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Research Article

Evaluation of the Proximate and Sensory Properties of Spread Produced from Cashew Nut and Groundnut Blend

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Abstract

Spread was produced from cashew nut (*Anacardium occidentale .L*) and groundnut (*Arachis hypogea*) seed slurries. The proximate composition was carried out on both the slurry and the product while sensory properties were carried out on the product. From the results obtained, it was observed that the proximate composition both in slurry and the product (spread),shows that 100% of cashew nut had higher protein of (34.00) and (29.82), respectively than other samples and 100% of groundnut had the highest moisture content of (6.23) and (6.33), respectively. Meanwhile sample H 10% cashew nut and 90% groundnut had the lowest crude fiber content of 1.15 and 1.21 respectively amongst the samples. From the sensory evaluation results, it was observed that sample C 90% cashew nut and 10% groundnut had better flavor than all the other samples as shown in Table 3 (7.50). Also sample a 100% cashew nut slurry had the best texture with the value of (7.60) when compared with the control sample (8.70). Apart from the control sample which was significantly ($p \leq 0.05$) different from all the samples, samples A, C, E, F, G (100% of cashew nut, 90% of cashew nut and 10% of groundnut, 70% of cashew nut and 30% of groundnut, 60% of cashew nut and 40% of groundnut, 50% of cashew nut and 50% of groundnut) respectively had no significant ($p \geq 0.05$) difference amongst each other and were moderately and closely followed the control sample. None of the samples were rejected out rightly and as such all the products were acceptable. From these results, it could be said that cashew nut and groundnut blends had almost the same features and properties compared with the peanut butter (control) sold in markets.

Keywords: Slurry; Spread; Proximate composition; Sensory properties

Introduction

The cashew (***Anacardium occidentale l.***) belongs to the genus *Anacardium*, a member of the family of *Anacardaceae*. Cashew trees are known by different names all over the world, for example, among the Portuguese it is called "caju", in Madagascar "mabibo" and in French as "Pomme-caju", while in Nigeria, cashew trees are known among the Igbo, Yoruba and Hausa tribes as "Kashuu", "Caju and "Kadinnia" respectively.

Being a tropical plant, many parts of the cashew tree are utilized by man in various forms both as food and as non-food products. The parts used as foods are the cashew apple and the cashew nuts. The cashew when fully ripe may be eaten raw, preserved as jams or the juice made into a beverage or fermented into wine [1]. In the southern region of "Mtwara" Tanzania, the cashew apples (bibo in Swahili) are dried, kept and later reconstituted with water and fermented, then distilled to make strong liquor known as "gongo" [2]. On the other hand, cashew nut is a popular snack and its rich flavor means that it is often eaten roasted, on its own, lightly salted or sugared, or covered in chocolate [3]. In Mozambique, "bolo polana" is a cake prepared using powdered cashew nuts and mashed potatoes as the main ingredients which are also popular in South Africa [2]. It could be used in confectionary and bakery products.

According to [4], cashew bark extract has good in-vitro antibacterial activity against *E. coli* and *pseudomonas* [5]. Reported that cashew fruits have antibacterial activity against the gram negative bacteria *Helicobacter pylori* which causes stomach ulcer. Because of its high content of vitamin C and mineral salts, cashew fruit is used as a catalyst in the skin and to remineralize the skin [4]. Cashews are a good source of anti-oxidants especially alkyl phenols [6].

Nutritionally, the cashew apple is rich in nutrients and contains five times more vitamin C than an orange [7]. On the other hand, one hundred grams of cashew nuts contains; 30.19% of carbohydrate, 43.85% of fat, 18.22% of protein, 5.2% of water, 1.06mg (0.00106%) of Niacin, 0.86mg (0.00086%) of pantothenic acid, 37mg (0.037%) of calcium, 593mg (0.593%) of phosphorus, 660mg (0.660%) of potassium and 292mg (0.292%) of magnesium. The fats and oil in cashew nuts are 54% of monounsaturated fats, 18% polyunsaturated fats and 16% saturated fat [6].

There are lot of problems associated with cashew processing and its maximum utilization as food. The pulp of the cashew apple is very juicy, but the skin is fragile making it unsuitable for transportation [8]. The nut is surrounded by a double shell containing an allergenic phenolic resin, anacardic acid, a potent skin irritant chemically related to the better known allergenic oil urushiol which is also a toxin found in related poison [9]. Cashew apples have a stringent taste due to the waxy layer on the skin that causes tongue and throat irritation after eating those [7]. The hypothesis of this study was to evaluate

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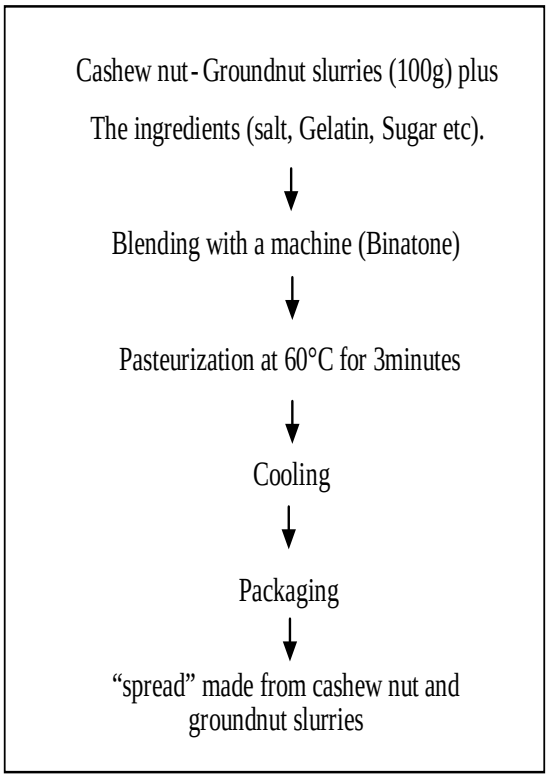

Figure 1: Flow chart for the production of cashew nut slurry.

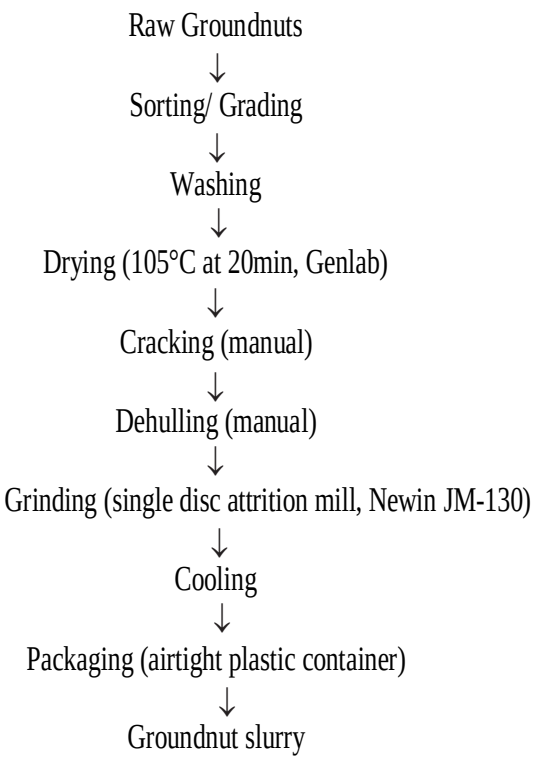

Figure 2: Flow chart for the production of groundnut slurry.

INGREDIENTS	AMOUNTS IN GRAMS
Salt	0.2
Ascorbic Acid	0.32
Gelatin	2
Sugar	4.9
Laser (soybean) oil	30ml

the proximate and sensory qualities of spread produced from cashew nuts and groundnuts in comparison with that already in existence in the market.

Based on the nutritional qualities of these nuts (high protein, minerals and vitamins) as stated above; the consumers would use these products to improve their nutritional status. Also from the sensory parameters, if they find it acceptable, they can use the product to replace many other such products that their sensory properties are not acceptable. As a result this will add to the choice of products available in the market for consumers.

Therefore, the objectives of this research are

- To evaluate the proximate compositions of cashew nuts and groundnuts.
- To produce "spread" using different blends of cashew nuts and groundnuts.
- To evaluate the nutritional compositions of the various "butter" blends.
- To evaluate sensory qualities of the blends.

The results of the sensory analysis if favorable will help to produce cheap and affordable "spread" whose nutritive values could be compared with those of the real butter made from animal fat as well as promote the planting of cashew trees in Nigeria.

Materials and Methods

Raw materials, equipment and chemical procurement

The cashew nuts used were purchased from Ihube town in Okigwe L.G.A. of Imo State. The ascorbic acid used was purchased from gateway laboratory, Royce Road, Owerri while the other materials used such as; groundnuts, sugar, salt, soybean oil (laser) and gelatin were all purchased from Ekeonunwa market both in Owerri Municipal L.G.A of Imo state. All the chemicals used during this research work were of analytical grade. The 20 man panelist was decided from the method used. Since they were untrained, a larger number was used. This selection was made from the University Community and those who use spread. But since they were picked randomly and not trained we needed this large number to be able to ascertain how the general public or consumers will rate these new products.

Raw Material Preparation

Production of cashew nut and groundnut slurries

The cashew nuts as well as the groundnuts were sorted manually to remove spoilt ones and then cleaned with water and weighed with a weighing balance. They were manually cracked and dehulled into

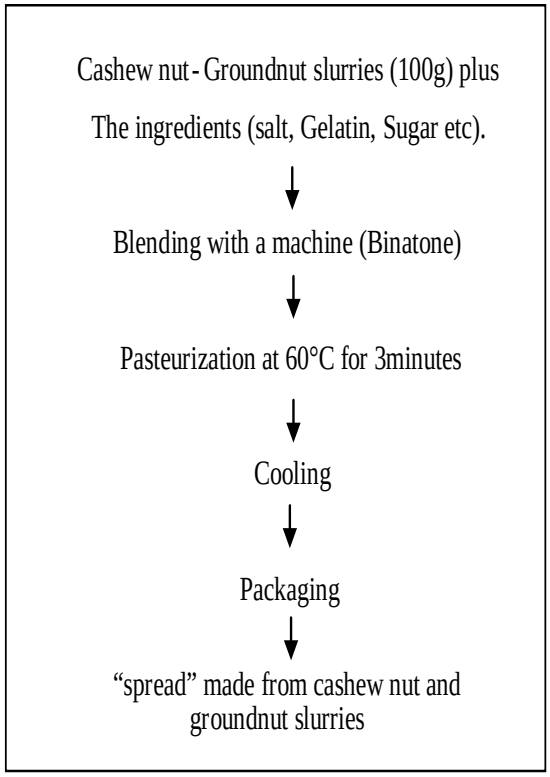

Figure 3: Flow chart for the production of "spread" samples from different blends of cashew nut and groundnut slurries.

separate stainless steel bowls. From the bowls, they were ground separately with the aid of single disc attrition mill (NEWIN JM-130) into slurries. The slurries were then weighed again to determine their percentage yield before being packaged and stored in airtight plastic containers for further analysis. The flow charts for the production of cashew nut slurry and groundnut slurry are as given in figures I and II.

Production of "Spread" Samples

Preparation of the different sample blends

The cashewnut slurry and the groundnut slurry were blended in the ratio of 90:10, 80:20,70:30,60:40,50:50,and vice versa with each samples weighed out into three places using a weighing balance and a plastic spoon. One hundred percent each of cashew nut slurry and groundnut slurry weighing 100g each was also weighed out into three places which was used as control sample. The entire blends above were each separately with 2g of gelatin, 0.32g of ascorbic acid, 4.9g of sugar, 0.2g of salt and 30ml of soybean oil (laser). The different blends were then placed in plastic containers.

Production of "Spread" Samples from Different Blends of Cashewnut and Groundnut Slurries

The "butter" samples were produced in batches by weighing out 100g of each of the blends with the aid of a weighing balance and then mixing them with the other ingredients already weighed out as stated. Then, each were blended or mixed thoroughly with the aid of a blending machine before being pasteurized at 60°C for 3 minutes. After cooling, they were packaged and stored in airtight plastic containers for sensory evaluation and proximate analysis.

Proximate analysis

The association of official Analytical chemist [10] procedure was used to determine the proximate compositions of the Cashew nut and groundnut slurries and the product of the different blends.

Determination of moisture content

Two (2) grams of each of the samples was weighed out with an analytical balance into dried, cooled and weighed dish in each case. The samples in the °C dishes were then put into a moisture extraction oven set at 105 and allowed to dry for 3 hours when this time elapsed, the samples were then transferred into a dessicator with a laboratory troy and then allowed to cool for about 20 minutes. They were thereafter weighed again and their respective weights recorded accordingly. These processes were repeated for each sample until a constant weight was obtained in each case. The difference in weight was calculated as a percentage a of the original sample. Percentage Moisture content = $\frac{W_{2-W_1}}{W_1} \times \frac{100}{1}$

Where w_1 =Initial weight of the empty dish, $W_{2=}$ Weight of the dish + undried sample and $W_{3=}$ Weight of dish + dried sample.

Determination of ash content

Two (2) grams of each of the samples was weighed out using an analytical balance into a dried, cooled and weighed crucible in each case. The samples were then charred by placing them on a Bunsen flame inside a fume cupboard to drive off most of the smoke for 30minutes. The samples were then transferred into a pre- heated furnace at 550°cwith a laboratory tong. They were allowed to stay in the furnace for 3 hours until a white or light grey ash resulted. Samples that remained black or dark in color after this time had elapsed were moistured with small amount of water to dissolve salts, dried in an oven and then the ashing processes repeated again. After ashing, the crucibles were then transferred into a desiccator with a laboratory tong after cooling they were each weighed again and recorded accordingly.

Percentage Ash Content = $\frac{W_{3-}W_1}{W_2 - W_1} \times \frac{100}{1}$

Where w_1 = Weight of empty crucible, $W_{2=}$ weight of crucible + food sample before ashing and $W_{3=}$ weight of crucible + ash.

Determination of fat content

Two hundred and fifty milliliters of boiling flasks were washed with water, dried in an oven set at 105°c for 25minutes, cooled in a desiccator and then used for each sample. The flasks were firstly labeled, weighed with a weighing balance and then filled with 200ml of petroleum ether in each case. Then, five grams of each of the samples was weighed out into a correspondingly labeled thimble. The extraction thimbles were in each case tightly plugged with cotton wool. The soxhlet apparatus was then assembled and allowed to reflux for 6 hours. Thereafter, the thimble was removed and the petroleum either was collected in each case in the top of the container in the set up and drained into another container for re-use. The flasks were then removed in each case and dried in an oven at 105°c for 1hour. After drying, they were placed in a desiccator where they cooled for about 20minutes and thereafter weighed. The percentage fat content was calculated for each sample thus:

Table 1: Proximate Compositions of Cashew Nut Slurry, Groundnut Slurry And Their Blends.

Slurries	Components (g/100g slurry)					
	Moisture content (%)	Ash content (%)	Fat content (%)	Crude fibre content (%)	Protein content (%)	Carbohydrate content (%)
Cashew nut (100%) (A)	4.70^{b}	2.20^{e}	26.21^{e}	3.55^{a}	34.00^{a}	29.34^{g}
Groundnut (100%) (B)	6.23^{a}	3.90^{a}	33.29^{a}	1.92^{d}	25.34^{e}	29.32^{g}
C	2.98^{f}	3.84^{ab}	10.91^{h}	2.41^{b}	33.10^{b}	46.76^{a}
D	2.99^{f}	2.91^{d}	17.21^{g}	2.40^{b}	30.81^{c}	43.68^{c}
E	3.02^{f}	2.78^{d}	18.55^{f}	2.25^{c}	28.30^{d}	45.10^{b}
F	3.06^{f}	2.34^{e}	18.92^{f}	1.98^{d}	28.14^{d}	45.56^{b}
G	3.41^{e}	2.32^{e}	27.75^{d}	1.36^{f}	24.83^{ef}	40.33^{d}
H	4.55^{bc}	3.65^{abc}	32.20^{b}	1.15^{g}	23.15^{g}	35.30^{f}
I	4.36^{cd}	3.58^{bc}	32.14^{b}	1.40^{f}	23.38^{g}	35.14^{f}
J	4.18^{d}	3.36^{c}	31.31^{c}	1.67^{e}	24.43^{f}	35.05^{f}
K	3.59^{e}	2.86^{d}	30.73^{c}	1.94^{d}	24.55^{f}	36.33^{e}
LSD	0.23	0.30	0.65	0.17	0.52	0.73

Means in the same column with the same superscript are not significantly different at (P ≥ 0.05).

Key:
A = 100% Cashew nut slurry
B= 100% Groundnut slurry
C = 90%: 10% (CS/GS)
D = 80%: 20% (CS/GS)
E = 70%: 30% (CS/GS)
F = 60%:40% (CS/GS)
G = 50%:50% (CS/GS)
H = 10%:90% (GS/CS
I = 20%:80% (GS/CS)
J = 30%: 70% (GS/CS)
K = 40%:60% (GS/CS)
Q = Reference sample from the market

$$\text{Percentage fat} = \frac{C-A}{B}\times\frac{100}{1}$$

Where A = weight of empty flask, B = weight of the sample and C = weight of the oil after drying.

Determination of crude fiber content

Five grains (5g) of each of the samples were used in this determination. The samples were each boiled in 500ml flask containing 200ml of 1.25% H_2SO_4 solution under reflux for 30minutes. When this time elapsed, the samptles were washed with several portions of hot boiling water using a two-fold muslin cloth to trap the residual particles. The residual particles in each case were carefully transferred qualitatively back to the flasks and 200ml of 1.25% NaOH solution was then added into each flask. Again, the samples were boiled for 30minutes and washed as before with hot water. Then, they were each carefully transferred into a weighed crucible and then dried in an oven set at 105°c for 3 hours. The dried samples were then put into desiccator where they cooled for about 20 minutes before being weighed again. They were then put into a muffle furnace set at 550°C for 2 hours (until ashed).

Finally, they were cooled in desiccator and weighed again. The crude fiber content for each sample was calculated thus; percentage crude fiber = $\frac{W_{2-W_3}}{W_1}\times\frac{100}{1}$

Where $W_{2=}$ weight of crucible + sample after washing and drying in the oven, $W_{2=}$ weight of crucible + sample as ash and w_1 =weight of original sample.

Determination of carbohydrate content

The carbohydrate contents of each of the samples analyzed were determined by difference using the formula below; Percentage Carbohydrate= 100- (% moisture + % Ash + % Crudefiber + % Fat).

Recipe for the Production of "Spread" Using Cashew Nut and Groundnut Slurries

Determination of crude protein content

Half a gram (0.5g) of each of the samples was mixed with 10ml of concentrated H_2SO_4 acid in a Kjeldahl digestion flask. A tablet of the selenium catalyst was added to each of the samples which were then digested (heated) inside a fume cupboard until a clear solution was obtained in a separate flask in each case. Also, a blank was made by digesting the above reagents without any sample in it. Then, all the digests were carefully transferred into a 100ml volumetric flask in each case and were made up with distilled water. A 100ml portion of each digest was mixed with equal volume of 45% NaOH solutions in a Kjeldahl distilling unit. The resulted mixtures were each distilled and the distillates collected in each case into 10ml of 4% boric acid solution containing three drops of mixed indicators (bromocresol green and methyl red). A total of 50ml of each distillate was obtained and titrated with 0.02 molar H_2SO_4 solutions. Titration was done from the initial green color to a deep red end-point. The nitrogen contents of each sample were calculated thus;

$$\text{Percentage Nitrogen} = \frac{(100\times N\times 14\times V_{F)T}}{W\times 1000\times V_a}$$

Where W= weight of sample analyzed, N= concentration of H_2SO_4 titrant, V_f= total volume of digest, V_a =Volume of digest distilled and T= titre value of the sample, minus titre value of the blank. The above result for each sample was multiplied with the factor 6.25 to obtain the crude protein content of each sample.

Sensory evaluation of the "spread" sample

Sensory evaluation was carried out using a 20 man panelists to assess the organoleptic attributes of the butter samples. The organoleptic attributes assessed were; texture, flavor, appearance, spread-ability, mouth-feel and the overall acceptability, the panelists were selected randomly from the staff and students of the University. They were made to carry out the organoleptic assessment under controlled environment to avoid biased results. The butter samples wrapped with transparent polyethylene bags were presented in small sizes and coded. The panelists were told to rate the "butter" samples based on 9- point hedonic to scale ranging from 9 = liked extremely to 1= disliked extremely.

Statistical analysis

Triplicate determinations were done. The significant difference obtained from the results were calculated using fisher's least significant difference (LSD), test in a one way analysis of variance (ANOVA). The results were calculated using the statistical tools of Microsoft excel. The raw scores were assembled and statistically analyzed using

TABLE 2: PROXIMATE COMPOSITIONS OF "SPREAD" SAMPLES MADE FROM CASHEWNUT SLURRY, GROUNDNUT SLURRY AND THEIR VARIOUS BLENDS. COMPONENTS (g/100g "SPREAD")

Spread Samples	Moisture Content (%)	Ash Content (%)	Fat Content (%)	Crude Fibre Content (%)	Protein Content (%)	Carbohydrate Content (%)
A	5.62^{bc}	1.77	30.18^{e}	5.95^{a}	29.82^{a}	26.66^{g}
B	6.33^{a}	2.48^{a}	36.22^{a}	5.83^{a}	20.53^{e}	28.61^{f}
C	3.43^{f}	1.39^{f}	26.37^{g}	5.59^{a}	27.41^{b}	35.81^{e}
D	3.61^{f}	1.63^{ef}	26.69	2.72^{b}	25.90^{c}	39.45^{c}
E	3.65^{f}	1.84^{cde}	27.44^{f}	2.57^{b}	23.65^{d}	40.85^{a}
F	3.75^{f}	1.93^{bcd}	29.98^{e}	2.04^{c}	23.63^{d}	38.67^{d}
G	4.24^{e}	1.96^{bcd}	32.58^{d}	1.44^{d}	19.58^{f}	40.25^{ab}
H	6.11^{a}	2.14^{b}	35.53^{b}	1.21^{d}	19.59^{f}	35.42^{e}
I	5.96^{ab}	2.08^{bc}	35.37^{b}	1.41^{d}	19.56^{f}	35.62^{e}
J	5.23^{cd}	1.72^{de}	33.35^{c}	1.96^{c}	19.54^{f}	38.20^{d}
K	4.95^{d}	1.70^{de}	32.97^{cd}	2.01^{c}	18.59^{g}	39.78^{bc}
LSD	0.45	0.28	0.64	0.41	0.57	0.72

Means in the same column with superscript are not significantly different at (P ≥ 0.05).
Key:
A = 100% Cashew nut slurry
B= 100% Groundnut slurry
C = 90%: 10% (CS/GS)
D = 80%: 20% (CS/GS)
E = 70%: 30% (CS/GS)
F = 60%: 40% (CS/GS)
G = 50%: 50% (CS/GS)
H = 10%: 90% (GS/CS)
I = 20%: 80% (GS/CS)
J = 30%: 70% (GS/CS)
K = 40%: 60% (GS/CS)
Q = Reference sample from the market

the method of Ihekoronye and Ngoddy [11].

Results and Discussion

Proximate compositions of the slurries and their various blends

The composition of the reference sample was groundnut and soy bean. From table 1, the results of the proximate composition of the cashew nut and groundnut slurries showed that groundnut slurry (100%) had a higher moisture content of 6.23% compared to that of the cashew nut slurry of 4.70%. Among the blends, sample "H" which contained 10% cashew nut slurry and 90% groundnut slurry had the highest moisture content of 4.55% followed by sample "I" (20% cashew nut slurry; 80% groundnut slurry) with a moisture content of 4.36%. Sample "C" (90% cashew nut slurry: 10% groundnut slurry) had the least moisture content. The above results indicates that the higher the percentage of "B" (100% groundnut slurry) in the blends, the higher the moisture content.

Also from table 1, the ash contents did not follow any trend. Though sample "B" (100% groundnut slurry) had higher ash content (3.90% compared to that of sample "A" (100% cashew nut slurry) 2.20%, no trend was observed. Rather, sample "C" (90% cashew nut slurry: 10% groundnut slurry) had the highest ash content of 3.84% while sample "G" (50% cashew nut slurry: 50% groundnut slurry) has the least ash content of 2.32%.

On the other hand, table 1 further showed that sample "B" (100% groundnut slurry) has a higher fat content (33.29%) compared with 26.21% fat content of sample "A" (100% cashew nut slurry). This reflected in the blends as sample "H" (10% cashew nut slurry: 90% groundnut slurry had the highest fat content followed by sample "I" (20% cashew nut slurry: 80% groundnut slurry) with 32.14% fat. Sample "C" (90% cashew nut slurry: 10% groundnut slurry) had the least fat content. This implies that the higher the percentage of cashew nut slurry in a sample, the lesser the fat content of such a sample.

The crude fiber content of sample "A" (100% cashew nut slurry) was 3.55% from table 1 was higher than that of sample "B" (100% groundnut slurry). This difference did not reflect much in the blends. The crude fiber contents of the blends reduced from the highest, sample "C" (90% cashew nut slurry: 10% of groundnut slurry) to sample "H" and then increased again from sample "I" (20% cashew nut slurry: 80% groundnut slurry) to sample "K" (40% cashew nut slurry: 60% groundnut slurry). But in all the samples, sample "H" had the least crude fiber content.

The protein content of sample "A" (100% cashew nut slurry) 34% was higher than that of sample "B" (100% groundnut slurry) of 25.34%. This reflected in their various blends as the protein contents of the blends decreased from highest, sample "C" (90% cashew nut slurry: 10% groundnut slurry) 30.10% to sample "H" (10% cashew nut slurry: 90% groundnut slurry) which had the least protein content of 23.15%. This result shows that cashew nuts are richer in proteins compared to groundnuts.

The carbohydrate content of sample "A" (100% cashew nut slurry) and sample "B" (100% groundnut slurry) were 29.34% and 29.32%. There was no significant (P≥ 0.05) difference and thus, no trend were observed among the blends. But in all, sample "C" (90% cashew nut: 10% groundnut slurry) had the highest carbohydrate content, while sample "J" (30% cashew nut slurry: 70% groundnut slurry) had the least carbohydrate content of 35.03%. Based on the result obtained in table 1, there was a significant difference in the moisture content which was 100% of groundnut and in fat content which had 50% of cashew nut and50% of groundnut, 80% of cashew nut and 20% of groundnut, 90% of cashew nut and 10% of groundnut, 100% of cashew nut and 100% of groundnut.

Proximate compositions of the slurries and the "spread" samples made from them

From table 2, the results of the proximate compositions of the "butter" samples made from 100% cashew nut slurry, 100% groundnut slurry and their various blends revealed that sample "B" (100% groundnut slurry) had a higher moisture content of 6.33% than sample A (100% cashew nut slurry). Among their various blends, sample "H" (10% cashew nut slurry: 90% groundnut slurry) had the highest moisture content of 6.11% whereas sample "C" (90% cashew nut slurry: 10% groundnut slurry) had the least moisture content of 3.43%. This result shows that the higher the percentage of "B" (100% groundnut slurry) in a sample, the higher the moisture content and vice versa, because groundnut has higher moisture than cashew nuts.

Similarly, table 2 also showed that sample "B" (100% groundnut slurry) had higher ash content of 2.48% compared to sample "A"

(100% cashew nut slurry) with an ash content of 1.77%. Sample "C" (90% cashew nut slurry: 10% groundnut slurry) had the least ash content of 1.39%. The above result indicates that the ash contents of the samples increased in line with the addition of more groundnut slurry.

In the same vein, the fat content of sample "B" (100% groundnut slurry) 36.22% was higher than that of sample "A" (100% cashew nut slurry) 30.18%. This had marked difference in the other blends as sample "H" (90% groundnut slurry: 10% cashew nut slurry) had the highest fat content of 35.53% followed by the sample "I" (80% groundnut slurry: 20% cashew nut slurry) with a fat content of 35.37%. Again, sample "C" (90% cashew nut slurry: 10% groundnut slurry) had the least fat content of 26.37% among the entire samples. This shows that the groundnut slurry contains more fat than the cashew slurry. Hence, the fat contents of the "butter" samples produced from their different blends increased as the percentage of the groundnut slurry increased in the blends and vice versa. In moisture content, sample C, D, E, F, J and K have no significant ($p \geq 0.05$) difference, only sample G which is 50% of cashew nut and 50% of groundnut have significant ($p \leq 0.05$) difference. In protein, sample E, F, G, H, I, and J have no significant ($p \geq 0.05$) difference but sample A, B, C, D and K have significant ($p \leq 0.05$) difference.

Furthermore, table 2 also showed that the crude fiber content of sample "A" (100% cashew nut slurry) 5.95% was higher than that of sample "B" (100% groundnut slurry) 5.83%. This had a noticeable effect on the crude fiber contents of their blends as sample "C" (90% cashew nut slurry: 10% groundnut slurry) had the highest crude fiber, content of 5.59% followed by sample "D" (80% cashew nut slurry: 20% groundnut slurry) whose crude fiber content was 2.72%. Sample "H" (10% Cashew nut slurry: 90% groundnut slurry) had the least crude fiber content of 1.21 %. The above result revealed that the crude fiber contents of the samples decreased as the percentage of cashew nut slurry decreased in the various samples from sample "C" (90% cashew nut slurry: 10% groundnut slurry) to sample "H" (10% cashew nut slurry: 90% groundnut slurry).

The protein content of sample "A" (100% cashew nut slurry) from table 2 was 29.82%. This value was higher compared to that of sample "B" (100% groundnut slurry) 20.53%. This reflected in their various blends as sample "C" (90 % cashew nut slurry: 10% groundnut slurry) had the highest protein content of 27.41% followed by sample "D" (80% cashew nut slurry: 20% groundnut slurry) with a protein content of 25.90%. Sample "K" (40% cashew nut slurry: 60%groundnut slurry) had the least protein contents of the samples revealed that the higher the percentage of groundnut slurry in the various blends, the lower the protein content.

Finally, though the carbohydrate content of sample "B" (100% groundnut slurry) 28.61% was higher than that of sample "A" (100% cashew nut slurry) 26.66%, there was no observable trend in their various blends rather, sample "E" (70% cashew nut slurry: 30% groundnut slurry) had the highest carbohydrate content of 40.85% followed by sample "G" (50% cashew nut slurry: 50% groundnut slurry) with a carbohydrate content of 40.25%. Sample "H" (10% cashew nut slurry: 90% groundnut slurry had the least carbohydrate content of 35.42%.

Sensory Evaluation of Spread Samples

From table 3, the mean score of the reference sample "Q" in terms of texture was 8.70. This was the highest score followed by that of sample "C" (90% cashew nut slurry: 10% groundnut slurry) of 7.55.

There was marked significant ($p \leq 0.05$) difference between the texture of the reference sample "Q" and those of the other blends of cashew nut slurry and groundnut slurry. Table 3 further showed that there was no significant ($p \geq 0.05$) difference between the textures of sample "A" (100% cashew nut slurry) and sample "C" (90% cashew nut slurry : 10% groundnut slurry) similarly, no significant ($p \geq 0.05$) difference existed in terms of texture between sample "D" (80% cashew nut slurry: 20% groundnut slurry) and F between samples "B" (100% groundnut slurry), "H" (10% cashew nut slurry: 90% groundnut slurry) and "J" (30% cashew nut slurry: 70% groundnut slurry). There was no significant ($p \geq 0.05$) difference in the textures of samples "B" (100% groundnut slurry) and "J" (30% cashew nut slurry: 70% groundnut slurry). The above results showed that none of the blended samples had a texture close to that of the reference sample "Q" at ($p = 0.05$). Despite this, the results also indicated that the texture of the various blends remained the same even at 70% substitution with groundnut slurry.

On the other hand, though there was a marked significant ($p \leq 0.05$) difference between the reference sample "Q" and the rest of the blends in terms of flavor, there was no significant ($p \geq 0.05$) difference in the flavors of samples "B" (100% groundnut slurry), "E"(70% cashew nut slurry: 30% groundnut slurry), "F" (60% cashew nut slurry: 40% groundnut slurry), "G" (50% cashew nut slurry: 50% groundnut slurry), "H" (10% cashew nut slurry: 90% groundnut slurry), "I" (20% cashew nut slurry: 80% groundnut slurry), "J"(30% cashew nut slurry: 70% groundnut slurry) and "K" (40% cashew nut slurry: 60% groundnut slurry).

There was no significant difference in the flavors of samples "C" (90% of cashew nut slurry: 10% groundnut slurry) and "D" (80% cashew nut slurry: 20% groundnut slurry) whose flavor differed significantly at ($p \leq 0.05$) from the rest of the blends. The reference sample "Q" had the highest mean score of 8.55 while sample "B" (100% groundnut slurry) had the least means score in terms of flavor of 6.30. The results showed that reduction of cashew nut slurry up to zero level did not affect the flavor of the "butter" samples.

Similarly, the reference sample, "Q" had a mean score of 8.60 in terms of appearance which differed significantly at ($p \leq 0.05$) with the rest of the blends/samples. Among the blends or samples, sample "C" (90% of cashew nut slurry: 10% groundnut slurry) had the highest mean score of 7.25 in terms of appearance followed by sample "G" with a mean score of 7.20. Sample "K" had the least mean score of 6.40 in terms of appearance. Although a marked significant difference existed between sample "K" and the other samples at ($p \leq 0.05$) in terms of appearance, there was no significant difference in the appearances of sample "K" and sample "H" at ($p \geq 0.05$).

Also, there was no significant difference in the appearances of samples "B", "D", "H" and "J" at ($p \geq 0.05$). The above results showed that the appearance of the reference sample "Q" was the best followed by that of sample "C" and then sample "G".

In the same vein, table 3 revealed that the reference sample had

the highest mean score of 8.65 in terms of spread-ability followed by sample "A" with a mean score of 7.35 and then sample "C" with a mean score of 7.15. Sample "B" had the least mean score in terms of spread-ability. The reference sample, "Q" differed significantly in terms of spread-ability with the rest of the blends/samples at ($p \leq 0.05$). There was no significant difference in the spread-abilities of samples "D", "E", "F", "G" and "I" at ($p \geq 0.05$). Again, there was no significant difference in the spread-abilities of samples "B", "H", "I" and "J" at ($p \geq 0.05$). Though the above results showed that the reference sample "Q" with a mean score of 8.65 differed significantly at ($p \leq 0.05$) with the other sample blends in terms of spread-ability, samples with higher contents of cashew nut slurry to groundnut slurry were more spreadable compared with samples with higher contents of groundnut slurry.

Moreover, the mouth-feel of the reference sample, "Q" with a mean score of 8.60 was higher than those of the various blends/samples and also differed significantly at ($p \leq 0.05$) compared to the others from table 3. There was no significant ($p \geq 0.05$) difference between samples "A", "C", "D", "E", "F", "G", "H", "I" and "J" in terms of mouth-feel. Also the mouth-feel of samples "D", "E", "F", "G", "H", "I", "J" and "K" were almost the same as there were no significant ($p \geq 0.05$) difference among them. There was marked significant difference between samples

TABLE 3: MEAN SCORES OF THE SENSORY EVALUTION OF "SPREAD" SAMPLES MADE FROM BLENDS OF CASHEW NUT AND GROUNDNUT SLURRIES.

Samples	Texture	Flavor	Appearance	Spread ability	Mouth-feel	Overall acceptability
A	7.60^{b}	6.95^{b}	7.15^{b}	7.35^{b}	7.35^{bc}	7.55^{b}
B	6.50^{fg}	6.30^{d}	6.70^{bc}	6.20^{e}	6.35^{e}	6.65^{fg}
C	7.55^{b}	7.50^{b}	7.25^{b}	7.15^{bc}	7.40^{b}	7.35^{bc}
D	6.90^{e}	7.10^{bc}	6.90^{bc}	6.95^{bcd}	7.05^{bcd}	7.05^{cdef}
E	7.10^{d}	6.55^{cd}	7.15^{b}	6.70^{cde}	6.95^{bcde}	7.20^{bcd}
F	6.80^{e}	6.70^{cd}	7.05^{b}	7.05^{bcd}	6.95^{bcde}	7.10^{bcdef}
G	7.30^{c}	7.05^{bcd}	7.20^{b}	7.00^{bcd}	6.95^{bcde}	7.15^{bcde}
H	6.40^{g}	6.45^{cd}	6.45^{cd}	6.25^{e}	6.65^{de}	6.40^{g}
I	6.60^{f}	6.80^{bcd}	7.10^{b}	6.50^{de}	6.80^{bcde}	6.75^{defg}
J	6.40^{g}	6.80^{bcd}	7.00^{bc}	6.30^{e}	6.75^{cde}	6.70^{efg}
K	6.20^{h}	6.65^{cd}	6.40^{d}	6.60^{c}	6.90^{bcde}	6.70^{efg}
Q	8.70^{a}	8.55^{a}	8.60^{a}	8.65^{a}	8.60^{a}	8.65^{a}
LSD	0.18	0.76	0.57	0.58	0.64	0.47

Means in the same column with superscript are not significantly different at ($P \geq 0.05$).

Key:
A = 100% Cashew nut slurry
B= 100% Groundnut slurry
C = 90%: 10% (CS/GS)
D = 80%: 20% (CS/GS)
E = 70%: 30% (CS/GS)
F = 60%: 40% (CS/GS)
G = 50%: 50% (CS/GS)
H = 10%: 90% (GS/CS)
I = 20%: 80% (GS/CS)
J = 30%:70% (GS/CS)
K = 40%: 60% (GS/CS)
Q = Reference sample from the market

"A" and sample "B" at ($p \leq 0.05$) in terms of their mouth-feel. The above result showed that sample "C" had the highest mean score of 7.40 among the blended samples followed by sample "A" with a mean score

Of 7.35 while sample "B" had the least mean score of 6.35 in terms of mouth-feel.

Finally, from table 3, the reference sample, "Q" had the highest mean score of 8.65 in terms of overall acceptability which differed at ($P \leq 0.05$) compared with those of the various blends of Cashew nut slurry and groundnut slurry. Also, sample "A" with a mean score of 7.55 differed significantly at ($P \leq 0.05$) with sample "B" whose mean score was 6.65 in terms of overall acceptability. Though sample "A" differed significantly at ($P \leq 0.05$) with sample "D" in terms of overall acceptability, there was no significantly at ($P < 0.05$) with sample "D" in terms of overall acceptability, also there was no significant difference between samples "D" "E", "F" "G" and "I". Similarly, no significant difference existed between samples "A", "C", "D", "E" "F" and "G" at ($P \geq 0.05$) in terms of overall acceptability. The above results showed that samples with higher content of cashew nut slurry were accepted more than those with high content of groundnut slurry, although the whole samples were all accepted at the different ranges of both blends.

Conclusion

From the results obtained as shown in Table 3; it could be deduced that the reference sample was better and well accepted than all the other samples. It is the best sample although the blended samples were also accepted by consumers. Although the blended "spread" samples had significant ($p \leq 0.05$) difference with the reference sample in terms of the sensory parameters tested, 100% cashew nut slurry butter gave a better spreadable product compared to groundnut slurry spread. The flavors of the different blends of spread did not differ significantly at ($p \geq 0.05$) even when the cashew nut slurry level was at zero percent

Recommendations

It is therefore recommended to use 100% cashew nut slurry to produce "spread" whose sensory attributes though will differ from the real spread in the markets but will be more spreadable than "butter" made from 100% groundnut slurry.

Also, to produce "spread" with consistent flavor, the total inclusion of cashew nut slurry will help to reduce the cost of production since it does not alter the flavor of the products to any appreciable extent. Since the 100% cashew nut "spread" was accepted by panelists, the packing should be made more attractive to the consumers and also the nutritional composition well spelt out on the label. If the cashew nut "spread" was assessed worse than the existing product (reference sample), it would have gone back for reformation work for improvement to meet the wants of consumers because the consumers would have rejected the product.

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