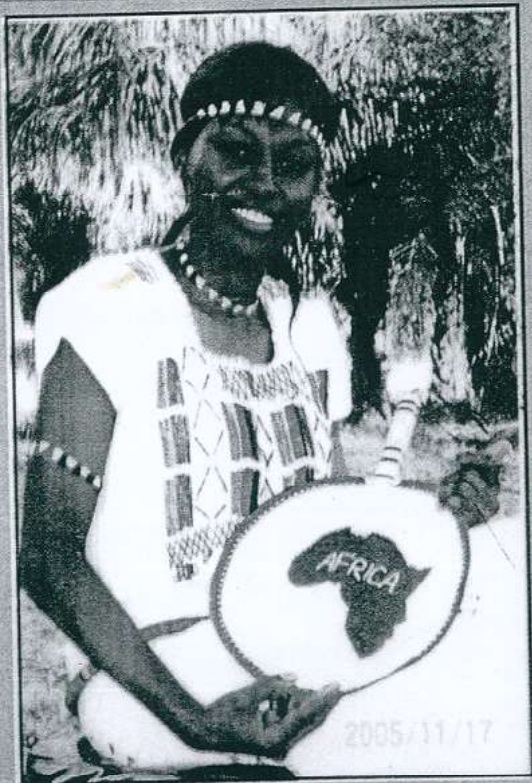


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## Nutritional Evaluation of Snacks made from Sweet Potato, Wheat and Composite Flour at various level

A.O. Okhiria

Department of Home and Hotel Management, College of Agricultural Sciences,  
Olabisi Onanbanjo University, Ayetoro  
Ogun State, Nigeria  
E. mail: [bimpeOkhiria@yahoo.com](mailto:bimpeOkhiria@yahoo.com)

### ABSTRACT

The study focused on evaluating the nutritional contents of snacks made from sweet potato, wheat and the composite mixture at various levels. 2kg of fresh potatoes were washed, peeled and sliced thinly. They were blanched, drained and sun dried. They were later ground to powdery form. Various blends of potato flour with wheat flour at various levels of substitution were made at 25%, 50% and 100% using 100% wheat flour as control sample. Crude protein contents were significantly ( $p < 0.05$ ) increased in the cake samples that contained 100% wheat flour than the chin chins and cookies that has 50% wheat flour and 50% sweet potato flour. However, data obtained showed that the higher the inclusion levels of either wheat or sweet potato flour the higher the crude protein content. Cakes prepared from 100% wheat flour and 100% sweet potato flour had the highest crude protein content respectively. Cakes made from either sweet potato flour or wheat flour compared favourably with respect to protein content. Fat content was also higher ( $p < 0.05$ ) in the cake samples with values ranging between 13.75g% and 14.90g%, most likely as a result of the higher number of eggs in the recipe. The cookies, however, gave the lowest fat contents. Carbohydrate contents were relatively high in all the cakes, chin chins and cookies with values ranging from 65.38g% and 73.23g%. Marginal variations ( $p < 0.05$ ) were obtained in the colour, texture, taste, aroma and general acceptability of the cakes, chin chins and cookies. Moreover, cakes, cookies, and chin chins containing 100% wheat and 25% sweet potato flour and 75% flour had higher sensory scores, which were close to one another respectively. It is therefore concluded that sweet potato flour could be used in making either cakes, cookies or chin chins, at least at 25% level of inclusion.

Key words: snacks, sweet potato, wheat and composite flour.

### INTRODUCTION

Potatoes are widely grown tubers with many varieties of species one of which is sweet potato; *Ipomea batatas*. Spp. Sweet potatoes are often considered as falling into two culinary classes, the forms are dry - fleshed and the soft moist - fleshed type. The industrial and feed varieties represent other classes available. New varieties released to growers since 1940 have largely replace the older varieties. New varieties similar to the dry fleshed type have orange - coloured fleshed rather than a firm yellow flesh typical of the older - fleshed types.

Sweet potatoes are native to tropical parts of the Americas and were domesticated at least 5000 years before spreading to topical and warm temperate regions wherever there is sufficient water to support the growth such as Europe, Asia and other parts of the world including Africa (O' Briens, and Patricia 1972).

Currently, potatoes appear to be widely consumed in the area of production especially in the northern part of Nigeria. Consumption outside the main production areas is primarily among the urban higher income groups, (Badiru and Shofela, 1985). Dehydrating potatoes has been found to be a way of reducing bulk for storage and transportation, with few physiological and biochemical changes. Potato

processing at the village level has considerable potentials to reduce post harvest losses and to generate income through the manufacture of value added product Parkin and Schwobe, (1990).

Potato flour can improve the functional properties of several food product because of it's rich starch contents which can be used in great varieties of foods, and confectionaries. It has it's own distinctive flavour and texture, when compared with products made from other starchy staple foods of tropical Africa, potatoes flour ranks quiet high in supply of principal nutrients. It's protein content is superior to that of cassava and yam flour, slightly inferior to that of refined maize meal and wheat flour, and similar to that of rice. Potato flour has high level of fibres than refined wheat flour, maize and rice but lower level of fibres than cassava and yam flour. Its carbohydrate and energy content are comparable to those of similar foods (Woolfe, 1987). Potatoes flour has been found to be well balanced in terms of protein and energy (Kulkani et al, 1994).

Composition of Wheat Grain.

The composition of wheat varies depending on the variety. Wheat is classified into two types, hard and soft. In comparison with soft wheat, hard wheat is higher in protein, yield a stronger flour, which forms a more elastic dough, and is ideal for bread / making when a strong elastic dough is needed for higher leavened volume. While the soft

wheat produces weaker flour, because of its lower protein quality. Strong flour is suitable for making bread, while weak flours make better cakes, doughs, cookies and biscuits. Kabira et al (1990), Badiru and Soela (1985)

Nutrients are not uniformly distributed within a grain of wheat, this is due to the variety of the seed, the nature of the soil and the climate. The endosperm forms about 83% of the total weight and it is mainly composed of starch, some protein, some B vitamins and mineral elements Kabira et al.

#### Problem statement

Wheat importation is substantial and is a heavy burden on the balance of trade of developing countries like Nigeria, yet it is relied on for production of pastry, biscuits, bread etc. Potatoes are widely consumed in production areas, their storage is poor and so potatoes are sold immediately after harvest due to absence of effective storage facilities. This has been an important constraint on their extensive distribution to non production areas. However, dehydrating potatoes has been the only way of reducing bulk for storage and transportation with few physiological and biochemical changes which have been helpful in reducing post harvest losses and wastage. In the advent of these gradual replacements it will reduce over-reliance on importation and exploitation of wheat in the country. It will further lead to improvement and development in locally produced potatoes as well as food and snacks made from it. Obigbesan (1976)

The broad objective is to evaluate the nutritional contents of the snacks made from sweet potato, wheat and composite flour at various levels.

The specific objectives are:

1. Substitution of sweet potato flour and wheat flour at various levels;
2. Preparation of snacks with sweet potato, wheat and the composite flour at various levels;
3. Evaluating the nutrient contents of the prepared snacks through chemical analysis; and
4. Sensory evaluation of the snacks.

#### Materials and Methods

The sweet potato used in preparation of sweet potato flour is the common species in the local market which is sold as "sweet potatoes" *Ipomea batatas* ssp

These potatoes and all other ingredients for preparation of snacks including the wheat flour were purchased at Ayetoro market in Ogun State.

#### Preparation of potato flour

This was carried out in the Home and Hotel Management Laboratory of Olabisi Onabanjo University, Ogun state according to the methods of Kabira et al, 1990.

The fresh potatoes were washed and peeled, sliced thinly, blanched, drained, spread on trays or aluminum sheets on single layers and placed in sun to dry. Dried potato flakes were ground to powdery texture. (Figure 1)

This was followed by preparation of blends of potato flour with wheat flour at various levels of substitution e.g 25%, 50% and 100% using 100% wheat flour to serve as control.

These blends were used in the preparation of three snacks such as cake, chin chin and cookies

Potato flour was substituted for wheat at various levels of 25% 50% and 100% for cakes, chin chin and cookies using 100% wheat as control.

The samples were coded as follows:

##### Queens Cake

Sample 101 – 100% wheat flour; Sample 102 – 100% sweet potato flour; Sample 103 – 50% sweet potato flour, 50% wheat flour; Sample 104 – 25% sweet potato flour, 75% wheat flour

##### Chin Chin

Sample 201 – 100% wheat flour; Sample 202 – 100% sweet potato flour; Sample 203 – 50% sweet potato flour, 50% wheat flour; Sample 204 – 25% sweet potato flour, 75% wheat flour

##### Cookies

Sample 301 – 100% wheat flour; Sample 302 – 100% sweet potato flour; Sample 303 – 50% sweet potato flour, 50% wheat flour; Sample 304 – 25% sweet potato flour, 75% wheat flour

##### BASIC RECIPES FOR:

##### Queen Cakes

Flour sample (101/102/103/104): 320g; Margarine: 250g; Sugar: 200g; Eggs: 3 pieces; Baking powder: 1 dessert spoon (level); Vanilla Essence: 5ml; Milk (optional) 60ml

##### Chin Chin

Flour sample (201/202/203/204): 410g; Margarine: 62.5g; Sugar (levelled cup) 130g; Baking powder: 1 dessert spoon; Nutmeg: 1 piece; Egg: 1 medium; Milk (optional): 120 (except sample (203) 204ml; vegetable oil (for frying): 1 bottle.

##### Cookies

Flour sample (301/302/303/304/ respectively): 300g; Margarine: 125g; Sugar: 100g; Egg: 2 medium sizes; Milk (optional): 60ml; Baking powder: 1 dessert spoon; Vanilla essence: 5ml.

### PROXIMATE ANALYSIS

Snack samples made from cakes, chin chin and cookies from sweet potatoes, wheat and composite mixture were analysed according to (AOAC, 1990) procedures for crude protein, ash and moisture. Carbohydrate was determined by differential method according to Ikehehoronye and Ngoddy (1985). Fat content was determined using Soxhlet extraction method.

### SENSORY EVALUATION

A panel of 15 persons, both male and female staff and students of the University participated as sensory panel. The samples of cakes chin chin and cookies were coded and displayed for the panelists to test. The samples were evaluated on a nine point hedonic scale for appearance, texture aroma, taste and overall acceptability in a 9 – 1 descending order i.e like extremely - 9, like very much -8 dislike extremely -1 etc. The mouth was rinsed with water after tasting each sample.

### STATISTICAL ANALYSIS

All the data generated were tested using chi-square ( $\chi^2$ ) analysis for relationship at ( $p < 0.05$ ) level of significance Wahua (1999).

### RESULTS AND DISCUSSION

#### Proximate Composition

Results obtained on crude protein, fat, fiber, ash, carbohydrates and moisture content of cakes, chinchin and cookies made from wheat potato flour are presented in Table 2

The proximate values of the prepared snack samples indicated the cake sample comprising of 75% wheat + 25% sweet potato flour had the highest protein content of (12.83g) followed by cake sample of 50% sweet potato + 50% wheat flour having 12.79gm. cookies sample made with 100% sweet potato flour had the least protein of 5.87g.

Data obtained in the fiber contents showed that cakes made from 25% sweet potato flour and 75% wheat had the highest crude fiber content of (1.43g). Followed by cake made from 100% sweet potato flour (1.31). cakes made from 100% wheat and 25% sweet potato flour and 75% wheat flour had crude fiber values that were statistically ( $p > 0.05$ ) similar. Marginal differences ( $p > 0.05$ ) were however obtained in crude fiber contents of the chin chin with various mixtures having values ranging between 0.74, 0.78, 0.82 and 1.12. The lowest fibre value

0.82gm was obtained from chinchin of 100% sweet potato flour

Food fibers are the indigestible components of plant materials. Among are the celluloses hemicelluloses, pectins and lignins that help to hold water, soften stools, and decrease stool transit time through the large intestine Woolfe, (1987) Dietary fibre, according to Potter and Robison (1987) also lowers plasma cholesterol, insulin level, requirements for diabetes and decrease the incidence of colon cancer.

As for fat, significant ( $p < 0.05$ ) increase with values ranging between 13.84g and 14.90g were obtained in the fat contents of cakes made from 100% wheat flour, 100% sweet potato flour, 50% sweet potato flour and 50% wheat flour, (13.78gm) and 25% sweet potato flour and 75% wheat (13.91gm) respectively. Cookies however gave the lowest fat content with values ranging from 7.92gm, 8.36gm 8.46gm, 8.11gm and 7.92gm. The lowest fat content were cookies made with 75% wheat + 25% sweet potato flour.

Carbohydrate value was highest in cookies made with 75% wheat and 25% sweet potato flour 73.28gm% followed by cookies of 50% wheat and 50% sweet potato flour 73.27gm%. The lowest carbohydrate score was recorded from cake made with 100% sweet potato flour 65.38gm%

Higher amounts of moisture contents were obtained in cookies made from 100% wheat 8.06g% and 100g% sweet potatoes 8.13g% respectively. Also, the moisture content values obtained in the cakes and chin chins made from 100g% sweet potato flour and chin chins made from 25g% sweet potato flour and 75g% wheat flour were statistically ( $p > 0.05$  similar). These values are however considered moderate to preserve the cakes, chin chin and cookies from spoilage within a short time. Low moisture content, according to Wolf and Lechwich (1989) often increase shelf life of some food products.

Table 3: For colour, Scores ranging from 5.6 and 7.4 were obtained in the colour of the cakes chin chins and cookies. These scores did not however differ significantly ( $p > 0.05$ ). However, among the samples the highest score of 7.4 was obtained in chin chins containing 100% sweet potato flour, and 25% sweet flour and 75% wheat flour respectively.

The textural scores recorded for each snack sample were 7.4, 7.2, 6.6 and 5.6. They were obtained from chinchin 100% wheat flour, cake 100% wheat, cake 50% wheat, 50% sweet potato chinchin 100% sweet potato respectively.

The highest scores (7.8) were however obtained from chin chin sample containing 75% wheat +25% sweet potato flour. While the lowest texture score was recorded on chin chin 100% sweet potato flour

The highest score of 7.4 was obtained in the taste of cakes containing 100% wheat, followed by cake 50% wheat and 50% sweet potato flour, 7.2 score. The lowest recorded were 100% sweet potato chin chin and cake 100% sweet potato flour 6.4g%, and 6.4g%.

These taste scores value indicated a significant difference ( $p < 0.05$ ) at the level of high wheat flour inclusion into sweet potato flour in the preparation of chin chin, cakes and cookies

**Conclusion and recommendations**

The study showed that sweet potato flour or the composite at 25% inclusion can be used in making cakes, cookies and chin chin of high energy and nutritional value which could also be well accepted by the public. Based on this finding, the study recommended that sweet potato processed into flour be utilized to reduce post harvest losses and wastage. This will also introduce variety to the production of confectionaries as well as making the product available all the year round.

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Table 1: Blend of wheat and composite at various levels

Blends mixture%	Wheat Flour %
100	0
25	75
50	50
0	100

Source: Field survey (2005)

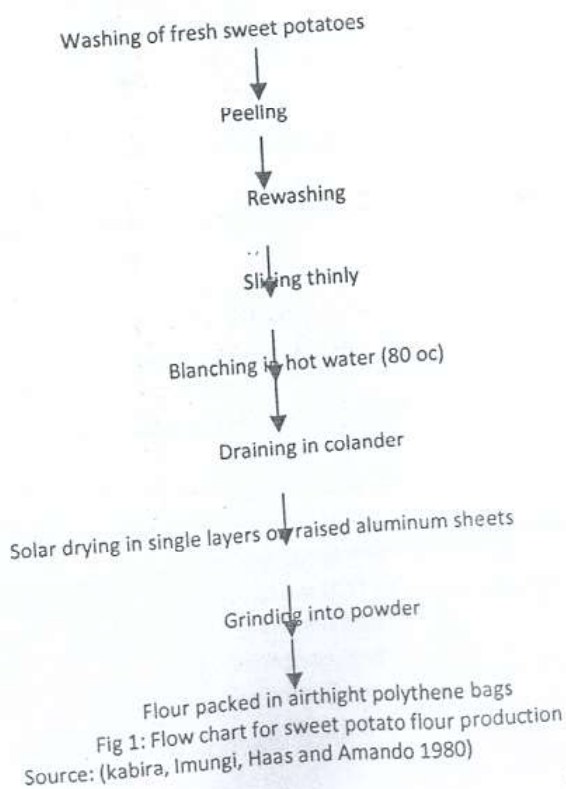


Table 2: Proximate Composition of Cakes, Chinchin and Cookies Made From Wheat and Sweet Potato Flours

FOOD SAMPLES	CRUDE PROTEIN (gm)	CRUDE FIBER (gm)	FAT (gm)	ASH (gm)	CHO (gm)	MOISTURE CONTENT (gm)
Cake (100%wheat flour)	12.23 <sup>a</sup>	1.15 <sup>c</sup>	13.84 <sup>b</sup>	1.39 <sup>b</sup>	66.03 <sup>d</sup>	7.39 <sup>b</sup>
Cake (100% sweet potato flour)	12.16	1.31 <sup>b</sup>	14.96 <sup>a</sup>	1.30 <sup>c</sup>	65.38 <sup>c</sup>	7.46 <sup>b</sup>
Cake (50% wheat + 50% sweet potato flour)	12.79 <sup>b</sup>	1.12 <sup>b</sup>	13.78 <sup>b</sup>	1.35 <sup>b</sup>	66.85 <sup>d</sup>	7.17 <sup>b</sup>
Cake (75% wheat + 25% sweet potato flour)	12.83	1.43 <sup>a</sup>	13.91 <sup>b</sup>	1.43 <sup>a</sup>	66.10 <sup>d</sup>	7.32 <sup>b</sup>
Chin chins (100% wheat)	5.96 <sup>d</sup>	1.12 <sup>d</sup>	10.81 <sup>d</sup>	0.94	72.65 <sup>b</sup>	6.33 <sup>d</sup>
Chin chins (100% sweet potato flour))	12.12	0.82 <sup>b</sup>	11.69 <sup>c</sup>	1.12 <sup>d</sup>	71.40 <sup>c</sup>	5.33 <sup>d</sup>
Chin chins (50% wheat + 50% sweet potato flour)	6.23 <sup>d</sup>	0.78 <sup>d</sup>	10.72 <sup>d</sup>	0.91 <sup>e</sup>	72.09 <sup>b</sup>	6.21 <sup>c</sup>
Chin chins (75% wheat + 25% sweet potato flour)	9.87 <sup>d</sup>	0.74 <sup>d</sup>	10.89 <sup>d</sup>	0.89 <sup>e</sup>	72.85 <sup>b</sup>	5.74 <sup>d</sup>
Cookies (100% wheat)	9.87	1.08 <sup>b</sup>	8.36 <sup>e</sup>	1.08 <sup>d</sup>	70.53 <sup>c</sup>	8.06 <sup>a</sup>
Cookies (100% sweet potato flour)	5.87	0.87 <sup>d</sup>	8.46 <sup>e</sup>	1.11 <sup>d</sup>	73.16 <sup>a</sup>	8.13 <sup>a</sup>
Cookies (50% wheat + 50% sweet potato flour)	8.80 <sup>c</sup>	0.84 <sup>d</sup>	8.11 <sup>e</sup>	1.13 <sup>d</sup>	73.27 <sup>a</sup>	7.85 <sup>b</sup>
Cookies (75% wheat + 25% sweet potato flour)	9.14 <sup>c</sup>	0.81 <sup>d</sup>	7.92 <sup>f</sup>	1.16 <sup>d</sup>	73.28 <sup>a</sup>	7.70 <sup>b</sup>
TOTAL	0.65	0.06	0.49	0.64	1.25	0.32

Means with different supscripts along the columns are significantly different (p<0.05)

Source: Field Survey (2005)

Table 3: SENSORY QUALITY OF CAKE, CHINCHIN AND COOKIES MADE FROM WHEAT AND SWEET POTATO FLOURS

FOOD SAMPLE	APPEARANCE ( $\bar{x} \pm SD$ )	TEXTURE ( $\bar{x} \pm SD$ )	TASTE ( $\bar{x} \pm SD$ )	AROMA ( $\bar{x} \pm SD$ )	GENERAL ACCEPTABILITY ( $\bar{x} \pm SD$ )
Cake (100% wheat flour)	7.2	7.2	7.0	7.8	8.5
Cake (100% sweet potato flour)	6.2	6.2	6.4	7.0	7.8
Cake (50% wheat + 50% sweet potato flour)	6.6	6.6	7.2	7.4	7.5
Cake (75% wheat + 25% sweet potato flour)	7.0	7.0	7.0	7.0	7.6
Chin chins (100% wheat)	7.4	7.4	7.4	7.4	7.5
Chin chins (100% sweet potato flour)	5.6	5.6	6.4	6.8	7.7
Chin chins (50% wheat + 50% sweet potato flour)	7.0	7.0	7.0	7.0	7.6
Chin chins (75% wheat + 25% sweet potato flour)	7.4	7.8	7.0	7.0	7.4
Cookies (100% wheat)	7.2	7.2	7.0	7.4	7.5
Cookies (100% sweet potato flour)	6.8	6.8	7.1	7.0	7.4
Cookies (50% wheat + 50% sweet potato flour)	7.2	7.2	6.6	7.0	7.4
Cookies (75% wheat + 25% sweet potato flour)	6.6	6.6	7.0	7.0	7.8
TOTAL	0.05	0.09	0.06	0.08	0.07

Means along the columns are not significantly different ( $p > 0.05$ )

Source: Field Survey (2005)