# PRODUCTION, SHELFLIFE STUDY AND SENSORY EVALUATION OF TWO VARIETIES OF PLANTAIN FLOUR FOR "AMALA" PUDDING.

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## ABSTRACT

The aim of the study is to determine the shelf life and sensory evaluation of two varieties of plantain flour for Amala pudding., .In this study, plantain was produced into flour using oven drying method and subject to microbiological analysis for four weeks and sensory attributes. The result shows that sample B had higher microbial counts than A. Total viable count of ranged from $13.0\times10^2$ to$29.50\times10^2$ cfu/g a,. *Staphylococcus* ranged from $2.12\times10^2$ to $5..0\times10^2$cfu/g. Fungal count of samples ranged from $0.5.\times10^2$ to $4.2\times10^2$cfu/g . .All the microbial count was within the standard. Microbes isolated were *Bacillus, Lactobacillus, Staphylococcus, ,Rhizopus, Mucor* and *Sacharomyces sp*. The sensory evaluation of the plantain flour into Amala pudding shows significant difference among the samples in colour, aroma ,texture ,taste and the sample B(Horn plantain flour) had the best overall acceptability with score of 8.78. .This study shows that oven drying method makes plantain flour has a fewer microbial count and thus has a better shelf life more than four weeks and sample B reconstituted to Amala pudding was the most acceptable.

Key words; Plantain flour, shelf life, sensory, evaluation .pudding.

## INTRODUCTION

Plantain (*Musa Paradisiaca*) is a tropical staple fruit in West Africa (Akinsanmi *et al.,* 2015*)* and belongs to the genus Musa of the family *Musaceae*. It is often in the form of a green crescent at harvest that changes to yellow upon ripening. The French horn (Apem) and giant horn (apantu) cultivars are the most commonly grown plantain in Ghana (Zakpaa *et al.,* 2010*).*

Plantain is high in dietary fibre, which is relevant in lowering cholesterol preventing constipation and also helps lower blood pressure (Ng and Fong, 2000). It also contains substantial amounts of potassium, magnesium and phosphate but low in fat (Adewale *et al.,*2013). Because of its richness in potassium, it is highly recommended for individuals in need of diuretics (Best *et al.,* 1984; Alvarez-Acosta *et al.,* 2009*).* It is ideal for diabetics , children and pregnant women, Plantain contain small amount of secrotonin which has the ability to dilate the arteries and improve blood circulation( Agw *et al.,*2014). It's regular consumption help to cure anemia and maintain a healthy heart (USDA, 2010. )

Plantain as compared to banana contains more starch that is slowly broken down in the body when consumed (Soares *et al.,* 2011). This attribute (especially with unripen plantain) is highly appreciated amongst diabetics since it aids in the control of blood sugar concentration (Best *et al*., 1984; Alvarez-Acosta *et al.,* 2009). Nutritionally, plantain has the tendency to provide a higher energy yield compared to most locally consumed foods. For every 100 g of the raw plantain fruit, about 112 kcal is obtainable, boiled fruit yields 122 kcal and the ripe fried fruit yields 267 kCal (Chandler, 2003).

Plantain has been used as a dietary source and cash crop in many countries found in Africa, Latin America and Asia (Akubor and Adejo, 2000; Mosha *et al.,* 2000; Dury *et al.,* 2002*).* Food and

Agricultural Organisation(2010) reported Ghana to be the largest producer of plantain in West Africa Product.

According to Dzomeku *et al. (*2011*),* production of plantain has great socio-economic importance in Ghana. In Nigeria, is the business of processing plantain into either flour or plantain chips. But locally, many Nigerians are also into roasting and frying plantain into chips, *'kelewele', 'kaklo'* and *'tatale'*. Plantain cultivation and harvest are faced with many challenges. Strong winds and rainfall highly affect harvest volumes and its availability during rainy and windy seasons leading to high prices in dry seasons (Dzomeku *et al.*, 2011).

Once fruits are harvested, they are subjected to biochemical and microbial deterioration and as they continue to metabolize, losses in their edibility, quality and availability occur (Fallik and Aharoni, 2004). In addition, the plantain fruit is considered to be climacteric, ripening process occurs after harvest (usually between 2 –7 days after harvesting) and does so rapidly once it commences (Kende, 1993; Robinson, 1996; Ogazi, 2009).. Ripening of plantain fruit is hastened through mechanical injuries, temperature stress and chemicals present during transportation, storage and the immediate surroundings (Sharma and Singh, 2000; Brecht *et al.,* 2004*).* Thus plantain fruit is highly perishable and its deterioration overtime negatively affects its quality and quantity which may lead to higher selling prices. Technologists have resorted to processing as a way of preserving the fruit (Thompson, *1995).* Different methods for processing and preserving plantain fruits for storage to promote their availability in lean seasons have been developed. Including canning in syrups, application of extrusion, infrared and microwave technology to develop high valued end products (Thompson, 1995; Chandler, 1995). Dehydration via sun, oven, solar drying, convective drying and freeze drying have also been exploited (Johnson and

Brennan, 2000; Falade *et al.,* 2003; Matazu and Haroun, 2004). Several drying methods have been found to significantly affect the physical, proximate, rheological and functional properties of plantain fruit (Pacheco-Delahaye *et al.,* 2008*).* Though freeze dried plantain gives better results it is considered expensive (Pacheco-Delahaye *et al.,* 2008*).*

Drying via sun, solar and oven methods have been seen to have decreased the nutritional content (lipids, protein and carbohydrates) in some plantain (Agoreyo *et al., 2011;* Hassan *et* al., 2007). This could be attributed to lipid oxidation and Maillard reactions.

Plantains are easily cultivated and are therefore a cheaper traditional and functional food compared to other functional foods *(*Ruel *et al*., 2004*).* It however perishes easily due to factors such as respiration, ethylene production and sensitivity, transpiration, compositional changes (Irtwange, *2011*). But a longer life span of plantain can be achieved under proper storage conditions (Falade *et al.,* 2003*).* Preservation methods for plantain fruits include drying methods which are currently the most commonly used to produce unripe plantain flour and study its shelf stability. The objective of this work is to produce and examine the microbiological quality of Plantain flour for the shelf life study and evaluate the sensory evaluation of the reconstituted plantain flour known as 'Amala'

## MATERIALS AND METHODS.

## MATERIALS

### 1 SOURCE OF MATERIALS

Plantain (*Musa Paradisiaca*) of both varieties French horn and False horn were gotten from Sayedero Market in Ilaro.Ogun State Nigeria.

## SAMPLE PREPARATION

The method of Ogazi (1984) [18] was used to prepare the plantain flour. Green matured plantain fruits were washed to remove adhering soil particles, peeled and sliced into thin thickness, abour 1 cm thick.and blanching was carried out on the sliced samples in hot water .The product was dried in the cabinet dryer at 60°C for 24 h. The dried plantain slices were milled into flour using a milling machine and then sieved. It was flour was packaged in a polythene bag.

## MICROBIAL ANALYSIS

Ten (10) grams of each Plantain flours samples was diluted in 90 ml of sterile distilled water in a conical flask to get the aliquot, a ten fold serial dilution was carried out. An aliquot of 1 ml from selected dilutions of each sample was inoculated aseptically into labelled triplicate agar plates using standard pour plate method .Nutrient Agar, was used for total viable count, Baird parkers Agar for *Staphylococcus* count and Potatoe dextrose Agar for Fungi count. and incubated at 37°C ±2°C for 24 to 48 hours. Potato Dextrose Agar was incubated at (28°C±2°C) for 3 to 5 days for isolation of fungi. Colonies were enumerated at the end of incubation period using digital colony counter (Gallenkamp England))( lyne ,2003)

### Sensory Evaluation Analysis

Sensory evaluation was carried out on the two varieties of plantain flour. Trained and conversant panel of judges from the polytechnic.. The samples were assess for taste, colour, aroma, texture, mouthful and overall acceptability of the sample. The samples were arranged randomly and presented to the judges in the sample type of clean and transparent plates and each sample were

coded in such a way that the panellist could not be biased. The judges recorded sensory characteristics of each sample using an 8 – point hedonic scale as described by[9] (Ihekoronye and Ngoddy, 1985)

**Statistical Analysis** Means of duplicate data were subjected to a one-way analysis of variance (ANOVA) using SPSS statistical package version 20.0 (SPSS Inc, Chicago, USA) to determine significant differences between the quality attributes of samples with Duncan's Multiple Range Test (DMRT) at $p<0.05$.

## RESULTS AND DISCUSSION

## RESULTS

**TABLE 1: MICROBIAL ANALYSIS OF TWO VARIETIES OF PLANTAIN FLOUR**

| SAMPLES | TOTAL VARIABLE COUNT (cfu/g) | STAPHYLOCOCCUS COUNT ($x10^2$cfu/g) | FUNGI COUNT ($x10^2$cfu/g) | WEEK /DAY |
|---|---|---|---|---|
| A | 13.00 ±2.83 | 3.50 ±2.1211 | 0.50 ±0.71 | **WEEEK 1** |
| B | 14.00 ±9.90 | 6.0 ±1.410 | 2.50 ±0.71 | |
| A | 25.50 ±6.36 | 4.50 ±0.71 | 7.00 ±4.24 | **WEEK 2** |
| B | 29.50 ±13.44 | 3.50 ±2.12 | 7.50 ±3.54 | |
| A | 25.00 ± 2.83 | 6.00 ± 8.49 | 4.00 ±1.41 | **WEEK 3** |
| B | 26.50 ± 2.12 | 5.00 ± 1.41 | 3.00 ±1.41 | |
| A | 13.50 ± 1.50 | 2.12 ± 1.41 | 4.00 ± 4.95 | **WEEK 4** |
| B | 21.50 ± 3.50 | 2.12± 1.41 | 4.10 ± 2.12 | |

**KEY:** Sample A 100% of false plantain flour

Sample B 100% of Horn plantain flour

**TABLE 2: SENSORY EVALUATION OF PLANTAIN FLOUR RECONSTITUTED TO AMALA PUDDING.**

| PARAMETERS | SAMPLES | |
|---|---|---|
| | **A** | **B** |
| COLOR | 7.78± 0.83 | 8.67± 0.50 |
| AROMA | 7.33 ±1.12 | 7.78 ±1.64 |
| TEXTURE | 7.44 ±1.13 | 8.44. ±73 |
| TASTE | 7.67 ± 1.12 | 8.22 ± 0.83 |
| MOUTH FELL | 7.67± 0.87 | 8.44 ± 0.73 |
| OVERALL ACCEPTABILITY | 8.00 ± 0.71 | 8.78 ± 0.44 |

**KEY:** A; 100% of false plantain flour

B; 100% of Horn plantain flour

**DISCUSSION**

The microbial analysis of the two varieties of plantain flour are presented in Table 1. The total viable count (cfu/g) of all blend slightly increased with increasing levels of plantain during the period of storage of 4weeks with values Ranging from $13.0\times10^2$ to $29..50\times10^2$cfu/g for week one. to two weeks. Total viable count for week four was $13.5\times10^2$to $15.5\times10^2$cfu/g. The increase is as a result of microbial exponential growth rate at the week two and three. At the fouth week the Total viable count deceases in the two samples. for week four was $13.5\times1^3$to

15.50×$10^2$cfu/g The total viable counts recorded was lower than the findings of (Bills *et al.*,2020) who sun dry unripe plantain for one week and isolated count range from 5.6x$10^3$ to 6.2x$10^3$ The fungal count of blend sslightly increased as well with increasing level during the period of storage with values Ranging from *0..5*×$10^2$ *to..7.0* x$10^2$cfu/g and and fourth week range from4.00×$10^2$ to 4.2.×$10^2$cfu/g The incrase is as a result of microbial exponential growth ratr and at the fourth week the fungi counts decreases The staphylococcus count ranged from 3.5×$10^3$ to 6.0×$10^2$ and the fourth week ranged from 2.1 ×$10^2$to 2.1×$10^2$cfu/g .All the counts recoreded were within the microbial standard.

General of micro-organism isolated include, *Bacillus ,Lactobacillus Staphylococcus* and the molds were *Rhyzopus and Mucor sp*. and *Saccharomyces sp*. Similar organisms were isolated from previous work carried out by (Ohehen *et al* 2006) in their study on micro-organisms associated with preparation of plantain pudding in Western Nigeria. Also similar findings with ( Ajayi ,2018, Bills *et al.*,2020) who determine the microbial load of dry and wet plantains. The sources of this microbes present in plantain flour could be air, environment or contaminations due to processing and handling of samples. The microbial proliferation may be attributed to availability and favorable micronutrient with resultant recovery of homeostatic imbalance. (Ogbulie *et al* 2007). During cooking of the plantain flour to Amala pudding the microbes wil be eliminated through heating. Plantain flour can be use a food thickner in the food industries and drug binders in pharmaceutical ( Zakpan *et.,al* 2010). There was no insect infestation in the samples during the period of storage.

The sensory evaluation of plantain flour reconstituted to Amala pudding is presented in table 2

The sensory evaluation of the plantain flour into Amala pudding shows significant difference among the samples in colour, aroma ,texture ,taste .Among the attribute assessed, sample B ( Horn plantain flour) has the highest rating score than sample A( False plantain flour) and the sample B(Horn plantainflour) had the best overallacceptability of 8.78t..This study shows that oven drying method makes plantain flourt has a fewer microbial count and thus has a better shelf life more tham four weeks and sample B reconstituted to Amala was the mostt acceptable.

## CONCLUSION

From the study, plantain flour subjected to microbial analysis shows a decrease in the count as the days of storage increases. few count of microbes were enumerated till fourth week and this could confirm a longer shelf life that could last for six months Sensory analysis of the two varieties, shows samples B(Horn plantain flour) has the best overall acceptability .Hence oven drying of plantain should be encourage.

## RECOMMENDATION.

Future work should be done on the Functional, Nutritional, and Rheological Properties of plantain flour samples.

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