

Sensory Evaluation and Proximate Composition of Rock Buns and Cakes Prepared from Partially-dried Ripe Pawpaw Pulp Incorporated into Wheat Flour

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ABSTRACT

The incorporation of partially-dried ripe pawpaw pulp into wheat flour for the preparation of Rock Buns and Cakes was studied. An evaluation of the chemical and organoleptic properties of the products was investigated. The Pawpaw was peeled, blended, drained and solar dried for four hours to obtain a semi-solid form of texture of partially dried pawpaw pulp. The wheat flour was substituted by the partially-dried pawpaw pulp at levels of 0, 10, 20, 30 and 40%. The sensory attributes evaluated by 50 untrained panelists were aroma, taste, aftertaste, texture and color. The overall acceptability of the products was determined using the overall mean score of the sensory attributes. Panelists also ranked the products in order of preference. The proximate composition and energy contents of the most accepted products and controls (100:0) were determined. The Rock Buns with 20% substitution had the highest overall mean score of 6.11 and was considered as the most acceptable product while the cake sample with 40% substitution of pawpaw pulp had the highest overall mean score of 6.76 and represented the most acceptable product among the product formulations. Generally the substitution of wheat flour with partially-dried ripe pawpaw pulp increased the proximate composition and energy contents of the most acceptable Rock buns and Cakes compared to their respective controls.

Keywords: Partially-dried ripe pawpaw, Wheat flour, Rock buns, Cakes, Sensory attributes.

INTRODUCTION

Pawpaw (*Carica papaya*) is a member of the family *Caricaceae* and is one of the fruits enjoyed by most people in the world. The fruit is a large edible berry with numerous seeds and is mostly eaten fresh without the skin or seeds when perfectly ripe. The fruit is used as an ingredient in preserves or cooked in various ways. The juice can serve as a beverage and the unripe green fruit can be cooked and eaten usually in curries, salads and stews. The ripe flesh of pawpaw is commonly made into sauce for shortcake or ice cream desert with toppings. The pulp can be fermented for production of beer, wine or brandy. Pawpaw has a unique flavour that resembles a variety of tropical flavours including banana, pineapple and mango. The flavour and custard-like texture make pawpaw to be a good substitute for banana in almost any recipe. Research has shown pawpaw to be a rich source of vitamin C, carotene, fibre, minerals such as magnesium, iron, copper, manganese, potassium and several amino acids. [9,10]. Pawpaw is higher in niacin, calcium and potassium than apples, oranges and bananas. Pawpaws have three times much vitamin C as apples, two times as much as bananas and one-third as much as oranges. Pawpaw is the only fruit with all essential amino acids and is loaded with antioxidants. [7]. All these nutrients boost the health of the cardiovascular system, apart from providing protection against colon cancer. Being a rich source of fibre, pawpaw consumption helps in lowering high cholesterol levels [8].

Over the years, baked products have increased in the Ghana as more Ghanaians patronize them. Urbanisation in Ghana has increased the consumption of processed food and bakery products as well as increased the demand for imported products [11]. Wheat flour has been used in the production of bread, rolls and pastry products. However, in most developing countries, the soil and climatic conditions do not permit wheat to be grown locally or do make it difficult. The use of composite flours has been advantageous in supplying protein for human nutrition as well as encouraging better use of local or domestic agricultural products as flour [4,5]. Arogba [3] reported that composite sorghum-maize-wheat flour cookies are highly accepted in Nigeria. Local raw material substitution for wheat flour is increasing due to the growing market for confectionaries. [15]. Pawpaw derived products as carbohydrate-based, fat-reducing agents in baked food formulations have been studied. The use of pureed pawpaw pulp in the preparation of baked foods has been found to decrease trans-fatty acid, total fatty acid caloric content and increase overall nutritional value. Consumer acceptability of products baked with 25% pawpaw pulp has also been reported [14]

Marketed as a fresh fruit, pawpaw has a short self life of two to three days at room temperature and up to three weeks with refrigeration. There is therefore commercial processing potential for pawpaw pulp to be

incorporated into ice cream, yoghurt, baked and other food products. The objective of this research work was to determine the sensory qualities and proximate composition of Rock buns and Cakes prepared from partially-dried ripe pawpaw pulp incorporated into wheat flour.

MATERIALS AND METHODS

Source of Raw Materials

Pawpaw (Solo Hawaii variety) fruits were obtained from a farm at Efiduase in the Ashanti Region of Ghana. Other materials used for baking the Cakes and Rock buns were eggs, margarine, wheat flour, sugar, pineapple and vanilla essences, nutmeg and baking powder. These were purchased from the Ayigya market in Kumasi, the capital city of Ashanti Region.

Sample preparation of partially-dried pawpaw pulp

Two pawpaw fruits weighing 1kg and 0.96 kg were washed and peeled. The seeds were removed and the pulp was cut into uniform sizes and blended into a puree. The puree was transferred into a cheese cloth to allow the juice to drain out until no further liquid from the pulp drained out and the weight was taken. The pulp was then poured on a drying tray and solar dried for 4 hrs to give a firm soft texture for analyses.

Table 1: Blends of wheat flour and partially dried ripe pawpaw pulp

Wheat flour(%)	Partially dried pawpaw(%)
100	0
90	10
80	20
70	30
60	40

Preparation of Cakes and Rock buns

Table 1 shows the formulation blends of wheat flour and partially-dried ripe pawpaw pulp used for the preparation of cakes and Rock buns. Cakes were prepared according to AACC [1] method with some modifications by using nutmeg, vanilla and pineapple essences as part of the ingredients. Rock buns were also prepared based on the method described by Cesaerani and Kinton [6] without the use of eggs and diluted milk in the formulation. However, vanilla and pineapples essences were added.

Sensory Evaluation of Cakes and Rock buns

The sensory attributes evaluated by fifty (50) untrained panellists were aroma, taste aftertaste, colour, texture and the overall acceptability which was determined as the overall mean score of all the sensory parameters. The 9-point hedonic scale with a scale ranging from 1(representing dislike extremely) to 9(representing like extremely) was used to evaluate the sensory attributes.

Proximate composition of preferred Cakes and Rock buns

The proximate analyses of the most preferred samples of Cake and Rock buns and the respective control samples were determined based on AOAC [2]. The moisture, ash, fat, crude fibre, crude protein and carbohydrate (by difference) were determined. The energy content of the samples was determined using the Atwater factors.

Statistical Analyses

The results from the sensory evaluation were subjected to one way analysis of variance (ANOVA) using Statgraphics Centurion at 95% confidence interval ($p \leq 0.05$). The results of the proximate analyses were subjected to the student's t-test using Minitab at a 95% confidence interval ($p \leq 0.05$).

RESULTS

Table 2 shows the mean values of the sensory parameters of the Rock bun samples. The sample with 20% substitution of pawpaw pulp had the highest overall mean score of 6.11 and was therefore the most acceptable product in terms of the sensory qualities. It was followed by the control with 0% substitution. The product with 10% substitution had the lowest overall mean score and was considered as the least acceptable product.

Table 2: Sensory evaluation of Rock buns from different formulation ratios

Products	Aroma	Taste	Aftertaste	Colour	Texture	Ovm
(100:0)	6.36±1.37 ^b	6.36±1.41 ^a	6.02±1.52 ^a	5.46±1.81 ^a	5.48±2.00 ^a	5.94±1.23 ^a
(90:10)	5.36±1.80 ^a	5.26±1.86 ^a	5.62±1.71 ^a	5.54±1.76 ^a	5.40 ± 2.02 ^a	5.44±1.42 ^a
(80:20)	6.00±1.81^a	6.08±2.12 ^a	5.84±1.93 ^a	6.34±1.87 ^{a,c}	6.28 ± 1.96 ^a	6.11±1.61 ^a
(70:30)	5.60±2.05^a	5.78±2.09 ^a	5.62±2.08 ^a	5.78±1.83 ^a	5.18±2.43 ^a	5.59±1.56 ^a
(60:40)	5.52±1.97^a	5.60±2.20 ^a	5.50±1.82 ^a	6.52±1.57 ^c	5.94±2.06 ^a	5.82±1.44 ^a

Mean values in the same column with different superscript are significantly different (p≤0.05). Ovm: means overall acceptability

Table 3 represents the mean scores of the sensory parameters of the cake samples. The sample with 40% substitution of pawpaw pulp had the highest overall mean score of 6.76 and represented the most acceptable product among the product formulations. This was followed by the product with 30% substitution. However the control sample had the lowest overall mean score of 6.24 and was therefore the least acceptable product.

Table 3: Sensory evaluation of Cakes from different formulation ratios

Products	Sensory Parameters					
	Aroma	Taste	Aftertaste	Colour	Texture	Ovm
(100:0)	6.64±1.40 ^a	6.34±1.47 ^b	5.78±1.33 ^a	6.32±1.41 ^a	6.14±1.21 ^b	6.24±0.32 ^a
(90:10)	6.44±1.33 ^a	6.50±1.28 ^b	5.98±1.60 ^a	6.42±1.67 ^a	6.08±1.70 ^b	6.28±0.24 ^a
(80:20)	6.56±1.33 ^a	6.40±1.16 ^b	6.38±1.24 ^b	6.52±1.23 ^a	6.04±1.26 ^b	6.38±0.21 ^a
(70:30)	6.44±1.39 ^a	7.04±1.36 ^a	6.56±1.39 ^b	6.86±1.28 ^a	6.70±1.45 ^a	6.72±0.24 ^b
(60:40)	6.66±1.29 ^a	6.96±1.44 ^a	6.34±1.41 ^b	6.96±1.37 ^a	6.86±1.57 ^a	6.76±0.26 ^b

Mean values with different superscripts in the same column indicate significant differences (p≤0.05).

Ovm: refers to overall acceptability

The preference ranking scores of Rock bun samples are indicated in Table 4. Approximately 22% of the panellists ranked the product with 20% substitution as the most acceptable product. This was almost the same as the percentage which ranked the control. About 18% of the panellist ranked the sample with 10% substitution as the least acceptable product.

Table 4: Preference ranking scores of Rock Bun samples

Sample Percentage (%)	Percentage (%)
100:0	21.50
90:10	17.49
80:20	21.90
70:30	18.70
60:40	20.43

The preference ranking scores of Cake samples are shown in Table 5. About 24% of the panellists ranked the product with 40% substitution as the most acceptable product followed by the formulation with 30% substitution, which 23% of the panellist ranked as the second most acceptable product. Almost 17% of the panellist ranked the control (0% substitution) as the least acceptable product.

Table 5: Preference ranking scores of Cake samples

Sample	Percentage (%)
100:0	17.20
90:10	17.47
80:20	18.13
70:30	23.33
60:40	23.87

The proximate composition of the most acceptable Rock buns and control samples are presented in Table 6. The moisture content of 28.44% of the most acceptable product (M) was less than that obtained for the control (C). Product M respectively had higher values of 1.60, 14.50 and 1.00% in terms of ash, fat and fibre contents than those obtained for the control. The energy content of Product M was 347.93kcal/100g and that of the control was 332.77 kcal/100g. The protein and carbohydrate contents of the control (7.67 and 50.99%) were a bit higher than the most acceptable product (7.54 and 47.05%) sample.

Table 6: Proximate composition of the most acceptable sample of Rock buns and control

Component	M (80:20)	C(100:0)
Moisture (%)	28.44 ^a ± 0.50	28.54 ^a ± 0.00
Ash(%)	1.60 ^b ± 0.07	1.30 ^b ± 0.07
Crude fat(%)	14.50 ^c ± 1.41	10.75 ^c ± 0.35
Crude fibre(%)	1.00 ^d ± 0.07	0.50 ^d ± 0.01
Protein (%)	7.54 ^e ± 0.04	7.67 ^e ± 0.08
Carbohydrate (%)	46.83 ^f ± 0.25	51.34 ^g ± 0.30
Energy kcal/100 g	347.93 ^h ± 0.85	332.77 ^h ± 1.07

Mean values with different superscripts in the same row are significantly different ($p \leq 0.05$). M: the most acceptable product C: control sample

The proximate compositions of the most acceptable cake sample and control are shown in Table 7. The moisture content of 11.58% of the most acceptable product (MA) was less than that obtained for the control (CT). The percentage compositions of the other food components of the most acceptable product were all higher than those obtained for the control. The energy content of Product (MA) was also higher than that of the control.

Table 7: Proximate composition of the most acceptable Cake sample and Control

Component	MA (60:40)	CT (100:0)
Moisture (%)	11.58 ± 0.20 ^b	15.62 ± 0.60 ^a
Ash (%)	1.90 ± 0.14 ^a	1.60 ± 0.01 ^a
Fat (%)	22.25 ± 0.35 ^a	20.75 ± 1.06 ^a
Crude fibre (%)	1.50 ± 0.71 ^a	0.5 ± 0.00 ^a
Crude Protein (%)	10.91 ± 0.07 ^a	10.01 ± 0.08 ^a
Carbohydrate (%)	51.86 ± 1.41 ^a	51.79 ± 1.55 ^a
Energy (kcal/100 g)	451.35 ± 2.76 ^b	433.91 ± 3.04 ^a

Mean values with different superscripts in the same row are significantly different ($p \leq 0.05$). MA: means most acceptable blend. CT: refers to control.

DISCUSSION

Sensory evaluation of and Rock buns and Cakes

The mean scores of all the sensory parameters of Rock buns (Table 2) shows that all the samples were acceptable to the panellists and indicated they liked the products slightly and also neither liked nor disliked the products. Panellist detected significant differences ($p < 0.05$) in the aroma and colour of the Rock buns. This is an indication of the fact that the pawpaw pulp had an impact on these two sensory qualities. The colour of the product with the highest substitution (40%) had the highest mean score among the five products. The level of substitution imparted a yellowish colour to the Rock buns which the panellists recognized and admired. It has been reported that the nutrient composition and colour of the pawpaw fruit contribute to the colour of the final baked product [14]. Significant differences ($p > 0.05$) were not established in the taste, after taste, texture and overall acceptability of the samples. The mean score of these sensory parameters indicates that the pawpaw pulp did not have significant impact on the cake samples. The overall mean score, which represents the product with the highest sensory quality, was highest in the product with 20% substitution than all the other samples. Based on the evaluation by Panellist, the sensory impact of the partially dried ripe pawpaw pulp on Rock buns was considerably minimal in the formulated products.

The mean scores of the sensory parameters (Table 3) indicated that all cake samples were generally acceptable to the panellists and indicated they liked the products slightly or moderately based on the 9 point hedonic scale. There were significant differences ($p < 0.05$) in the taste, aftertaste, texture and overall acceptability of the samples. However there were no significant differences ($p > 0.05$) in the aroma and colour of all the five samples. In terms of taste, aftertaste, colour and overall acceptability, all the samples with substitutions had higher scores than the control. This indicates that the partially-dried pawpaw pulp contributed adequately to these sensory qualities of the cake which the panellists appreciated more than the control. Samples with 30% and 40% substitution had higher mean scores in taste, aftertaste, colour texture and overall acceptability than those with substituted levels of 0%, 10 and 20%. In this respect, Panellist found cakes with these higher substitutions as being significantly, more appealing and tastier than samples with lower substitutions. This confirms the assertion that baked goods and other products with pawpaw pulp incorporated have been increasingly appealing to today's consumers [13]. The overall mean score increased from control sample to sample with 40% substitution which indicated that, as the amount of pawpaw in each sample increased, the consumers liked the product the more. This could be attributed to the fact that increased amounts of pawpaw increased the sugars which interact with amino compounds through the Maillard reaction to produce a series of more flavourful compounds which are essential for recognition and taste acceptance of many processed products [12]

Preference Ranking of Rock buns and Cake samples

The degree of liking of the products was subjected to preference ranking test where panellists ranked the products in descending order of preference. The ranking scores of Rock buns shows that the product with 20% substitution with the first, followed closely by the control (0% substitution), then thirdly and fourthly by substitutions with 40 and 30% respectively. Lastly was the product with 10% substitution.

Similarly, the preference ranking scores of the cake samples indicated product with 40% substitution as the first, followed by 30% substitution, thirdly and fourthly by substitutions with 20 and 10%. Lastly was the control. The favourable response, preference and acceptance of both baked products by panellists indicate that a broader outlet and potential exist for pawpaw beyond its sole consumption as fresh fruit sold on the local market [13]. The influence of the partially-dried pawpaw pulp on the aroma, colour, taste, aftertaste, texture and overall acceptability of the Rock buns and cakes influenced the preference of the substituted products over the control [14].

Proximate Compositions of the most acceptable products (M and MA) and Controls

The most preferred Rock buns (80:20) had higher amounts of ash, fat, fibre and energy than the control (100:0). There were no significant differences ($p>0.05$) between these food components with the exception of carbohydrate where a significant difference existed ($p<0.05$). The protein, fat fibre ash and carbohydrate contents of the most preferred cake (60:40) were similarly higher than the control. The moisture content of the Cake was significantly lower than the control and the energy content was also significantly ($p <0.05$) higher than the control. Generally the substitution of wheat flour with partially dried ripe pawpaw pulp improved the proximate composition of Rock buns and cakes.

CONCLUSION

The effect of the partially-dried pawpaw pulp on the aroma, colour, taste, aftertaste, texture and overall acceptability of the Rock buns and cakes influenced the preference of the panellists for substituted products over the control. Panellist found cakes with higher substitutions of 30% and 40% pawpaw pulp being significantly, more appealing and tastier than samples with lower substitution 0%, 10 and 20%. The preference ranking score of cake sample with 40% substitution was the highest among all the products. The overall mean score, which represents the product with the highest sensory quality, was highest in the Rock buns with 20% substitution of partial-dried pawpaw pulp than all the other samples. This sample was also ranked as the most preferred sample among the formulations. The substitution of wheat flour with specific amounts of partially dried ripe pawpaw pulp enhanced the sensory qualities and proximate composition of Rock buns and cakes.

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