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Proximate Composition and Sensory Properties of Cassava (*Manihot esculenta)* Snack (Kpokpo Gari) Enriched with Groundnut *(Cocos nucifera)* and Coconut *(Arachis hypogaea.)*

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Abstract

The proximate composition and sensory properties of cassava (*manihot esculenta)* snack (kpokpo gari) enriched with groundnut *(cocos nucifera)* and coconut *(arachis hypogaea.)* was investigated. The cassava mash, coconut and groundnut were mixed at different ratios 100:0:0, 70:15:15. 60:20:20, 50:25:25 respectively. The kpokpo gari samples were subjected to proximate, mineral, physical and sensory analysis. The outcome of the proximate analysis revealed a gradual increase in the protein contents (5.47-13.31%), ash (1.09-1.65%) and fat (1.18-4.76%) as the percentage of groundnut *(arachis hypogaea.)* and coconut *(cocos nucifera)* increased while there was a reduction in carbohydrate content (53.50-63.44%), moisture (5.40-8.05%) and crude fibre (18.49-19.53%). The mineral analysis showed that calcium ranged between (0.027-0.042mgIl00g), magnesium (O.059-0.l24mgIlOOg), Sodium (0.033-0.192mg/100g). Iron (49.90-53.59mg/100g) and phosphorus (0.012-0.019mg/l00g). There was a significant (p<O.O5) difference in the sensory scores between the enriched kpokpo gari and control sample (100% cassava mash) with sample C (Cassava (*manihot esculenta),* coconut*(cocos nucifera)* and groundnut*(arachis hypogaea.)*. 60:20:20%) as most preferred. Sensory analysis showed that the incorporation of groundnut *(arachis hypogaea.)* and coconut *(cocos nucifera)* at levels of 20 and 25% were accepted by the panelists.

Keywords: Gari, Enriched, Groundnut, Coconut, cassava, snack.

Introduction

Cassava (*Manihot esculenta)* is a staple food cultivated for its tuberous root which is further processed into different products such as cassava flour and snacks. In Nigeria, it is one of the important and most cultivated food crops, it is widely eaten by most household as gari, fufu, lafun, kpokpo gari and tapioca. Cassava *(Manihot esculenta)* is a major source of carbohydrate root crop, it plays a major role in effort to alleviate food crisis because of its efficient production of food energy, year-round availability. Among the starchy staples, cassava (*Manihot esculenta)* gives a carbohydrate production that is about 40% higher than rice and 25% more than maize. Cassava also consist of essential

micronutrients, such as vitamins A, B C, iron and zinc (Viduranga, 2018). According to Nwafor, Akpomie, Ejiro (2015) cassava (*Manihot esculenta)* contain 62% water,35% carbohydrate, 1.0% protein, 0.3% fat and 1.0% mineral, some of these nutrients may be lost due to heat during processing of cassava (*Manihot esculenta)* to edible product such as cassava (*Manihot esculenta)* chips, kpokpo gari, tapioca, gari, flour. Gari is a dried granular carbohydrate food made from cassava (*Manihot esculenta)* root, it is a major component of everyday diet in Nigeria providing about 357 calories per 100g (Bankole, 2018). Gari is usually consumed by preparing with boiled water to a paste and eating with soup as an accompaniment, it can also be mixed with cold water with addition of sugar or salt, groundnut (*Arachis hypogaea* L.) or coconut (Cocus nucifera) and consumed as snack by adult or children, most time it is eaten as kpokpo gari snack without mixing of water or any liquid.

Kpokpo gari, is a cassava (*Manihot esculenta)* based snack that is popular and relished by the Southern Nigerians precisely the Itsekiri, Ijaw, Isoko and Urhobo people. It is white in color and made from hard crump of processed cassava (*Manihot esculenta)*. What makes this dry snack different from garri used in making eba is the finishing during the procession. Just as cassava tubers for garri is taken to the mill to be blended, so also kpokpo garri goes to the mill. The blended pulp is put in bags and left to drain for days. Unlike the garri, kpokpo gari is not sieved before frying. It is salted and fried in big frying pans dry, with all the lumps and shafts; this is more like using heat to further remove any form of wetness in it which eventually make it hard and rough in the mouth. Kpokpo garri, is highly nutritive, with carbohydrate, fibre, minerals and less fat and protein (Alikson 2019). This product is eaten singly as snacks by many without any accompaniment or while eat it as meal with fresh fish pepper soup. Kpokpo gari contains very little amounts of protein, fiber and fat, (Nwokolo, 2019). Most snack foods are cereal or tuber-based with high starch content and some of such snacks are deficient in protein, (Wordu and Akusu 2016). Kpokpo gari know as a low protein, fat and oil content snack need to be enriched or fortified with groundnut (*Arachis hypogaea* L.) and coconut (Cocus nucifera) due to the quality and considerable amount of nutrients (protein and mineral) they contain.

Groundnut (*Arachis hypogaea* L.) is a very important legume which is widely grown as a food crop. Although small in size it plays a vital nutritional role and contains amazing health benefits (Mubiru 2016). From previous research it is reported that groundnut (*Arachis hypogaea* L.) seed contains high amount of oil and protein (50% oil and 27-29% protein) contents, (Zhenghuo, 2012). The oil and protein content in groundnut can be used to fight against malnutrition, especially protein energy malnutrition and the presence of calcium, magnesium and phosphorus is good indication that groundnut (*Arachis hypogaea* L.) is rich in the minerals which is good for bone formation, (Eshun, Amankwah and Barimah,

2013). Groundnut (*Arachis hypogaea* L.) is also rich in B-complex vitamins providing high quality dietary protein, Its protein is increasingly becoming important as food sources especially in developing countries where protein from animal sources is not within the reach of majority of the populace and the seeds are mostly consumed as snack after roasting, used to make peanut butter, oil soups, stews and other products (Ayoola el a!., 2012).

Coconut (Cocus nucifera) belonging to the family Arecaceae, it is a fibrous one-seeded drupe grown nut in the world. It possesses vitamin B6, iron, and minerals like magnesium, zinc, copper, manganese, and selenium, (Migala, 2019). The nut is usually consumed in its raw form and most times eaten alongside other products such as cassava (*Manihot esculenta)* chips, maize and date fruit, among others. It is used as food and believed to possess many medicinal properties, it is also used with date fruit and tiger nut in preparation of some drinks such as the nutritious drink known as "Kunu aya" popularly consumed in Nigeria, (Imo, Ezeonu, Imo and Anigbo, 2018). A blend of cashew, coconut and pkokpo gari can be used to produce palatable snack rich in minerals. (Emelike and Akusu, 2018). The proximate composition of coconut *(cocos nucifera)* shows that it contain a considerable amount of moisture 8.33%, fat 56.36%, protein7.53%, energy value (kcal) 662.65%. (Ojobor, Anosike, Ezeanyika, 2018). This indicated that coconut may be good source for enrichment of food products or snacks such as kpokpo gari. The press cake from coconut*(Cocus nucifera)* oil processing also contains protein content of 19-20%, 12% crude fiber, carbohydrate 43-45% which can be utilized in the enrichment and fortification of foods, (Yalegama and Chavan, 2009). The enrichment of foods is an integral part of improving the nutritional quality and sensory properties of food (Oluwamukomi, 2015).

Despite the numerous benefits of cassava(*Manihot esculenta) and kpokpo gar*, it contain low level of protein and fat content, the dependence on cassava (*Manihot esculenta)* based diets and snacks alone, may lead to serious protein deficiency problems. Such malnutrition problems has been reported among consumers that rely primarily on cassava flour and other cassava products as major food source with little or no high protein food sources as compliments (Rudo el al., 2017). Malnutrition is one of the major concerns to most developing African countries such as Nigeria where most diets are predominantly carbohydrate or starchy food crops, therefore there is need to improve the nutritive quality of our local foods through enrichment and kpokpo gari is one of such basic foods worthy of attention. The use kpokpo gari as a snack food is limited by its low protein content and may be deficient in essential amino acids too. Compared with other cereal grains, cassava (*Manihot esculenta)* is low in protein and the protein it has is of poor quality with very low essential amino acid contents, (Morgan and Mingan, 2016).

However due to low level of protein content in cassava (*Manihot esculenta)* and high cost of animal protein, there is

need to enrich cassava (*Manihot esculenta)* snacks or food products such as (kpokpo gari) with good quality protein source that are readily available. Hence this study aims to determine the proximate and sensory properties of cassava (*manihot esculenta)* snack (kpokpo gari) enriched with groundnut *(cocos nucifera)* and coconut *(arachis hypogaea*. This will enhance the protein content of kpokpo gari and decrease the incidence of protein malnutrition among the major consumers of this product.

Purpose of the study

The general purpose of the study was to determine the proximate, and sensory properties of cassava (*manihot esculenta)* snack (kpokpo gari) enriched with groundnut *(cocos nucifera)* and coconut *(arachis hypogaea)*.

Specifically, the study determined:

1. proximate composition of *kpokpo gari* snacks
2. Mineral content of *kpokpo gari* coconut*(cocos nucifera)*/groundnut *(arachis hypogaea)* snack.
3. sensory attributes of *kpokpo gari* coconut*(arachis hypogaea)*/groundnut *(arachis hypogaea)*.snack.

Materials and Methods

***Collection of Materials*:** Fresh harvested cassava (*manihot esculenta)* tubers from a farm in Yeghe. Gokana Local Government Area, Rivers State was used while matured coconut *(cocos nucifera)*, raw groundnuts *(arachis hypogaea)*and jaggery were purchased from Mile 3 Market, Port Harcourt, Rivers State. All reagents used for the chemical analysis were obtained from the Biochemistry Laboratory, Department of Food Science and Technology, Rivers State University, Nkpolu- Oroworukwo Port Harcourt. The reagents were of analytical grade,

Preparation of Coconut *(cocos nucifera)***:** Coconut *(cocos nucifera)*,crush was prepared from the fully matured dry coconut*(cocos nucifera)*,. The coconut *(cocos nucifera)*,endosperm after the removal of the shell was shredded and the coconut *(cocos nucifera)*,milled using an electric blender. The residue was then oven dried for 24hr at 50°C. The crush obtained was stored at room temperature and used for further preparation.

Preparation of groundnut flour: About l000g of cleaned and sorted raw groundnuts *(arachis hypogaea)* were roasted and dehulled. They were then milled using electric blender into flour and stored for further use.

Processing of Cassava *(manihot esculenta)*: About 20kg of freshly harvested cassava (*manihot esculenta)* tubers were peeled and washed with clean water to remove adhering soil particles. Thereafter, the tubers were milled (by grinding) using a milling machine (Simply, China). One litre (IL) of clean water was added to 20kg of mash and then put into a jute sack and left to drain for days.

Production of Kpokpo gari: The traditional method of kpokpo gari preparation described by Nwokolo (2019) was used with modifications. Pressed cassava (*manihot esculenta)* mash, coconut *(cocos nucifera)*,crush and groundnut *(arachis hypogaea)*paste were mixed using different formulations. Each blend was roasted for 10-

I5minutes in a shallow wide hot metal pan (pot) until a consistently whitish chip (kpokpo gari) was obtained. The chips were removed from the pan into a metal tray using a large spoon with long handle and allowed to cool at room temperature (29°C). The chips were bagged in polyethylene bag and stored for further analysis. The formulation blend were: (A) mashed cassava(*manihot esculenta)* 100%, NO coconut, groundnut *(arachis hypogaea)*and jiggery (B) 60% mashed Cassava(*manihot esculenta)* to 20% coconut*(cocos nucifera)* granules, 20% groundnut *(arachis hypogaea)*flour and 15ml jaggery solution. (C) 50% mashed Cassava(*manihot esculenta)*, to 25% Coconut *(cocos nucifera)*granules, 25% groundnut *(arachis hypogaea)*flour and 15ml jaggery (D) 40% mashed Cassava to 30% coconut *(cocos nucifera)*granules, 30% groundnut *(cocos nucifera)*flour and 15ml jiggery.

***Proximate Analysis*:** Moisture, ash, fat, protein, crude fibre and carbohydrate of the kpokpo gari samples were determined according to the AQAC (2012) method while total carbohydrate was determined by difference. The weight, diameter and height were determined using the method of Srivastava et al. (2012).

***Mineral Analysis*:** The mineral content of the formulated *kpokpo gari* samples were evaluated using the method of Adedeye and Adewoke (1992). Calcium, phosphorus, magnesium, iron and sodium contents of the *kpokpo gari* samples were determined using an Atomic Absorption Spectrophotometer (Buck Scientific Atomic Absorption Emission Spectrophotometer model 205, manufactured by Nowalk, Connecticut, USA).

***Sensory Analysis*:** Sensory analysis was carried out using twenty member panelists consisting of students of Food Science and Technology Department, Rivers State University, Port Harcourt, Nigeria. The sensory qualities of the samples were served raw/dry with cold water, milk, dried fish and it was evaluated for colour, flavour, taste, aroma, texture and overall acceptability. Each sensory attribute was rated using a 5-point hedonic scale with one (I) representing dislike extremely and 5-like extremely as reported by Iwe (2010).

***Data Analysis*:** Results were expressed as mean values and standard deviation of triplicate experiment. Data were analyzed using a one way analysis of variance (ANOVA) using statistical packages for social sciences (SPSS) version 20.0 software 2011 to test the level of significance at 5% level of probability ($p<0.05$). Least significance difference test was used to separate the means where significant differences existed.

Result

Table 1. Proximate Composition of *kpokpo gari* snack enriched with coconut and Groundnut

Samples	Moisture	Ash	Fat	Protein	Fiber	Carbohydrate
A	8.05±0.15^{a}	1.09±0.10^{b}	1.18±0.00b	5.47±1.71^{b}	19.53±1.62^{a}	63.44±0.21 ^{a}
B	6.40±0.00^{c}	1.55±0.05^{ab}	1.5±1.00b	10.25±0.62^{a}	18.75±1.22^{a}	61.86±0.88^{a}
C	5.40±0.00^{b}	1.09±0.10^{b}	3.46±0.4.9ab	12.06±0.00^{a}	18.49±2.44^{a}	59.02±2.50^{ab}
D	7.90±0.20^{a}	1.64±0.15^{a}	4.76±0.60a	13.31±000^{a}	18.89±2.44^{a}	53.50±0.82^{b}
LSD	0.46	0.54	2.95	4.50	3.87	6.61

Mean± SD of three replicates, *Mean values within a column with different are significantly different (p>0.05)

KEY:

A= 100%Cassava (*manihot esculenta)*mash for *kpokpo gari* (Control sample)

B= 70% 15% Ratio of Cassava(*manihot esculenta)*, coconut *(cocos nucifera)*and groundnut *(arachis hypogaea)*flour in the *kopkpo gari* respectively

C= 60% 25% Ratio of Cassava(*manihot esculenta)*, coconut*(cocos nucifera)* and groundnut *(arachis hypogaea)*flour in the *kopkpo gari* respectively

D= 50% 20% Ratio of Cassava(*manihot esculenta)*, coconut *(cocos nucifera)* and groundnut*(arachis hypogaea)* flour in the *kopkpo gari* respectively

Proximate Composition of *kpokpo gari* snack enriched with coconut and groundnut.

Table 1 shows the proximate composition of the *kpokpo gari* samples. The moisture content of the samples ranged between 5.40-8.05% with the control sample having the highest moisture content and sample C (Mashed Cassava(*manihot esculenta)*/ coconut*(cocos nucifera)* /groundnut *(arachis hypogaea* 60:20:20) least moisture content followed by samples D and B (7.90, 6.40) respectively. The decrease in moisture content in sample C may be due to the inclusion of coconut granules and groundnut flour in the sample. Ash content ranged between 1.09-1.65% with Sample D (Cassava/coconut/ groundnut, 50:25:25) having the highest ash content, while sample A containing 100% cassava mash had the lowest value. There was no significant (p<0.05) difference between samples sample A and C (1.09%and 1.09%) respectively.

The fat content of the *kpokpo gari* samples increased significantly (p<0.05) from 1.18% for control sample to 4.76% (Cassava/coconut/groundnut. 50:25:25) in the treated samples (A, C and D) respectively. This could be attributed to the inclusion of coconut granules and groundnut flour in the samples B, C and D respectively. The protein content of the samples ranged from 5.47-13.31% with sample D having the highest and sample A having the lowest respectively. It was observed that the higher the quantity of coconut granules and groundnut flour the higher the protein content.

The crude fibre ranged between 18.49-19.53% with control sample having the highest value. There was no significant difference (p<0.05) in the crude fibre content of the *kpokpo gari* samples. The carbohydrate content ranged between 53.50-63.44% with sample A having highest carbohydrate content while sample D had the least.

There was no significant (p<0.5) difference between sample B(58.86%), c (53.02%) and D (53.50) respectively.

Table 2. Mineral Composition (mg/bOg) of *kpokpo gari* snack enriched with coconut and groundnut

Sample	Calcium	Management	Sodium	Iron	Phosphorus
A	0.027±0.00^{d}	0.059±0.00d	0.033±0.00^{d}	49.900±0.15^{d}	0.0012±0.00^{d}
B	0.030±0.00^{c}	0.081±0.00c	0.202±0.00^{a}	80.625±0.53^{a}	0.016±0.00^{c}
C	0.035±0.00^{b}	0.111±.00b	0.177±0.00^{c}	52.675±0.8^{c}	0.030±0.00^{a}
D	0.042±0.00^{a}	0.124±0.00a	0.192±0.00^{a}	53.585±0.52^{b}	0.019±0.00^{b}
LSD	**0.01**	**0.01**	**0.00**	**1.96**	**0.00**

Mean± SD of three replicates, *Mean values within a column with different are significantly different (p>0.05)

KEY:

A=100%Cassava (*manihot esculenta)*mash for *kpokpo gari* (Control sample)

B= 70% 15% Ratio of Cassava(*manihot esculenta)*, coconut *(cocos nucifera)*and groundnut *(arachis hypogaea)*flour in the *kopkpo gari* respectively

C= 60% 25% Ratio of Cassava(*manihot esculenta)*, coconut*(cocos nucifera)* and groundnut *(arachis hypogaea)*flour in the *kopkpo gari* respectively

D=50% 20% Ratio of Cassava(*manihot esculenta)*, coconut *(cocos nucifera)* and groundnut*(arachis hypogaea)* flour in the *kopkpo gari* respectively

Mineral Composition of ***kpokpo gari*** **snack enriched with coconut and groundnut**

Table 2 shows the mineral concentrations (mg iCOg of *kpokpo gari* samples. The results indicated the calcium, magnesium. Sodium, iron and phosphorus content ranged from 0.027-0.042mg/l00g, 0.059-0.124mg/b0g 0.033-0.192mg, 49.90-53.59rng/100g and 0.012-0.0l9mg/l00g with magnesium having the highest value while phosphorous have the lowest value respectively. There was no significant (p<0.05) difference between phosphorous samples respectively.

Table 3. Physical Properties of *kpokpo gari* snack enriched with coconut and groundnut

Sample	Weight (g)	Diameter (mm)	Height (m)
A	13.56±0.03a	3.65±0.07^{b}	4.34±0.01^{c}
B	11.50±0.01b	3.75±0.21^{b}	4.41±0.01^{bc}
C	11.33±0.23b	3.75±0.00^{b}	4.72±0.08^{a}
D	10.16±0.16b	3.80±0.06^{b}	4.69±0.09^{ab}
LSD	**0.47**	**0.24**	**0.24**

Mean± SD of three replicates*Mean values within a column with different are significantly different (p>0.05).

KEY:
A=100%Cassava (*manihot esculenta)*mash for *kpokpo gari* (Control sample)
B= 70% 15% Ratio of Cassava(*manihot esculenta)*, coconut *(cocos nucifera)*and groundnut *(arachis hypogaea)*flour in the *kopkpo gari* respectively
C= 60% 25% Ratio of Cassava(*manihot esculenta)*, coconut*(cocos nucifera)* and groundnut *(arachis hypogaea)*flour in the *kopkpo gari* respectively
D=50% 20% Ratio of Cassava(*manihot esculenta)*, coconut *(cocos nucifera)* and groundnut*(arachis hypogaea)* flour in the *kopkpo gari* respectively

Physical Properties of *kpokpo gari* snack enriched with coconut and groundnut

The result in table 3 shows that the physical quality of *kpokpo gari* such as weight, diameter and height were affected by the level of groundnut and coconut. The weight, height and diameter of the *kpokpo gari* samples ranged between 10.16-13 .56g, 4.34-4.69rn and 3.65-3.80mm respectively.

Table 4. Sensory Properties of *kpokpo gari* snack enriched with coconut *(cocos nucifera)* and groundnut *(arachis hypogaea)*

Sample	Color	Taste	Flavor	Texture	overall Acceptability
A	2.55	1.95	2.05	2.06	2.15
B	3.55	3.60	3.15	3.25	3.60
C	3.95	3.90	3.40	3.70	**4.35**
D	3.90	4.15	3.45	3.65	5.85
LSD	**0.61**	**0.52**	**0.60**	**0.63**	**0.54**

Mean value with same alphabet as superscript are the same while those with different alphabet are significantly different ($p<0.05$)

KEY:
A=100%Cassava (*manihot esculenta)*mash for *kpokpo gari* (Control sample)
B= 70% 15% Ratio of Cassava (*manihot esculenta)*, coconut *(cocos nucifera)*and groundnut *(arachis hypogaea)*flour in the *kopkpo gari* respectively
C=60% 25% Ratio of Cassava(*manihot esculenta)*, coconut*(cocos nucifera)* and groundnut *(arachis hypogaea)*flour in the *kopkpo gari* respectively
D=50% 20% Ratio of Cassava(*manihot esculenta)*, coconut *(cocos nucifera)* and groundnut*(arachis hypogaea)* flour in the *kopkpo gari* respectively

Table 4 shows the sensory properties of *kpokpo gari* snacks. As shown in figure 1, sample C (Cassava/coconut/groundnut, 60:20:20%) was the most acceptable for color, texture and overall acceptability, sample B (Cassava/coconut/groundnut, 60:20:20%) was most acceptable for taste and flavor while sample A (control sample) was the least for all sensory parameters.

Discussion

Table 1 showed that the proximate composition of *kpokpo gari* snack enriched with coconut *(cocos nucifera)* and groundnut *(arachis hypogaea)*. The

Inclusion of groundnut and coconut into the cassava marsh for the production of *kpokpo gari* resulted in significant ($p<0.05$) reduction in the moisture content ranged between 8.5% to5.40%. This compared favorable well with the analysis of moisture content of *kpopko gari* snack enriched with cashew *(Anacardium occidentale)* nut and coconut *(arachis hypogaea)* which ranged from7.60-4.22% (Emelike and Akusu 2018). This is advantageous because reduction in moisture will reduce the proliferation of spoilage organisms especially mold, thus improving shelf stability of the product as reported by Appoldt and Raihani (2017) in food quality and safety that moisture content influences the taste, texture, weight, appearance and shelf life of food stuffs. The ash content increased as the quantity of added coconut and groundnut increased and the quantity of cassava mash decreasing. The increase in ash content is a reflection of an increase in the mineral content of the *kpokpo gari* produced which was comparable to that reported by Arisa et al. (2011) for gari made from blends of cassava and groundnut flour was (0.00 15-0.490%) ash.

The fat content of the *kpokpo gari* samples increased significantly ($p<0.05$) from 1.18% for control sample to 4.76% (Cassava/coconut/groundnut.
50:25:25). The increase in fat content could have been due to the fact that groundnut *(arachis hypogaea)* granules and coconut *(cocos nucifera)* flour has a high percentage of fat as it is and oil bearing seed. This result is also in line with a previous study on chemical and sensory properties of gari enriched with sesame seed flour (sesamum indicum l.) where the fat content of enriched gari significantly increased from 0.33% in the control sample to a range of 5.42% in the enriched sample, (Oluwamukomi (2015).

The protein content of the samples ranged from 5.47-13.31% the increase in protein content could be due to the addition of groundnut and coconut during the production of the snack. This result is similar to earlier studies by Oluwamukomi and Adeyemi (2014) who reported the increased of protein content of gari by supplementing it with legume protein sources.

The decrease in Crude fibre could be due to reduction of groundnut and coconut in the cassava mash (which had lower fibre and carbohydrate contents than cassava mash). It was observed that as the quantity of groundnut and coconut increased, the carbohydrate content decreased. The decrease in carbohydrate is a direct consequence of increasing groundnut (*arachis hypogaea)* and coconut(*cocos nucifera)* in the cassava mash blends.

Generally the increase in mineral content in the *kpokpo gari* samples is due to higher concentrations in coconut and groundnut compare to cassava mash. The coconut meat contains sodium, potassium, calcium, magnesium. This result is in line with previous study by (Eshun, Amankwah and Barimah,(2013) who reported that coconut is rich in the minerals which is good for bone formation. Thus these flours could be composited with cassava to improve the nutritional quality of resultant food product. The presence of these minerals in the snack

is beneficial as they could mitigate the prevalence of certain nutritional deficiencies. The result is an indication of the usefulness of coconut and groundnut in increasing the mineral concentrations of *kpokpo gari*

The diameter and height of the *kpokpo gari* samples increased with inclusion of groundnut and coconut compared to the control. The high fat content present in groundnut (*arachis hypogaea)* and coconut (*cocos nucifera)* correlates with the increasing diameter and height of *kpokpo gari* samples and as a result. The sensory evaluation revealed that *kpokpo gari* from 100% cassava mash (*manihot esculenta)*, (control sample without coconut *cocos nucifera* and groundnut *arachis hypogaea*) was significantly ($p<0.05$) different in all sensory parameters. This indicates that the incorporation of groundnut and coconut at levels of 20 and 25% were accepted by the panelists.

Conclusion

The study has shown that kpokpo gari can be enriched with nutrients using coconut *(cocos nucifera)* and groundnut *(arachis hypogaea)*. Inclusion of groundnut and coconut into the cassava marsh for the production of kpokpo gari resulted in significant ($p<0.05$) increase in the protein, fat and ash contents of kpokpo gari with a corresponding decrease in carbohydrate, moisture and crude fiber contents. There was also an increase in the mineral concentration, diameter and height of the kpokpo gari samples with a decrease in weight of the kpokpo gari samples. This study indicates that though all the samples were accepted, but the blend of Cassava/coconut/groundnut 60:20:20% was the most preferred. Addition of coconut and groundnut helped to reduce the carbohydrate content but enhanced availability of desirable minerals and protein, therefore incorporation of coconut and groundnut paste into the production of kpokpo gari product would improve nutritional content and prevent malnutrition among consumers of these products.

Recommendation

1. Enriched snack such as Cassava mash, coconut granules and groundnut (kpokpo gari) snack is recommended for consumers due to its nutritional qualities identified in the course of this study
2. Further research should be carried out on microbiological and storage stability of mashed cassava, coconut granules and groundnut flour (kpokpo gari) snack

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Footwear Merchandizing Skills Needed by Graduates of Colleges of Education for Self-Reliance in Delta State

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Abstract

This study determined footwear merchandising skills needed by graduates of Colleges of Education for self- reliance in Delta State. Survey research design was adopted. Three research questions guided the study. The population was made up of 2,450 foot wear and clothing and textile related business merchandisers/entrepreneurs and 62 home Economics lecturers in Colleges of Education in Delta State. Simple random and non-proportionate stratified random sampling technique were used to select a sample size of 200 entrepreneurs and lecturers. Questionnaire was used for data collection. The instrument was face validated by three experts (3). The internal consistency of the instrument was determined by using Cronbach alpha reliability method and 0.96 reliability coefficient was obtained. The data generated were analyzed using mean and standard deviation. Findings of the study include fourteen (14) planning, ten (10) organizing and eleven (11) marketing merchandizing skills needed for footwear business venture and its growth. Recommendations were made based on the findings of the study among which includes the need for more practical teaching in clothing and textile related business venture for self-reliance

Keywords: Footwear, Merchandising, Skills, Entrepreneurial, Graduates, Business, Venture

Introduction

Graduates in Nigeria today are faced with a range of socio-economic challenges. Despite policies and programmes to curb unemployment and poverty, unemployment and poverty remains a major challenge to the developmental process of the Nigerian economy. According to National Bureau of Statistics (NBS) (2019) the unemployment and poverty rate in Nigeria has risen to 6.11 percent

and 40.1 percent respectively. The challenges of unemployment and poverty however, still remain unabated (Mbah and Umurhurhu, 2016). The situation has been attributed tovarious factors including lack of entrepreneurial skills, competence based and demand driven curriculum in schools. This has created a gap between the skills needed for employment and skills possessed by graduates, which cannot empower graduates for self-employment and self-reliance. This high rate of unemployment among graduates has prompted a renewed call on entrepreneurship especially in technical and vocational courses in Nigeria.

Technical and Vocational Education and Training play a vital role in a society's economic growth and social development (Amedome and Fiagbe (2013).Programmes embedded in technical and vocational education training include competency-based applied learning which contributes to an individual's academic knowledge, higher-ordered reasoning, problem solving and occupation-specificskills, necessary for economic independence (Forster, Quarcco, LamiAshong and Ghanny, 2017). In Nigeria today, emphasis is on technical and vocational education in order to provide graduates with employable skills that will make them self- reliant and employers of labour in order to reduce unemployment and poverty. One of the programmes under technical and vocational education in Nigeria is Home Economics, which is studied at all levels of education.

Clothing and textiles which is an area of Home Economics equips students with skills for self- employment while they are still in school. Technical Skills acquired from clothing and textiles in schools alongside entrepreneurial skills can help graduates initiate clothing and textiles related businesses. It also equips them with skills for constant improvement and innovations in their undertaken. Empowering clothing and textiles students with entrepreneurial skills is essential. Clothing and textile skills according to Shaw (2003) in Chidume and Emelue (2011) includes working with hands, working with machine, quality work, critical thinking, focusing, school skills- mathematics, reading, science and art etc. Students that have acquired entrepreneurial skills in textiles and clothing can establish business ventures in garment construction, laundry services, bedding production, garment making, fabric production and design, clothing and foot wear merchandizing among others which can result to self-employment(Chedume and Emelue, 2011).

One solution to unemployment is the generation of self- employment. Technical and entrepreneurial skills such as planning, organizing, marketing, accounting, implementing among others are essential for running a successful business venture (Anyakoha, 2015). In the same vein, Armstrong-Gibbs and McLaren (2017); Pearson, (2017) noted that planning, organizing, accounting, human resources, marketing are an essential function of merchandising management process. These technical and entrepreneurial skills as well as merchandising management processes are also needed

in footwear merchandizing business venture. The need for foot wear merchandizing for self –reliance has become imperative in the face of gross unemployment of NCE graduates and reduction in availability of teaching positions and other paid employment. The footwear merchandising skills needed by NCE graduates include: planning skills, organizing skills and marketing, which the study is delimited to. The success of any foot wear merchandising business is a function of committed and dedicated foot wear merchandising entrepreneurs.

Merchandise describes the products and services that a merchant offers to the target market while merchandising refers to all the decisions that go into the selling of a product or service. These decisions include what to sell, who to sell it to, how the product item will be packaged and displayed and the price at which the product will be offered to the consumers, among other activities (Jacobs, 2018). According to Gilbert (2017) merchandising is a plan approach to selecting, buying, presenting and selling merchandise to maximize profit on investment and satisfy consumer demand through making the right merchandise available at the right places, times, prices and quantities. For the purpose of this study, merchandising is defined as a key retail function that manages and/or coordinates the development, buying, planning, sourcing, and distribution of products in the supply chain to offer the right merchandise assortment(s) to satisfy a specific target market's needs and wants, as well as generate profit.

Footwear merchandising includes all the activities involved in the planning, buying and selling of foot wear items. It entails all activities aimed at bringing foot wear goods and services to the market place, selling strategies, profit making and record keeping. It is thus product or service meant for sale and is capable of giving the consumer satisfaction .According to Gilbert (2017) foot wear merchandising therefore, entails; idea generation, planning, promotion, selling, buying and distribution of foot wear products and services to the consumer. It is a means of maximizing sales using product design, selection, packaging, display and pricing to stimulate consumers to spend more.

Foot wear merchandising simply put is therefore the skills and knowledge involved in the buying and selling of foot wear goods and services. Numerous foot wears and items can be merchandised and these include; foot wear for babies, men shoes, women shoes, sports/athletic shoe, slippers, slip-on for different individuals, ages and sex,foot wear accessories like; shoe lace, foot wear strap, shoe brushes, shoe buckle, shoe sole, shoe care products among others. This consequently, creates enormous market and employableopportunities for the foot wear merchandiser. The place of foot wear as a basic human need makes these opportunities very important and viable. Foot wear merchandising exists as large, medium and small scale enterprises. Such enterprises exist in varying forms for assorted components of foot wear in both urban and rural areas of the country.

Foot wear is a product that is used to protect human feet from effects of all biological damages.According to Thompson and Philip (2015) footwear is used for covering and protecting the foot from ground textures, temperatures, and from gravel roads. In Nigeria, the knowledge of foot wear and its importation into Nigeria came along with the presence of the colonial masters. As the need to protect the feet became glaring, the quest for foot wear became essential. Today, it is difficult to see a Nigerian adult, teenagers and children outside their homes without one form of footwear or the other. Everybody wears shoes whether rich or poor; they are basic fashion accessories necessary to complete an outfit and look beautiful. Everybody needs shoes, and everybody wears them. Most people have more than one pair, others have closets full of shoes. The opportunities that lie in footwear merchandizing business are real and ever-present (Uwadia, 2019). Dressing up is not complete without nice shoes to go with it and this is one of the reasons why footwear merchandising business is a very lucrative business not just in Nigeria but also in the world at large. With creativity and style, graduates of NCE could invest in this business and enjoy financial freedom as foot wear is a very rewarding and profitable venture for new and aspiring entrepreneurs and can be a source of wealth creation (Uwadia, 2019; (Sarkar, 2013).

Successful entrepreneurs must possess certain entrepreneurial skills. Skill is the ability to use ones knowledge effectively in doing something well and successfully. According to Onuka and Olaitan (2007) skill is the capability to accomplish a task in a manner accepted by workers in the profession or domain. Skills needed to successfully conceive a business, plan for a business, establish and run the business successfully using human and non – human resources are regarded as entrepreneurship skills. The skills according to Onuoha (2007) include planning and documentation of activities in order to implement them; organizing and arranging activities resources and implementation.Thus one can be said to have acquired entrepreneurship skills in foot wear merchandising if the afore mentioned activities are carried out expertly by such a person. With necessary and adequate training from Home Economics lecturers to their students, graduates of Colleges of Education can have technical and entrepreneurial skills that can yield satisfactory employment in footwear merchandizing and this will help to better equip them and improve their economic status. This will also reduce poverty and social vices that emanates from unemployment and bring about economic benefits on graduation

Purpose of the Study

The major purpose of the study was to evolvefootwear merchandising skills needed by graduates of Colleges of Education for the establishment of footwear merchandising business venture in Delta State. Specifically, the study determined footwear merchandising skills needed for:

1.planning footwear merchandising business venture and its growth;

2.organizing footwear merchandising business venture and its growth;
3.marketing of footwear products

Research questions

The following research questions were formulated to guide the study:

1. What are the footwear merchandizing skills needed for planning footwearbusiness venture and its growth?
2. What are the footwear merchandizing skills needed for organizing footwear business venture and its growth?
3. What are the footwear merchandizing skills needed for marketing foot wear products?

Methodology

***Research Design*:** This study adopted a survey research design.

***Area of the Study*:** The study was conducted in Delta State, Nigeria. Delta state has a good number of colleges of Education that offers home economics courses and produce graduates on a yearly basis into the market field. Also a lot of foot wear merchandising business opportunities exist in this area that is filled up with students and working class men and women found in diverse sectors of the economy.

***Population of the Study*:** The population for the study comprised of all registered footwear and clothing and textile related business merchandizers and lecturers of Home Economics in the selected institutions which included: College of Education, Asaba; College of Education, Warri; College of Education, Agbo; and College of Education, Mosoga. According to the Delta State Ministry of Interior (2018), there were 2,450 registered entrepreneurs in foot wear, clothing and textiles-related enterprises in the state. The four institutions used for the study had a total of 62 lecturers ((Delta State Ministry of Education, 2018). Therefore, the total number of the population studied was 2,512.

***Sample/Sampling Technique*:** The sample size for this study was 200 respondents selected from the registered entrepreneurs in foot wear and clothing and textilerelated enterprises in the state and the lecturers in the four colleges of education in the state. Simple random sampling technique was used to select fifty (50) merchandisers/entrepreneurs from the three senatorial zones (Delta South, Delta North and Delta Central) respectively in Delta State given a total of 150 merchandizers/entrepreneurs.Non-proportionate stratified random sampling technique was used to select lecturers from the four colleges of education in the state as follows: College of Education, Asaba (14); College of Education, Warri (17); College of Education, Agbo (10); College of Education, Mosoga (9).

***Instrument for Data Collection*:** Afour point scale questionnaire was used for data collection. These were developed based on objectives of the study. The instrument was face validated by three experts.A test-retest method was adopted to ascertain the reliability of the instrument using Cronbach co-efficient Alpha. The reliability co-efficient of 0.96 was obtained.

***Method of Data Collection*:** A total of 200 copies of the questionnaire were distributed by the researcher with the help of three research assistants to the respondents. All 200 copies of the questionnaires, which is 100 % return rate, were retrieved by the researcher.

***Method of Data Analysis*:** The research questions were analyzed using mean and standard deviation (SD).Items with 2.50 and above were regarded as needed or agreed while items with a mean score below 2.50 were regarded as not needed or disagreed.

Table 1: Mean responses of foot wear merchandisers and lecturers on the merchandising skills needed in planning foot wear merchandising business venture.

S/N	Foot wear merchandizing skill of planning	Mean	Std. Dev.	Remark
1	Setting goal for footwear merchandizing	3.52	0.15	Agreed
2	Identify and select suitable location	3.53	0.19	Agreed
3	Identify market for footwear merchandizing	3.18	0.84	Agreed
4	Plan effectively for goal attainment	3.12	0.90	Agreed
5	Plan for facilities and select appropriate equipment	3.08	0.79	Agreed
6	Select skills and qualified personnel	2.62	0.27	Agreed
7	Identified market, make budgets and register the business	2.81	0.21	Agreed
8	Draw schedule of activities for the business	2.55	0.29	agreed
9	Understand importance of time management and job demand	2.60	0.27	Agreed
10	Supervise an employee in an effective manner	2.56	0.23	Agreed
11	Communicate very well with customers and business associate	3.51	0.07	Agreed
12	Determine personnel salary with caution	3.13	0.10	Agreed
13	Under competent of short long term planning	3.90	0.01	Agreed
14	Estimate seasons for high and low sales to maximize profit	3.58	0.04	Agreed

Key: Std. Dev = Standard Deviation.

Table 1 reveals that all the items needed above meet the criterion level of acceptance. This shows that the respondents agreed that all the fourteen (14) footwear merchandising skill of planning are essential for foot wear merchandising business venture and growth.

Table 2: Mean responses of foot wear merchandisers and lecturers on the merchandising skills needed in organizing foot wear merchandising business venture.

S/N	Foot wear merchandizing skill of organize	Mean	Std. Dev	Remark
1	Employ competent staff and provide them with job description	3.24	0.87	Agreed
2	Acquire and arrange facilities and equipment for footwear merchandizing	3.39	0.57	Agreed
3	Procure good and quality facility and equipment that will last	3.58	0.18	Agreed
4	Provide facilities and equipment for staff to perform their job	2.62	1.10	Agreed
5	Correct and direct staff, reward good performance and job effectiveness	2.75	1.09	Agreed
6	Hold regular management meetings with staff to Access progress of the business	3.45	0.24	Agreed
7	Formulate and document policies made in enterprise	3.55	0.18	
8	Prepare a planned budget for the year	3.08	0.37	Agreed
9	Estimate income and expenditure account for the year	3.50	0.14	Agreed
10	Make provision for delivery notes for sales	3.32	0.08	Agreed

Key: Std. Dev = Standard Deviation

Table 2 above shows that the entire mean indicated that respondents agreed in all the ten (10) items of footwear merchandizing skill of organizing as essential and needed for foot wear merchandising business venture and growth

Table 3: Mean responses of foot wear merchandisers and lecturers on the merchandising skills needed in marketing foot wear.

S/N	Foot wear merchandizing skill of marketing	Mean	Std. Dev	Remark
1	Recording number of foot wear purchase and sold	3.19	0.06	Agreed
2	Calculating cost price and selling price	2.60	1.13	Agreed
3	Fix price of foot wear and transport them	3.64	0.91	Agreed
4	Sell finished foot wear products	2.56	1.15	Agreed
5	Ensure price tags on products	3.55	0.77	Agreed
6	Ensure adequate packaging of finished products for competitive advantage	3.87	0.79	Agreed
7	Use credit sales to aid marketing	2.25	1.12	Agreed
8	Advertise business to promote sales	3.76	0.73	Agreed
9	Maintain a customer oriented philosophy	3.56	0.76	Agreed
10	Determine current and future trends in sale of products	3.56	0.79	Agreed
11	Should be able to withstand competition	2.60	1.10	Agreed

Key: Std. Dev = Standard Deviation; A= Agreed

Table 3 reveals that all the items above meet the criterion level of acceptance. This shows that the respondents accepted that all the eleven (11) footwear merchandising skills are needed for footwear merchandising business venture and growth.

Discussion of Findings

The findings in Table 1 showed that setting goals for foot wear production; identifying suitable business location; planning for facilities and selecting appropriate equipment; selecting skilled and qualified personnel and identifying market, make budget and registering the business are entrepreneurial skills of planning needed for foot wear business venture and its growth. The present study is in agreement with the assertions of Anaplan (2016); Gilbert (2017) that setting of goals and planning for facilities and personnel will help merchandisers stay accountable, measure progress and avoid waste of money and other resources. The study is also in tandem with Awo and Ukoneze (2012) who asserted that drawing up a business plan for procurement of facilities is a vital skill for successful business enterprise. This study also affirms the assertions of Emelue (2010) that entrepreneurship skills for planning a clothing production business included identifying suitable location business location, selecting appropriate equipment and tools, selecting qualified personnel among others. The authors also identified entrepreneurship skills as being the panacea to youth economic self-reliance. Specifically, Lemo (2013) added that exceptional skills in entrepreneurship are essential for succeeding in entrepreneurship enterprises. Due to the innovations in modern business, it is important to note that promoting skills in entrepreneurship will be right step in the right direction towards business growth.

Table 2 showed that Employing competent staff for specific jobs in foot wear production and providing them with job description; acquiring and arranging facilities and equipment for foot wear production; procuring good and quality facility and equipment that will last; providing facilities and equipment for staff to perform their jobs; Correcting and directing staff, rewarding good performance and job effectiveness; holding regular management meetings with staff to access progress of the business are entrepreneurship skills of organizing needed for foot wear business venture and its growth. The finding is in consonance with the assertions of Pearson (2017) that organizing is the starting point to getting an organized footwear shop as an organized shop increases work productivity and the time it takes to serve customers. The author added that customers have high expectations onhow products are organized and presented by merchandisers therefore spending time to organize a footwear business venture is essential to raise profit. The study is also in line with Onuka and Olaitan (2007); Fernades (2019) who noted that organizing as entrepreneurship skill is essential in any business production and growth. The authors further added that organizing skills such as providing staff with job description, acquiring and

arranging facilities, procuring quality equipment that will last and rewarding staff effectiveness will aid the growth of business venture.

Table three showed that the entrepreneurship skills needed in marketing foot wear products will aid the success of foot wear business venture and growth and recording number of foot wear sales; calculating cost price and selling price; fixing prices of foot wear and transporting them; selling foot wear products, offer an enticing retail experience and ensuring adequate packaging of finished products are entrepreneurship skills of marketing needed for foot wear business venture and its growth. This study is in line with Armstrong-Gibbs and McLaren (2017) who stated that any entrepreneur without good knowledge of marketing as a managerial function cannot operate optimally. Marketing is a major ingredient for driving sales through creating convenient shopping experience to customers and making every customer interaction counts. This will help drive the future of a business within and across strategic, tactical and operational level. This finding is also in agreement with Uwadia (2019) who noted that understanding products hierarchy as well as adequate packaging is an essential entrepreneurship marketing skill that will aid growth of business venture.

Conclusion

The study established that planning, organizing and marketing are essential entrepreneurial skills for foot wear merchandising business venture growth for graduates of Colleges of Education for self -reliance. Therefore, graduates should be well equipped with technical knowledge and entrepreneurial skills in clothing and textile related business ventures as this is an antidote to Colleges of Education graduates unemployment and poverty. These skills will also help entrepreneurs improve their performance in the area of planning, organizing personnel administration and marketing.

Recommendations

Based on the findings of the study, the following recommendations were made.

1. Clothing and textilescurriculum be organized to emphasize technical and entrepreneurial skills such as business plans, marketing strategies, business empowerment content that will provide life skills training in clothing and textilerelated business venture for students under clothing and textile education.
2. Clothing and textiles teaching of related business venture should be more of practical than theory and that functional textiles and clothing laboratories be provided in schools.
3. Lecturers in clothing and textiles should be more committed to practical teachings that will lead to technical and entrepreneurial skills for self-reliance

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