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Evaluation of the nutritional quality of Kuli-kuli (Peanut cake) produced from Melon seeds and Groundnut.

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Abstract:

In the bid to enhance human health and secure food safety as well as public health enlightenment to food, there is the need to evaluate the Nutritional quality of Kuli-kuli from melon seeds. Kuli-kuli which is majorly produced from groundnut is one of the major snacks consumed by most Nigerians especially in the North. The use of melon seeds in the production of Kuli-kuli is not known. Therefore, this research work was carried out to produce and evaluate the nutrient of Kuli-kuli produced from Melon seeds. Sensory evaluation showed that the Kuli-kuli produced from melon seeds varied in appearance, aroma, texture, taste, and acceptability.

Introduction

Kuli-kuli (Peanutcake) is the byproduct of oil extraction from groundnut, It is also used as a groundnut-based snack which is indigenous to the West African coasts. Being a snack, it is consumed by all ages but more specifically by children and the middle aged. Kuli-kuli is mostly consumed by the low-income populace and therefore not seen as a major food. It is usually produced from groundnut during groundnut oil extraction or otherwise, and it is simply regarded as the fried residue obtained from this process (Adebesin*et al*., 2001). Kuli-kuli is rich in protein and crude fat similar to its parent material, groundnut (Aletor and Ojelabi, 2007; Kolapo*et al*, 2012).Peanuts and its derivatives are often classified as street food which satisfies essential need of the urban population by being affordable and available (Boli*et al*., 2014). It is also used as a major ingredient in the production of poultry feed formulation (Ademola et al., 2015). It has been reported to be rich in protein and crude fat similar to its parent material, groundnut (Aletor and Ojelabi, 2007; Oladimeji and Kolapo, 2008).

Melon seeds have an increasing demand since they contribute greatly towards achieving a balanced diet (Fokou*et al*., 2004). They have good quantities of sulphur, calcium, potassium, magnesium, phosphorus and manganese. They are necessary in the diets as they have high nutritive and caloric values. Akusu and Kiin-kabari(2015) reported that melon seeds contains 9.30% moisture, 3.33% ash, 42.89% fat, 25.36% protein, 3.83% fibre and 15.31% carbohydrate. Melon seeds are known to have therapeutic effects such as antioxidant, anti-inflammatory and analgesic effects in the human body (Chen *et al*., 2014).In Nigeria and other parts of the world, they are used to prepare food condiment with a characteristic aroma. They can also be used as flavouring and thickening agents in stews, soups and sauces (Onyeike and Achera, 2002). "Ogiri" is a locally fermented melon popularly used among the Igbo part of Nigerian tribe as a food condiment to season or flavour soup (Yusuf *et al*., 2006). However, the suitability ofmelon seedsfor use in the production of kuli-kuli is not ascertained. Although Kuli-kuli is mostly made from groundnut,this research work aims to produce melon seeds.Ginger was added to the improve its flavour of kuli-kuli produced.

Materials and Methods

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The raw materials which are groundnut seeds, melon seeds, ground chili pepper, ground ginger and salt, were purchased at Anyigba central market in Kogi state, Nigeria.50g of commercially produced kuli -kuli was obtained from the market and used as a control sample.

Sample preparation

Preparation of Kuli-kuli using groundnut seeds

Groundnut seeds were cleaned manually by hand to remove foreign material such as dust, dirt, piece of stones. The groundnut seeds were roasted followed by grinding to produce paste. The process followed the flow chart as seen in figure 1.

250g of the groundnut paste was mixed with 8g of grounded chili pepper, 10.5g of grounded ginger and 9g of salt. 80ml of water was added to the mixture before it was further pressed, molded and fried. It was the cooled and packaged for further analysis.

Preparation of kuli-kuli using melon seeds

The melon seeds were sorted to remove damage seeds and dirt particles followed by roasting, milling to produce melon seeds flour. The process followed the flow chart as seen in figure 2.

250g of melon seed flour was mixed with 8g of grounded chili pepper, 10.5g of grounded ginger and 9g of salt. 80ml of water was added to the mixture before it was further pressed, molded and fried. It was the cooled and packaged for further analysis.

Groundnut seed

↓

Sorting

↓

Roasting

↓

Peeling

↓

Winnoing

↓

Grinding

↓

Mixing (ginger, pepper, salt)

↓

Kneading

↓

Pressing (extraction of oil)

↓

Mounding

↓

Frying

↓

Cooling

↓

Packaging

Figure I: Flow diagram for the production of kuli-kuli using groundnut seeds

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Melon seeds
↓
Sorting
↓
Roasting
↓
Grinding
↓
Mixing (ginger, pepper & salt)
↓
Kneading
↓
Pressing (extraction of oil)
↓
moulding
↓
Frying
↓
Cooling
↓
Packaging

Figure II:Flow diagram for the production of kuli-kuli using melon seeds

Sample Analysis.

For the analysis, commercially produced kuli-kuli was used as a control sample and this was evaluated together withmelon seed kuli-kuli and the groundnut kili-kuli made with ginger.

A = Egusi (Melon) Kuli-kuli

B = Groundnut Kuli-kuli with ginger

C = Control (Market Sample) Groundnut Kuli-kuli

The Proximate composition of the samples was determined as prescribed by Association of Official Analytical Chemist (AOAC), 2010). Some selected mineral constituents were investigated using Atomic Absorption Spectrometry method as prescribed by Fashakin*et al.*, (1991). All the data obtained was subjected to statistical analysis using Analysis of variance (ANOVA) and the means was separated using Turkey's test at 5% significance level (SPSS version 20.0 computer software was used).

Sensory Evaluation

Sensory evaluation of the kuli-kuli samples was carried out. The samples were coded and presented in identical containers. A seven -point hedonic scale as described by (Akinjaiyeju, 2009) was used. The scale ranged from like extremely (7) to dislike extremely (1). Each of the samples was rated for Taste, Flavour, Texture, Colour, Mouth feel and Acceptance. During sensory evaluation, panellists was instructed to drink water or rinse their mouths to clear the palate after each evaluation.

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Results and Discussion

Proximate Analysis of Kuli-kuli made from Melon and Groundnut

The Proximate Analysis of Kuli-kuli made from melon and groundnut is presented in Table 4.1

Table 1: Proximate Analysis of Kuli-kuli

Samples	Moisture (%)	Ash (%)	Crude Fiber (%)	Crude Protein (%)	Fat (%)	Carbohydrate (%)
A	$2.98^{b}\pm0.00$	$4.03^{b}\pm0.04$	$3.78^{c}\pm0.04$	$27.83^{c}\pm0.06$	$19.40^{a}\pm0.71$	$41.84^{a}\pm0.21$
B	$7.55^{a}\pm0.07$	$4.53^{a}\pm0.04$	$3.94^{b}\pm0.01$	$46.18^{a}\pm0.03$	$10.16^{b}\pm0.03$	$26.41^{c}\pm0.26$
C	$7.75^{a}\pm0.07$	$4.80^{a}\pm0.14$	$4.41^{a}\pm0.01$	$44.70^{b}\pm0.09$	$8.93^{b}\pm0.04$	$27.49^{b}\pm0.04$
Means	6.09±2.41	4.45±0.36	4.04±0.30	39.57±9.12	22.83±20.59	35.08±12.92

Values are means ±SD of duplicate determinations. Values in the same column with different superscripts were significantly ($p<0.05$) different
Where A = Egusi (Melon) Kuli-kuli,
B = Groundnut Kuli-kuli, 'with ginger
C = Control

The proximate composition of the samples in Table 1 revealed significance ($p < 0.05$) difference in sample A and B.The moisture content which influences the shelf-life of food ranged from 2.93% for sample A to 7.75% for sample C which is the control. There was significant ($p > 0.05$) difference between sample A which is 100% melon and sample B which is 100% groundnut. This is similar to that ofFokou et al. (2004) who reported a moisture content that ranged from 4.33 to 7.26% for five different melon seeds. Azhari et al. (2014) and Ibeto et al. (2012) also reported moisture content of melon seeds to be in the range of 4.27 to 5.63%. These values are within the range observed in this study. Hence, these values are low which is an indication that these melon seeds can be stored for a long period of time.

The ash content ranged from 4.03% for sample A to 4.80% for sample C which is the control. There was significant ($p > 0.05$) difference between sample A which is 100% melon and sample B which is 100% groundnut. Azhari*et al.* (2014) and Obasi*et al.* (2012) found ash content of melon seeds to range from 2.40 to 4.33% while Akusu and Kiin-kabari (2015) reported 3.33%. The results showed that the melon varieties in the present study have significant amount of ash which are important sources of minerals.

Crude fibre content ranged from 3.78% for sample A to 4.41% for sample C which is the control. There was significant ($p > 0.05$) difference between sample A which is 100% melon and sample B which is 100% groundnut. The lowest value was observed in 100% melon, while the highest value was detected in sample B which is 100% groundnut. This finding is in contrast with that of Fokou*et al.* (2004) who reported crude fibre contents of 0.90 to 1.63%. Similarly, Loukou et al. (2007) reported crude fibre of 2.30 to 2.94%. These values are low compared to the value observed in this study. This difference could be

attributed to the level of drying temperature applied and the season at which the study was conducted. There is a natural phenomenon that food materials are moister during rainy season than in dry season.

The protein being the body building nutrient ranged from 27.83% for sample A to 46.18% for sample B which is 100% groundnut. There was significant ($p > 0.05$) difference between the sample tested. The variation in these results can be attributed to their original raw materials. The highest value was observed in B which is 100% groundnut, while the lowest value was observed in sample A which is 100% melon. Thisfinding is similar to that of Fokou et al. (2004) who reported a range of 24.30 to 41.60% for five melon seeds while Azhari et al. (2014) and De Mello et al. (2001) reported 11.67 to 35.0%. These melon seed varieties are rich in crude protein content and could be used to enrich food products.

The fat contents ranged from 8.93% for sample C which is the control to 19.40% for sample A which is 100% melon. There was significant ($p > 0.05$) difference between the samples tested. Similar findings were reported by Ibeto et al. (2012) and Mian-Hao and Yanson (2007). The melon seed varieties studied had high fat contents. Hence, the seeds are classified as excellent sources of dietary oil (Abiodun and Adeleke, 2010).

The results for total carbohydrate were between 27.49% for sample C which is the control and 41.84% for sample A which is 100% melon. Sample C which is the control had the lowest value and for sample A which is 100% melon had the highest value. Raji and Orelaja (2014) reported 3.14% for melon seeds which is lower than 55.84% obtained from this study. From this result, these melon seed varieties cannot be considered as potential sources of carbohydrate.

Mineral Element of Kuli-kuli made from Melon seeds and Groundnut seeds

The mineral element of Kuli-kuli made from melon and groundnut is presented in Table 2.

Table 2: Mineral Element of Kuli-kuli

Samples	Na (mg)	Ca (mg)	Fe (mg)	K (mg)	Mg (mg)
A	$120.55^{a}\pm0.35$	$2840.00^{a}\pm0.00$	$42.45^{a}\pm0.21$	$180.60^{a}\pm0.14$	$270.15^{a}\pm0.07$
B	$96.20^{c}\pm0.14$	$2470.25^{c}\pm0.35$	$31.92^{c}\pm0.07$	$135.55^{c}\pm0.78$	$241.55^{c}\pm0.21$
C	$115.90^{b}\pm0.14$	$2560.25^{b}\pm0.35$	$36.42^{b}\pm0.07$	$150.50^{b}\pm0.14$	$245.45^{b}\pm0.49$
Means	110.88±11.56	2623.50±172.46	36.93±4.73	155.55±20.53	252.38±13.87

Values are means ±SD of duplicate determinations. Values in the same column with different superscripts were significantly ($p<0.05$) different

Where A = Egusi (Melon) Kuli-kuli,
B = Groundnut Kuli-kuli, ‘with ginger
C = Control

The mineral element of the samples in Table 2 revealed significance ($p < 0.05$) differencein sample A and B.The sodium contents of the three samples ranged from 96.20mg/100g which is 100% groundnut to 120.55mg/100g which was 100% melon. There is significant difference in sodium contents of the samples ($P<0.05$). The sodium content of sample B (96.20mg) was significantly lower than the sample A.
The calcium contents of the samples ranged from 2470.25 which was 100% groundnut to 2840.00 mg which is 100% melon. There were significant differences in calcium contents of the samples ($P<0.05$). The

calcium content of 100% groundnut (2470.25mg) was significantly lower than the than the sample A (2840.00mg).

The potassium contents of the samples ranged from 135.55 which was 100% groundnut to 180.60 mg which was 100% melon. There was significant difference in potassium contents of the samples (P<0.05). The potassium content of 100% groundnut (135.55mg) was significantly lower than the sample A (180.60mg). Potassium was relatively high, especially in sample A and in agreement with earlier observation of Olaofe and Sanni (1988) that potassium is an abundant mineral in Nigerian agricultural products.

The magnesium contents of the samples ranged from 241.55 which is 100% groundnut to 270.15 mg which is 100% melon. There is significant difference in magnesium contents of the samples (P<0.05). The magnesium content of 100% groundnut (241.55mg) is significantly lower than the than the sample A (270.15mg). Tait (2003) reported that Bambara groundnut is rich in mineral element. This result is in accordance with the report of Amoakoah*et al.* (2015). Amoakoah*et al.* (2015) reported that mineral are essential nutrients that are needed in the body to facilitate proper functioning of certain organs.

The Iron contents of the samples ranged from 31.92 which is 100% groundnut to 42.45mg which is 100% melon. There is significant difference in iron contents of the samples (P<0.05). The iron content of 100% groundnut (31.92mg) is significantly lower than the than the sample A (42.45mg).

Sensory Analysis of Kuli-kuli made from Melon and Groundnut

The sensory analysis of Kuli-kuli made from melon and groundnut are presented in Table 3.

Table 3: Sensory Analysis of Kuli-kuli

Samples	Appearance	Aroma	Texture	Taste	Overall acceptability
A	$7.10^{c}\pm0.852$	$7.10^{c}\pm0.968$	$7.80^{b}\pm1.105$	$7.65^{c}\pm1.182$	$7.40^{c}\pm0.821$
B	$7.75^{b}\pm0.786$	$7.50^{b}\pm0.875$	$7.70^{c}\pm0.979$	$8.25^{b}\pm0.786$	$8.10^{b}\pm0.788$
C	$8.55^{a}\pm0.759$	$8.30^{a}\pm0.865$	$8.35^{a}\pm0.745$	$8.65^{a}\pm0.489$	$8.65^{a}\pm0.489$
Means	7.80±0.988	7.75±1.019	7.95±0.982	8.18±0.948	8.05±0.872

Values are means ±SD of duplicate determinations.
Values in the same column with different superscripts were significantly (p<0.05) different

Where A = Egusi (Melon) Kuli-kuli,
B = Groundnut Kuli-kuli, ‘with ginger C = Control

The result in Table 3 shows the sensory analysis of Kuli-kuli made from melon and groundnut. The results revealed that Kuli-kuli from groundnut was rated high in terms of appearance, aroma, taste and overall acceptability. Appearance of the sample ranged from 7.10 to 8.55. Values for crispness (texture) were between 7.80 and 8.35. And the overall acceptability was in the range of 7.40-8.65. However, sample B which is Kuli-kuli from melon was rated high in term of texture. The textural properties have important roles to play in determining quality and acceptability of the final products (Yagci and Gogus, 2008). The textural property may reflect the crispness of the product. This is expressed in the significant difference (p<0.05) observed in the sensory quality variables for all the samples.

Conclusion

The research finding revealed that melon could be a possible raw material substitute for Kulikuli production in regions where groundnut is under cultivate or unavailable.

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