Production And Acceptability of Chinchin Made from Cassava Flour Blends A Substitute For Wheat Flour In Jos, Plateau State, Nigeria

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Abstract

The study investigated the use of cassava flour in the production of chin-chin, the aim of this study was to evaluate the proximate and functional properties of different substitution levels of wheat cassava flours and their effect on the proximate composition and acceptability of deep fat- fried chin-chin made from them. The study used an experimental design. The flour variety used includes wheat flour, cassava flour. Five items and 5-point hedonic scale of 1-5 extremely acceptable and extremely inacceptable was used by twenty (20) trained panelist to rate each of the five-sample chin-chin sample. Data were collected and analyzed using analysis of variance (ANOVA) at p<95% confident level (p<0.05). The result analyzed showed that three out of five, samples A, C and D were not significantly different in (taste, texture, flavor and appearance) while sample D had the highest mean score for taste of 4.85 from all others. In term of flavor sample, A had the highest mean score of 4.60, sample D and E had the highest mean score for appearance of 4.55 and sample A and D had the highest mean score for texture of 4.55 which was the lowest mean among all others. It was observed that with control of ingredients, continuous trial and modification, more acceptable chin-chin can be produced by bakeries, home makers, Home Economics students and teachers using good cassava flour to produce chin-chin. It was recommended that the federal government should embark on organizing trainings and empowerment for women. Home Economics teachers should include cassava flour in their baking recipes. Hotels, bakeries and Food production companies should include cassava flour on their recipes when producing snacks such as pizza, shawarma bread, cakes and other creative recipes.

Key Words: Baking, Sensory Evaluation, Chin-chin, Palava sauce

Introduction

Cassava has long been recognized as a staple food crop with potentials as a raw material base for a wide range of processed products. Over the past three decades, cassava development research by Sub-Sahara Africa (SSA) has significantly enhanced these features in the crop. In the mid-1990s. Through a combination of conventional and new approaches, the partnership has developed improved cassava varieties which combine multiple pest/disease resistance with superior postharvest qualities and improve the yield potential in many locations (Echendu, Onimawo, & Somtochi, 2014). At least, 165 improved varieties have been released in 26 countries. The availability of these elite cassava varieties with 50% more yielding potential reflects the vision of an expanded future role of cassava in food, feed, and industrial applications. (Gbola, 2012). This is a vital step to increase on-farm yields/productivity, promote value addition targeting diverse markets in schemes to commercialize the crop enabling it to contribute significantly to poverty reduction

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An Annual Publication of The Society for Human Ecologists in Nigeria (SHEN)

strategies (Chukwu, 2012).

The use of cassava flour was first introduced in Nigeria in 2002, via the presidential initiative on cassava, and in 2004, 10% inclusion was made mandatory for baking by the Federal Government of Nigeria. This policy on cassava inclusion stipulated strategies for all categories of bakers to include cassava flour in their products in the country. According to Adegunwa, Ganiyu, Bakare, and Adeborale (2014), the reasons for the policy were for the: stabilization of price, creation of new market, jobs and most importantly, and reduction expenditure on wheat importation. However, between 2007 and 2010, the percentage inclusion was reduced to 5% due to pressure from bakers and other interested economic and political stakeholders. In fact, bakers across the country reverted to the use of 100% wheat flour for baking, until 2012, when the Federal government announced the 40% cassava flour inclusion (Aristizabal, Garcia, & Ospina, 2017). Despite this, the policy has not been successful due to ignorance on the part of the bakers on the use of cassava flour and the inability of industries to meet the demand of bakers with respect to industry-grade cassava flour (United states Department of Agriculture 2018).

Cassava (Manihot esculenta Gramtz) is a major root crop and an important staple food for over 500 million people in the developing world (Akinwumi, 2012). Cassava pulp which represents about 10 to 15% of the root contains 60 to 70% moisture content and 50% carbohydrates on a dry weight basis (Falade & Akingbala, 2010). Dried cassava pulp is low in protein (approximately 2%), deficient in carotene, and has high levels of insoluble fibre (James, 2016). Wheat-cassava composite flour artificially substituted with cassava flour for the production of leavened bread, unleavened baked products, porridges, pastas and snack foods such as chin-chin. Formally, only few types of flour (sorghum, or maize) being used for the substitution for economical and nutritional purposes, but today several composite flours like millet-wheat, wheat - plantain, wheat-soybeans, wheat-African yam beans, and wheat-cassava have been documented (Adeniji,2013).

The National Agency for Food and Drug, Administration and Control (NAFDAC), has affirmed that the use of cassava flour for baking is healthy based on the nutrient's composition of cassava (Adepoju & Oyewole, 2013). On the other hand, the production of cassava in Nigeria has been bedeviled with several technical challenges. This is due to the nature of cassava production process, marketing and consumption in Nigeria. To start with, cassava is a perishable commodity; its decay starts from the second day after harvesting, thus making it lose value for industrial use (Mepba, Eboh, & Nwaojigwa, 2017). Also, due to the manual process of producing cassava flour, lower quality flours are produced. The slow nature of manual processing encourages fermentation, thus making it produce lower quality products in baking (McWattlers, Ouedraogo, Resurrection, Hung, & Philips, 2013). To produce high quality cassava flour (HQCF) for baking, the process must be completed rapidly to prevent fermentation. Therefore, the use of screw presses reduces the moisture content of grated cassava rapidly thereby decreasing the rate of fermentation (Olaoye, Ubbor, & Okakpu, 2016).

Despite the availability of equipment for cassava processing, peeling is still mostly done manually and is associated with high wastage of cassava (Nzelu, Nwosu, & Onwurah, 2012). According to Oluwamukomi, Oluwalana, and Akinbowale (2010), manual peeling also predisposes the cassava to human contact which increases the chances of microbial activities in the process This supports the inquiry into the effectiveness of the cassava flour inclusion in bakery products policy in Plateau State and Nigeria at large.

Chin-chin is a deep-fat-fried snack produced from unleavened dough, prepared from wheat flour kneaded with water and ingredients such as sugar, milk, egg among others according to choice. According to

Sanni, Adebowale, and Tafa (2016), the dough is pressed and cut into thin slices of different shapes like small squares and long stripes before frying. Deep-fat frying is suitable for food of all shapes; irregularly shaped foods tend to retain greater volume of oil when removed. During deep-fat-frying, all the chin-chin surfaces receive equal heat treatment to produce uniform color.

Many efforts have been made to promote the use of composite flours from partially substituted wheat flour with locally grown crops in pastry products to save importation cost (Onimaw & Akubor, 2015). The use of wheat-cassava flour in chin-chin production will diversify cassava uses, enhance cassava production and value addition. Wheat (Triticum aestivum) flour, either hard or soft, has been the major ingredient for producing deep fat fried pastry products. Wheat provides nearly 78.10% carbohydrate, 14.70% protein, 2.10% fat, 2.10% minerals (zinc, iron, selenium and magnesium) and considerable proportions of vitamins B complex (Thongkratok, Khempaka, & Mole, 2010). Cassava is very rich in starch and contains significant amounts of calcium (50 mg/100g), phosphorus (40 mg/100g), and vitamin C (25 mg/100g). However, they are poor in protein and other nutrients. Fresh, peeled roots may be 30 to 35 percent carbohydrate, but only 1 to 2 percent protein and less than 1 percent fat.

In contrast, cassava leaves are a good source of protein (23 percent) if supplemented with the amino acid methionine despite containing cyanide. According to Ugwu and and Ukpabi (2020), the quality of cassava protein is relatively good when cooked in various ways. The soft-boiled root has a delicate flavor and can replace boiled potatoes in many uses: as an accompaniment for meat dishes, or made into purées, dumplings, soups, stews, and gravies. Deep fried (after boiling or steaming), it can replace fried potatoes, with a distinctive flavor. Tapioca and foufou are made from the starchy cassava root flour. Tapioca is an essentially flavor-less starchy ingredient, or fecula, produced from treated and dried cassava (manioc) root and used in cooking. Also, the leaves can be pounded to fine chaff and cooked as a palaver sauce in Sierra Leone, usually with palm oil but vegetable oil can also be used. Palaver sauces contain meat and fish as well. It is necessary to wash the leaf chaff several times to remove the bitterness.

Furthermore, Cassava is also used to make alcoholic beverages. In many countries, significant research has begun to evaluate the use of cassava as an ethanol biofuel. In China, dried tapioca is used among other industrial applications as raw material for the production of consumable alcohol and emerging non-grain feedstock of ethanol fuel, which is a form of renewable energy to substitute petrol (gasoline). Cassava sometimes is used for medicinal purposes. The bitter variety of Manihot root is used to treat diarrhea and malaria. The leaves are used to treat hypertension, headache, and pain. Cubans commonly use cassava to treat irritable bowel syndrome; the paste is eaten in excess during treatment.

As much as cassava contains various beneficial nutrients (carbohydrates, vitamins and minerals, proteins, fiber and essential amino acids), it also has anti-nutritional and toxic substances, which impair nutrient uptake and absorption of nutrients. However, it has been documented in that various processing methods reduce the levels of some of these toxic substances in cassava. Manihot esculenta Crantz is not so commonly used in herbal medicine, but indigenous people do employ it for various purposes. Some of it has potentially toxic components and sometimes considered as non-edible and toxic in various parts of the world. However, it is definitely one of the most useful medicinal plants. Various phytochemicals are present in this plant for numerous medicinal uses and detoxification mechanism.

It is evident that the benefits of Cassava need not to be overemphasized. As the researcher did observe high cost of wheat flour in the market, making families to shift from the use of snacks made from flour to other products for breakfast and other family meals, the need for this study was birthed to substitute wheat flour with cassava flour in order to eliminate the outrageous cost of the ingredients hitherto involved in the production of chin-chin. Therefore, this study was on the production and sensory evaluation of chin-chin made from cassava flour as a substitute for wheat flour in Jos, Plateau State, Nigeria.

Objectives of The Study

The objective of the study was on the production and sensory evaluation of chin-chin made from cassava flour as a substitute for wheat flour in Jos, Plateau State, Nigeria. The following objectives were formulated in order to achieve the aim of the study.

1. Determination of the nutritional value of cassava flour
2. Production of chin-chin with cassava flour
3. Sensory evaluation of wheat-cassava Chin-chin.

Method and Procedure

This research employed experimental design which is a traditional approach in conducting a quantitative and qualitative research, so it was adopted to determine and obtain accurate results in the acceptability of chin-chin made from cassava flour as a substituting of wheat flour.

Materials

Wheat flour and the other ingredients used in this research were purchased from Farin-gada market in Jos North Local Government Area while the cassava tubers were procured from the National Root Crops Research Institute Vom (NRCRI) in Jos South Local Government Area, all in Plateau State, Nigeria.

Production of Cassava Flour

The cassava tubers were sorted peeled and washed and soaked in clean water to remove dirt and also allows it ferment for three days. The cleaned tubers were grated with a grating machine and dewatered with the aid of a screw jack to obtain a semi-solid cassava cake.

Sample Formulations

The chin-chin blends of cassava and wheat were prepared in 100% wheat (control), 100% cassava, 50% cassava-50% wheat and 70% cassava-30% wheat, 70% wheat and 30% cassava.

Preparation of Chin-Chin

Chin-chin was prepared according to Adegunwa et al. (2014). The composite flour blend, sugar, margarine, baking powder, egg and milk were measured into a 20 L stainless steel bowl and mixed thoroughly together before kneading with water into dough. The dough formed was placed on floured board surface and further kneaded into smooth and elastic dough which was rolled with a wooden roller to about 2 cm thick and cut with stainless knives into 2 cm by 6 cm sizes. The slices were deep-fat-fried in hot vegetable oil (about 180°C) with open pan for about 8 min until golden color was attained. The fried chin-chin was removed and allowed to drain off excess oil before cooling and packing in airtight polyethylene film for analysis.

Table 1. Blending ratios of wheat-cassava composite flour

Sample	Wheat (%)	Cassava(%)
A	100	0
B	0	100
C	50	50
D	70	30
E	30	70

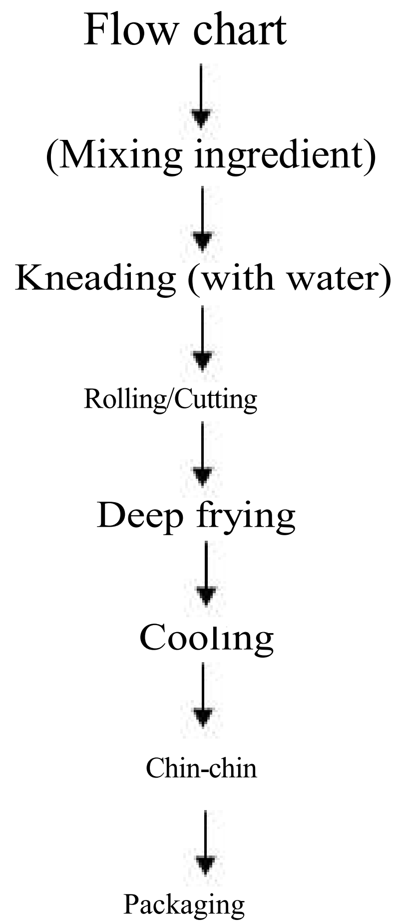


Figure1. Flowchart for the preparation of Chin-chin

Results and Discussion

The result obtained from the sensory evaluation of the five samples under study by trained panelist are shown in table 2

Table 2: Acceptability of the Five Chin-Chin Sample (ANOVA) Chin-Chin Sample Sensory

Attribute	Sample A	Sample B	Sample C	Sample D	Sample E
Taste	4.65±0.49	4.45±0.51	4.25±0.44	4.85±0.37	4.35±0.75
Texture	4.50±0.61	4.30±0.80	3.80±0.62	4.50±0.51	3.80±0.99
Flavour	4.60±0.60	4.45±0.51	3.90±0.64	4.05±0.61	4.25±0.85
Appearance	4.45±0.51	4.35±0.67	3.85±0.99	4.55±0.61	4.55±0.51

From the table sample A is a products from 100%wheat flour which was the control, the normal flour used in the production of chin-chin while sample B is a product from 100%cassava flour, while sample C was the mixture 50% wheat flour and 50%cassava flour and sample D is a product from 30% cassava and 70% wheat flour and sample E is a product from 30% wheat flour and 70% cassava flour, from the table sample A to E shown an acceptability of the mean score average for taste sample ABCD and E are: 4.65, 4.45, 4.25, 4.85, and 4.35 in general showed that all the varieties of chin-chin useful were acceptable to all the 20 panelist. Through the score for sample C was the lowest.

Discussions

Finding according to research question one, which was geared toward providing an answer to respondents' knowledge on the nutritional value of cassava flour used in making cake. From the proximate analysis, the moisture content of cassava is between 8.29-10.48% while the dry matter ranges between 92-94% also, the protein content from the proximate analysis is 2.8% whereas, the fat content ranges from 16.84-17.57% This agrees with the submission made by Sanni and Tafa, (2016) that cassava root tuber no matter the location of its plantation, it still have same nutritional content and therefore a very good source of energy for humans.

Based on research question two as regards production of chinchin made from cassava flour the researcher has five samples that was blended with wheat and cassava. This ratio ranges from 100% percent cassava flour for the production of chinchin, 50 50% of flour and wheat flour 70 cassava and 30% wheat, lastly, 70 wheat flour and 30% cassava flour making 5 samples. The product was displayed to the 20 panelists for testing and scoring accordingly. The five-product blended with flour gave an acceptability value to the respondents and shows a balanced level of dietetry requirement and higher nutritional value and bioactive compounds. This is in line with the findings by Gbola, (2012) who established that consumption of foods with high dietary fibers has been reported in prevention for its high nutritional value and bioactive compounds, and protection of oxidative damage mediated in the organism through cellular metabolic activities.

Similarly, finding in relation to research question three on the sensory evaluation of chin chin made from cassava flour with respect to color, aroma, texture, taste, and general acceptability revealed that dark colour of the chinchin made from cassava flour is preferred by majority of the respondents. However, majority of the respondents slightly liked the aroma of the chin chin, and rated the texture of chinchin 'good', rated the taste 'fair', and 'liked very much' the general acceptability of the chinchin made from cassava flour.

Proximate Composition of Wheat-Cassava Chin-Chin Samples

Moisture content (MC)

The MC of the chin-chin samples (8.29-10.40%) increased significantly ($P<0.05$) more than the controls (7.05 and 7.61%) with increase in cassava flour inclusion. This may be due to significant ($P<0.05$) higher MC (Table 3) and water absorption capacity (WAC) in Table 4 of cassava than wheat flour this is reflected in the significant ($p<0.05$) higher M C (7.61%) of chin-chin from 100% cassava flour than 100% wheat (7.05%). The values were higher than 3.98-5.04% reported by Adepoju, and Oyewole, (2013). Chin-chin made from millet-wheat composite flour. Sample D (70% wheat: 30% cassava flour) with 8.29% MC may likely have better shelf stability as supported by Ugwuand and Ukpabi (2020), and texture than the counterparts at same storage conditions.

Dry matter (DM)

The DM content of chin-chin increased significantly ($P<0.05$) with decrease in cassava flour in the flour blends. This could be as a result of significant ($0<0.05$) higher MC of cassava flour than wheat (Table 3) which correlates inversely with DM. This is evident in the significant ($P<0.05$) higher DM (92.94%) of sample A of sample A (100% wheat) than B (100% cassava) with 92.38%. Also, the least value (89.59%) of sample E (30% wheat: 70% cassava) testified that. As DM is an indication of the food mass, samples with lower levels of cassava will have more mass.

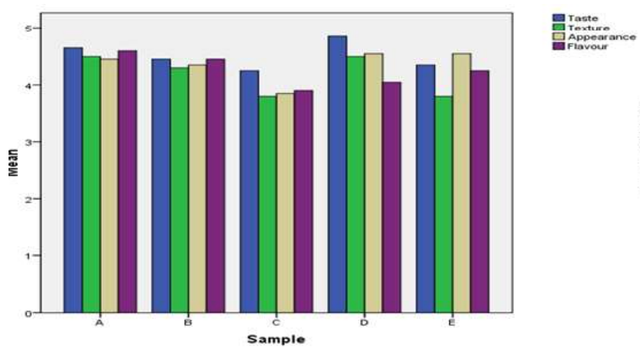
Protein

Significant ($P<0.05$) protein decrease (6.66-3.50%) with increase in cassava inclusion in the blend could be attributed to lower protein content of the cassava flour than wheat (Table 3) which tends to lower the protein content of the chin-chin. This is attested by higher protein content (7.16%) of sample A (100 % wheat) than B (100 percent cassava) with 2.81%. The protein content of all the chin-chin from composite flour is lower than that from 100% wheat flour, but higher than that of 100% cassava flour.

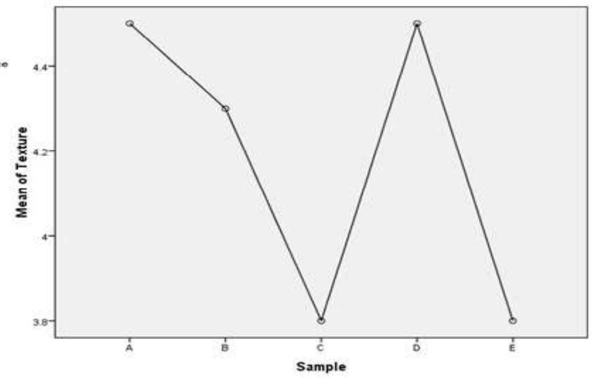
Fat

Fat content of sample A (100% wheat) is significantly ($P<0.05$) higher than B (100%

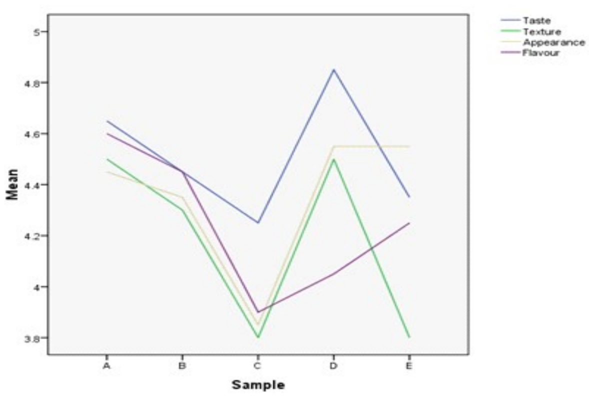
cassava). This could be traced to higher fat content of wheat flour than cassava (Table 3) and higher oil absorption capacity (OAC) of wheat flour than cassava (Table 4). Similar decreasing fat content of chin-chin was also evident in the entire samples produced from composite flours from 17.57% in sample D (70% wheat: 30% cassava) to 16.84 in sample E (30% wheat: 70% cassava) fat variation between samples C (50% wheat: 50% cassava) and D (70% wheat: 30% cassava)



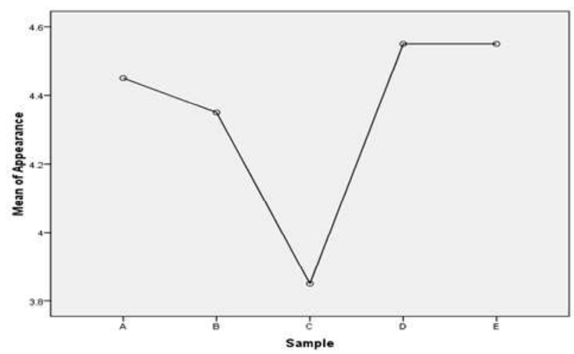
BAR GRAPH



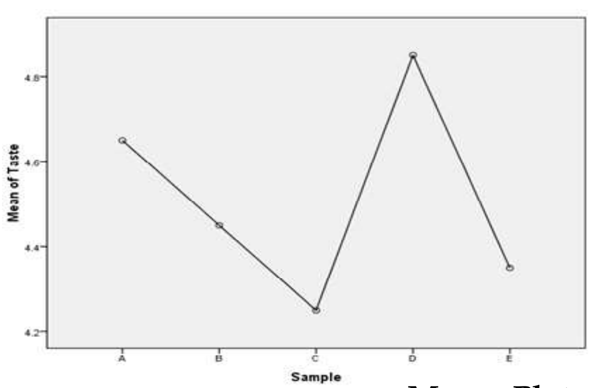
Line Graph of taste



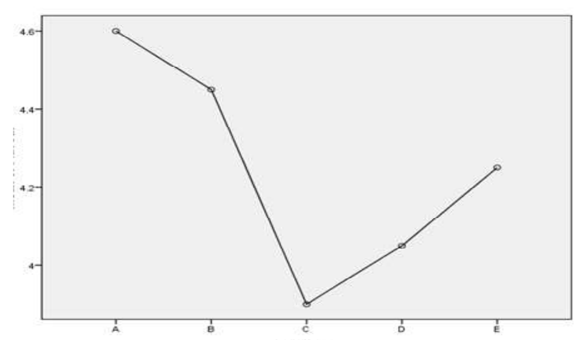
Bar Graph with error bars



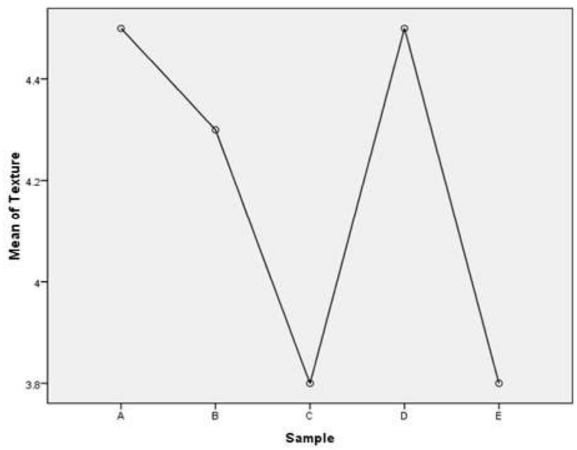
Line Graph of appearance



Means Plots



Line Graph of flavor



Line Graph of texture

Conclusion And Reccomendation

Based on the findings of this study with respect to frying of chin chin using cassava flour as a substitute for wheat flour, it was concluded that cassava flour , also known as (Manihot esculenta Gramtz) is a whitish smooth flour used for different purposes including fufu, gari, gusgus, koskoro, and other products. It can be used in making cake with ingredients such as flour, sugar, eggs, salt, and baking powder, and it promotes heart health, supports weight management, boosts nutrients absorption among others. As it is revealed in this study, there was high acceptability of the 30% cassava versus 70% wheat flour with acceptability value of 4.55 by the panelist and sample D also scoring 4.55 which also shows high acceptability meaning that cassava flour can be used as a substitute for wheat flour in the production of chin-chin for household use. From this research work, it has been established that chin-chin can be successfully produced with cassava flour especially when mixed together with wheat flour, it gives it a very nice texture, taste, flavor and appearance.

The following recommendations were made from the findings of the study:

1. The federal government should embark on organizing and trainings for illiterate women through practical demonstration on how to use cassava flour and also empowers farmers to farm in large quantities.
2. Seminars should be organized to enlightened women and home makers on the use of cassava flour and its benefits to individuals and to also encourage Home Economics teachers use it in baking recipes for more varieties.
3. Hotels, bakeries and food production companies should include cassava flour on their recipes when producing snacks such as pizza, shawarma bread, cakes to be creative or meals that need thickeners such as vegetables soup, Oha and banga soup.

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