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Nutritional and Sensory Evaluation of Cashew Nut Butter Produced from Nigeria Cashew

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Abstract: Cashew nut butter recipe of 70, 80 and 90% cashew kernel inclusion was formulated and produced. Nutritional composition of the 3 cashew nut butter and a commercial Peanut butter was determined in terms of nutrient composition. The Nutritional composition of the cashew nut butter increased with the increased inclusion of cashew kernel in the recipe. The protein content of cashew nut butter compared favourably with that of commercial Peanut butter. Also, Magnesium, Phosphorous and Potassium content of 80 and 90% cashew nut butter were significantly higher than that of Peanut butter at $p<0.05$. Sensory evaluation conducted on the 3 cashew nut butter, with commercial Peanut butter as reference sample, revealed that Aroma and Taste of cashew nut butter were significantly different ($p<0.05$) from that of Peanut butter. Cashew nut butter of 80% cashew kernel inclusion was more accepted by the panellist than Peanut butter at $p<0.05$.

Key words: Cashew nut butter, peanut butter, nutritional composition, sensory evaluation, cashew kernel

INTRODUCTION

Cashew (*Anacadium occidentale* L.) belongs to the family Anacardiaceae, with about 75 general and 700 species. Most members of the family are tropical, with some subtropical species (Ohler, 1979). Cashew as a tropical tree species cultivated in many tropical countries of the world from its centre of origin in South and Central America to Africa, Asia and tropical Australia (Ayodele *et al*., 2001). However, cashew originated from South America around Peru, Ecuador and Bolivia (Valvilov, 1951). Also, it was reported that cashew is native to Brazil and was introduced into frica by Portuguese adventurers around 17th century (Venkatoramah, 1976). It was also reported that cashew was introduced to India, Central America, Asia and East Africa notably; Mozambique, Tanzania and Kenya in the Fifteenth and Sixteenth centuries (Woodroof, 1967).

Cashew was introduced into Nigeria in 17 century, but large scale planting started in 1953 (Akinwale and Esan, 1989). However, cashew cultivation has spread to Western, Eastern and Northern states of Nigeria (Ayodele *et al*., 2001). Cashew tree was reported to flourish in all agro-ecological regions of Nigeria (Annonymous, 1999).

Recently, cashew is attracting more attention from the International Commodity Board (ICB) because the Common Fund for Commodity (CFC) has recently taken steps to integrate cashew into the work-plan of Food and Agriculture Organisation (FAO) committee on commodity problems (CPP) (Annonymous, 1999). Also, recent emergence of cashew Association of Nigeria (CAN) has further increased the awareness of socio-economic potentials and importance of the crop to the Nigerian economy. The increasing awareness of the abundant economic potentials of cashew, the universality of its cultivation and its global acceptability has further led to the influx of farmers, government agencies, state governments and Non-Governmental Organisations (NGOs) into the agricultural business of cashew production.

Recent survey jointly carried out by the cocoa Research Institute of Nigeria (CRIN) and Bio-hybrids Agriculture systems Ltd., UK, showed that the number of cashew farmers is increasing yearly while the areas of land cultivated to the crop has also increased considerably (Topper *et al*., 2001). Also, it was reported that the annual raw cashew nut production in Nigeria increased from 727 tons in 1970-70,000 tons in the year 2000 (FAO, 2001).

Cashew fruit is made up of the apple that bears the fruit in which the kernel is embedded. The real fruit of the cashew is the nut. The nut is composed of kernel and pericap or shell. The kernel represents 20-25% of the nuts weight and one ton of raw nut yields about 220 kg of kernels (Ohler, 1979).

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Cashew is of considerable economic importance because its components are of one economic use or the other. Cashew apple is used as food, in the production of cashew beverages and spirits (Akinwale, 2000). Also, osmotically dehydrated cashew apples received high acceptability (Falade *et al*., 2004).

The kernel is slightly curved back on itself and formed two cotyledons, representing about 20-25% of the nuts weight, it is wrapped in a thin, resistant peel (testa) like a membrane, reddish-brown in color, which in turn approximates to 5% of the whole nut. Cashew kernel is of high food value with about 40-57% oil and 21% protein contents (Fetuga *et al*., 1975). It is an important delicacy, which is mainly used in confectionery and as desert nut. The kernel can be roasted and consumed; it can also be used as adjunct in chocolate and chicken feeds (Kapur *et al*., 1952). The powdered milk used in the standard milk chocolate recipe was replaced with 25% roasted cashew kernel (Ogunwolu and Akinwale, 2003).

The world production of cashew nuts in 1988 was reported to be about 475,900 metric tons representing about 89% of tropical nut production and about 14% of the total world tree nut market (Carlos and Dawes, 1990). According to Jaffers (1994), current total world production of raw cashew nuts is estimated to be around 900,000 metric tones. In the recent time, India produces around 400,000 metric tones of raw cashew nuts per annum. Brazil accounts for a production of about 200,000 metric tones per annum. Other major producing countries are Tanzania, Mozambique, Kenya in East Africa. Nigeria, Guinea Bissau and Cote D`ivoire in West Africa and Indonisia, Vientnam, Philippines and Thailand in South East Asia.

In view of increasing production of cashew nut in Africa, there is need for increased utilisation of cashew nut, especially the nutritious cashew kernel. The focus of this research is therefore, to produce and determine the nutrient composition and sensory quality of cashew nut butter produced from Nigeria cashew.

MATERIALS AND METHODS

Cashew nuts were obtained from cashew plantation of Cocoa Research Institute of Nigeria, Ibadan. Salt, Emulsifier and preservative were purchased from Agbeni market, Ibadan.

Cashew kernel production: The processing of cashew nuts was done as described by Falade *et al*. (2004); a batch of dried wholesome cashew nuts was steamed in a retort at 121°C and 5 lb pressure for 5 min and then allowed to cool. The cashew nuts were manually splitted into two equal halves using hand-operated cashew nut Sheller. The kernels were then separated from the shells using small knives. The kernels were air-dried in a cabinet (Gallenkamp) oven at a temperature of 50°C for 5 h to reduce the moisture content to between 5-6% and to ensure adequate colour and flavour. The testa of dried kernels were removed manually, packaged and stored.

Cashew nut butter production: Dried kernel was ground into very fine paste using laboratory mills; other ingredients like Salt, Emulsifier and hydrogenated palm oil were weighed and homogenously mixed with the cashew paste using an homogenizer, to produce cashew nut butter. The percentage of cashew kernel in the recipe was varied at 70, 80 and 90. The butter was then packaged into opaque small plastic containers and stored at room temperature (about 27°C).

Nutrient composition: The nutrient compositions of the 3 cashew nut butter were determined using the method of (AOAC, 1990). Crude protein was determined by multiplying the total nitrogen content by a factor of 6.25. Carbohydrate was obtained by difference. The Gross energy values were estimated by multiplying the proportions of Carbohydrate, Protein and Fat present in the cashew nut butter by 4, 4 and 9, respectively (AOAC, 1990). The Mineral contents, Na, K, Ca, Mg, Fe, Cu, Mn and Zn were determined using Atomic Absorption Spectrophotometer (AAS) MODEL 703 (AOAC, 1990).

Sensory evaluation: The sensory evaluation of the cashew nut butter was carried out using a semi-trained panel of 20 judges. The three different coded samples of cashew nut butter were presented to a panel of 20 judges, who are members of staff of Cocoa Research Institute of Nigeria.

The samples were 70% cashew kernel butter, 80% cashew nut butter and 90% cashew nut butter. A commercial Peanut butter was used as a reference sample. The Panellists were asked to assess the 3 cashew nut butter and compared them with the reference sample (Peanut butter), in terms of the attributes like Colour, Taste, Aroma, Smoothness and Overall acceptability, using 9-point hedonic scale, with 9 representing like extremely and 1 representing dislike extremely. Tasters were provided with a warm water to rinse their mouth in between the tasting.

Statistical analysis: All data collected were collected in duplicate and subjected to Analysis of Variance, using SPSS 10 Computer programme. Means were separated using Duncan's multiple range test and significance was accepted at $p<0.05$ (Steel and Torrie, 1980).

RESULTS

Proximate composition: The moisture content of the cashew nut butter increased with an increase in the percentages of cashew kernel in the formulation, 70, 80 and 90% cashew nut Butter have 1.4, 1.5 and 1.58% moisture content (Table 1). Also, cashew nut Butter of 90% cashew kernel has protein content of 24.52%, which is higher than that of Peanut butter (22%), which is the reference sample, while cashew nut Butter of 70 and 80% has protein content of 19.7 and 23.52, respectively. The Fat and Ash contents of the 90% cashew nut butter are 54 and 4.3% and they were also higher than that of reference sample, which were 53.73 and 2.1, respectively. The Carbohydrate and Energy value of 80% cashew nut butter (18.8% and 700 kcal) and that of 90% cashew nut butter (19.8 and 715%) were closed to one another and were higher than the reference sample (Table 1).

Minerals composition: Cashew nut butter of 90% kernel has highest content of Calcium, Phosphorous, Magnesium and Potassium (38, 520, 285 and 745 mg/100 g, respectively). The reference sample has the highest composition of Sodium (350 mg/100 g) and Calcium, Phosphorous, Magnesium and Potassium of 37, 330, 180 and 350 mg/100 g, respectively. Cashew nut butter of 70% kernel has the lowest dietary fibre of 3.02%, while the reference sample has the highest dietary fibre of 6.8% (Table 2).

Table 1: Proximate composition of cashew nut and peanut butter

	Cashew nut butter (%)			
Composition (%)	70	80	90	Peanut butter
Moisture	1.40b	1.50a	1.58a	1.12c
Crude protein	19.7c	23.52a	24.52a	22.61b
Fat	47.60b	52.92a	54.30a	53.73a
Ash	2.97b	3.90a	4.30a	2.10b
Dietary fibre	3.02c	3.50b	3.47b	6.80a
Sugar	6.70b	7.00a	7.35a	6.70b
Carbohydrate	16.70b	18.80a	19.80a	13.10c
Energy (kcal)	655.00a	700.00a	715.00a	623.00b

Table 2: Minerals composition of cashew nut butter and peanut butter

	Cashew nut butter (%)			
Minerals (mg/100 g)	70	80	90	Peanut butter
Calcium	34.00b	37.00a	38.00a	37.00a
Phosphorous	400.00b	500.00a	520.00a	330.00b
Magnesium	200.00b	280.00a	285.00a	180.00b
Sodium	268.00c	290.00b	301.00b	350.00a
Potassium	705.00b	740.00a	745.00a	700.00b
Iron	6.20b	6.35a	6.40a	2.00c
Copper	2.04b	2.15a	2.20a	0.69c
Zinc	5.70b	5.80a	5.90a	2.90c
Manganese	1.80b	1.87a	1.90a	1.60c

a-c, Means in the same row with the same letter are not significantly different ($p<0.05$)

Table 3: Sensory mean scores for cashew nut butter and peanut butter

	Attributes				
Samples	Colour	Aroma	Taste	Smooth-ness	Overall acceptability
70% cashew nut butter	7.3a	7.8a	7.5a	4.3b	7.2b
80% cashew nut butter	7.2a	7.9a	7.7a	4.2b	8.2a
90% cashew nut butter	7.4a	7.5a	7.7a	4.2b	4.2c
Peanut butter	7.2a	5.4b	5.0b	7.8a	7.1b

a-c, Means in the same row with the same letter are not significantly different ($p<0.05$)

Sensory evaluation: Cashew nut butter of 80% kernel has the highest rated mean score of 7.9 and 8.2 in terms of Aroma and Overall acceptability attributes by the panellists. In terms of Taste and smoothness attributes, 80 and 90% cashew nut butter have the same mean score of 7.7 and 4.2, but the reference sample has the highest mean score of 7.8 in terms of smoothness. In colour attribute, 80% cashew nut butter and the reference sample have the same mean score of 7.2, while the cashew nut butter of 90% kernel inclusion has the highest mean score of 7.4 in colour attribute as rated by the panellists (Table 3).

DISCUSSION

The chemical composition of the cashew nut butter, which is an indication of its Nutritional value, was as shown in Table 1 and 2. The Nutritional composition of the cashew nut butter increased with the increased inclusion of cashew kernel in the recipe, this could be as a result of high nutritional value of the cashew kernel (Fetuga *et al*., 1975). The percentage protein content of 80 and 90% cashew nut butter were not significantly different ($p>0.05$) from one another, but were significantly different ($p<0.05$) from others. The value of the protein content of 80 and 90% cashew nut butter were higher than that of Pea nut butter; this may be as a result of the protein content of cashew nut, which was found to be about 21% protein (4) and 42% in defatted cashew nut (Kapur *et al*., 1952). The fat content of 80 and 90% cashew nut butter were not significantly different ($p>0.05$) from that of Pea nut butter (Table 1). Also, the Ash content, Sugar, Carbohydrate and Energy value of 80 and 90% cashew nut Butter were not significant different ($p>0.05$) from one another, but they are significantly different ($p<0.05$) and higher than that of 70% cashew nut butter and Pea nut butter. The dietary fibre of Pea nut butter was significantly different ($p<0.05$) and higher than all the cashew nut butter samples (Table 1).

Magnesium, Phosphorous and Potassium composition of 80 and 90% cashew nut butter were significant higher ($p<0.05$) than that of Peanut butter. This showed that cashew nut butter is a good source of these minerals (Table 2).

According to Table 3, the mean sensory scores of all the three cashew nut butter samples compared favourably well with commercial Peanut butter in all attributes evaluated except Taste, Aroma and Smoothness ($p<0.05$). The Aroma and Taste of the cashew nut butter was found to be significantly different ($p<0.05$) from that of Peanut butter, while the smoothness of the Peanut butter was rated higher than that of the cashew nut butter at $p<0.05$, this may be as a result of the industrial mill used for the production of the Peanut butter, which will be more efficient than that of laboratory mill used for the production of the cashew nut butter. Cashew nut butter of 90% cashew kernel was the least accepted by the panellist, as it was found to be too oily. Cashew nut butter of 80% cashew kernel was more accepted than the Peanut butter ($p<0.05$).

CONCLUSION

Although, the cashew nut butter of 90% cashew kernel has highest nutritional composition among the three cashew nut butter formulations, cashew nut butter of 80% cashew kernel is recommended due to its better sensory attributes, as rated by the panellist and its nutrient composition is comparable with that of 90% cashew nut butter.

Therefore, cashew nut butter could be produced as described above using 80% cashew nut inclusion in the recipe. Also, cashew nut butter was found to have high nutritional composition and its sensory attributes compared favourably with the Peanut butter that is already in the market.

Production of cashew nut butter could be an additional way of utilisation of cashew nut in Nigeria and other cashew producer countries of Africa.

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