

Sensory Attributes and Consumer Acceptance of Cocoa Powder Supplemented Bread in Nigeria

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Abstract – As a means of increasing the local consumption of cocoa in the major cocoa producing countries located within the West African sub-region, the sensory attributes and consumer acceptance of cocoa powder supplemented bread recipes were studied in Nigeria.

The wheat flour portion of the control bread recipe was supplemented with cocoa powder at 0-5% levels. Repeated organoleptic trials indicated that the 2% cocoa powder level was the most acceptable. It was rated better than the control and other samples for colour, flavour, puffiness and overall acceptability. It also exhibited a longer shelf life than the control. The respondents on consumer acceptability of the cocoa bread 72% of respondents to consumer acceptability survey of cocoa bread preferred it to other loaves in town. Following media outreaches by CRIN, the cocoa bread is now being commercially produced by some institutions in Nigeria.

Keywords – Cocoa Bread, Sensory Attributes, Consumer Acceptance.

issues in the region, viz; Malaria, Diabetes and Hypertension (Addai, 2013). The EU commission, in addition, recently approved the health claim that cocoa flavonols (antioxidant components of cocoa powder) support healthy blood flow by improving elasticity of the blood vessels (Cocoa News, 2013).

Bread is a staple food in West Africa. In fact, it a common food all over the world accounting for 20% of the calories consumed by humans (FAO, 2011).

Inclusion of cocoa powder in bread for consumption in the West African sub region will go a long way in mopping up excess cocoa in the international market with an expected positive effect on cocoa bean pricing. The objective of this study was to investigate the best organoleptically acceptable level of cocoa powder incorporation in bread and consumer acceptance of the cocoa bread recipe.

I. INTRODUCTION

Local consumption of cocoa in the major producing countries has been identified as a critical factor towards a sustainable global cocoa economy (African Cocoa Summit, 2006). This applies particularly to West African countries which together produce 65.4% of world cocoa (ICCO, 2013). The demand and supply chain of cocoa for over a century showed that West Africa consumes a negligible percentage while exporting the bulk of her cocoa beans. This has titled the trade gains far more to the consuming countries of Europe and America. The expansionist programmes for cocoa production by the West African giants of Ivory Coast, Ghana and Nigeria is likely to exacerbate the trade imbalance. Nigeria, for instance, plans to double production from the current level of 250,000 metric tonnes to 500,000 by 2015 (Adesina, 2013).

It is glaring from the proceeding facts that West Africa has to look inwards for local consumption of some of her cocoa. Interestingly, recent findings and developments showed that local consumption of cocoa powder will bring tremendous health benefits against three of the main health

II. MATERIALS AND METHODS

The study was conducted at CRIN. The method used in bread production was the Straight Dough Method. The ingredients used and their proportions are shown on Table 1. The amount of water used was about half the total weight. Bread samples were prepared by adding a quantity of cocoa powder (1-5% the proportion of the wheat flour) to the ingredients in the control bread.

Physical and chemical analyses: Bread volume was determined immediately after the bread samples were depanned. The method of Ebiringa and Echebiri (2004) was employed by measuring length, width and breadth of the bread and using the formula $\text{Volume} = \text{length} \times \text{width} \times \text{breadth}$.

The percentage moisture, protein, ash and carbohydrate were determined by AOAC (1990) method.

Sensory analysis: This was conducted within 20 hours after baking by a 10 member panelists that were randomly selected from staff of CRIN. Panelists evaluated the bread samples for colour, taste, flavor, puffiness and overall acceptability, using a 9 point hedonic scale, ranging from 9- like extremely to 1- dislike extremely.

Table 1: Formula for cocoa bread at 5 levels of cocoa Powder Supplementation in wheat flour

Ingredient	Bread Samples (levels of cocoa powder)% in wheat flour					
	0	1	2	3	4	5
Wheat Flour (g)	1000	1000	1000	1000	1000	1000
Cocoa Powder (g)	0	10	20	30	40	50
Water (ml)	500	495	490	485	480	475
Fat (g)	20	20	20	20	20	20
Salt (g)	20	20	20	20	20	20
Yeast (g)	4	4	4	4	4	4
Sugar (g)	100	105	110	115	120	125

Market Survey and Economic Analysis: CRIN mass produced the cocoa bread recipe using the local bakery that was within the Institute premises. Sales were conducted daily to staff members and vendors from outside the Institute. The sales were subjected to economic analysis.

Experimental Design and Data Analysis: Data were collected in triplicates and analyzed using analysis of

variance for randomized complete block design. Data for sensory evaluation were analyzed using multiple range tests.

Consumer preference and acceptability study Questionnaires were administered to sixty six (66) consumers and marketers of the CRIN cocoa bread. The data collected were analyzed using descriptive and inferential statistics.

III. RESULTS

Table 2: Chemical composition of wheat flour and cocoa powder

Components	wheat flour	cocoa powder
Moisture (%)	11.25	11.16
Total solids (%)	87.16	30.41
Minerals (%)	0.47	30.41
Protein (%)	10.72	22.10
Carbohydrate	70.21	58.87

Table 3: Chemical and physical attributes of cocoa bread sample moisture, ash and volume of cocoa bread samples

Sample (% content of cocoa powder)	Moisture%	Ash%	Volume (cm3)
0	35.24+0.004	1.31+0.004	578.34+0.006
1	35.12+0.021	1.33+0.016	576.02+0.011
2	34.98+0.015	1.40+0.068	570.31+0.023
3	34.37+0.015	1.40+0.068	567.22+0.034
4	34.16+0.03	1.41+0.006	535.63+0.037
5	33.05+0.020	1.43+0.002	503.45+0.037

Table 4: Sensory evaluation of cocoa bread samples acceptability

(% Level of Cocoa Powder)	Colour	Taste	Flavor	Puffines	Overall Acceptability
0	7.78b	8.22a	6.88b	6.11b	7.34b
1	7.21b	8.14a	7.01ab	7.42ab	7.21b
2	8.33a	8.36a	7.26a	7.86a	8.21a
3	8.01a	7.42a	7.14a	7.81a	7.41a
4	6.42c	6.71c	7.35a	7.83a	7.15b
5	5.13d	5.44d	7.40a	7.88a	6.32

Note: figures of the same column with different super scripts differ significantly

Table 5: Shelf life evaluation of cocoa bread sample

(% level of cocoa powder)	Day 1	Day 2	Day 3	Day 4	Day 5
0	Puffy/softness	Puffy	Semi-hard	Hard	Stale
1	Fuffy	Puffy	Puffy	Mouldy	Stale
2	Puffy	Puffy	Puffy	Puffy	Puffy
3	Puffy	Puffy	Puffy	Puffy	Puffy
4	Puffy	Puffy	Puffy	Puffy	Puffy
5	Puffy	Puffy	Puffy	Puffy	Puffy

IV. DISCUSSION

The different Formula for cocoa bread at 5 levels of cocoa Powder supplementation in wheat flour are represented in Table 1.

The chemical and physical properties of wheat flour and cocoa powder are shown on Table 2. The moisture content of the bread samples ranged between 24 and 33%. The

protein content and the mineral content of the formulated cocoa powder bread are very high compare with the control; therefore the formulated cocoa sample is richer in nutrient. The control bread had high volume size in comparison to cocoa bread samples. The crumb colour was also found to darken as the % cocoa powder increases and hence decrease the acceptability of high cocoa inclusion in bread in respect to the crumb colour. This is in

agreement with the result of Ebiringa and Echbiri (2004) that recorded same trend in bread produced with the use of honey. Moreover, the texture of the bread tends to become hardened with increase in percentage of cocoa powder inclusion but the aroma is stronger and more inviting as the cocoa increases. The 2% cocoa powder supplemented bread recipe was rated better for colour, taste, flavor, puffiness and overall acceptability. The cocoa bread sample with 1% cocoa powder substitution showed little difference from the control sample while 4 and 5% substitution of cocoa powder in the bread samples were too dark and were scored low. Overall, the 2% level of cocoa powder incorporation was rated best and accorded the highest acceptance for consumption and sale.

The shelf life evaluation of the bread samples showed that cocoa bread sample could maintain its freshness for more than five days at room temperature and thus making it lasted more than the control which was observed to have become stale by the 3rd day. The cocoa bread maintained its softness/puffiness beyond the 3rd day. It is interesting to note that no preservative was used and this was specifically done so as to really determine its shelf life.

V. CONCLUSION

It is envisaged that the introduction of the cocoa bread recipe will mop up excess cocoa bean meant for the international market, increase local processing and consequently improve the cocoa economy of Nigeria. The issue of cocoa powder supplementation in bread recipes has received a boost sequel to media outreaches by CRIN. Presently some institutions including CRIN and Landmark University, Omu-Aran, Kwara State, Nigeria, have begun commercial production of the bread, in addition, the largest cocoa processing company in Nigeria, Multi-Trex has developed its own cocoa bread recipe.

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