Proximate and sensory evaluation of cake from composite flour of rice and sweet potatoes

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ABSTRACT

Wheat flour is the main ingredient for production of the bakery products such as cake, biscuits, meat pie and other products. These products are imported by countries like Nigerian with unfavourable climate for growing wheat. Nigeria has spent huge amount of income in importing wheat flour, this has paced burden on the foreign exchange reserve of the economy. As result of high cost of imported wheat, this has led to the development and use of composite fours for production of biscuits, bread and pastry products. Rice and sweet potatoes were processed into flour were blended in the ratio of 100:0, 0:100, 75:25, 50:50 and 25:75. They were coded as RFF, SPF, SPR25, SPR50 and SPR75 respectively. 100% wheat (sample WFF) served as control. Proximate composition and sensory attributes of cake were evaluated. The result revealed that proximate composition ranged as follows: moisture25.20 -29.90%, protein 4.21 to 8.44%, fat: 10.76 -17.89%, ash: 0.99 -2.61%, fibre content 0.76 t0 1.76 and carbohydrates: 47.85 – 52.59% . Cake made from 100% wheat flour did not differ ($p<0.05$) significantly from those made from 75% sweet potatoes: 25% rice flour in most sensory attributes. Nutritional and acceptable cake can produced from blends rice and sweet potatoes.

Key words: Cake, composite flour, rice, sweet potatoes, quality.

1. INTRODUCTION

Cake is a soft bakery products produced mainly from four, sugar, margarine baking powder and other ingredients. Consumption of cake prepared from wheat four has become popular in most developing countries of the tropic especially among children and adolescences [1]. Sometime bakery products are used as vehicle for the incorporation of different nutritionally rich ingredients [2]. Kure *et al.* (1998) reported that snacks produced from four, margarines egg among others, which are transformed into appetizing products through application of heat in the oven [3].

Rice (*Oryza sativa* L.) is a cereals food stuff which is part of three major food crops of the world population [4]. According to Okaka, (1997) a milled rice grain contain about 80% starch, 6.8 to 8 % protein, 0.5% ash, 0.2% fibre, 11% moisture and 398 cal/100 g [5]. It is also a source of thiamine, riboflavin and niacin. Rice is used in variety of food products such as" masa"-

a fermented puff batter [6-8], "garabia" – a traditional snacks food [9], "Tuwon shinkafa"- a thick gruel [10] cooked rice breakfast cereals among others. Rice is important cereals because it has a highest digestibility, biological value and protein efficiency ratio (PER) among all other cereals [11].

Sweet potatoes (*Ipoma batatas*) belong to the family convovuaceace. It is an irregular shaped oblong tuber that has sweet taste [12]. It is important staple food in developing countries especially in Nigeria. Sweet potatoes have high nutritional values and sensory versatility in terms of flesh, colour taste and texture and are also rich in total phenolics, carbohydrates, dietary fibre, ascorbic acids, folic acids, and minerals [13]. Sweet potato contains β-carotene and anthocyanin contents and has beneficial effects on human health such as improving the immunity and reduces the susceptibility of body to various ailments like cancer and muscular degenerations [14-15]. Sweet potato flour can be added as natural sweetener, colour and flavour to processed food products.

Developing composite flour bends of rice and sweet potatoes in cake production will increase overall nutrient of cake, encourage utilization of underutilized crops like rice and sweet potatoes, increase the cake varieties and at the sometimes, reduce dependence on wheat flour.

This research work evaluates the quality of cake produced from blends of rice and sweet potatoes flour

2. MATERIALS AND METHOD

2.1. Collection of Raw materials

Sweet potato, sugar, milk, baking powder, flavouring, butter and nutmeg were purchased from Eke-Oko while rice was purchased in Omogho both in Orumba North local government area at Anambra State, Nigeria.

2.2. Rice flour Preparation

The method described by Okpala and Egwu (2015) was used to produce rice flour [16]. The rice grains were sorted manually to remove extraneous materials. The rice was washed with potable water, sundried and milled using hammer mill to pass through a 40 mesh sieve. Flour was stored in airtight plastic container at room temperature until needed.

2.3. Sweet potatoes flour Preparation

Sweet potatoes were sorted, peeled, washed in clean water, sliced and blanched at 62 ℃ and sundried. The dried potato chips were milled to pass through 40-mesh sieve sweet potato flour was store in air tight plastic container for further use.

2.4. Formulation of flour blends

Rice flour and sweet potatoes flour were prepared in percentage proportion of 100:0, 75:25, 50:50, 25:75 and 0:100 respectively. Hundred per cent (100 %) wheat flour was served as the control.

2.5. Cake preparation

The method used for the preparation of cake was the creaming method described by Olaoye *et al*. (2007) [17]. Fat and sugar were creamed

together using the Kenwood mixer (United Kingdom) at medium speed for 2 minutes. After creaming, all the ingredients like egg, baking powder, nutmeg, vanilla flavour, milk and composite flours were added. Mixing of the ingredients was done using a manually operated hand mixer. Baking took paced in pre-set oven at 181 ºC for 75 minutes.

2.6. Determination of proximate composition

The moisture, protein, fat, ash and crude fibre content of the cake was carried out according to the methods of AOAC (2010) [18], while carbohydrate was calculated by differences.

2.7. Sensory evaluation

The panel of 10 members were trained on sensory attributes for the evaluation of cakes on a 9-points Hedonic scale (where 9= extremely like and 1= dislike extremely). The samples were scored for colour, flavour, taste, texture and overall acceptability.

2.8. Statistical analysis

The experiment adopted was complete randomization design (CRD). The data generated from all analyses and sensory evaluation were subjected to statistical analysis of variance (ANOVA) using the Statistical Package for Social Statistics (SPSS) version 20. Means were separated using the Duncan's Multiple Range Test and significance was accepted at $p < 0.05$ [19].

3. RESULTS AND DISCUSSION

Proximate composition of cake from composite flour of sweet potatoes and rice is shown in Table 1. Moisture content ranged from 29.90 to 25.20%. Increase in proportion of sweet potatoes increased the moisture content of cake from blend of sweet potatoes and rice. This may be due to the increase in fibre and sugar contents of sweet potatoes which has high hygroscopic nature and higher water absorption capacity [20]. This result was in agreement with Alloush (2015) and Malter (2015) who reported that increasing level of replacing sweet potatoes in wheat flour increase moisture content of cake and bread respectively [21-22].

There was a significant ($p < 0.05$) difference in protein content of cake from composite flour of sweet potatoes and rice. Protein content ranged from 4.21 to 8.44 %. Similar value was observed by Okpala and Egwu (2015) in biscuit from sweet potatoes and cocoyam blends [16]. Increasing the level of sweet potatoes in rice flour for cake production significantly ($p < 0.05$) reduced the protein content of cake. This could be attributed to high level of carbohydrates present in sweet potatoes. Enwerem (1998) reported that carbohydrates predominately in root and tuber [23]. Fat content ranged from 10.76 to 17.89 %. Sample WFF (100% wheat) had the highest value of fat content while sample SPR75 (25% sweet potatoes: 75% rice flour) had lowest value of fat contents. The value reported in this study was lower than the value reported by Olatunde *et al*., (2019) in cake made from composite four from pigeon pea, sweet potatoes and wheat flour.

Table 1. Proximate composition of cake from composite flour of sweet potatoes and rice.

Sample	Moisture	Protein	Fat content	Ash content	Fibre	Carbohydrates
RFF	28.38[b]±0.01	6.10[c]±0.10	12.88[c]±0.01	0.99[e]±0.10	0.76[e]±0.01	50.89[b]±0.01
SFP	26.18[d]±0.01	4.21[e]±0.01	15.00[b]±1.00	1.82[c]±0.01	1.36[d]±0.10	50.30[c]±0.01
SPR25	29.90[a]±0.10	5.67[d]±0.01	12.10[c]±1.00	2.61[a]±0.01	1.76[a]±0.01	47.96[d]±0.10
SPR50	27.16[b]±0.01	6.67[b]±0.01	11.87[c]±0.01	1.94[b]±0.01	1.55[b]±0.01	50.81[b]±0.01
SPR75	25.20[e]±0.10	8.44[a]±0.01	10.76[d]±0.01	1.55[d]±0.01	1.46[c]±0.01	52.59[a]±0.01
WFF	25.20[e]±0.10	5.96[d]±0.01	17.89[a]±0.01	1.57[d]±0.10	1.57[bc]±0.10	47.85[e]±0.01

Values are means of triplicate determination ± standard deviation
Values on the same column with different superscript are significantly different (p<0.05).

Table 2. Mean score of sensory Evaluation of cake produced from blends of rice and sweet potatoes.

Sample	Colour	Taste	Texture	Aroma	Overall acceptability
RFF	6.80[ab]±0.10	6.10[b]±0.10	5.50[c]±0.10	6.10[c]±0.10	6.13[b]±1.00
SFP	6.00[b]±1.00	5.20[d]±1.00	6.00[ab]±1.00	5.50[e]±0.10	5.68[f]±0.01
SPR25	6.80[ab]±0.10	6.80[a]±0.10	6.70[a]±0.10	6.80[a]±0.10	6.78[b]±0.01
SPR50	6.00[b]±1.00	5.90[c]±0.10	5.90[c]±0.10	6.30[b]±0.10	6.03[e]±0.01
SPR75	6.20[b]±0.10	6.10[b]±0.10	6.00[b]±1.00	5.90[d]±0.10	6.05[d]±1.00
WFF	7.40[a]±0.10	6.80[a]±0.10	7.10[a]±0.10	6.80[a]±1.00	7.03[a]±1.00

Values are means of triplicate determination ± standard deviation
Values on the same column with different superscript are significantly different (p<0.05).

RFF= 100% Rice Flour, SFP = 100% Sweet potatoes Flour, SPR25 = 75% sweet potatoes flour: 25% , Rice flour,

SPR50 = 50% sweet potatoes flour :50% Rice flour, SPR75 = 25% sweet potatoes flour :75% Rice flour, WFF =

100% wheat flour

The decrease in the fat contents of the cake may be attributable to the addition of sweet potato flour [24]. Sweet potato cultivar contains a lower level of mean crude fat content [25]. High fat content are undesirable in food product because they could lead to rancidity and odorants compound [26]. There were significant (p<0.05) difference in ash content of cake made from sweet potatoes and rice flour.

Ash content significantly (p<0.05) increased from 1.55 to 2.61% as proportion of sweet potatoes increased. The same increase in proportion sweet potatoes flour was in agreement with report of Olatunde *et al*., (2019) in cake made from pigeon pea, wheat and sweet potatoes flour [24]. Ash content is an indication of the minerals present. This is also an indication that the inclusion of sweet potatoes flour may enhance the amount of mineral intake in the food product [27], and as such would contribute appreciable dietary amounts of the mineral.

Fiber content ranged from 0.76 to 1.76 %. There was significantly (p<0.05) difference in fibre contents of cake samples. Low fibre content may be due to dilution occasioned by the dilution of batter which result small quantity left [28]. Fibre is known to add bulk to the food and also fiber is of great benefit to the body, as it helps to maintain bowel integrity, lower blood cholesterol level, and control blood sugar level. The consumption of this product has potentials to provide an appreciable amount of fiber to the body for proper functioning of the digestive and excretory systems. There were significant (P<0.05)

difference in carbohydrate content of cake sample. Sample SPR75 had the highest value of 52.59 % while sample SPR25 had the lowest value 47.76%.

Mean score of sensory Evaluation of cake produced from blends of rice and sweet potatoes is presented in Table 2. There were significant (p<0.05) difference in colour, taste, texture aroma and overall acceptability among the samples. The mean score of sample WFF (100%) was significantly (p<0.05) higher in colour and it was not significantly (p<0.05) difference from sample RFF and sample SPR25. Sample WFF (100% wheat) and sample SPR25 were not significant (p<0.05) difference in taste, texture and aroma from each other. With respect to overall acceptability, the control sample and sample SPR25 were most preferred, did not differ (p<0.05) significantly in most sensory attributes .while sample SPF was least preferred

4. CONCLUSION

This study has shown that blend sample SPR25 has great potential production of cake, as cake produced from them compared favourably with sample WFF (100% wheat) in most of the parameter studies. The use of local available crops (such as sweet potatoes and rice flour) in cake production could help to reduce dependence on importation of wheat.

5. ACKNOWLEDGEMENT

NA

6. CONFLICT OF INTEREST

The authors have declared that there is no conflict of interest.

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