
*Likeness of the
Taste and
Colour of Cake
Baked with Shea
Butter and
Margarine as
Source of Fat in
Nsukka, Enugu
State*

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Abstract

The aim of the research was to determine the acceptability of the colour and taste of cake baked with Shea butter compared with those baked with margarine as source of fat. Shea butter were bought directly from the milling industry in Minna, Niger State while margarine and other cake ingredients were bought from Nsukka main market.

*Two kilogram of wheat flour and other cake ingredients were used for each sample. 500g of fat (Shea butter and margarine) and sugar was added to the different bowels for each sample alongside with other necessary ingredients for the production of the different cake samples. The taste and colour were ascertained using a 9 – point Hedonic rating scale by fifty (50) man panel of assessors. The data generated were analysed using mean and standard deviation, while the *t* – test statistic was used to test the null hypotheses. The findings of the study showed that the colours of both cake samples were the same while the taste of the cakes differs. Based on the findings of the study, it was recommended that confectionary/food industries should be enlightened and supported to use shea butter as source of fat in baking since it has good colour, while relevant agencies of government should encourage research and support the processing of raw shea butter to improve its taste.*

Key words: Shea butter, margarine, cake, colour, taste

Introduction

Globally, the rate of consumption of snacks and fast foods is increasing on daily basis. In Nigeria, due to factors such as tight schedule and increasing workload, eating

habits, urbanization, rural – urban migration, education, poverty among others, people tend to resort more to the consumption of baked products (Eneche, 2007). Pressure of work, lack of time and the need for students and children to take lunch while in school, have led to increase in the consumption of baked products and fast foods.

Baked product is any food cooked using baking method. Baking according to Day (1999) is a method of cooking food with dry heat in an enclosed space. Mudambi and Rajagopal (2007) observed that food placed in an enclosed container to be baked is cooked by dry heat, through the convection currents of hot dry air and conduction of heat from the container to the food and moist heat. The air within the enclosed space is heated up to the required temperature thereby cooking the food. Some examples of baked products are bread, biscuit, pies and cakes, among others.

Cakes according to Ozge (2007) are chemically leavened baked products used in ceremonies from birthdays to weddings, traditional marriages and anniversaries among others. They are rich in proteins, fats and carbohydrates, and are eaten as snacks in the home and work places. Cakes are majorly made of flour, fat, sugar, egg,

baking powder, spices, and mixed fruits using different methods such as melting, all in one method, whisking and creaming. Notwithstanding the method employed in the baking process, every baked product has major ingredients, one of which is fat.

Generally, fat is important in nutrition because it is a source of dietary energy, antioxidants, bio fuels and raw materials for the manufacturing of several industrial products. In cake, fat is to provide tenderness to the product, and is directly linked to the final texture and volume of the cake product (Sahi and Alavan, 2003). As noted by Ozge (2007), fat helps to entrap air during the creaming process, resulting in aeration and hence leavens the products, as well as impacts desirable flavor, texture, taste and colour to the cakes. There are many types of fats in existence but the major ones are butter and margarine. Butter is a pure animal fat specially produced from animals such as cow. It is made by churning milk or cream. The butter we most often buy is made from cow's milk, although other varieties made from the milk of sheep, goat, yak or buffalo are also available (Foster, 2015). Butter is also used as spread in frying foods and in making sauce. It is an excellent source of fat – soluble vitamins: A, D, E and K (Chow, 2008). For some decades, butter has been

blamed for heart disease due to its high saturated fats (Atli, 2019) . Whole milk according to Noakets, Nestel and Clifton in Gonzales and Herbein (2003) and some dairy products which butter is one of them have been listed as one of the risk factors in coronary heart disease still because of their high content of saturated fatty acids. Due to the high content of saturated fats in butter and it's adverse effects, nutritionist and researchers there by resort to the use of margarine as alternative.

Margarine is a pure vegetable fat basically made from vegetable plant such as palm oil, coconut oil, olive oil etc, and contains water, milk flavor, preservatives and artificial colour to enhance its quality. Unfortunately, margarine is also saturated and contains a more dangerous fat called Trans fat. Trans fat according to Malachi (2015) results from the manufacturing process of margarine called hydrogenation - addition of hydrogen to the oil in which the liquid vegetable oils are made into a solid form. This process leads to the generation of trans- unsaturated fatty acids . Eating trans fats as noted by Mozaffarian, Pischon, Hankison, Rifain, Joshipura, Willet and Rimm (2004) increases the levels of Low Density Lipoprotein (LDL) and lowers the levels of High Density Lipoproteins (HDL) . It also promotes an

over activity of the immune system that has been implicated in heart disease, stroke, diabetes and other conditions the authors further stated . Dornic, Sharnp, Saikia, and Longvah (2018) are also of the view that the shift from traditional cooking oils towards partially hydrogenated oils is contributing to the growing global epidemic of cardiovascular disease. Coronary heart disease is a leading cause of death in America (American Heart Association,2000). Considering the health implications, non availability and high cost of butter and margarine, it has become pertinent to source for locally available indigenous traditional fats that are nutritious, cheap and readily available, but most often under exploited such as shea butter produced from shea tree.

Shea butter according to Gaetner in Maranz, Wiesman, & Bianchi (2004) is the fat extracted from the kernels of *Vitellaria paradoxia* (Shea tree) which is also known as *Butyrospermum Parkii*. The Shea tree *Vitelaria paradoxa* is indigenous to the African continent. In Nigeria, Shea tree is found scattered around farm lands in Niger state and other northern parts of Nigeria and is variously known in some local languages as: “Emie emi” (Yoruba), “Kandanya” (Hausa), “Ichamegh” (Tiv), “Okuma”(Ebira) and among the Igbos, it

is commonly known as “Okwuma” (Ani, Aondona & Soom, 2012), where it grows mostly in the wild. The fruit produced by Shea tree is the major source of shea butter. It is green in colour with fleshy edible pulp that contains carbohydrate, protein, ascorbic acid, iron and calcium Food Agriculture Organization (FAO, 1998). Olaniyan and Oje, (2007) opined that shea tree bears fruits that are made up of green epicarp, fleshy mesocarp (pulp) and a relatively hard shell (endocarp) that encloses the shea kernel (embryo) from which the butter is produced. Shea butter is naturally rich in vitamins A, E and K (Ademola, Oyesola and Osawa, 2012), and is very useful to health as it contains some nutrients such phenolic compounds known to have antioxidant properties (Maranz, Wiesman and Garti, 2003). Shea butter contains five principal fatty acids: palmitic, stearic, oleic, linoleic acids and arachidonic acid (Maranz, Wiesman, & Bianchi, 2004). The fatty acid compositions are dominated by stearic acid and oleic acids, while the high percentage of both give Shea butter its solid and soft consistency respectively.

Shea butter is found very useful by the cosmetic industries and for medicinal purposes. In areas where Shea butter is produced, it is not just used for medicinal purposes but also in cooking. Among the

people of Adamawa state in Northern Nigeria, Shea butter is used in preparing some native soups. It is used by locals in frying foods such as “akara” (African bean cake), potatoes, yam, plantain, eating boiled yam, cooking beans and native soups, and is ranked second to palm oil as the most important source of cooking fat by West African rural dwellers (Aguzue, Akanji, Tafida, & Kamal, 2013). Malachi (2015) found that Shea butter does not have Trans fat as is the case with margarine and requires no hydrogenation process during its production thereby a good alternative to margarine, noting that the health related problems associated with trans fats found in margarine can be reduced by using Shea butter as alternative in food production. It therefore becomes necessary to compare the organoleptic attributes, especially taste and colour of cake baked using shea butter and margarine as source of fat.

Organoleptic attribute also known as sensory attribute is the use of sense organs such as taste, sight, smell and touch among others to assess, identify and evaluate the quality and acceptability of a particular food product using trained personalities. Greenwood (2000) noted that the sensory aspects of food can be determined through measures of taste intensity, evaluation of flavour profile and assessments of food

texture, aroma, colour, appearance and general acceptability. Sensory attributes are generally evaluated using Hedonic scale. In this study, the taste and colour of cake baked with shea butter and cake baked with margarine were evaluated using a 9 – point hedonic scale to determine their general acceptability.

Acceptability is being able to agree with something or have a positive opinion over a thing. It states or describes the degree or extent of one's likeness over a product. For any sensory evaluation to be successful, acceptable and yield good and dependable result, the product must be prepared using a standard or standardized recipe. A standard or standardized recipe as noted by the United States Department of Agriculture (USDA, 1995) is the recipe that “has been tried, adapted, and retried severally for use by a given food service operation and has been found to produce the same good results when the exact procedures are used with the same type of equipment and the same quantity and quality of ingredients”. The benefits of using a standard recipe include consistency, predictable yield, consumer satisfaction, consistency in nutrient content among others.

In spite of the fact that Shea butter has been found useful in cooking, its use as source of fat in baking is not widespread, as

most bakers rely on margarine as source of fat, with its attendant health problems such as stroke, diabetes, arteriosclerosis, obesity among others. Considering its nutritional and health benefits, and the fact that it is locally available in most parts of Africa including Nigeria, it becomes imperative to determine the organoleptic attributes and acceptability or likeness of cake baked with shea butter when compared with margarine as source of fat, with particular emphasis on the taste and colour of the cake. This is with a view to recommending shea butter as alternative source of fat considering its relative local availability, cheap cost and nutritional/health benefits. The study is therefore designed to determine the acceptability of the taste and colour of cake baked with shea butter and margarine. The findings are expected to be of immense value to bakers, nutritionists, and the general public. A knowledge of the likeness of the taste and colour of cake baked with shea butter as fat source will expose bakers to shea butter as cheap and locally available source of fat, and provide healthy baked products for the general public. Specifically, the study was designed to determine the:

1. colour of cake baked with Shea butter when compared with margarine.

2. taste of cake baked with Shea butter when compared with margarine.

Research questions

1. To what extent do respondents like the colours of cake baked with Shea butter when compared with margarine?

2. To what extent do respondents like the taste of cake baked with Shea butter when compared with margarine?

Research hypotheses

Ho₁: There is no significant difference in the mean ratings of the respondents on the level of likeness of the colours of cake baked with Shea butter and that of margarine as fat.

Ho₂: There is no significant difference in the mean ratings of the respondents on the level of likeness of the taste of cake baked with Shea butter and that of margarine as fat

Method and Materials

The study adopted experimental research design. According to Nnaekwe (2007), experimental design is concerned with identifying cause and effects relationship. The design is suitable because it helps to determine the effects of different fat sources on the colour and taste of cake. The study was carried out in the Food and Nutrition Laboratory, Department of Home Economics and Hospitality Management

Education, University of Nigeria, Nsukka. The population for the study was 50 respondents, made up of 8 lecturers in the Department of Home Economics and Hospitality Management Education, and 42 registered Postgraduate students of the same department. The entire population was used for the study. The instrument for data collection was a 9 – point hedonic scale. It is a standard instrument and needs no validation. The scale ranged from: like extremely (9); like very much (8); like moderately (7); like slightly (6); neither like nor dislike (5); dislike slightly (4); dislike moderately (3); dislike very much (2); and dislike extremely (1). The materials used for the experiment include electric oven, electric mixer, mixing bowl, baking pans, turner, sieve, knife and spoon, while the ingredients used include flour, Shea butter, margarine, sugar, egg, baking powder, brandy wine, dry fruits (raisins) and vanilla essence.

Shea butter was bought directly from the producers in the milling industry in Minna, Niger state, Nigeria. This was to avoid buying adulterated Shea butter. Other ingredients such as margarine, flour, sugar, vanilla essence etc were purchased from Nsukka main market. The flour, sugar and vanilla essence were sifted differently in different bowls to remove dirt. The

Margarine cake was baked using the following recipe: 500g of plain wheat flour, 500g of margarine at room temperature, 10 eggs at room temperature, 350g of sugar, 2tbsp of baking powder, 2tbsp of vanilla essence, 1cup of brandy, and 1 handful dry fruits (Lete,2018).The Shea butter cake was baked using 500g plain wheat flour, 500g shea butter at room temperature, 10 eggs at room temperature, 350g of sugar, 2tbsp of baking powder, 2tbsp of vanilla essence, 1cup of brandy, and 1 handful dry fruits (Lete,2018).

Both cakes were differently baked using creaming method (Lete) with the following procedures:

1. Soak the dry fruit in the brandy, prepare the pans by thinly greasing the inside with margarine and shea butter respectively to prevent the cake from sticking to the pan. preheat the oven for 15 minutes at 150C or 300F mark.
- 2 . In a bowl, sift together the flour and baking powder. In an electric cake mixer, use the slow setting mode and cream the fat until it's light, fluffy and white. Add the sugar and continue creaming until it goes from grainy to fluffy again.
3. Add eggs one after the other as you continue to cream, add the flavor and the soaked fruits. Gradually add the flour

mixture, one cup at a time, mix until well incorporated.

Half fill the cake pan with the cake batter and smooth the top with a spatula.

4. Bake in the preheated oven for (150⁰c or 300F) for 1hour or until a skewer inserted in the center comes out clean. Cool the cakes for 10 minutes, then turn onto a wire rack and leave to cool completely.

After baking, the cake products were coded as follows: Sample A –MGC - Margarine Cake and Sample B - SBC – Shea butter cake, for evaluation by the panelists. The data collection involved the evaluation of the food samples for their colour and taste. A rating scale was used to record the scores of each food sample. The panelists rated the colour and taste of the baked cake. After eating the first sample, carrot & water were given to them to rinse their mouths. This helped them in distinguishing the various taste. The researcher then collected the completed rating forms from the panelists. The data that was generated from all the sensory evaluation were analyzed using Mean and Standard deviation for the research questions while t – test statistics was used to test the null hypotheses at 0.05 level of significance. For the purpose of making decisions, a mean score of 0.50 – 1.49 was taken as dislike extremely (DE), 1.50 – 2.49

dislike very much (DVM), 2.50 – 2.49 dislike moderately (DM), 3.50 – 4.49 dislike slightly (DS), 4.50 – 5.49 neither like nor dislike (NLND), 5.50 -6.49 like slightly (LS), 6.59 – 7.49 like moderately (LM), 7.50 – 8.49 like very much (LVM), and 8.50 – 9.49 like extremely (LE). For the hypotheses, the null hypotheses were rejected when the t – critical value is greater than the 0.05 level of significance.

Control of Extraneous variables: to control extraneous variables such as taste of previous food consumed by the evaluators, time of food consumption and the evaluation environment, the researchers ensured that the evaluation centre was well ventilated, having no odour and dark light. The evaluation was done in a day light, while the evaluators were provided with clean water to wash their hands and rinse their mouths before testing the food products. After tasting each sample, they rinsed their mouths with water and took carrot and finally rinsed their mouths again with water before going over to the next sample.

Results

Research Question 1

To what extent do respondents like the colours of cakes baked with shea butter and margarine as source of fat? Each research

question was answered using mean and standard deviation obtained from the sensory evaluation.

Table 1: Extent of Likeness of the Colours of Cakes Baked with Shea Butter when Compared with Margarine as Source of Fat

S/ N	Attribut es	N	\bar{X}	SD	Remar ks
1	Colours	5	7.7	1.1	LVM
	of MGC	0	6	0	
2	Colours	5	7.7	1.0	LVM
	of SBC	0	6	4	

Keys: N = Total Number of the respondents, \bar{X} = Mean of the two cake samples, SD = Standard Deviation of the two cake samples, LVM = Liked Very Much, MGC = Margarine Cake; SDC = Shea Butter Cake.

Table 1 indicates that the colours of the two different cake samples have the same mean score $\bar{X} = 7.76$. This shows that the colours of the two cake samples were liked very much by the respondents.

H₀₁: There is no significant difference in the mean ratings of the respondents on the extent of likeness of the colours of cakes baked with shea butter when compared with margarine as source of fat.

Table 2: The t-test result of the mean responses of respondents on Extent of Likeness of the Colours of Cakes Baked with Shea Butter when Compared with Margarine as Source of Fat.

S/ N	Attribut	N	\bar{X}	SD	Remarks
1	Colours of MG C	50	7.10	1.08	NS
2	Colours of SBC	50	7.40	1.04	

Keys: *N* = Number of respondents; *NS* = Not significant, *df* Degree of freedom, *P.value* = Probability value (2 sig tailed) *SD* = Standard deviation; \bar{X} = mean; level of significance = 0.05; *MGC* = Margarine cake; *SBC* = Shea butter cake.

Table 6 revealed that the probability value (*P.value* = 1.00) was greater than the level of significance 0.05. Hence the null hypotheses were upheld. This means that there is no significant difference between the mean responses of respondents on the

level of likeness of the colours of cakes baked with shea butter and margarine as source of fat.

Research Question 2

To what extent do respondents like the taste of cakes baked with shea butter when compared with margarine as source of fat?

Table 3: Extent of Likeness of Taste of Cakes Baked with Shea Butter and Margarine as Source of Fat

S/ N	Attribut	N	\bar{X}	SD	Remarks
1	Taste of MGC	50	6.72	1.20	LM
2	Taste of SBC	50	4.60	1.80	NLND

Keys: *N* = Total Number of the respondents, \bar{X} = Mean of the two cake samples, *SD* = Standard Deviation of the two cake samples, *LM* = Liked Moderately, *NLND* = Neither Liked Nor Disliked, *MGC* = Margarine Cake; *SBC* = Shea Butter Cake

Table 3 indicates that the taste of cake baked using margarine as source of fat had mean rating of 6.72, meaning that it was liked moderately by the respondents, while the caked baked using shea butter as source

of fat received mean rating of 4.66 indicating that the taste was neither liked nor disliked by respondents.

H₀₂: There is no significant difference in the mean ratings of the respondents on the extent of likeness of the taste of cakes baked with shea butter when compared with margarine as source of fat.

4: The t -test result of the mean responses of respondents on the Extent of Likeness of the Taste of Cakes Baked with Shea Butter when Compared with Margarine as Source of Fat.

S	Attr	N	\bar{X}	S	T	d	P.v	Re
/	ibut			D	f	alu	ma	
N	es				e	rks		
1	Taste of MG C	5	6.72	1.05	6.985	9	0.00	S
2	Taste of SBC	5	4.66	1.08				

Keys: N = Number of respondents; S = Significant, df Degree of freedom, P.value = Probability value (2 sig tailed) SD = Standard deviation; \bar{X} = mean; level of significance = 0.05; MGC = Margarine cake; SBC = Shea butter cake.

Table 3 revealed that the probability value (P. value = 0.00) was less than the level of significance 0.05. Hence the null hypothesis was not upheld. This means that there is significant difference in the mean ratings of the respondents on the extent of likeness of the taste of cakes baked with shea butter and margarine as fat in favour of the taste of cake baked with margarine which received higher mean rating.

Discussion of Findings

The findings of the study showed that the panelists like the colours of both cakes baked with shea butter and margarine as source of fat. Results of the sensory evaluation showed that both cakes had same mean value (7.76). This may be due to the creamy colour of margarine which is also found in shea butter. This finding is in agreement with that of Nikiema & Umali (2007) who reported that shea butter has a smooth and soft paste texture with a colour that ranges from either yellow-white to ivory colour while some are creamy depending on how it is processed. The sameness in the level of likeness of the colour of both cake samples could be attributed to the creamy nature of both Shea butter and margarine as reported by Bastin (2010). Further, the hydrogenation process used in margarine production changes the red colour of the oil used for the production

to creamy/white colour. The sameness in the colour of the baked products may be due to the natural nice looking nature of baked products as observed by Egbon (2007).

The panelists moderately liked the taste of margarine while that of shea butter was neither liked nor disliked. This may be due to the refined nature of margarine and the fact that people have become familiar with the taste of margarine in baked products. Because of the refined nature of margarine, it is likely that the panelists would prefer its taste to the unrefined taste associated with shea butter. The moderate liking of the taste of margarine due to its popularity among the people corroborates the findings of Eneche (2007) who reported that familiarity of people makes them to always prefer such products over others.

Conclusion

Cakes prepared with shea butter as source of fat had similar colour with those of margarine while the taste of cake baked with margarine as source of fat was preferred over those of shea butter.

Recommendations

1. Confectionary/food industries should be enlightened and supported to use shea butter as source of fat in baking since it has good colour

2. The relevant agencies of government should encourage research and support the processing of raw shea butter to improve its taste.

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