

## Varietal Effects and Associated Mycoflora on the Shelf Life of Groundnut Paste Preserved with Some Botanicals

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### Abstract

Research on the varietal effects and associated Mycoflora on the shelf life of groundnut paste preserved with some botanicals was conducted in the Botany Laboratory of the Rivers State University, Port Harcourt, Nigeria. Three varieties of groundnut were used namely Sam nut 21, Sam nut 23 and Sam nut 24. Six plant materials comprising three different three seeds samples viz: *Aframomum melegueta*, *Monodora myristica* and *Piper guineense* were used for the study. The samples were aseptically treated and sundried for three days and crushed into powder. 10 grams of the groundnut paste was weighed and varying concentrations of the powdered seed samples were added to the pastes and labelled accordingly. The treated groundnut paste samples were allowed to store in the laboratory and their proximate compositions tested for a period of six months on a monthly basis to determine the effects of the applied plant materials. Powdered *Monodora myristica* indicated no significant difference in ash, protein, Iron, phytates and tannins across the different varieties. A significant reduction was observed in lipids, calcium, phosphorous, potassium, Thiamin, Niacin and Vitamin A, while all other parameters such as moisture, fibre, carbohydrate, Sodium, Vitamin C, significantly increased at ( $p < 0.05$ ) across the different varieties. Powdered Alligator pepper indicated no significant difference in ash, protein, Iron, sodium, oxylate, tannins and polyphenols across the three different species. A significant reduction was observed in lipids, calcium, magnesium, potassium, Niacin, carotenoids and Vitamin A, while all other parameters such as moisture, fibre and carbohydrate significantly increased at ( $p < 0.05$ ) across the three different species. Powdered ewhuru seed indicated no significant difference in ash, protein, Iron, phytates, tannins and polyphenols across the three different species. A significant reduction was observed in lipids, calcium, phosphorous, potassium, Thiamin, Niacin and Vitamin A, while all other parameters such as moisture, fibre, carbohydrate, Sodium, Vitamin C, lignants etc. significantly increased at ( $p < 0.05$ ) across the three different species. The result from this work revealed that the addition of the various plant materials to groundnut paste generally increased the shelf life of groundnut paste during the Six months of study. Five fungal pathogens were found to cause spoilage of groundnut paste viz: *Aspergillus niger*, *Aspergillus flavus*, *Fusarium oxysporum*, *Penicillium italicum* and *Candida tropicalis*.

**Key Words:** Groundnut paste *Aframomum melegueta*, *Monodora myristica* and *Piper guineense*, Proximate Composition.

### INTRODUCTION

Groundnut (*Arachis hypogea* L) is a legume and occupies a relevant position in the monetary value of different countries mainly in developing nations of the world. It is believed to have originated from South Africa and have been domesticated in different part of the world. The major *Arachis hypogea* L producing countries include India, China and USA. *Arachis hypogea*

*L* was introduced into Nigeria in the 16<sup>th</sup> century and has been estimated to have been planted on up to 1.4 million hectares of land (Sales and Resurreccion, 1985). The producing of *Arachis hypogea L* has been hampered flossing its spoilage by fungi mainly *Aspergillus flavus* which secretes *aflatoxin* and application cancer in man. It has also been said that that the incidence of *Aspergillus flavus* is enhanced through broken shells at harvest, and kernel splitting at making. Faster scholars have said that the identification of this fungus in Tokyo, 1986 – 1990. Groundnut nut is consumed in Nigeria in a different means as boiled, fried, dried and usually consumed in mixing with other commodities like maize, tapioca, egg in garden and cucumber. It can be processed into other forms as meals applied at traditional ceremonies like marriages, chieftaincy coronation, etc. Part of food of *Arachis hypogea L* is kulikuli (*Arachis hypogea L* cake) a traditional recipe prepared after extracting oil from groundnut, fried and consumed as snake. It is filled with in protein and applied in feeding livestock and man. Another local product from *hypogea L* is “yaji” *Arachis hypogea L* flour that has been mixed with pound ginger, dried cereals, native pepper and added salt to taste. Dankwa is another local product from *hypogea L* which has been added pound native peper, dried cereal, sugar, salt and made to balls. These condiments are seen among the Hausas. However, in the east and the southern Nigeria the most popular is the *Arachis hypogea L* paste called okwuse. Groundnut paste which is called okwuse is a cherished delicacy in the Niger Delta and among the Igbos. It is usually prepared by frying healthy *Arachis hypogea L* seeds and grinding the seeds in sterilized blender. The goundnut paste is usually spiced with different spices to give it the needed taste. The recipe could be consumed with egg in garden, cucumber and any other food of interest. The *Arachis hypogea L* paste is prepared both in the market place and at home and sold in the market, along road sides under unhygienic condition. This product is sold as they last without any knowledge of the base existence and the associated deteriorating fungi (Chuku, 2011). It is based on this dearth of knowledge on the base existence of paste and the associated fungi that this study was embarked upon.

## MATERIALS AND METHODS

Twenty kilograms of 3 varieties of freshly harvested and shelled groundnut was purchased from Rumuokoro market in Port Harcourt metropolis and transported to School To Land Farm at Rumuodamaya for identification. The groundnut varieties identified were Samnut 21, Samnut 22 and Samnut 23. The groundnut were transported to Ozuoba in Obio/Akpor Local Government Area, in Rivers State for further preparation. The seeds were sorted and the bruised ones were removed from the unblemished ones. The seeds were wetted by sprinkling with water and small quantity of salt and mixed thoroughly and sundried for one hour. The dry seeds were then fried in a metallic frying pan using a low heated local oven powered by fire wood. Care was taken to ensure that the seeds were well fried without allowing them to burn. Smooth frying was achieved by frying the groundnut seeds in garri. The fried seeds were allowed to cool before peeling. After peeling, the seeds were ground in manual blender and preserved for further studies (Chuku, 2011)

### 3.2 Collection and Preparation of Plant Materials.

Six plant materials were purchased from Rumuokoro markets comprising three different seeds samples viz: alligator pepper, ewhuru seeds and uziza seeds. The seed samples were washed and sun dried for five days. The seeds samples were crushed into powder by blending in a manual blender and each of the samples stored in a clean plastic container and labelled accordingly for further studies.

Determination of Proximate Composiution of Groundnut Paste and the Plant Materials

The various prepared samples were taking to Food Science Technology Laboratory in the Rivers State University for analysis. The method of analysis used was the AOAC (2005).

## Results and Discussion

**Table 1: Effects of treatment of *Piper guinensis* (Uziza seed) on the proximate composition of different species of groundnut paste.**

Uziza	PROXIMATE COMPOSITION					
	Moisture%	Ash %	Lipid %	Fibre %	CHO %	Protein%
SAM NUT 21_2g	12.43±0.16 <sup>ab</sup>	3.45±0.12 <sup>b</sup>	31.38±2.16 <sup>e</sup>	2.92±0.2 <sup>a</sup>	21.5±0.49 <sup>a</sup>	28.32±1.18 <sup>a</sup>
SAM NUT 21_3g	12.57±0.32 <sup>ab</sup>	3.58±0.04 <sup>ab</sup>	31.08±0.2 <sup>e</sup>	3.01±0.1 <sup>a</sup>	21.78±0.16 <sup>a</sup>	28.31±0.59 <sup>a</sup>
SAM NUT 21_4g	11.72±0.04 <sup>ab</sup>	3.47±0.08 <sup>b</sup>	31±0 <sup>e</sup>	3.1±0 <sup>a</sup>	22.33±0.16 <sup>a</sup>	28.38±0.2 <sup>a</sup>
SAM NUT 21_Ctrl	10.67±0.41 <sup>b</sup>	3.22±0.04 <sup>b</sup>	45.04±0.51 <sup>a</sup>	1.52±0.04 <sup>c</sup>	16.29±0.35 <sup>bc</sup>	23.4±0 <sup>bc</sup>
SAM NUT 23_2g	13.37±0.99 <sup>ab</sup>	3.22±0.34 <sup>b</sup>	32.2±3.13 <sup>e</sup>	2.73±0.41 <sup>a</sup>	21.95±0.35 <sup>a</sup>	26.53±3.49 <sup>ab</sup>
SAM NUT 23_3g	10.98±4.56 <sup>ab</sup>	3.48±0.19 <sup>ab</sup>	34.78±2.62 <sup>de</sup>	2.73±0.34 <sup>a</sup>	21.95±0.6 <sup>a</sup>	23.93±2.68 <sup>bc</sup>
SAM NUT 23_4g	11.77±0.99 <sup>ab</sup>	4.03±0.75 <sup>a</sup>	38.65±2.87 <sup>cd</sup>	1.98±0.58 <sup>bc</sup>	20.92±2.65 <sup>a</sup>	22.7±1.55 <sup>c</sup>
SAM NUT 23_Ctrl	11.33±0.75 <sup>ab</sup>	3.28±0.08 <sup>b</sup>	43.45±1.41 <sup>ab</sup>	1.57±0.05 <sup>c</sup>	16.1±0.89 <sup>bc</sup>	23.77±0.75 <sup>bc</sup>
SAM NUT 24_2g	13.87±1.06 <sup>a</sup>	3.03±0.36 <sup>b</sup>	32.1±2.36 <sup>e</sup>	2.52±0.39 <sup>ab</sup>	22.23±0.44 <sup>a</sup>	26.25±3.08 <sup>abc</sup>
SAM NUT 24_3g	13.43±0.79 <sup>ab</sup>	3.43±0.27 <sup>b</sup>	33.93±2.14 <sup>e</sup>	2.62±0.39 <sup>ab</sup>	21.97±0.62 <sup>a</sup>	24.62±2.82 <sup>abc</sup>
SAM NUT 24_4g	11.28±0.98 <sup>ab</sup>	3.48±0.15 <sup>ab</sup>	40±2.84 <sup>bc</sup>	2.45±0.59 <sup>ab</sup>	19.37±2.53 <sup>ab</sup>	22.9±1.55 <sup>bc</sup>
SAM NUT 24_Ctrl	11±0.55 <sup>ab</sup>	3.25±0.05 <sup>b</sup>	44.04±1.33 <sup>ab</sup>	1.53±0.05 <sup>c</sup>	14.11±6.36 <sup>c</sup>	23.68±0.57 <sup>bc</sup>
Pr > F(Model)	0.0021	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Significant	Yes	Yes	Yes	Yes	Yes	Yes

**LEGEND: CHO=Carbohydrate**

**Table 2: Effects of treatment of Alligator pepper (*Aframomim melegueta*) on the proximate composition of different species of groundnut paste.**

Alligator Pepper	Moisture%	Ash %	Lipid %	Fibre %	CHO %	Protein%
SAM NUT 21_2g	13.55±0.12 <sup>ab</sup>	3.4±0 <sup>a</sup>	34.55±0.61 <sup>c</sup>	2.17±0.16 <sup>b</sup>	21.283±0.20 <sup>a</sup>	25.05±1.10 <sup>ab</sup>
SAM NUT 21_3g	13.78±0.20 <sup>a</sup>	3.5±0 <sup>a</sup>	32.68±1.43 <sup>c</sup>	2.33±0.08 <sup>ab</sup>	21.5±0.25 <sup>a</sup>	26.2±1.96 <sup>ab</sup>
SAM NUT 21_4g	12.55±0.12 <sup>bc</sup>	3.42±0.2 <sup>a</sup>	32.52±1.27 <sup>c</sup>	2.33±0.16 <sup>ab</sup>	21.25±0.12 <sup>a</sup>	28.6±0.49 <sup>a</sup>
SAM NUT 21_Ctrl	10.67±0.41 <sup>f</sup>	3.22±0.04 <sup>ab</sup>	45.04±0.51 <sup>a</sup>	1.52±0.04 <sup>c</sup>	16.29±0.35 <sup>b</sup>	23.4±0 <sup>ab</sup>
SAM NUT 23_2g	12.97±0.44 <sup>abc</sup>	3.12±0.22 <sup>ab</sup>	39.5±4.06 <sup>abc</sup>	2.13±0.02 <sup>b</sup>	21.9±0.55 <sup>a</sup>	20.34±4.01 <sup>b</sup>
SAM NUT 23_3g	12.45±0.88 <sup>bcd</sup>	3.14±0.41 <sup>ab</sup>	38.33±5.73 <sup>abc</sup>	2.53±0.45 <sup>ab</sup>	22.1±0.45 <sup>a</sup>	21.66±5.35 <sup>ab</sup>
SAM NUT 23_4g	12.33±0.5 <sup>cd</sup>	3.2±0.25 <sup>ab</sup>	38.33±5.68 <sup>abc</sup>	2.46±0.5 <sup>ab</sup>	22.52±0.10 <sup>a</sup>	21.28±5.44 <sup>b</sup>
SAM NUT 23_Ctrl	11.33±0.75 <sup>def</sup>	3.28±0.06 <sup>ab</sup>	43.45±1.41 <sup>ab</sup>	1.57±0.05 <sup>c</sup>	16.1±0.89 <sup>b</sup>	23.77±0.75 <sup>ab</sup>
SAM NUT 24_2g	13.32±0.62 <sup>abc</sup>	3.23±0.20 <sup>ab</sup>	37.22±4.05 <sup>bc</sup>	2.16±0.12 <sup>b</sup>	21.68±0.53 <sup>a</sup>	22.35±3.89 <sup>ab</sup>
SAM NUT 24_3g	12.4±1.16 <sup>bcd</sup>	3.37±0.27 <sup>a</sup>	35.9±5.68 <sup>c</sup>	2.66±0.45 <sup>ab</sup>	22±0.55 <sup>a</sup>	23.57±5.50 <sup>ab</sup>
SAM NUT 24_4g	12.17±0.51 <sup>cde</sup>	2.95±0.20 <sup>b</sup>	35.35±5.39 <sup>c</sup>	2.78±0.5 <sup>a</sup>	22.48±0.10 <sup>a</sup>	24±5.11 <sup>ab</sup>
SAM NUT 24_Ctrl	11±0.55 <sup>ef</sup>	3.25±0.06 <sup>ab</sup>	44.04±1.33 <sup>ab</sup>	1.53±0.05 <sup>c</sup>	14.11±6.36 <sup>b</sup>	23.68±0.57 <sup>ab</sup>
Pr > F(Model)	< 0.0001	0.001	< 0.0001	< 0.0001	< 0.0001	0.0158
Significant	Yes	Yes	Yes	Yes	Yes	Yes

**LEGEND: CHO=Carbohydrate**

Means within the same column with different superscript (abcd) are significantly different (P<0.05)

**Table 3: Effects of treatment of Ewhuru seed (*Monodora myristica*) on the proximate composition of different species of groundnut paste.**

Ewhuru	PROXIMATE COMPOSITION					
	Moisture%	Ash %	Lipid %	Fibre %	CHO %	Protein%
SAM NUT 21_2g	12.73±0.33 <sup>abcd</sup>	2.97±0.08 <sup>b</sup>	42.28±0.53 <sup>abc</sup>	2.2±0.15 <sup>b</sup>	22.15±0.12 <sup>a</sup>	17.67±0.26 <sup>e</sup>
SAM NUT 21_3g	11.65±0.12 <sup>bcde</sup>	3.12±0.04 <sup>ab</sup>	41.68±0.2 <sup>abcd</sup>	2.25±0.17 <sup>ab</sup>	20.5±0 <sup>a</sup>	20.8±0.54 <sup>d</sup>
SAM NUT 21_4g	11.57±0.41 <sup>cde</sup>	3.17±0.08 <sup>ab</sup>	40.43±0.16 <sup>bcde</sup>	2.18±0.04 <sup>b</sup>	20.17±0.08 <sup>a</sup>	22.48±0.04 <sup>cd</sup>
SAM NUT 21_Ctrl	10.67±0.41 <sup>e</sup>	3.22±0.04 <sup>ab</sup>	45.04±0.51 <sup>a</sup>	1.52±0.04 <sup>c</sup>	16.29±0.35 <sup>bcd</sup>	23.4±0 <sup>bcd</sup>
SAM NUT 23_2g	14.05±1.3 <sup>a</sup>	3.37±0.19 <sup>a</sup>	33.15±2.07 <sup>f</sup>	2.47±0.44 <sup>ab</sup>	21.45±0.54 <sup>a</sup>	25.97±2.73 <sup>ab</sup>
SAM NUT 23_3g	13.47±1.57 <sup>ab</sup>	3.3±0.22 <sup>a</sup>	37.45±3.24 <sup>e</sup>	2.26±0.17 <sup>ab</sup>	20.75±0.61 <sup>a</sup>	22.77±2.12 <sup>cd</sup>
SAM NUT 23_4g	13.17±1.37 <sup>abc</sup>	3.18±0.04 <sup>ab</sup>	37.97±2.17 <sup>de</sup>	2.22±0.04 <sup>b</sup>	19.75±0.35 <sup>abc</sup>	23.87±1.08 <sup>bc</sup>
SAM NUT 23_Ctrl	11.33±0.75 <sup>de</sup>	3.28±0.08 <sup>ab</sup>	43.45±1.41 <sup>ab</sup>	1.57±0.05 <sup>c</sup>	16.1±0.89 <sup>cd</sup>	23.77±0.75 <sup>bc</sup>
SAM NUT 24_2g	13.22±1 <sup>abc</sup>	3.3±0.39 <sup>a</sup>	32.65±2.42 <sup>f</sup>	2.67±0.45 <sup>a</sup>	21.5±0.39 <sup>a</sup>	26.97±2.07 <sup>a</sup>
SAM NUT 24_3g	13.52±0.63 <sup>a</sup>	3.32±0.24 <sup>a</sup>	38.52±3.4cd <sup>e</sup>	2.32±0.33 <sup>ab</sup>	20.77±0.65 <sup>a</sup>	22.56±1.81 <sup>cd</sup>
SAM NUT 24_4g	12.33±1.3 <sup>abcde</sup>	3.2±0 <sup>ab</sup>	38.97±2.23 <sup>cde</sup>	2.22±0.04 <sup>b</sup>	19.98±0.38 <sup>ab</sup>	23.22±1.15 <sup>cd</sup>
SAM NUT 24_Ctrl	11±0.55 <sup>de</sup>	3.25±0.05 <sup>ab</sup>	44.04±1.33 <sup>ab</sup>	1.53±0.05 <sup>c</sup>	14.11±6.36 <sup>b</sup>	23.68±0.57 <sup>bc</sup>
Pr > F(Model)	< 0.0001	0.0092	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Significant	Yes	Yes	Yes	Yes	Yes	Yes

**LEGEND: CHO=Carbohydrate**

Means within the same column with different superscript (abcd) are significantly different (P<0.05)

#### **Treatment with *Piper guinensis* (Uziza Seeds)**

The results of the effects of treatment of different varieties of groundnut paste with *Piper guinensis* (uziza seed) is presented in Table 1. The proximate composition was analyzed. The Treatment of groundnut paste with different concentrations of powdered seed of uziza (*Piper guinensis*). Revealed that there was a significant reduction in Carbohydrates, Ash, Protein, Fibre, and Lipids concentration of the different species of nut when compared with their respective control samples, while all other parameters such as Moisture content significantly increased at (p<0.05).

The value recorded for the effects on the shelf life of groundnut paste with ground Uziza seed stored for Six months depicted lower moisture content at the various concentration levels compared to the control irrespective of the concentration levels and the different varieties

#### **Treatment with *Aframomim melegueta* (Alligator pepper)**

The results of the effects of treatment of different varieties of groundnut paste with *Aframomim melegueta* is presented in Table 2. The proximate composition, was analyzed. The Treatment of groundnut paste with different concentrations of powdered Alligator pepper (*Aframomim melegueta*) as revealed from the research indicated no significant difference in ash and protein. A significant reduction was observed in lipids, while all other parameters such as moisture, fibre and carbohydrate significantly increased at (p<0.05) across the three different varieties.

The result of the treatment effect on the shelf life of groundnut paste with ground Alligator pepper stored for Six months showed little or no difference in the Ash content at the various concentration levels compared to the control irrespective of the concentration levels and the different varieties.

#### **Treatment with *Monodora myristica* (Ewhuru seed)**

The results of the effects of treatment of different varieties of groundnut paste with *Monodora myristica* is presented in Table 3. The proximate composition was analyzed. The Treatment of groundnut paste with different concentrations of powdered *Monodora myristica* as revealed from the research indicated no significant difference in ash, protein.

There was a significant reduction observed in lipids, while all other parameters such as moisture, fibre, carbohydrate significantly increased at ( $p < 0.05$ ) across the three different varieties.

The value recorded for the effect on the shelf life of groundnut paste with ground Ewhuru seed stored for Six months depicted higher moisture content at the various concentration levels compared to the control irrespective of the concentration levels and the different varieties.

## CONCLUSION

It was revealed from this work that the addition of the various plant materials to groundnut paste increased the moisture content of the groundnut paste during the Six months of study. The research was done with the aim of isolating the fungi associated with groundnut paste with some plant materials and with the objective of determining the proximate composition on different varieties of groundnut paste and also the shelf life using different plant materials.

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