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AN INVESTIGATION INTO THE PROCESSING AND UTILIZATION OF CASSAVA FLOUR IN THE PRODUCTION OF SNACKS IN THE CATERING ESTABLISHMENTS IN ANAMBRA STATE

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Abstract

This study was carried out to process and utilize cassava flour and composite flour to produce various snacks. The varying proportion included 100% cassava flour, (30-70)% composite wheat flour/cassava flour. The projects were subjected to sensory evaluation to test for colour, taste, aroma, crispness, crunchiness and overall acceptability by a panel of (20) judges comprising staff and students of the Federal Polytechnic Oko. Standard deviation, score values obtained from various parameters was tested. Major findings were that commercial processing of cassava flour are applicable to composite wheat flour which made cassava flour to compete favourably with composite wheat flour. Based on the major findings, the researcher through the conducted experiment, however recommended that improved variety of cassava stem should be made available to farmers to give better yield and less duration in the cultivation of cassava.

Keywords*: Cassava, Cassava flour, wheat flour/cassava flour, snacks, colour, taste, aroma, Crispness, and Crunchiness*

Introduction

Cassava, manihot Esculenta Crantz (synmahot utilissima phol) is a dicotyledonous perennial belonging to the botanical family euphorbiaceae. It is the third most important source of energy in the tropics. It is a starchy root crop that is given almost entirely in the hotter lowland tropics. The crop is known under a variety of names according to the region in which it is cultivated, cassava in the English speaking countries of North America, Europe and Africa, manioc in French-speaking countries, tapioca in the English-speaking countries of South America. According to Asiedu (2009), the total amount of cynogenic glycosides in cassava root is often used to place the numerous cassava cultivars into two major groups. The "bitter" varieties in which the cynogenics are distributed throughout the tuber and are at a high level and the "sweet" varieties in which glycosides are confined chiefly to the peel are at "low" level. Nigeria is the current largest producer of cassava in the world, producing 22% of the world's 165.3 million per annum. It is eaten by up to 600million people (on a daily basis) in Africa, Asia and Latin America.

According to Asiedu (2005) cassava is grown principally for its swollen roots, although its leaves are also consumed in some part of Africa especially the democratic republic of Congo, as a cash crop. Cassava generates cash income for the largest number of household in comparism with other staple foods. As food crop, cassava has some inherent characteristics which makes it attractive, especially to the small holder farmers in Nigeria (FAO). Firstly it is rich in carbohydrates, especially starch and consequently has a multiplicity of end users. Secondly, it is available all the year round, making it preferable to others, more seasonal crop for food security. Compared to grains, cassava is more tolerant to low soil fertility and more resistant to drought, pest and moth after they mature, these attributes combined with other socio-economic consideration are therefore what IFAD (International Funds for Agricultural Development, 2014) has recognized in the crop as tending itself to a commodity based approach to poverty alleviation (FAO, 2015).

Cassava tuber is a staple crop consumed in our society but its use in confectionary industries is limited. The processing into flour basically for baked products when in season would not only promote cultivation by the farmers but create diversity in the usage apart from preparation for "Garri and Fufu".

Aims and Objectives

The broad objective of this study is to ensure that cassava is processed into other forms in order to reduce wastage and to provide raw materials needed for production by catering industries. It will seek to:

To produce cassava flour

(i) To produce snacks from the cassava flour and various ration of wheat flour.

(ii) To evaluate the acceptability of the snacks.

This study will be significant in different ways because it will create awareness in the use of cassava for other food production other than the conventional use both at home and commercial levels It will create a system for increased alternative utilization of cassava at household and industrial level and for improved rural livelihoods through food and income security.

This will be achieved through promoting cassava production, encouraging the consumption of processed cassava and provide market linkages and public-private sector partnerships. The study will serve as an avenue for innovation in cassava commercialization and increased cassava value. In addition, this will help to address the food security challenges facing the country presently.

Review

Cassava a perennial crop produced a high yield of tuberous root in 6months three years after planting, originating in the central and South American. Cassava spread rapidly and arrived on the West coast of Africa via the gulf of Benin and the river Congo at the end of the sixteenth century and on the east coast via the Reunion Island, Madagascar and Zanzibar at the end of .the eighteenth century.

Origin of Cassava

The cassava plant is said to have originated in Northern Brazil with the likelihood of an additional centre of origin to Central America (Royers, 2013). Numerous cassava cultivars exist which are differentiated on the basis of morphological characteristics such as leaves, shapes and sizes, plant height and branching pattern. Petiole and stems collor, tuber, shape, cynogenic glycoside of the root, the cynogenic glycosides content of the root storage organ is used to classify the cassava into two groups: Bitter and sweet varieties.

Cassava Production in Nigeria

In Nigeria, cassava is cropped or inter cropped with vegetable. There has been a steady growth in cassava production in Nigeria from 12 million tons in 1986 to 31 million tons in 1996. With current production estimated to 34millions tones, this increase is falling due to an increase in the number of hectares under cultivation (FMANR, 2007) Most farming families engage in cassava processing firstly as a way of producing food for the immediate use of household and secondly to add value to the product in order to increase their farm income.

Thirdly, cassava is bulky unlike yam or other root crops and it is not directly edible. The crops exhibit certain characteristics in terms of deterioration in quality of product, if it is not immediately utilized. Processing extends the shelf live, reducing the risk of wastage and extensive cost of transportation over a long distance.

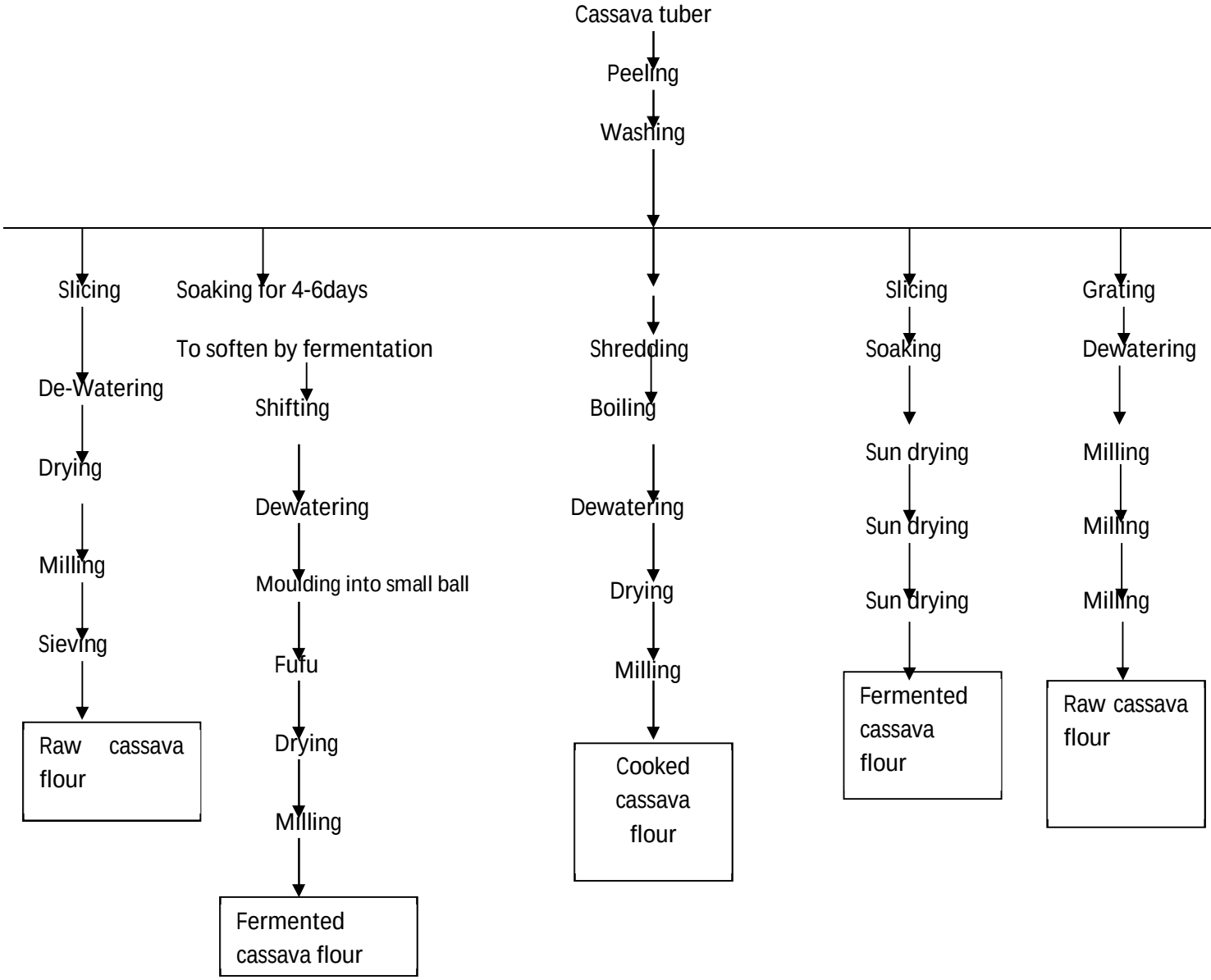
Cassava Processing

After harvesting, cassava roots are processed to stop physiological and microbial spoilage to reduce the cynogenic glycoside content (Asiedu, (2009) This converts the roots to other product which are more acceptable. Cassava roots are processed into product such as "garri, fufu," (abacha), ' elubo, syrup and dextrin. Many food product made from cassava are produced from fermentation (Oyewole and Odunfa, 2002). Durations and method of fermentation varies depending on the product under consideration.

The flour from cassava has received and is still receiving considerable attention as snacks for economic reasons. Wheat must be wholly or at least partly substituted in snacks making by locally available flour. Cassava flour is made from peeled, washed, sliced and sun dried cassava tuber. These sun-dried chips are grounded with a mortar and pestle into flour. In most cases, flour prepared by this

method is not of good quality due to the considerable contamination with dirts. Also, a certain degree of reaction occurs "during the relatively long drying period. It is important to avoid long drying time, since fermentation impact a dark colour and acid taste to the product. Cassava flour of acceptable quality is obtained through the accelerated drying of the particle dehydrated pulp. In this process, manually or mechanically peeled cassava tubers are washed and chipped.

There are many processes used for producing cassava flour. They may involve all or some of the following unit operation. Peeling of the cassava roots, washing, grading, soaking, fermentation, milling, drying and storage used for various purposes. The flour produced can be fortified with Soya beans flour to increase the protein content up to 100%.



Field study (2016): flowchart of cassava root processing into different food products.

Chemical Composition of Cassava

Depending on variety, age and maturity, the edible flesh of the cassava make up 80 to 90% of The roots. The tubers of cassava contain 149.0% calories and 68.0mg calcium while the leaves has 303.0mg calcium and 3110.mg vitamin C. the flesh can be chalk, white or yellowish. Cassava roots are very rich in starch and contain significant amount of calcium (50mg/100g) phosphorous (400mg/100g) and vitamin C (25mg/100g) wikipedia (2007).

However, they are poor in protein and other nutrients In contrast, cassava leaves are a good source of protein rich in the amino acid lysine, though deficient in methionine and possibly typtophan.

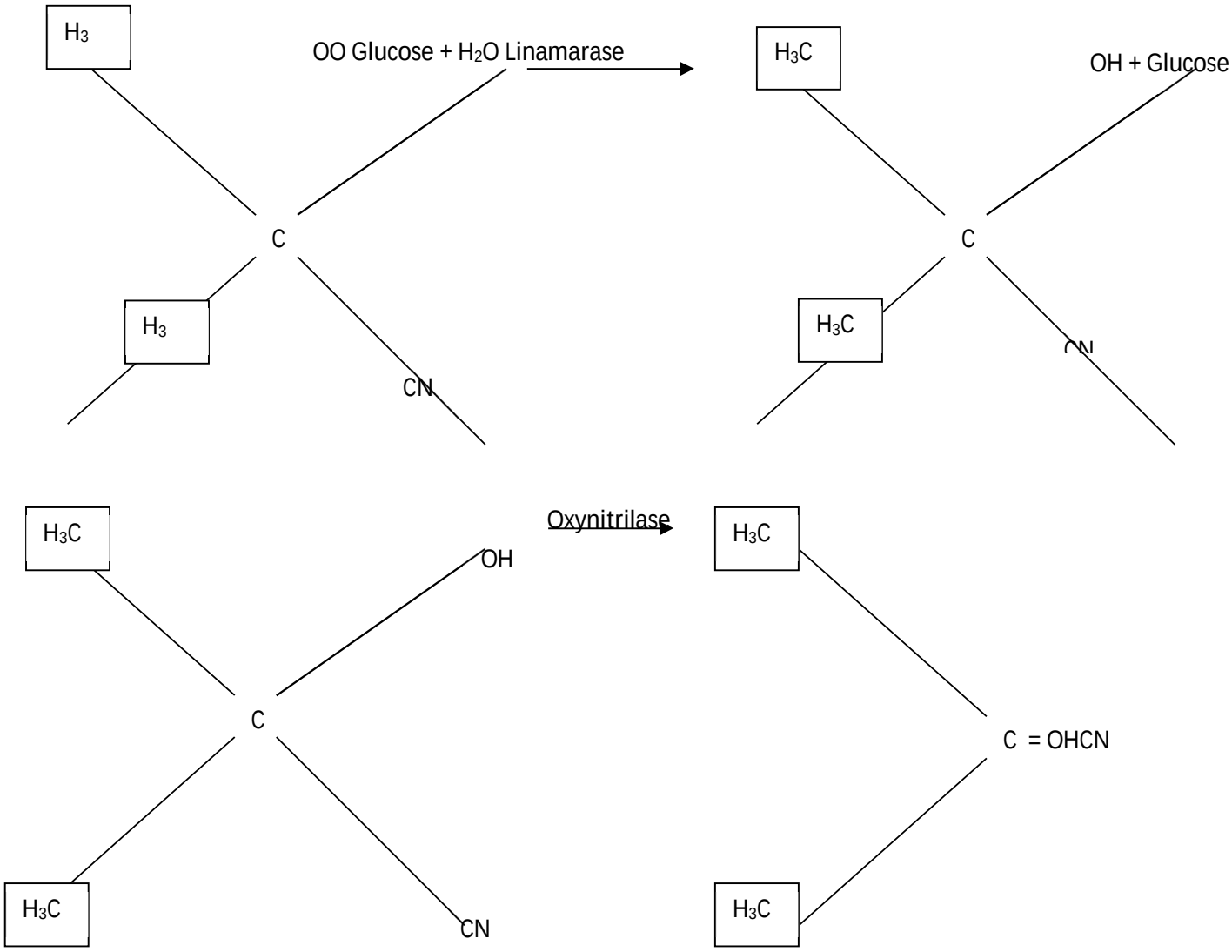
Table 1:

Constituent	Peeled tuber total matter %	Dry matter %
Water	66.2	……..
Starch	27.5	81.5
Sucrose	1.0	3.0
Glucose	0.4	1.1
Fructose	0.3	0.8
Protein	0.4	1.3
Fats	0.2	0.6
Minerals	0.8	2.5
Dietary fibre	1.5	4.4
Remainder	1.7 '	4.9
Cyanide	150-300	300 – 900

Source: field study 2016.

The Nutritional Value of Cassava

Source: field study 2016.



Cassava contains primary carbohydrate of these carbohydrate, .64-72 percent is made up of starch. About 17 percent sucrose is found in sweet varieties and small quantities of fructose and dextrose are

also traced (Alabi, 2005): Peeling of cassava tuber result in the loss of part of the valuable protein content of their root because the peel contains more protein than is found in the fresh root, while fermentation of the root results in protein enrichment to 6 percent (Hahn,2002). Cassava root is reasonably rich in calcium and vitamin c, but large proportion of riboflavin, thiamine and niacin are lost during processing.

Cassava leaves are good source of protein and vitamins which can provide a valuable supplement to predominantly starchy diets (Hahn 2002). Nutritional value of cassava leaves is similar to that of any other dark green leaves, which are extremely valuable source of vitamin A (Carotene) and C, Fe and Ca. studies have shown that total essential amino acid content of cassava leave is similar to that found in hen's egg and is greater than that in oat and rice grain, soya beans seed and spinach. While the vitamin content of the leave is high, the process techniques for preparing the leaves for consumption can lead to huge losses.

Toxicity and Detoxification Cassava

It is known that cassava contain two major cynogenic glycoside; (Linamarin and lotaustralin).

Both glycoside are hydrolyzed to produce hydrocyanic or.

Enzymatic degradation Linamar conn, 1980) prussic acid (HCM) a poison, when they come in contact with the enzyme Linamarin and the subsequent -production of cyanide toxicity in human and animals on cassava diet is a well recognized problem (Okeke,2008, Osuntokun et al., 2009, Coursey;2003,Eraman, 2008).

The presence of cynogenic glycoside in most cassava cultivars necessitates a certain degree of detoxification before the root can be consumed. The prussic acid in particular in lethal if more than about 0.lg of it, is contained in the food eaten by an individual at any point in time (Onwueme, 2008). In general, three method of detoxification are employed.

a. Microbial detoxification through fermentation.
b. Decomposition of the glycosides by heating them about 150.
c. Rupture of the root to allow intimate interaction between linamarase and the glycoside, then expressing or volatilizing the resultant product of hydrolysis.

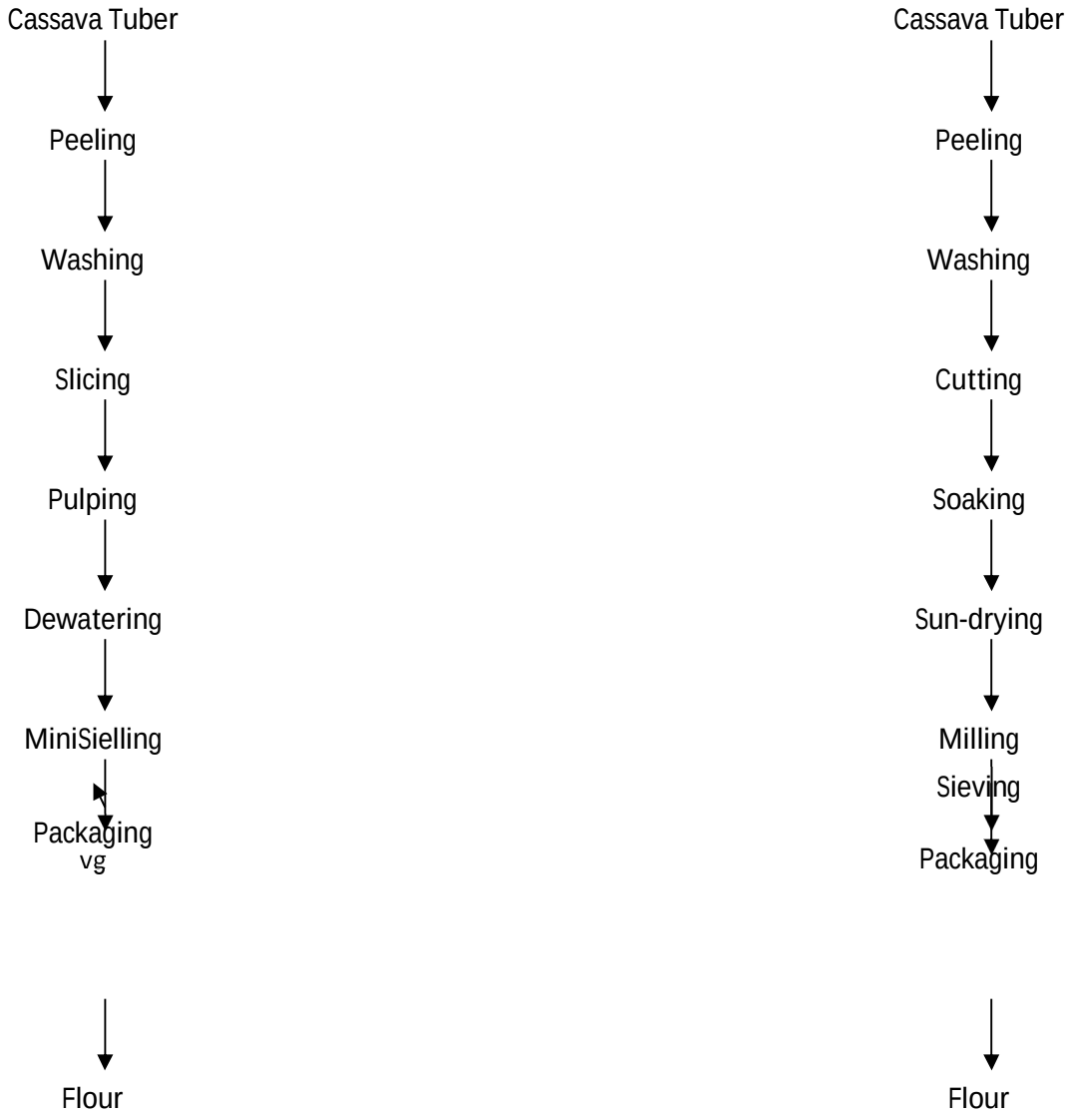
Snacks

Snacks are light meals, which are popularly taken at only time of the day. There are varieties of snacks prepared as bakery and confectionary products from wheat and composite flour including cassava flour inform of cakes, pies, doughnut, Swiss roll and assorted breads. They are quick, easy meal for industrialist and civil servant that have little or no time to travel home for breakfast and lunch meals. Snacks prepared from wheat and composite flour is rich in essential food nutrient. These include vitamin, proteins, fats, minerals and carbohydrate.

Methodology

Cassava flour used as the primary ingredient for the experiment, was locally purchased at Onitsha main market and processed into the flour and other materials bought were wheat flour, yeast, vanilla flavouring essence, butter, baking powder, salt, sugar, egg, vegetable oil, milk.

The processing of cassava tuber into cassava flour



Flow chart of home processed cassava flour (Source: Asiedu, 2009).

Production of Cassava Snacks Production of Fish Cake

Recipe: 70 -30% cassava flour + wheat flour

Cassava flour	-	-	140g
Wheat flour	-	-	60g
Baking powder	-	-	1 teaspoon
Sugar	-	-	125g
Egg	-	-	3 medium
Fish	-	-	Titus fish

Method

1. Boil fish in salted water for 5mins
2. Separate by hand and remove bones.
3. Cook the fish thoroughly.
4. Mix to a firm dough.
5. Mix the flour and sugar in a mixing bowl.
6. Mould into ball.
7. Bake at 250°C .

Production of Doughnut

Recipe: 70 -30% cassava flour + wheat flour

Cassava flour	-	-	140g
Wheat flour	-	-	60g
Yeast	-	-	1 teaspoon
Butter	-	-	125g
Salt	-	-	pinch
Milk	-	-	few drop

Method

1. Sieve the flour into a dry bowl.
2. Add water and mix it together
3. Add yeast.
4. Dilute milk with water.
5. Add the mixture little by little.
6. Add a little butter.
7. Knead it very well.
8. Allow it to proof.
9. Grease nylon and cover in warm place for 20mins.
10. Cut in ring shape.
11. Fry in deep oil.

Production of Puff-Puff

Recipe: 70 -30% cassava flour + wheat flour

Cassava flour	-	-	140g
Wheat flour	-	-	60g
Butter	-	-	50g

Few drop of lemon juice

Yeast	-	-	1 teaspoon
Sugar	-	-	50g

Method

1. Rub flour, sugar, yeast and butter together
2. Add water and lemon juice.
3. Knead very well in a shape of ball
4. Relax the dough in warm place
5. Cut into ball and fry golden brown colour.
6. Ready to serve.

Production Of Swiss Roll

Recipe: 70 -30% cassava flour + wheat flour

Cassava flour	-	-	70g
Wheat flour	-	-	30g .
Sugar	-	-	50g
Egg	-	-	3 pieces

Vanilla flavouring essence few drop

Method

1. Whisk the egg and sugar with a ballon whisk in a bowl over a pan of hot water.
2. Continue until mixture is light and creamy
3. Remove from the heat and whisk until cold and thick.
4. Add the flour very gently and stir.
5. Grease Swiss roll tin and line the greased, grease proof or silicon paper.
6. Put in the baking pan and bake for 30mins.
7. Turn out to a sheet of paper, sprinkle with caster sugar.
8. Remove the paper from the Swiss roll, spread with warm jam.
9. Roll into a fairly tight roll, leaving the paper on the outside for a few minute.
10. Remove the paper and allow cooling on a wire rack.
11. Cut and serve

Production of Chin - Chin
Recipe: 70-30% cassava flour + wheat flour

Cassava flour	-	-	140g
Wheat flour	-	-	40g
Milk	-	-	25g
Salt	-	-	a pinch
Egg	-	-	1 piece
Sugar	-	-	30g
Butter	-	-	50g
Baking powder	-	-	½ teaspoon

Method

1. Sieve the flour, baking powder and salt in a large bowl.
2. Mix the flour, sugar, salt and baking powder.
3. In a small bowl mix together egg and milk.
4. Make a well in the centre of the day ingredient and pour egg and milk in mixture in.
5. Mix and then knead with your hands, turning the mixture out onto a counter and knead until it forms solid dough.
6. Roll out dough on a flavoured board.
7. Cut into stripes or cubes.
8. Fry in deep or shallow oil

Production of Queens Cake
Recipe: 70-30% cassava flour + wheat flour

Cassava flour	-	-	140g
Wheat flour	-	-	60g
Egg	-	-	3 medium sizes
Sugar	-	-	125g
Butter	-	-	100g
Baking powder	-	-	1 teaspoon

Method

1. Sift the flour and baking powder
2. Cream butter and sugar together until pale and fluffy
3. Add the beating egg to the mixture
4. Gradually add flour
5. Grease the baking tin and fill the tin half full.
6. Bake for 15-20mins 190°c (375°f) until garden brown
7. remove from oven and serve

Method of Data Collection
Twenty (20) judges were used to evaluate the products for: texture, colour, flavour, taste and general acceptability based on a 9-point hedonic scale (Ikehoronye and Ngoddy - 2005)
Data Analysis Methods
Mean and, standard scores of data collected from sensory evaluation of the products were calculated and recorded accordingly
Results and Discussions
Results:

Table 2: the sensory quality for the various snacks

Parameter	X	Y	Z	XY	ZO	ZY
Colour	4.2±0.83	4.05±0.94	4.35±0.74	3.6±0.82	4.05±0.82	4.25 ±0.9
Taste	4.05±0.75	3.95±0.88	3.9±1,02	3.4±0.82	4+0.79	4.35± 0.8
Aroma	3.85±1.04	3.95±0.88	4.15±0.87	3.15±1.03	3.9±0.91	3.75±1.20
Crispness	3.84±0.83	3.7±1.08	3.68±1.00	3.42±1.01	3.52±0.77	3.47±0.90
Crunchiness	3.47±0.83	3.57±0.9	3.42±0.94	2.94±2.16	3.42±1.12	3.52±1.0
Overall acceptability	4.2 ±0.77	4.1 +0.9	42 ±0.85	3.5 ± 1.10	3.95±0.88	4.25±0.85

Discussion

The result of the sensory evaluation is presented in table 2 it showed the mean score for colour, taste, aroma, crispness, crunchiness and the overall acceptability.

The result compared favourable with composite wheat flour snacks. Promotion of cassava wheat snacks should be encouraged as a source of cheap protein, calories and also enhances increase cultivation of cassava.

Colour: The means score for the colour ranged from (3.6±0.82 to 4.35±0.7) with sample z having in the score. There were not much difference in the colour. A golden brown from the whole panelists

Taste: The mean score for the taste ranged from 3.4+0.82 to 4.35+0.8. The taste was quite acceptable by the panelists.

Cake prepared from 70:30 cassava flour + wheat flour score of highest value of 4.15±0.8 for aroma, with doughnut of similar proportion having taste score of 3.15±1.03. The aroma was equally acceptable to the panelists.

The values obtained to the crispness was about the same although fishcake was more crispy than other products.

Doughnut and puff-puff were less crunchy than other products. This could be associated to the nature of preparation which is dough -like.

Generally, doughnut and puff-puff prepared from equal proportion of cassava flour + wheat flour were less acceptable than for other products

Summary of the Procedure used in the Study

Cassava processing is one of the method that is widely used to produce flour that are been used for snacks, chin-chin etc. It can also be used for preparation of garri and fufu.

Many catering industries lack the knowledge of processing this cassava and this affect the way they produce their products and it is important to find out the necessary way of processing it.

Major Findings: From the study, colour, taste, aroma and crispness identified were relevant in the sensory evaluation of the processing and utilization of cassava flour in the production of snacks in the catering industries.

Conclusion

The processing and utilization of cassava and composite wheat flour for the production of snacks were researched upon. Different snacks were prepared, 70-30% cassava and composite wheat flour. The parameters tested were taste, colour, aroma, crispness, crunchiness and overall acceptability by a panel of twenty (20) judges, comprising staff and students in the Federal Polytechnic Oko. It was generally revealed in this study that the lower the proportion, the more acceptable it was to the panelist. This could partly be associated with the home processing techniques adopted in preparing the cassava flour in comparison, to commercialize the processing of cassava flour for it to favourably compete with all the purpose wheat flour used in the confectionary industry.

Recommendations

- The improved variety of cassava stems should be made available to farmers to give better yield and its duration in cultivation of cassava.
- Cost reduction on confectionary should be ensured by incorporating cassava flour usage in baked products.
- Government should fund adequately such researchers to improve on cassava flour production in Nigeria

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