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Proximate Composition and Sensory Properties of "Kuli-Kuli" Produced from the Blends of Groundnut and Cashew Kernel

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Abstract "kuli-kuli" was produced from the blends of groundnut and cashew kernel paste using 100:0, 50:50, 30:70, 70:30 and 0:100 blends and labeled A, B, C, D and E samples, respectively and sample A served as the control. The produced "kuli-kuli" samples were subjected to proximate and sensory analysis to ascertain the blend that can significantly be compared with the control sample. The result showed that there was a slight increase in the crude fibre and protein values of the "kuli-kuli" samples with the blends of 50 and 70% cashew kernel paste with the values ranging from 0.79 – 1.01% and 30.45 – 30.88%, respectively. An increase was observed in the moisture content of samples with cashew kernel blends (8.22, 7.33, 8.05 and 8.35% for samples B, C, D and E, respectively) compare to sample A (100% groundnut paste) with moisture value of 6.31%. Carbohydrate decreased in those same samples also with the blends of cashew kernel (52.19, 32.80, 35.20, 40.36 and 39.53%, respectively). There were no significant difference ($p<0.05$) in the fat values except for sample B. The results of the "kuli-kuli" blend samples showed that they were acceptable by the panelist and the "kuli-kuli" produced from 70% (sample C) cashew kernel blend had the highest value of overall acceptability and compared favorably with the control sample (100% groundnut). However, there were no significant difference ($p<0.05$) between samples B, C and D in the sensory results. It is conclusive that the blend of cashew kernel in "kuli-kuli" production at 50, 70 and 30% levels enhanced the overall acceptability of the product. This study also indicates that "kuli-kuli" with higher protein, fibre, ash and fat content can be produced from composite blends of groundnut/cashew kernel paste.

Keywords Proximate Composition, Sensory Analysis, Cashew Kernel, Groundnut, "Kuli-Kuli"

1. Introduction

There has been a growing interest in cashew (*Anacardium occidentale. L*) tree products as one of the major plantation cash crops grown in Nigeria and this can be ascribed to the usefulness of its by-products such the fruits and the kernels. The fruits varies in colour from yellow to intense red, it is known to have many uses although good percentage of it go waste in the orchard on a daily bases. The uses of cashew fruit includes the production of cashew apple juice [1], conversion of the juice into alcohol and non-alcoholic beverages, cashew apple residue into flour in the production of cookies [2, 3], cashew fruit candy, jam, jelly, syrup and many others. The kernel is derived from the mesocarp of the nut, the major product of cashew tree and a rich source of fat, protein, carbohydrate and triglycerides. They are of high nutritive value containing 19.8% protein, 47.1% fat, 5.7% moisture and 9% iron [4]. Cashew kernels can be used as an important source of lipids and protein as well as be substituted for groundnut/peanut and almond in the confectionery products such as cakes, biscuits, cookies and groundnut cake ("kuli-kuli"). Kuli-kuli is a by-product obtained after extraction of oil from the kernel, usually fried and used as delicious snacks or food supplements [5, 6] and it is indigenous to the West African coasts. It contributes to overall dietary protein intake for the large segment of population specifically school age children and young adults. Kuli-kuli is a popular food item with long history of consumption in the diet of the low-resource classes of the population in West Africa [7-10]. It is also used as a major ingredient in poultry feed formulation [11].

In the world market, large, white and wholesome cashew nut kernels of high quality attract the best prices. Cashew kernel production is very expensive due to the complex processes used. To obtain a high percentage of wholesome kernels, it is necessary to break the shell and remove the testa by means of high temperature treatments [12]. Broken cashew kernels obtained during processing loss their market value and are most times discarded by processors or used as feed for animals. Rather than incur these losses, the broken kernels can be used to formulate new products. They can be

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used singly or combined with other existing raw materials to formulate new products or improve the nutritional value of old products as a functional ingredient. Hence, adds to the variety of nourishing foods available to the populace. The main objective of this study is therefore to formulate groundnut cake ("kuli-kuli") from the blends of cashew kernels and groundnut and to access the proximate composition and sensory properties of the product.

2. Materials and Method

2.1. Materials

Cashew (*Anacardium occidentale L.*) nuts, groundnut (*Arachis hypogeal*) and ingredients such as dried pepper (*Capsicum spp*.) and salt were purchased from local market and transferred to the Laboratory of Home Science and Management in the Department of Food Science and Technology, Rivers State University, Port Harcourt, Nigeria for "kuli-kuli" production and analysis.

2.2. Sample Preparation and Production of "Kuli-Kuli"

The purchased roasted cashew kernels and groundnut were sorted to select wholesome ones and milled into smooth paste separately using kitchen blender (Kenwood). Cashew kernel and groundnut paste were weighed 250g each using electronic balance and formulated in the ratios of 100:0, 50:50, 30:70, 70:30 and 0:100 (groundnut/cashew kernel) and labeled A, B, C, D and E samples, respectively. 100% groundnut paste (sample A) was prepared to serve as the control.

Hundred grams of the formulated smooth paste was transferred into a mixing bowls and 0.5g of powdered dry pepper and 0.3g of salt were added as seasoning. They were thoroughly mixed in the bowl and transferred to properly cleaned chopping board. Vigorous kneading was applied to enable the oil to be extracted out of it. The mixture gradually harder and became sticky during the kneading process and oil was continually extracted. After which they were molded into ball shapes and fried using the oil extracted during the kneading process until a fairly brown colour was obtained. The produced "kuli-kuli" from the blends of groundnut and cashew kernel was allowed to cool in a room temperature (29±1^{o}C) for about 15 – 20min and then transferred to an air-tight container to keep the "kuli-kuli" crunchy and safe from microbes. The flow diagram showing the production of "kuli-kuli" blends is presented in Figure 1.

2.3. Analyses

2.3.1. Proximate Composition

The proximate composition of the kuli-kuli samples was analyzed for moisture, ash, fat, protein and crude fibre using the recommended methods of Association of Official Analytical Chemist [13] while Anthrone reagent method reported by Osborne and Voogt [14] was used to determine the total carbohydrate.

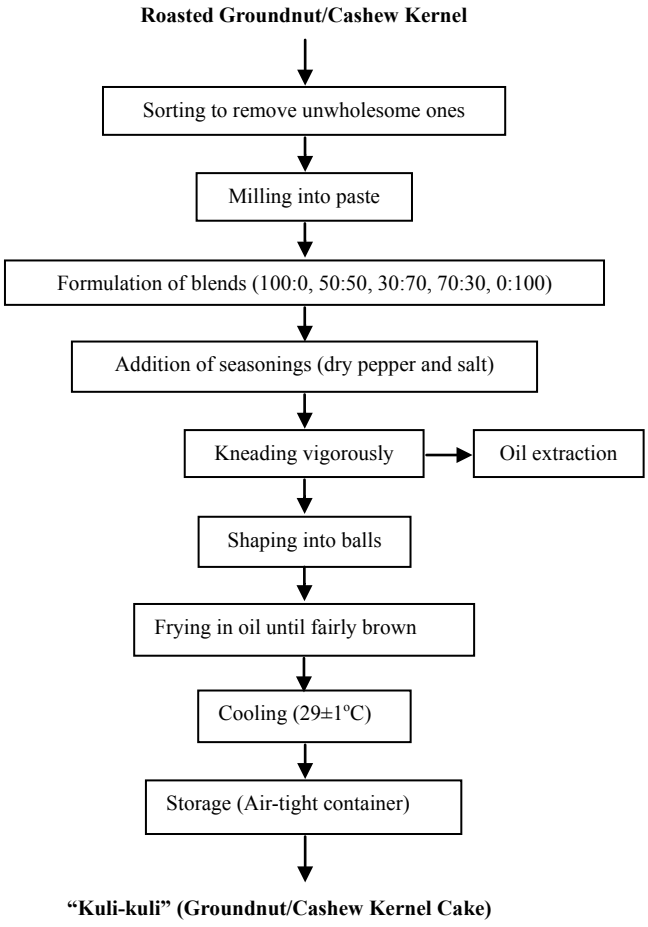

Figure 1. Flow Diagram Showing the Production of "kuli-kuli"

2.3.2. Sensory Evaluation

Sensory evaluation was carried out using a twenty trained panelist consisting of staff and students of Food Science and Technology Department, Rivers State University, Port Harcourt. Criteria for selection were that panelist were above 16 years of age, regular consumers of "kuli-kuli" and were neither sick nor allergic to nuts. A 9-point Hedonic Scale described by Iwe [15] was used to evaluate the "kuli-kuli" with scores ranging from 1 to 9 which represent Dislike and Like extremely, respectively. The panelists were instructed to rinse their mouth with water after each sample taste so as to prevent carry over flavour. The parameters evaluated were colour, taste, crispiness, flavour and overall acceptability.

3. Results and Discussion

3.1. Sensory Scores of the "Kuli-Kuli" Samples

The results of the sensory evaluation (Table 1) showed that sample A containing 100% groundnut had the highest score in terms of colour, taste, crispness, flavour and overall acceptability and was significantly different ($p<0.05$) from

the others. Samples B and C containing 50 and 70% cashew kernel were not significantly different ($p<0.05$) in sensory scores which implies that it was accepted and preferred to other samples. The colour and flavour of samples B, C, D and E were not significantly different ($p<0.05$) from each other. The low score of sample E in terms of crispness and overall acceptability may be due to the 100% cashew kernel used. Increase in the level of substitution with cashew kernel affected the sensory acceptability. The addition of cashew kernel to groundnut for "kuli-kuli" production can be achieved at a level of not more than 70%.

Table 1. Sensory Scores of Groundnut/Cashew Kernel "Kuli-Kuli" Blends

Samples	Colour	Taste	Crispness	Flavour	Overall Acceptability
A	7.8^{a}	7.4^{a}	7.8^{a}	7.0^{a}	8.2^{a}
B	6.4^{b}	5.9^{b}	6.2^{b}	6.0^{b}	6.5^{b}
C	6.5^{b}	6.6^{b}	6.6^{b}	6.4^{b}	6.8^{b}
D	6.2^{b}	5.6^{c}	5.4^{c}	5.9^{b}	6.4^{b}
E	5.9^{b}	5.1^{c}	4.2^{d}	5.9^{b}	5.6^{c}
L.S.D $_{(5\%)}$	**0.82**	**0.96**	**1.0**	**0.89**	**0.73**

Values along the same column with the same superscript are not significantly different ($p>0.05$).
Means = ± Standard deviation of triplicate determinations.
Key: Groundnut/Cashew Kernel: A = 100:0, B = 50:50, C = 30:70, D = 70: 30, E = 0:100

3.2. Proximate Compositions

Proximate composition of "kuli-kuli" samples shown that moisture contents were low and ranged from 6.31 – 8.35% for samples A and E, respectively as shown on Table 2. Samples B, D and E were not significantly different ($p<0.05$), so as samples A and C. Moisture content of "kuli-kuli" increased as the substitution level of cashew kernel increased. The range of moisture value reported here is high compare to the moisture content of cookies produced from cashew kernel and wheat flour [16]. This difference could be associated to the type of heat applied during the production of the two products. Ezekiel *et al.,* [17] equally reported moisture values ranging from 6.91 – 10.41% for peanut cake (kuli-kuli). Ash content of the samples ranged from 3.19 – 4.63% with samples D and A having the least and highest value, respectively. The blends were found to have significantly low ash content compared to samples A and E with significantly high ash values. Fat content of the samples were very high and ranged from 22.54 – 24.60% for samples D and B, respectively. There was no significant difference ($p<0.05$) between samples B and E, as well as C and D. High fat value reported is due to the high oil content of groundnut and cashew kernel. Aroyeun [18] also observed an increase in the fat content of biscuit at an increasing concentration of cashew kernel meal blend to wheat flour. Crude protein content of the "kuli-kuli" samples were high ranging from 13.40 – 30.88% with sample A (0% cashew kernel) having the lowest value and sample C with 70% cashew kernel having the highest value. The high protein values recorded in samples B and C is an indication that cashew kernel is a good source of protein than groundnut. Researchers such as Aremu *et al.,* [19], Omosuli *et al.,* [20] have also reported high protein values of cashew nut flour (25.3% and 27.31%, respectively). The protein value of cashew kernel is comparable to protein values of soybean, cowpeas, pigeon peas, melon, pumpkin and gourd seeds which ranged between 23.1 – 33.0% [21]. The high protein levels in the blends are desirable since the product will serve as an alternate source of protein in snack foods. This will also meet the recommended daily allowance of protein for school age children ranges from 23.0 – 36.0g [22]. Crude fibre of the samples ranged from 0.26 – 1.32% which showed that sample A (0% cashew kernel blend) had the least value while sample E (100% cashew kernel blend) had the highest value. The result showed that the increase in the concentration of cashew kernel blend resulted to an increase in the crude fibre value. A significant difference ($p<0.05$) was not recorded between samples C and E with 70% and 100% cashew kernel blends, respectively and both samples were significantly higher compare to other samples. This may be due to the high fibre content of cashew nut flour (1.42%) reported by Omosuli *et al.,* [20]. This is in line with the statement of Emelike *et al.,* [4] that cashew kernel can be incorporated as a functional ingredient in the formulation of snack products as they also reported high fibre value in cashew kernel flour. The carbohydrate contents of the samples ranged from 32.80% (sample B) to 52.19% (sample A) and all the samples were significantly different ($p<0.05$) from each other. It was observed that a decrease in the blend of cashew kernel led to an increase in the carbohydrate content of the "kuli-kuli" samples. Sample A which recorded the highest carbohydrate content is an evident that groundnut is a good source of carbohydrate. The carbohydrate values are in agreement with the findings of Oko *et al.,* [23].

Table 2. Proximate Composition of Groundnut/Cashew Kernel "Kuli-Kuli" Blends

Sample	Moisture (%)	Ash (%)	Fat (%)	Protein (%)	Crude Fibre (%)	Carbohydrate (%)
A	6.31 ± 0.11^{b}	4.63 ± 0.07^{a}	23.21 ± 0.09^{b}	13.40 ± 0.15^{d}	0.26 ± 0.02^{c}	52.19 ± 0.06^{a}
B	8.22 ± 0.50^{a}	3.34 ± 0.21^{b}	24.60 ± 0.48^{a}	30.45 ± 0.07^{a}	0.79 ± 0.05^{b}	32.80 ± 0.93^{e}
C	7.33 ± 0.50^{b}	3.44 ± 0.35^{b}	22.65 ± 0.46^{c}	30.88 ± 0.51^{a}	1.01 ± 0.06^{a}	35.20 ± 0.77^{d}
D	8.05 ± 1.30^{a}	3.19 ± 0.29^{b}	22.54 ± 0.25^{c}	25.26 ± 0.26^{b}	0.44 ± 0.04^{c}	40.36 ± 0.22^{b}
E	8.35 ± 0.28^{a}	4.22 ± 0.07^{a}	24.51 ± 0.45^{a}	21.64 ± 0.21^{c}	1.32 ± 0.16^{a}	39.53 ± 0.59^{c}
L.S.D$_{(5\%)}$	**1.13**	**0.55**	**2.88**	**0.64**	**0.19**	**1.45**

Values along the same column with the same superscript are not significantly different ($p>0.05$).
Means = ± Standard deviation of triplicate determinations.
Key: Groundnut/Cashew Kernel: A = 100:0, B = 50:50, C = 30:70, D = 70:30, E = 0:100

The low value of carbohydrate and high values of protein and fibre reported in this study showed that cashew kernel is not a good source of carbohydrate rather protein and fibre. This is an indication that cashew kernel will serve as a good source of raw material for the formulation of food for diabetic patient and health conscious individuals.

4. Conclusions

Sensory result revealed that samples produced from 100% groundnut and groundnut/cashew kernel blends were more acceptable than those produced from 100% cashew kernels. Proximate analysis showed that "kuli-kuli" with high nutritional value such as protein and fibre can be produced at substitution levels of 30, 50 and 70% as the result showed a good balance of all the samples.

REFERENCES

[1] Emelike N.J.T and Ebere C.O (2015). Effect of packaging materials, storage conditions on the vitamin C and pH value of cashew apple (*Anacardium occidentale L.*) juice. *Journal of Food and Nutrition Sciences*, 3(4), 160-165.

[2] Winterhatter P, Mearse H and Dekker E.D (1991). Fruits and Volatile Compounds in Foods and Beverages. New York, p. 389-401.

[3] Ebere C.O, Emelike N.J.T and Kiin-Kabari D.B (2015). Physico-chemical and sensory properties of cookies prepared from wheat flour and cashew-apple residue as a source of fibre. *Asian Journal of Agriculture and Food Sciences*, 3(2), 213-218.

[4] Emelike N.J.T; Barber L.I and Ebere C.O. (2015). Proximate, mineral and functional properties of defatted and undefatted cashew (*Anacardium occidentale Linn*.) kernel flour. *European Journal of Food Science and Technology,* 3(4), 11-19.

[5] Desai C.J, Gindhart J.G, Goldstein L.S.B and Zinn K (1996). Receptor tyrosine phosphatases are required for motor axon guidance in the Drosophila embryo. 84(4), 599-609. DOI: http://dx.doi.org/10.1016/S0092-8674(00)81035-1.

[6] Adebesin A.A, Saromi O.T, Amsusa N.A and Fagade S.O (2001). Microbiological quality of some groundnut products hawked in Bauchi, a Nigerian City. *Journal of Food Technology in African,* 6(2): 53-55. Doi.org/10.4314/jfta.v6i2.19287.

[7] Altschul A.M and Wilcks H.L (1985). New Protein Foods. Food American Oil Chemist Society, Spring Berlin/Heidelberg, 48(10), 605-610.

[8] Oshodi A.A and Aletor V.A (1993). Functional properties of haemagglutinins (lectins) extracted from three edible varieties of Lima beans (*Phaseolus lunatus*) Intern. *Journal of Food Science and Nutrition*, 44, 133-136.

[9] Fagbemi T.N, Oshodi A.A and Ipinmoroti K.O (2006). Effects of processing on the functional properties of full fat and defatted fluted pumpkin (*Telfairia occidentalis*) seeds flour. *Journal of Food Technology*, 4(1), 70-79.

[10] Aletor O and Ojelabi A (2007). Comparative Evaluation of the nutritive and functional attributes of some traditional Nigerian snacks and oil seed cakes. *Pakistan Journal of Nutrition*, 6 (1): 99-103.

[11] Akano D.A and Atanda O (1990). Present level of aflatoxin in Nigerian groundnut cake ('kulikuli'). *Letters in Applied Microbiology*, 10(4), 187-189. Doi: 10.1111/j.1472-765X.1990.tb00111.x.

[12] Jain S.K, Powar A.G, Kad V.P, Dandekar S.R, Salvi D.A and Dekale J.S (2004). Effect of direct steam roasting on organoleptic properties of cashew-nut kernels. *Cashew*, 18, 20-24.

[13] AOAC (2012). Association of Official Analytical Chemists, Official Methods of Analysis, 17th ed., Washington, DC, U.S.A.

[14] Osborne D.R and Voogt P (1978). The Analysis of Nutrients in Foods. London Academic Press, 130-134.

[15] Iwe M.O (2010). Handbook of Sensory of Analysis, Enugu, Nigeria. Rejoint Communication Science Ltd, 75-78.

[16] Ojinnaka M.C, Agubolum F.U (2013). Nutritional and sensory properties of cashew nut-wheat based cookies. *American Journal of Food and Nutrition*, 3(3), 127-134. Doi: 10.5251/ajfn.2013.3.3.127.134.

[17] Ezekiel C.N, Anokwuru C.P, Fari A, Olorunfemi M.F, Fadairo O, Ekeh H.A, Ajoku K, Gbuzue N and Akinsanmi F (2011). Microbiological quality and proximate composition of peanut cake (kulikuli) in Nigerian markets. *Academia Arena,* 3(4): 103-111.

[18] Aroyeun S.O (2009). Utilization of cashew kernel meals in the nutritional enrichment of biscuit. African Journal of Food Science, 3(10), 316-319.

[19] Aremu M.O, Olonisakin A, Bako D.A and Madu P.C (2006). Compositional studies and physicochemical characteristics of cashew nut (Anacardium occidentale) flour. Pakistan Journal of Nutrition, 5(4), 328-333.

[20] Omosuli S.V, Ibrahim T.A, Oloye D, Agbaje R and Jude-Ojei B (2009). Proximate and mineral composition of roasted and defatted cashew nut (*Anacardium occidentale*) flour. *Pakistan Journal of Nutrition*, 8(10), 1649-1651.

[21] Olaofe O, Adeyemi F.O and Adediran G.O (1994). Amino acid and mineral composition and functional properties of some oil seeds. *Journal of Agriculture and Food Chemistry*, 42, 878-8884.

[22] NRC (1989). Recommended Daily Allowances. National Research Council, 10th edition. National Academic Press, Washington D.C, USA. Pp. 24.

[23] Oko J.O, Abriba C, Audu J.A, Kutman N.A and Okeh Q (2015). Bacteriological and nutritional analysis of groundnut cake sold in an open market in Samaru, Zaria-Kaduna State. *International Journal of Scientific and Technology Research* 4(5), 224-227.