.05$) were observed in calcium, magnesium, phosphorus and iron content of the samples.

The sensory parameters evaluated showed no statistically significance ($p>0.05$) among the samples and parameters evaluated.

Recommendation

This research work recommends sample E- "Bambara Efa" produced in the ration of 80-20 (cassava to soybeans) because it produced the best products in terms of nutritional quality and sensory acceptance.

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