PROXIMATE COMPOSITION AND ORGANOLEPTIC EVALUATION OF COWPEA 
(Vigna unguiculata) AND SOYBEAN (Glycine max) BLENDS FOR THE PRODUCTION 
OF Moi-moi AND Ekuru (STEAMED COWPEA PASTE) 

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ABSTRACT

Present study was aimed to investigate the utilization of cowpea in combination with soybean for the production of steamed cowpea paste Moi-moi and Ekuru. For these preparations cowpea used in different ration for the substitution of soybean. The samples were processed into paste using traditional method the pasted samples were subjected to proximate analysis and two difference local products produced (Moi-moi and Ekuru) were subjected to sensory evaluation. The results of proximate analysis showed that the nutritional composition of the samples increased as the proportion of soybean substitution increased. The moisture content of the tested samples ranged between (48.36 to 54.93%), protein content (4.44 to 11.60%), ash (1.17 to 1.88%); crude fat (1.91 to 5.28%), crude fiber (0.92 to 1.19%) and carbohydrate (31.69 to 36.63%) respectively. The results of sensory evaluation showed that they competed favourably with the control except sample D. This research work showed that the combination of cowpea and soybean, in the investigated proportion, can be used to produce Moi-moi and Ekuru of acceptable sensory quality and improved proximate composition.

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1 Introduction

Moi-moi is a steamed cowpea paste that is popular in Nigeria and other West African Countries (Ngoddy et al., 1986). It is traditionally produced from cowpea (*Vigna unguiculata*) and it is an important dietary staple in West African nations because of its high protein. In Nigeria, the legume is now generally considered a healthy food and consumed by both rich and poor people but mostly consumed by the poor population. Cowpea consumed as a vegetable, often in combination with cereals or grains and are incorporated into a variety of recipes which are processed into various products (Odedeji & Oyeleke, 2011).

Moi-moi can be consumed alone as part of diet or can be eaten with other cereal based foods such as Akamu, Agidi or rice or gari. This increased nutritional value because cowpea is rich in lysine and deficient in sulphur containing amino acids. The amino acid composition makes cowpea an ideal dietary complement with cereals because cowpea is rich in sulphur containing amino acids but poor in lysine content. Nutritively synergistic combination of amino acids with cereals and legumes provides high quality protein in diets which are lacking in animal food sources (McWatters, 1983).

Ekuru is another cowpea based staple food in Nigeria and in some other West African countries. It is popular food in Southern & Western part of Nigeria where it used as a culture and traditional food by the peoples (Adedokun et al., 2014). It serves as a nutritional food in cultural, traditional and religious functions especially among the Yoruba’s. Although a steamed cowpea paste product like moi-moi is different in composition, preparation and exhibit distinctive rheological properties (Adedokun et al., 2014). The incorporation of air into the paste through whipping during its processing is an important operation which confers the unique fluffiness of the paste and it consider as an important quantity characteristic of the product. Ekuru can be eaten with prepared sauce made of spices and seasoning or vegetable soup. However, most people prefer consuming it with Eko or Agidi which are also cereal based foods.

Soybean (*Glycine max* L.) is a leguminous crop with high protein content but it is not very expensive. It is a healthy food because of its rich nutrient content and contains vegetable protein, oligosaccharides, dietary fibre, phytochemicals (especially isoflavones), and minerals. The averages protein content of the most of beans varies from 20-25%, whereas the protein content of soybean is about 40%. Soybean protein is low in sulphur amino acids but contained sufficient lysine which is deficient in most of the cereals. Soybean is equivalent in quality to animal protein (Mateos-Aparicio et al., 2008).

The pasting and functional properties of cowpea and soybean blends in varied ratios (100: 0, 90:10, 80:20, and 70:30) have been determined and compared by Ogundele et al. (2015). These different combinations significantly improved the functional properties of the blends and this value increased with the increasing amount of soybean; it is because of the presence of some oligosaccharide in cowpea but these are available in very low quantity in soybeans, vice versa also. Cowpea showed better pasting and functional properties than the blends however, the differences observed were not significant to discourage the trial of the blends for culinary uses which eventually led to the production of akara (Ogundele et al., 2014).

Although Moi-moi and Ekuru are a cowpea based product like akara but these are differed in their methods of preparation. Moi-moi and Ekuru are a steamed cowpea paste while akara is a fried cowpea paste. Hence there is need to evaluate the sensory qualities of moi-moi and Ekuru produced from cowpea-soybean blends in other to establish the nutritional composition and acceptability of the products. Hence, this study determined the proximate composition and sensory evaluation of Moi-moi and Ekuru prepared from different combination of cowpea soybean blends.

2 Materials and Methods

Cowpea and soybean were purchased from Owode market of Offa, Kwara State, Nigeria. The processing was conducted in the Food Processing Laboratory of the Department of Food Technology, Federal Polytechnic Offa, Kwara State.

2.1 Preparation of samples

The cowpea and soybean samples were sorted to remove damage ones and other extraneous materials. These were combined in the various ratios viz 100: 0 (A), 90:10 (B), 80:20 (C) and 70:30 (D) of cowpea and soybean respectively. Exactly 200g of mixture were weighed for each sample. The samples were labelled A, B, C and D where sample A was serving as control.

2.2 Preparation of paste

Each sample was soaked separately in a one litre of cold water for 1hr in order to soften the seed coats. Thereafter, the seed coats were removed manually and the seeds rinsed in water until they were clean and free from impurities. The sample were blended separately with 200ml of water using a Kenwood blender until a fine paste was obtained. Each paste was transfer into a clean bowl and label accordingly.

2.3 Production of Moi-moi

Each paste sample was mixed thoroughly using a home mixer and grinder (HM 430, Selangor. Malaysia) for 5 minutes after that seasonings and spices were added in this paste and mixing continued for 2 mins. A big stainless steel spoon was used to scoop the paste into aluminum foil, wrapped and steam-cooked for about 40minutes. The samples were left for cooling.
2.4 Production of Ekuru

Each paste sample was mixed thoroughly by using a home mixer and grinder for 10 minutes for aeration and fluffiness of the product after which a big stainless spoon was used to scooped the mixed sample into aluminum foil, wrapped and steam-cooked for about 40 minutes. The samples were left for cooling.

2.5 Proximate analysis of paste samples

Each paste sample was subjected to proximate analysis based on standard method in Association of Official Analytical Chemist (AOAC, 2010).

2.6 Sensory evaluation of samples

The moi-moi and Ekuru samples were subjected to sensory analyses by using a 5 point hedonic described by Watts et al. (1989) with a scaling range of 1-5 (1 = poor, 2 = fairs, 3 = good, 4 = very good, 5 = excellent). A panel of 50 member was used for sensory analysis. The data of the hedonic test was subjected to statistical anaysis using the statistical package for social sciences (SPSS) version 11 for windows.

3 Results and Discussion

3.1 Proximate composition

The proximate analysis results of the samples were presented in Table 2. It was observed that the moisture content of the paste reduced with increases in the level of soybean substitution. The reduction in the moisture content of the paste may be due to the increase in protein content of the paste as a result of addition of soybean. Protein has been reported to have some functional attributes such as water absorption, viscosity, elasticity, foamability, foam stability and fibre formation (Sanful et al., 2010; Dixit et al., 2011).

Table 1 Standard recipe for fried Moi-moi and Ekuru from cowpea soybean blend.

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Weight (Moi-moi)</th>
<th>Weight (Ekuru)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cowpea and Soybean paste</td>
<td>600g</td>
<td>600g</td>
</tr>
<tr>
<td>Onion</td>
<td>25g</td>
<td>-</td>
</tr>
<tr>
<td>Pepper</td>
<td>20g</td>
<td>-</td>
</tr>
<tr>
<td>Water to mix</td>
<td>150ml</td>
<td>100ml</td>
</tr>
<tr>
<td>Salt</td>
<td>1.5g</td>
<td>-</td>
</tr>
<tr>
<td>Seasoning</td>
<td>2g</td>
<td>-</td>
</tr>
<tr>
<td>Vegetable oil</td>
<td>600g</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Established based on preliminary study

Result of the study revealed that quantity of protein increased with the increasing the soybean substitution. The protein contents were recorded 4.44%, 7.36%, 9.49% and 11.60% for samples A, B, C and D respectively. This may be due to the presence of higher protein amount in soybean as compared to cowpea (Mateos Aparicio et al., 2008). This combination has been widely used for the improvement of nutritional qualities of selected foods (Dixit et al., 2011).

The fat content of samples also varied according to the percentages of soybean substitution, in sample A, it was reported 1.91% while for the sample B, C and D it was reported 3.38%, 4.06%, and 5.28% respectively. This may be due to the high oil content in the soybean being seed, these seed has higher crude fat content than cowpea. This is of nutritional importance of soybean oil, it mainly contains polyunsaturated fatty acids which are considered healthy for the human body. Furthermore, it has been observed that with fat other substances such as fat soluble vitamin A, D, E and K has been also associated (Coppin & Pike, 2001).

Ash contents of all the samples showed that sample A had lowest ash content (1.17%) while the highest ash content was reported from the sample D (1.88%). This improvement can be attributed to the presence of soybean in all the samples. This is of nutritional importance because soybean is a useful source of calcium and iron and these results are in agreement with the findings of Olaoye et al. (2006) and Sanful et al. (2010).

The indigestable component of plant material, which include cellulose, hemicellulose, pectine, lignins, and other plant materials are referred to collectively as crude fibre or dietary fibre. The crude fibre content of the samples showed a significant increase with increases in the percentages of soybean substitution. Sample A has lowest crude fiber (0.92%) while sample B, C, and D had 1.03%, 1.10% and 1.19% respectively. Crude fibre provides roughage which contributes to a healthy condition of the intestine (Odom et al., 2013).
The mean scores ranged between 4.52 to 4.80. Among these samples, sample D had the lowest sensory value ranged between (4.48-4.72) while the highest sensory value was reported in the sample A (4.64 - 4.80). Colour is not a major attribute formoi-moi because it could varies based on types and quantity of ingredients added during processing. However, there is no significant difference reported between the mean score of samples A and B for color at p<0.05 level. These results are contradictory to the findings of Ogundele et al. (2014) on “akara” produced from the soybean, cowpea blend.

Evaluation of the texture was based on the hand feeling, appearance and consistency of a substance. These are important discriminative attribute of moi-moi, it affects the moisture, mouthfeel and appearance of the product. The mean score range between 4.68 and 5.50 with sample A having the highest score of 4.68, while 4.62, 4.60 and 4.50 were recorded for samples B, C and D respectively. These results are in agreement with the results of Ogundele et al. (2014) those who have reported similar value in texture of “akara” made from cowpea and soybean blend. Taste is the sensation of flavour perceived in the mouth and throat on contact with a substance and it is one of the most important attribute watched out for in a product. The taste of the product could be affected by the types and quantity of ingredients added such as spices and seasonings. Since there was uniformity in the type and quantity of ingredients added, the variation in taste depend on the composition of the raw materials (i.e cowpea and soyabean) used in preparation of the samples. The result range between 4.76 to 4.54. Sample B had the highest score (4.76) while sample D had the lowest score (4.54).

Aroma is a distinctive, typically pleasant smell perceived by the olfactory sense. It is also an important sensory attribute for moi-moi. The mean score were 4.8, 4.8, 4.7 and 4.54 for samples A, B, C and D respectively. There was no difference in the score of sample A and B which indicated that soybean substitution into cowpea was still acceptable with the aroma. Overall acceptability refers to the general acceptance of the product with reference to all the discriminating sensory attributes of the sample. Samples A, B, and C have the same mean score of 4.64 and sample D has the lowest mean score of 4.48. This indicated that all the samples competed favorably with the control (sample A). There is no significant difference among all the samples at p<0.05 level.

The sensory evaluation result of Ekuru samples were shown in Table 4. For all the parameters evaluated, sample A (Control, 100% Cowpea) scored highest (Colour and Taste 4.86, Aroma 4.90, Fluffiness 4.70 and overall acceptability 4.74). These scores may be due to the source of the sample which was mainly cowpeawhich the judges were used to.

Fluffiness describes the softness in texture as a result of incorporation of air into the product it is a distinctive sensory quality desired in Ekuru. A number of factors contribute to the degree of fluffiness. Such factors include the nature of the raw material, particular size, moisture content, foaming and foam retention ability. The ability of the paste to retain air during cooling to a large extent, influence the degree of fluffiness of the product, the means score of samples ranged between 4.52 to 4.70 with sample A (Control) having the highest and sample D having the lowest. The mean score for sample B and C were 4.66 and 4.62 respectively. There was significant difference between sample B and C at p<0.05.

### Table 2: Proximate analysis result for “moi moi” made from cowpea and soybean (% Wet basis)

<table>
<thead>
<tr>
<th>Sample</th>
<th>Moisture</th>
<th>Protein</th>
<th>Ash</th>
<th>Crude Fat</th>
<th>Crude Fiber</th>
<th>Carbohydrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>54.93±0.01</td>
<td>4.44±0.01</td>
<td>1.17±0.01</td>
<td>1.91±0.01</td>
<td>0.92±0.01</td>
<td>36.63±0.23</td>
</tr>
<tr>
<td>B</td>
<td>54.20±0.02</td>
<td>7.36±0.01</td>
<td>1.74±0.01</td>
<td>3.38±0.01</td>
<td>1.03±0.02</td>
<td>32.29±0.21</td>
</tr>
<tr>
<td>C</td>
<td>52.76±0.01</td>
<td>9.49±0.01</td>
<td>1.80±0.01</td>
<td>4.00±0.03</td>
<td>1.10±0.01</td>
<td>30.79±0.35</td>
</tr>
<tr>
<td>D</td>
<td>48.36±0.01</td>
<td>11.60±0.01</td>
<td>1.88±0.02</td>
<td>5.28±0.02</td>
<td>1.19±0.01</td>
<td>31.69±0.12</td>
</tr>
</tbody>
</table>

Values are means of three replicates; value after ± represents standard deviation. Means followed by the same letter within the same column are not significantly (p<0.05) different according to LSD test.

### Table 3: Sensory evaluation result for Moi moi made from cowpea and soybean.

<table>
<thead>
<tr>
<th>Samples</th>
<th>Colour</th>
<th>Aroma</th>
<th>Taste</th>
<th>Texture</th>
<th>Overall acceptability</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.80±0.12</td>
<td>4.80±0.22</td>
<td>4.72±0.31</td>
<td>4.68±0.21</td>
<td>4.64±0.12</td>
</tr>
<tr>
<td>B</td>
<td>4.76±0.11</td>
<td>4.80±0.23</td>
<td>4.76±0.16</td>
<td>4.62±0.01</td>
<td>4.64±0.21</td>
</tr>
<tr>
<td>C</td>
<td>4.68±0.17</td>
<td>4.70±0.14</td>
<td>4.68±0.15</td>
<td>4.60±0.12</td>
<td>4.64±0.21</td>
</tr>
<tr>
<td>D</td>
<td>4.72±0.25</td>
<td>4.54±0.03</td>
<td>4.54±0.14</td>
<td>4.50±0.12</td>
<td>4.48±0.22</td>
</tr>
</tbody>
</table>

Values are means of three replicates; value after ± represents standard deviation. Means followed by the same letter within the same column are not significantly (p<0.05) different according to LSD test.

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## Table 4: Sensory evaluation result for “Ekuru” made from cowpea and soybean.

<table>
<thead>
<tr>
<th>Samples</th>
<th>Colour</th>
<th>Aroma</th>
<th>Taste</th>
<th>Fluffiness</th>
<th>Overall acceptability</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.86±0.01</td>
<td>4.90±0.11</td>
<td>4.86±0.12</td>
<td>4.70±0.01</td>
<td>4.74±0.14</td>
</tr>
<tr>
<td>B</td>
<td>4.80±0.01</td>
<td>4.84±0.17</td>
<td>4.70±0.21</td>
<td>4.66±0.12</td>
<td>4.68±0.01</td>
</tr>
<tr>
<td>C</td>
<td>4.76±0.14</td>
<td>4.74±0.32</td>
<td>4.70±0.15</td>
<td>4.62±0.15</td>
<td>4.62±0.24</td>
</tr>
<tr>
<td>D</td>
<td>4.68±0.15</td>
<td>4.70±0.12</td>
<td>4.56±0.12</td>
<td>4.52±0.15</td>
<td>4.50±0.16</td>
</tr>
</tbody>
</table>

Values are means of three replicates; value after ± represents standard deviation; Means followed by the same letter in the same column are not significantly (p<0.05) different according to LSD test.

Sample B (90% cowpea and 10% soybean) immediately followed to sample A in scoring with Colour (4.80), Aroma (4.84), Taste (4.70), Fluffiness (4.66) and Overall acceptability (4.68). There was no significant difference between sample A and B. This may be due to level of substitution of soybean into cowpea was very low. The scores of sample C showed a significant difference at p<0.05 for some parameters like Colour, Aroma and Fluffiness (4.76, 4.74 and 4.62) compared to sample A and B.

This may be due to the impact of soybean at 20% substitution in the sample. Sample D scored lowest value but other than the samples except in Aroma (4.70). The sample contained 70% cowpea and 30% soybean which may be the reason for the scores. With all the scores given to each sample by the judges, the scores were still encouraging when compared with the scales used. These results were not totally in consonance with the report of Ogundele et al. (2014) on “akara” produced for the same blend of soybean and cowpea. This may be due to difference ways of preparation of the two products (“Akara” and “Ekuru”) which resulted to variation in their properties.

### Conclusion

This study showed that cowpea and soybean blends, in the stated proportions, can be used to produced Moi-moi and Ekuru with the required sensory qualities and overall acceptability. There were little or no significance difference p<0.05 between the samples produced from 10% soybean blends with cowpea and the control (Sample A). It can be concluded that soybean and cowpea blend at different proportions will improve the nutritional quality of Moi-moi and Ekuru but 10% substitution of soybean in cowpea was mostly accepted.

### Conflict of interest

The authors declare no conflict of interest.

### References


Ogundele GF, Ojubaniere BA, Bamidele OP (2014) Evaluation of Akara made from cowpea (Vigna unguiculata) and soybean...

