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SUITABILITY OF FONIO AND COCONUT FLOUR BLENDED COOKIES PRODUCTION

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Abstract

The overdependence on refined wheat flour in food processing has called for a critical search for alternatives in snack production. Fonio is a nutritious, gluten free cereal with a low glycaemic index. Defatted coconut flour is low in calorie and rich in fiber. This work evaluated the quality of cookies produced from blend of fonio and coconut flour. This work was carried out in a laboratory setting. The chaff obtained was oven dried and milled into flour. Cookies were produced from blend of fonio and coconut flour at different ratios (90:10, 80:20, 20:80, 0:100%) and was analyzed for proximate, physical, and sensory attributes. The data obtained was subjected to statistical analysis. The results showed that the proximate composition of cookies ranged from 4.71 to 8.91%, 5.98 to 7.51%, 2.13 to 43.08%, 8.10%, 0.30 to 0.37% and 29.05 to 78.30.54% for moisture, protein, fat, crude fibre, ash and carbohydrate, respectively. The physical properties of cookies for weight, thickness and ratio of the cookies ranged from 5.50 to 6.40 g, 0.70 to 0.77 cm, and 5.91 to 6.64, respectively. The judges rated cookies from 100% coconut as most preferred in terms of overall acceptability. Cookies of acceptable quality were produced from 80:20 composite flours of fonio and coconut flour. Fonio and coconut flour blends can be used in the production of cookies with improved nutritional and sensory qualities.

Keywords: Coconut, fonio, cookie, proximate analysis, flour

Introduction

Cookie, a very tasty and widely accepted snack, is different from other baked products like bread and cakes because of its low moisture content which extends the shelf life of the product (Hussain, 2017). In many developing countries, the growing number of working mothers has contributed greatly to the popularity and increased consumption of snack food like cookies. The need for production of nutritious and health friendly snack foods. Fonio, which is known as *achacha* in Nigeria is an annual cereal crop indigenous to West Africa origin belonging to the family Graminae where it is cultivated as straw and edible grains (Jideani, 1999). It can be used in several ways which makes it play a vital role in food security to millions of African farmers. Wheat, the basic ingredient of bread and other bakery products, is the main source of nutrition for a large world population (Jisha *et al.*, 2008). However, most developing countries including Nigeria rely on its importation to get the necessary supply for most baked products. Therefore, there is keen interest to wholly or partly replace wheat flour with home-grown cereals. This can be achieved by using under exploited cereals that are nutrient-dense. Fonio is an underutilized cereal that does not contain gluten and is rich in fatty acids and has a low glycaemic index (Jideani, 1999). It is a good source of protein and a product from oil production.

Table 3. Sensory Evaluation of Cookies from Blend of Fonio and Coconut Flour

Sample	Colour	Flavour	Taste	Crispness	Texture	Overall acceptability
A	6.76±0.1 ^{ab}	6.76±0.9 ^{bc}	6.68±1.2 ^a	6.84±1.0 ^a	7.06±1.3 ^b	7.36±1.0 ^a
B	7.02±1.6 ^b	6.82±1.6 ^{bc}	6.67±1.5 ^c	6.92±1.10 ^a	7.04±1.0 ^b	7.25±1.0 ^a
C	7.00±1.2 ^b	6.96±1.3 ^c	7.48±0.9 ^d	7.08±0.9 ^a	7.16±0.9 ^b	7.40±1.0 ^a
D	6.28±0.9 ^a	6.16±1.3 ^a	5.52±1.6 ^a	5.24±1.2 ^a	5.56±1.6 ^a	6.04±1.0 ^b
E	6.65±1.2 ^{ab}	6.37±1.4 ^{ab}	6.14±1.4 ^b	6.71±1.5 ^a	6.22±1.3 ^b	6.80±1.0 ^b

Means with different superscripts are significantly different (P < 0.05).

Sample A – 100% Fonio flour; Sample B – 90% Fonio, 10% Coconut; Sample C – 20% Fonio, 80% Coconut; Sample D – 20% Fonio, 80% Coconut; Sample E – 100% Coconut

The higher the bulk density, the denser the packaging material required. It indicates the amount of a product which influences the package design and could be used in determining the amount of packaging material returned (Iwe and Onadipe, 2001). Low bulk density of flours has been reported to be useful for food formulation and such products have less retrogradation (Odeyemi and Aina, 2009). The pH of the samples ranged from 6.06 to 6.29. Acidic products are more stable than non-acidic counter parts (Ikpeme *et al.*, 2010) and all the samples in this study were slightly acidic.

Sensory Attributes of the Cookies Produced from Fonio/Coconut Flours

The result of the sensory evaluation is shown in Table 3. The cookies made with 80% fonio and 20% coconut flour were rated best for colour, flavour, taste, crispiness and overall acceptability among the treatments. The flavour of coconut flour possibly enhanced the taste and aroma of the cookie. All the samples attributes have score above like moderately.

Conclusion

The cookies produced, have relatively high protein, crude fibre, ash and carbohydrate which are desirable for good health and wellbeing. They also possess good physical and chemical attributes suitable for cookies production. The use of fonio and coconut flour will go a long way in enhancing nutrition, health and wellbeing of the consumers. It will reduce dependence on wheat flour, thereby saving the huge foreign exchange used in importing wheat, for other projects. Incorporation of fonio and coconut flour into the production of especially cookies should be encouraged.

Results and Discussion

Proximate composition

Moisture content of the samples ranged from 4.71 - 8.91% for all the samples which is the lowest value of moisture content for cookies. Flour produced from 100% fonio had the highest value of moisture content (8.91%) while sample with 20-80% coconut to fonio flour had the lowest value (4.71%) and coconut flours are low in moisture content because they were dried before cookie production, and this will increase their storage stability. The protein content of the samples ranged from 5.98% to 7.51%. Sample with 100% fonio had the highest protein content of 7.51%. It was observed that the protein content of fonio flour is higher than that of wheat flour. Protein is needed as building blocks for the body, necessary for the repair of damaged tissues (Wardlaw, 2004). Alternative use of fonio and coconut flour in cookie production shows that protein can also be obtained from other cereal products. The fat content of the samples ranged from 2.13 to 43.08%. Sample with 100% coconut had the highest value for fat content 43.08%. Fat is a rich source of energy and is essential as carrier of fat soluble vitamins: A, D, E and K. The highest value of crude fiber (8.1%) was obtained from 100% fonio while the lowest value (2.67%) was obtained from 100% coconut. Proper use of fiber in diet is an essential requirement for maintaining good health. It helps in reduction of blood insulin and postprandial glucose levels (Chen et al., 1988). Generally dietary fiber acts as non-caloric bulking agents, increase holding and retaining capacities and also enhances oxidation stability. Dietary fibers affect structural and physical properties of food, sensory characteristics, texture and shelf life of product (Elleuch et al., 2011).

The ash content of the five samples ranged from 0.30 to 0.49% with 100% fonio having the highest value. The high ash content indicates high level of minerals in the cookie produced. The ash content of the samples increased with increase in fonio flour. Carbohydrate content of the samples ranged from 29.05% to 78.30%. Flour produced from 100% coconut had the lowest carbohydrate content of 29.05% while 100% fonio had the highest value of 78.30%. The increase in the value of carbohydrate is as a result of the increase in the fonio content. The increase in the value of carbohydrate content decreased, and the crude fibre content increased. It was observed that the increased fibre content have several health benefits, as it aids digestion in the colon and helps in constipation often associated with products from refined grain flours (Elleuch et al., 2011). 100% whole fonio flour had the highest percentage carbohydrate content of 78.30%.

Physical properties of cookies

The physical properties of cookies are shown in Table 2. The weight, thickness and spread ratio of the cookies ranged from 5.50 to 6.79 g, 0.70 to 0.84, cm and 5.36 to 6.61, respectively. The weights decreased with increased substitution of coconut flours. The thickness of the cookies prepared from the composite flour did not vary significantly among the treatments. The findings obtained in this study was similar to findings of Bornare and Khan (2015) who observed decrease in weight and thickness of cookies as level of rolled oat increased in wheat rolled oat blend. The spread ratio increased (5.36 to 6.61) with increasing supplementation of coconut flour. Cookies prepared from 100% wheat sample had the lowest spread ratio and the highest thickness. Cookies prepared from 100% fonio had the highest spread ratio and the lowest thickness.

Table 1: Proximate composition of cookies

Sample	A	B	C	D	E
Moisture (%)	4.71	5.98	7.51	8.91	8.91
Protein (%)	5.98	7.51	7.51	7.51	7.51
Fat (%)	2.13	2.13	2.13	2.13	43.08
Crude fiber (%)	2.67	2.67	2.67	2.67	8.1
Ash (%)	0.30	0.30	0.30	0.30	0.49
Carbohydrate (%)	29.05	29.05	29.05	29.05	78.30

Table 2: Physical properties of cookies

Sample	A	B	C	D	E
Weight (g)	5.50	5.50	5.50	5.50	6.79
Thickness (cm)	0.70	0.70	0.70	0.70	0.84
Spread ratio	5.36	5.36	5.36	5.36	6.61

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