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Proximate composition of Biscuit produced from blends of Yam Flour (*Dioscorea rotundata*) and Watermelon Seed (*Citrullus lanatus*) Flour

C. N. ONYEKWELU

Department of Food Technology, Federal polytechnic, Oko. E- mail: chykems@yahoo.com

ABSTRACT

Biscuits were produced from blends of yam and watermelon seed flour at different ratio of 100:0, 50:50, 25:75, 75:25 and 0:100 respectively. Proximate composition of yam –watermelon biscuit was analyzed. The moisture content of the biscuit samples ranged from 6.00% to 14.00%. The protein content, fat, crude fibre and ash ranged from 4.80% to 30.60%, 1.65 to 19.00%, 0.60 to 2.60% and 1.50% to 4.30% respectively. Increase in level of watermelon seed flour increase the protein content, fat content, fibre content and ash of the biscuits. Carbohydrate content of the biscuit ranged from 37.70% for biscuit produced from 100% watermelon flour to 79.45% for biscuit produced from 100% yam flour. Carbohydrate decreased with increasing level of substitution with watermelon seed flour.

Keywords: *Blends, Malnutrition, Biscuits, Seed, Nutrition*

INTRODUCTION

The most worrisome aspect of world food problem is lack of adequate diet for the poor in developing countries. Lack and insufficient amount of protein in our diet is a problem facing developing countries today which has hugely led to protein malnutrition (Okpala, *et al.*, 2012). Protein malnutrition is a major public health hazard in some parts of Nigeria (Oji, 1994). Attention is now being focused in the utilization of plant or vegetable protein to substitute or supplement the much enjoyed animal protein which is in short supply and expensive in most developing countries.

Watermelon (*Citrullus lanatus*) belongs to the family *Cucubitacea* and is widely grown in the tropical and temperate regions of the world. The baked products produced with watermelon seed flour possess good amino acids profile and are rich in fat (Abufoul, 2004). Water melon contains about 37% protein and is also rich in nutrient such as potassium, iron, magnesium, zinc, calcium and phosphorus (Teraka and Khaled, 2001). It is also rich in some promoting antioxidant. Among the tropical tuber crops, yam (*Dioscorea rotundata*) is the most important staple crop in Africa with production just one third of the level of cassava (FAO, 1997). Nigeria is the highest producer of yam, producing about 73% of world population which is a major contributor to food security in West Africa (Polycarp *et al*., 2012). Yam is a good source of energy composed mainly of complex carbohydrates; they also contain protein, minerals like copper, potassium, iron and manganese (Akin-idowu *et al*., 2009).

Biscuits are ready-to- eat convenient and inexpensive food products, containing digestive and dietary principle of vital importance (Kulkam, 1997). Biscuit is defined as a small thin crisp cake made from flour salt, butter or vegetable shortening with baking powder as leavening agent. It could serve as a good alternative in place of complete meal. Wheat flour is the main ingredient used for biscuit production. Wheat flour lacks certain essential amino acids like lysine, tryptophan and threonine (Kent, 1975) hence high carbohydrate resulting in low nutritive value. Production of biscuit with a suitable amount and high

biological value protein will help in the development of nutritionally balanced biscuits, thereby eliminating the risk of malnutrition especially in infant and children. . The use of composite flour had added advantage in improving the nutritional value of baked food product. Composite flour can also be described as mixture of non-wheat flour with or without the addition of wheat flour. The use of composite flour for the production of bread, cakes, bons and biscuit to increase and improve the protein content has been carried out by several researchers. Cookies from composite flours of cassava and groundnut corn starch flour gave a noticeable increase in protein content of composite product (Agiriga and Iwe. 2008). It is therefore necessary to produce a highly acceptable snack with high nutritional quality that could be useful in nutritional programmes to combat malnutrition and nutrient deficiency (Rosa, *et al.*, 2003).

The objective of this study was to assess the nutritional composition of biscuits produced from yam and watermelon seed flour blends.

MATERIALS AND METHODS

White yam (*Dioscorea rodunta*) and water melon fruit were procured from Eke Ekwulobia.

PREPARATION OF FLOUR SAMPLES

WATERMELON SEED FLOUR PRODUCTION

The watermelon fruit were first cut to bring out the seeds. The seeds were washed and sundried. The dried seeds were dehulled. Milled and sieved to obtained watermelon seeds flour. The watermelon seeds flour was sealed in polyethene bag and stored at room temperature. (Fig. 1).

YAM FLOUR PRODUCTION

Yam tuber were peeled, washed and sliced, soaked in sodium metabisulphate for 10min. The resulting material was milled and sieved into flour of 0.2µmaperturesize. The flour was sealed in cellophane bag and stored at room temperature (25^{o}C) (Fig 2).

WATERMELON SEEDS
↓
Cutting
↓
Removing seeds
↓
Washing
↓
Sun drying
↓
Dehulling
↓
Milling (attrition mill)
↓
Sieving (0.2µm aperture size)
↓
Flour Packaging

Fig. 1: Flow chart for the production of Watermelon seed flour.

YAM TUBERS
↓
Peeling
↓
Washing
↓
Slicing
↓
Sulphating
↓
Drying
↓
Milling
↓
Sieving
↓
Flour Packaging

Fig. 2: Flow chart for yam flour production

FORMULATION OF COMPOSITE FLOUR

Composite blends of yam flour and watermelon seeds were blended in ratio of 100:0, 50:50, 75:25, 25:75 and 0:100 respectively. The flour was thoroughly mixed to obtained homogeneous blend.

Production of Biscuits: The method used for the preparation of dough was the creaming method where fat and sugar were creamed together using the Kenwood mixer (United Kingdom) at medium speed for two min. After creaming flour, baking powder and milk were added and mixed until dough was well mixed. The dough was manually kneaded to ensure uniformity. The dough was then transferred to a clean tray and gently rolled using a roller. The dough sheath was cut into round shapes using a cutter. Shaped dough pieces were placed into a greased pan and baked in the oven at 180^0C for 40min. The baked biscuits were placed on a cooling rack for 30min to cool before packaging. The production process is shown on Fig. 3.

PROXIMATE COMPOSITION ANALYSIS

The moisture, protein, fat, ash and crude fibre contents of the flour samples was carried out according to the methods of AOAC (2010) and this were determined in triplicates. The carbohydrate was determined by difference.

STATISTICAL ANALYSIS

Data obtained from proximate composition analysis were subjected to Analysis of Variance (ANOVA) using the statistical package for Social Sciences (SPSS) Version 17.0. Duncan's Multiple Range Test (DMRT) was used to compare the treatment mean. Statistical significance was accepted at ($p<0.05$).

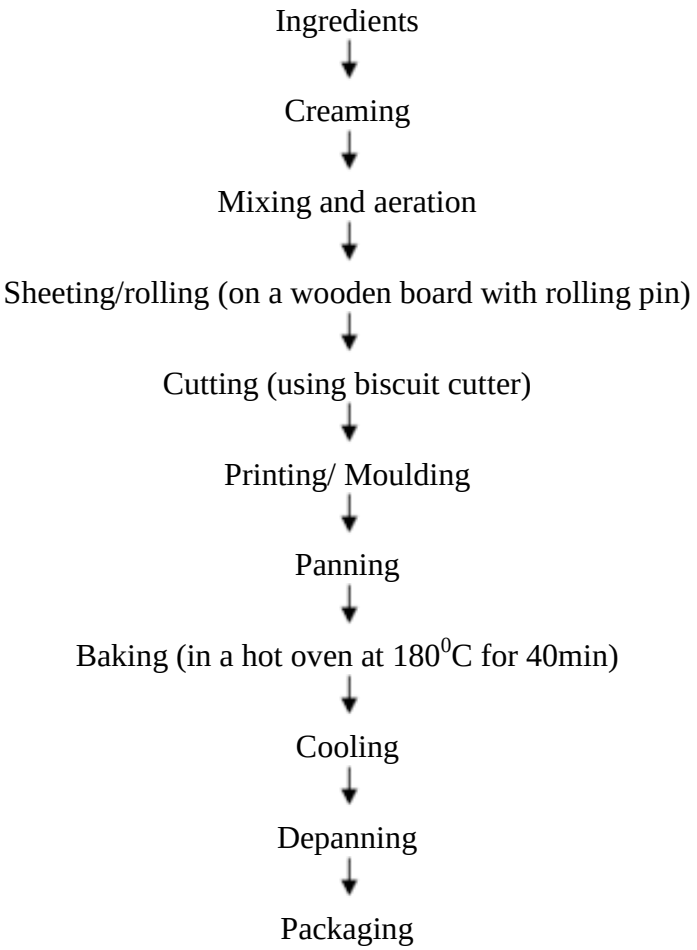

Fig. 3: Flow diagram for the production of Biscuits

RESULTS AND DISCUSSION

Proximate composition of biscuit made from yam and watermelon seed flour are shown in Table 1. The moisture content of biscuit samples ranged from 6.00% in biscuit with 100%watermelon seed flour to 14.00% in biscuit samples baked with 25% yam flour and 75% watermelon seed flour. This showed that decreased in moisture content of biscuit give rise to the longer the shelf life. There were significant different in the moisture content among biscuit samples at ($P<0.05$). Crude protein of the biscuits, increased with increase in

watermelon seed flour inclusion. All biscuits substituted with watermelon seed flour had the higher protein content than that made from 100% yam flour (4.80%). The protein content differed significantly (P<0.05) from one another. The increase in protein and fat contents of cookies was reported to be an advantage in improving nutrient densities of biscuits from flour blends over those of conventional wheat flour (Lornez, 1983, Iwe, 2002). The fat content differed significantly (P<0.05) from one another. Biscuit baked with 100% watermelon seed flour had the highest fat content(19.00%) followed by the biscuit baked with blends of 25% yam flour : 75%watermelon flour while biscuit baked with 100% yam flour had the lowest fat content (1.65%). The addition effect was also observed for ash and fibre content of biscuits samples increased as the level of fortification with watermelon seed increased. The ash content of the biscuit samples differed significantly (P<0.05) from each other. The total carbohydrate content of biscuit samples ranged from 37.7% (100% watermelon seed flour) to 79.45% (100% yam flour) .There was significant difference in carbohydrate content (P<0.05) among the biscuit samples. Carbohydrate contents of the biscuit samples decreased as the percentage of watermelon seed flour increased in the mixture. Iwe (2002) reported similar result when high levels of soy flour were added to sweet potato and plantain flour.

Table 1
Mean values of the proximate composition of the biscuits samples

Sample code/blend ratio (YAM: WATERMELONS) BISCUIT		Moisture (%)	Protein (%)	Fat (%)	Fibre (%)	Ash (%)	Carbohydrate (%)
A	100:0	12.00±1 .00^{b}	4.80±0.00^{e}	1.65±0.05^{e}	0.60±0.05^{d}	1.50±0.05^{e}	79.45±0.05^{a}
B	50:50	12.00±1.00^{b}	17.70±0.10^{c}	10.33±0.03 ^{c}	2.60±0.05^{a}	2.90±0.10^{c}	54.47±0.01^{c}
C	25:75	14.00±1.00^{a}	24.15±0.05^{b}	14.66±0.01^{b}	2.13±0.15^{c}	3.60±0.05^{b}	41.49±0.04^{d}
D	25:75	6.00±0.50^{c}	11.45±0.05^{d}	5.95±0.01^{d}	2.20±0.10^{c}	2.50±0.10^{d}	71.86±0.02^{b}
E	0:100	6.00±0.50^{c}	30.60±0.10^{a}	19.00±1.00^{a}	2.40±0.10^{b}	4.30±0.00^{a}	37.70±0.10^{e}

Means of triplicate determination, Means with the same superscripts within the column are not significantly different (p<0.05)

CONCLUSION

Result of this study showed that biscuit produced from yam-watermelon seed blends had high protein content, which ranged from 4.80% to 30.60% and increased with increase in watermelon seed flour inclusion. The protein content was found higher than biscuit made from 100% yam flour (4.80%). Hence low nutrition quality of biscuit can be improved through fortification with watermelon seed flour. Therefore biscuit from yam-watermelon seed flour blends can serve as a high nutritional food or snacks, which to help redress the problem of protein energy malnutrition.

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