EFFECT OF PROCESSING METHODS ON THE NUTRIENT COMPOSITION OF COCOYAM VARIETIES (XANTHOSOMA SAGITTIFOLIUM, COLOCASIA ESCULENTA AND COLOCOSIA ANTIGUORUM) AND SENSORY PROPERTIES OF THEIR SOUPS

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Abstract
The purpose of the study was to explore the effect of different processing procedures on the nutrient content of three different cocoyam varieties (Xanthosoma sagittifolium, Colocasia esculenta and Colocosia antiquorum) as well as the sensory qualities of their respective soups. The different varieties of Cocoyam were processed into flour, made into paste and formed into dough before analyzed for proximate and mineral content according to conventional procedures. Soups were also prepared using the flour, paste and dough from the different cocoyam varieties. The soups were evaluated for their organoleptic qualities. The data generated were subjected to analysis of variance and Turkey’s test was used to differentiate between the means. The result showed that moisture ranged from 6.17 to 8.00 percent, ash was between 0.59 and 5.73 percent, protein content was between 0.25 and 4.25 percent, fat was between 0.26 and 1.39 percent, crude fibre was between 2.65 and 14.70 percent and carbohydrate ranged between 15.83 and 74.02 percent. There was a statistically significant difference (p < 0.05) in the proximate composition of the samples based on variety and processing techniques. The potassium content ranged from 5467 to 7961 mg/100g, calcium was between 15.00 and 64.00 mg/100g while iron was between 10.50 and 47.90 mg/100g. The sensory qualities of the soups revealed that colour ranged from 4.00 to 7.50, taste ranged from 4.60 to 7.75, thickness was between 3.15 and 6.85, flavour ranged from 4.35 to 7.00 overall acceptability ranged from 4.60 to 7.05. The soups thickened with Colocasia antiquorum dough had the highest rating for its thickness while soup thickened with Colocasia esculenta dough had the highest mean rating colour, taste, flavour and overall acceptability and was the sample that was most preferred. There was no discernible difference in the acceptability of the soups prepared using dough made from the three varieties of cocoyam. Based on the findings of the study, dough from Colocasia esculenta can be used to thicken soups.

Keywords: Cocoyam, Processing, Nutrient, Soup, Sensory Evaluation.

Introduction
One of the foods considered to be staple is Cocoyam. Depending on the variety, cocoyam is also referred to as ede ofe, ede uhihe and ede-india or coco-india. In the Eastern and Southern part of Nigeria, cocoyam is commonly utilized as a soup thickener. Cocoyam is the third most important crop in terms of production value in Nigeria, behind yam and cassava respectively (Adeyeye and Oluwatola, 2015). Cocoyam is consumed in different ways and by both humans and livestock. They are often prepared by boiling or roasting and then served with a variety of sauces or palm oil. It is possible to process it into a dough that can be consumed as fufu or used as a thickening for soup. Boiled cocoyam is sliced into strips then dried; the dried strips can then be rehydrated. The rehydrated cocoyam strips along with vegetables, palm oil and oil bean seeds are used to make porridge (Igbozulike, 2015). Cocoyam can also be processed into starch which is used for industrial applications like the production of alcohol and medications. Additionally, cocoyam can be processed into flour which is used as a thickening for soup and for the preparation of biscuits, bread and puddings (Ogukwe, Amaechi and Enenebeaku, 2017).

The transformation of raw components into food or meal by means of physical or chemical processing is referred to as food processing. The term “food processing” refers to a variety of activities, the most fundamental of which is the preparation of foods and the transformation of food products from one form to another (Adam, 2020). There are many different ways that food can be processed and some of these procedures have the potential to improve the food’s nutritional content. Some of these methods might also increase the digestibility and palatability and might also have an effect on nutrients including proteins, carbohydrates, minerals and vitamins (Eke-Ejiofor and Onyeso, 2019). Nonetheless, it is possible to reduce the amount of nutrients that are
A liquid dish known as soup is prepared by combining a number of ingredients, including stock made from either meat or vegetables. Some Nigerian soups are typically made thicker so that they have a higher viscosity. In addition to increasing the soups’ viscosity, many of the thickeners that are used for soups also lend the soup their own unique flavour. Cocoyam which is used to make cocoyam soup as well as other forms of native soups is one example of such thickener. The consistency of the soup can be altered by using a variety of cocoyam. The ability of different varieties of cocoyam to thicken liquids varies and depends partly on the method of processing. According to Eke-Ejiofor and Awajiogak (2019), the capacity of soup thickeners to increase consistency is dependent on the composition of the thickener and the processing method used. Thus it is essential to evaluate the effect of different processing methods on the nutrient composition of different cocoyam varieties (Xanthosoma sagittifolium, Colocasia esculenta, Colocosia antiquorum) as well as the sensory qualities of soups that are thickened with these cocoyam.

**Purpose of the study**

The broad objective of the research was to investigate the effect of different processing techniques on the nutrient profile of different cocoyam varieties (Xanthosoma sagittifolium, Colocasia esculenta, Colocosia antiquorum) and the sensory qualities of soups that are thickened with them. The specific objectives were:

1. To determine the influence of different processing methods on the proximate composition of three cocoyam varieties (Xanthosoma sagittifolium, Colocasia esculenta, Colocosia antiquorum).

2. To examine the influence of different processing methods on the mineral content of three different cocoyam varieties (Xanthosoma sagittifolium, Colocasia esculenta, Colocosia antiquorum).

3. To investigate the effect of different processing methods on the sensory qualities of soups made with three different cocoyam varieties (Xanthosoma sagittifolium, Colocasia esculenta, Colocosia antiquorum).

**Research questions**

1. What is the influence of different processing methods on the proximate composition of three different cocoyam varieties (Xanthosoma sagittifolium, Colocasia esculenta, Colocosia antiquorum)?

2. What effect do different processing methods have on the mineral content of three cocoyam varieties (Xanthosoma a sagittifolium, Colocasia esculenta, Colocosia antiquorum)?

3. What effect do different processing methods have on the sensory attributes of soups prepared with three different cocoyam varieties (Xanthosoma sagittifolium, Colocasia esculenta, Colocosia antiquorum)?

**Methodology**

**Collection of Materials**

Cocoyam varieties (Xanthosoma sagittifolium, Colocasia esculenta and Colocosia antiquorum) in addition to other ingredients such as crayfish, meat, pepper, onion, seasoning cubes were obtained from Mile 3 market, Diobu, Port Harcourt. The chemicals and reagents that were used in the study were obtained from the Laboratory, Department of Food Science and Technology, Rivers State University Port Harcourt, Rivers State.

**Production of Cocoyam flour**

Each of the three different cocoyam varieties (Xanthosoma sagittifolium, Colocasia esculenta and Colocosia antiquorum) were sorted, peeled and cut into pieces using a kitchen knife, washed, sliced (2-3 cm thickness) and oven dried in a hot air oven (QUB 305010G Gallenkamp UK) at 65°C for 12 hours. The dried flakes were milled using a laboratory mill (Numex
Pep Grinding Mill) and sieved with a mesh size of 150 µm to obtain the flour which was stored in an airtight container until it was ready to be used.

**Production of Cocoyam dough**

Each of the three cocoyam varieties (Xanthosoma sagittifolium, Colocasia esculenta and Colocosia antiguorum) were individually sorted, peeled with a kitchen knife, washed, sliced into smaller pieces and boiled in water for 45 minutes. They were then pounded with a mortar and pestle to make dough which was then packaged in zip lock bag until it was time to use for soup preparation and analysis.

**Production of Cocoyam paste**

Each of the three varieties cocoyam (Xanthosoma sagittifolium, Colocasia esculenta and Colocosia antiguorum) were individually sorted, peeled with a kitchen knife, washed and grated with a stainless steel kitchen grater and then mashed with a wooden spatula to obtain a paste. The paste was kept in zip lock bag prior to use for soup preparation and analysis.

**Table 1: Recipe for soup preparation**

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cocoyam (flour, dough, paste)</td>
<td></td>
</tr>
<tr>
<td>Meat</td>
<td></td>
</tr>
<tr>
<td>Dried fish</td>
<td>70g</td>
</tr>
<tr>
<td>Cray fish</td>
<td>40g</td>
</tr>
<tr>
<td>Onion</td>
<td>10g</td>
</tr>
<tr>
<td>Bitter leave (fresh)</td>
<td>5g</td>
</tr>
<tr>
<td>Salt</td>
<td>5g</td>
</tr>
<tr>
<td>Palm oil</td>
<td>30ml</td>
</tr>
<tr>
<td>Water</td>
<td>1.2 liters</td>
</tr>
</tbody>
</table>

**Method of Soup preparation**

The procedure of Allen et al., (2019) was used to prepare soups with the flour, dough and paste from each of the three varieties of cocoyam. Stock was prepared with 200g of meat, 70g of dried fish, 10g onions, salt and pepper and allowed to boil for 20 minutes. After removing the meat and fish from the sauce pan, water (1.2 liters) and 30 ml palm oil were added and allowed to cook for 10 minutes. The cocoyam (flour, paste, dough) were then added and allowed to cook for 15 minutes so that it would dissolve and make the soup thicker. Salt, pepper and 40g crayfish were added, cooked for 10 minutes before the addition of meat and fish and further cooking for another 5 minutes. Washed bitter leaves (5g) was added and allowed to cook for a minute before the heat was put off.

**Proximate Analysis**

The method outlined by the Association of Official Analytical Chemists (AOAC, 2012) was utilized in determining the levels of moisture, ash, fat, protein and fiber contents of the samples. The Total carbohydrate content of the samples was obtained by difference (subtracting the sum of percent moisture, crude protein, crude fibre, crude fat, and ash from 100%).

**Mineral Analysis**

Using the method of Onwuka (2005), the mineral composition of the samples were determined with an Atomic Absorption Spectrophotometer (Buck Scientific Atomic Absorption Emission Spectrophotometer model 205, Nowalk, Connecticut, USA).

**Sensory Evaluation**

The 9-point hedonic as described by Iwe (2002) was utilized in determining the sensory qualities of the soups. The soups were evaluated on the basis of their colour, taste, thickness, flavour and overall acceptability by a panel of twenty (20) people recruited from the Department of Home Science and Management as well as the Department of Food Science and Technology. The panelists were not ill or allergic to any of the substances used in the preparation of the cocoyam soup; they also consume the soup regularly and were not sensitive to any of the ingredients.

**Statistical Analysis**

The Analysis of Variance (ANOVA) was performed on the data obtained from all analysis. Duncan Multiple Range Test was utilized in order to determine whether or not there were significant differences (subtracting the sum of percent moisture, crude protein, crude fibre, crude fat, and ash from 100%).
differences between means at 95% confidence level (p<0.05).

Results
The findings of the proximate composition analyses of cocoyam varieties (Xanthosoma sagittifolium, Colocasia esculenta and Colocosia antiguorum) are presented in Table 2. Sample A3 (Colocasia esculenta flour) had the lowest (6.17%) moisture content while sample C3 (Colocasia esculenta paste) had the highest (80.00%). The ash content ranged from 0.59% in sample C2 (Colocosia antiguorum paste) to 5.73% in sample A3 (Colocosia esculenta flour). Crude protein ranged from 0.25% in sample C3 (Colocosia esculenta paste) to 4.25% in sample A2 (Colocosia antiguorum flour). Fat content ranged from 0.20 to 1.39% in sample B3 (Colocosia esculenta dough) and A3 (Colocosia esculenta flour) respectively. Crude fibre content ranged from 2.65 to 14.70% in sample C1 (Xanthosoma sagittifolium paste) and sample A3 (Colocosia esculenta flour) respectively. Carbohydrate content ranged from 15.83 to 74.02% with sample C3 (Colocosia esculenta paste) having the least and sample A1 (Xanthosoma sagittifolium flour) having the highest.

Table 2: Proximate Composition of cocoyam varieties (%)

<table>
<thead>
<tr>
<th>Samples</th>
<th>Moisture</th>
<th>Ash</th>
<th>Crude protein</th>
<th>Fat</th>
<th>Crude Fibre</th>
<th>Carbohydrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>6.80±0.56</td>
<td>5.52±0.09</td>
<td>2.28±0.14</td>
<td>1.28±0.14</td>
<td>10.10±0.00</td>
<td>74.02±0.38</td>
</tr>
<tr>
<td>A2</td>
<td>7.35±0.06</td>
<td>5.39±0.56</td>
<td>4.25±0.30</td>
<td>1.09±0.14</td>
<td>9.68±0.00</td>
<td>72.26±0.66</td>
</tr>
<tr>
<td>A3</td>
<td>6.17±0.25</td>
<td>5.73±0.30</td>
<td>3.77±0.31</td>
<td>1.39±0.15</td>
<td>14.79±0.86</td>
<td>68.34±0.27</td>
</tr>
<tr>
<td>B1</td>
<td>64.96±0.38</td>
<td>1.76±0.21</td>
<td>0.53±0.01</td>
<td>0.49±0.06</td>
<td>3.85±0.00</td>
<td>28.45±0.51</td>
</tr>
<tr>
<td>B2</td>
<td>70.59±0.73</td>
<td>1.73±0.37</td>
<td>0.50±0.11</td>
<td>0.45±0.01</td>
<td>5.99±0.54</td>
<td>20.75±0.79</td>
</tr>
<tr>
<td>B3</td>
<td>77.18±0.80</td>
<td>1.50±0.01</td>
<td>0.32±0.01</td>
<td>0.20±0.01</td>
<td>3.52±0.17</td>
<td>17.29±0.61</td>
</tr>
<tr>
<td>C1</td>
<td>70.11±1.53</td>
<td>0.68±0.01</td>
<td>0.27±0.01</td>
<td>0.27±0.01</td>
<td>2.65±0.00</td>
<td>26.03±1.52</td>
</tr>
<tr>
<td>C2</td>
<td>74.25±0.55</td>
<td>0.59±0.02</td>
<td>0.30±0.09</td>
<td>0.31±0.05</td>
<td>2.73±0.14</td>
<td>21.83±0.57</td>
</tr>
<tr>
<td>C3</td>
<td>80.00±0.06</td>
<td>0.86±0.01</td>
<td>0.25±0.06</td>
<td>0.26±0.00</td>
<td>2.72±0.49</td>
<td>15.83±0.64</td>
</tr>
</tbody>
</table>

Values are means of duplicate determinations. Means within a column with different superscripts are significantly different at (p<0.05).

Key:
A1= Xanthosoma sagittifolium flour  A2= Colocasia antiguorum flour  A3= Colocasia esculenta flour
B1= Xanthosoma sagittifolium dough  B2= Colocasia antiguorum dough  B3= Colocasia esculenta dough
C1= Xanthosoma sagittifolium paste  C2= Colocasia antiguorum paste  C3= Colocasia esculenta paste

Table 3 shows the findings of the mineral content of the cocoyam varieties (Xanthosoma sagittifolium, Colocasia esculenta and Colocosia antiguorum). The samples had varying levels of potassium with the lowest being 546.70 mg in sample C3 (Colocasia esculenta paste) and the highest being 796.10 mg in sample C1 (Xanthosoma sagittifolium paste). The lowest amount of calcium (15.00 mg) was found in sample A1 (Xanthosoma sagittifolium flour) while the largest amount (64.00 mg) was found in sample B3 (Colocosia esculenta dough). Iron concentration varied from 3.03 mg in sample A1 (Xanthosoma sagittifolium flour) to 10.50 mg in sample A3 (Colocosia esculenta flour).

Table 3: Mineral Composition of processed cocoyam varieties (mg/100g)

<table>
<thead>
<tr>
<th>Sample</th>
<th>Potassium</th>
<th>Calcium</th>
<th>Iron</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>565.40±0.91</td>
<td>15.00±0.00</td>
<td>3.03±0.00</td>
</tr>
<tr>
<td>A2</td>
<td>683.00±0.15</td>
<td>20.40±0.46</td>
<td>4.79±0.41</td>
</tr>
<tr>
<td>A3</td>
<td>696.30±0.16</td>
<td>21.30±1.44</td>
<td>10.50±0.74</td>
</tr>
<tr>
<td>B1</td>
<td>618.00±0.00</td>
<td>22.70±1.35</td>
<td>4.58±1.07</td>
</tr>
<tr>
<td>B2</td>
<td>695.50±0.38</td>
<td>18.70±0.11</td>
<td>4.06±0.00</td>
</tr>
<tr>
<td>B3</td>
<td>589.50±0.41</td>
<td>64.00±0.62</td>
<td>4.24±0.32</td>
</tr>
<tr>
<td>C1</td>
<td>796.10±0.07</td>
<td>25.60±0.96</td>
<td>4.12±0.32</td>
</tr>
<tr>
<td>C2</td>
<td>731.10±1.27</td>
<td>19.20±0.20</td>
<td>3.52±0.80</td>
</tr>
<tr>
<td>C3</td>
<td>546.70±0.11</td>
<td>63.70±1.08</td>
<td>3.42±1.23</td>
</tr>
</tbody>
</table>

Values are means of duplicate determinations. Means within a column with different superscripts are significantly different at (p<0.05).

Key:
A1= Xanthosoma sagittifolium flour  A2= Colocasia antiguorum flour  A3= Colocasia esculenta flour
B1= Xanthosoma sagittifolium dough  B2= Colocasia antiguorum dough  B3= Colocasia esculenta dough
C1= Xanthosoma sagittifolium paste  C2= Colocasia antiguorum paste  C3= Colocasia esculenta paste
Table 4 presents the findings of the sensory qualities of soups prepared using several types of cocoyam (Xanthosoma sagittifolium, Colocasia esculenta and Colocosia antiguorum). The rating for the colour of the soup samples ranged from 4.00 to 7.50. Soup prepared with Colocosia antiguorum paste (sample C3) was rated the least while soup prepared with Colocasia esculenta dough (sample B3) was rated the highest for colour. The mean values for the taste of the soups ranged from 4.60 to 7.75 with sample A2 (Colocosia antiguorum flour soup) having the lowest mean value and sample B3 (Colocasia esculenta dough soup) having the highest mean value. The consistency of the soup samples ranged from 3.15 in sample C1 (Xanthosoma sagittifolium paste soup) to 6.85 in B2 (Colocosia antiguorum dough soup). The mean values for the flavour of the soup samples ranged from 4.35 to 7.00 in sample A2 (Colocosia antiguorum flour soup) and sample B3 (Colocasia esculenta dough soup). The overall acceptability of the soup samples ranged from 4.60 in sample C3 (Colocasia esculenta paste soup) to 7.05 in sample B3 (Colocasia esculenta dough soup).

Table 4: Sensory properties of soups produced from cocoyam corm varieties

<table>
<thead>
<tr>
<th>Samples</th>
<th>Colour</th>
<th>Taste</th>
<th>Thickness/Consistency</th>
<th>Flavour</th>
<th>Overall acceptability</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>6.10±1.51</td>
<td>5.10±1.74</td>
<td>5.15±3.23</td>
<td>4.80±2.12</td>
<td>5.55±1.63</td>
</tr>
<tr>
<td>A2</td>
<td>5.05±2.19</td>
<td>4.60±2.28</td>
<td>4.95±2.96</td>
<td>4.35±2.60</td>
<td>4.95±2.12</td>
</tr>
<tr>
<td>A3</td>
<td>6.15±1.49</td>
<td>6.25±2.02</td>
<td>6.05±1.66</td>
<td>6.40±1.43</td>
<td>6.50±1.23</td>
</tr>
<tr>
<td>B1</td>
<td>6.75±1.88</td>
<td>6.60±1.85</td>
<td>5.90±1.74</td>
<td>6.70±1.78</td>
<td>6.70±1.65</td>
</tr>
<tr>
<td>B2</td>
<td>6.95±0.46</td>
<td>6.95±1.57</td>
<td>6.85±1.34</td>
<td>6.90±1.40</td>
<td>7.00±1.29</td>
</tr>
<tr>
<td>B3</td>
<td>7.50±1.00</td>
<td>7.75±0.91</td>
<td>5.45±2.03</td>
<td>7.00±1.48</td>
<td>7.05±0.89</td>
</tr>
<tr>
<td>C1</td>
<td>5.00±2.02</td>
<td>6.20±1.99</td>
<td>3.15±1.72</td>
<td>5.55±2.01</td>
<td>5.10±1.45</td>
</tr>
<tr>
<td>C2</td>
<td>5.45±2.01</td>
<td>6.10±1.33</td>
<td>6.00±2.03</td>
<td>6.05±1.09</td>
<td>6.05±1.39</td>
</tr>
<tr>
<td>C3</td>
<td>4.00±2.20</td>
<td>5.20±2.26</td>
<td>3.20±2.09</td>
<td>5.35±1.59</td>
<td>4.60±1.50</td>
</tr>
</tbody>
</table>

Means within a column with different superscripts are significantly different at (p <0.05).

Key:
A1= Xanthosoma sagittifolium flour soup  A2= Colocosia antiguorum flour soup
A3= Colocasia esculenta flour soup  B1= Xanthosoma sagittifolium dough soup
B2= Colocosia antiguorum dough soup  B3= Colocasia esculenta dough soup
C1= Xanthosoma sagittifolium paste soup  C2= Colocosia antiguorum paste soup
C3= Colocasia esculenta paste soup

Discussion of Findings
The results of the proximate composition of the cocoyam varieties showed no significant difference (p>0.05) in the moisture content of the flour from the three varieties of cocoyam. The flour, dough and paste from the three cocoyam varieties were found to have significant variations with the flour samples having lower moisture content than the dough and paste. The variation in moisture content is attributed to the drying process used for the production of the cocoyam flour. The dough and paste are likely to deteriorate faster than the flour due to the larger proportion of moisture in them. The ability of processed foods to maintain their quality over time is strongly influenced by the amount of moisture they contain (Agunbiade, Ojezele, and Alao, 2015). The amount of ash in a food provide information about the minerals it contains (Agoreyo et al., 2011). The different methods of processing adopted in the study resulted in substantial differences (p<0.05) in the amount of ash in the cocoyam samples. The flour samples had the highest content of ash and there was no significant difference (p>0.05) between the flour from the three cocoyam varieties. The influence of processing may be responsible for the differences in the amount of ash in the various cocoyam samples. The ash content of the different cocoyam flour reported in this study are higher compared with the findings of James, Peter, Charles and Joel (2013) reported values of 3.31 and 3.34% for the ash content of Colocasia esculenta flour.

There was a significant difference (p<0.05) in the crude protein content of the cocoyam samples. The protein content of the cocoyam flour obtained from the three cocoyam varieties also varied significantly indicating that they are distinct from one another. The amount of protein present in the cocoyam dough
and paste did not differ significantly (p>0.05) among the different cocoyam varieties. Drying reduced the moisture in the flour samples, concentrated the dry matter and may be responsible for the higher protein in the flour samples. The findings of this study differed from those of Olaoye and Obidigwe (2018) who reported crude protein content of 8.75% and 8.90% for two varieties of Xanthosoma sagittifolium flour but were comparable to the value (4.72%) reported by Amah et al., (2018) for Xanthosoma sagittifolium flour. There was a significant difference (p<0.05) in the fat content of the cocoyam samples. The dough and paste had a lower percentage of fat compared to the flour samples which could also be due to the lower moisture content in the flour samples. According to Onyeike et al., (2015), the heat applied during drying has the ability to cause fat in food materials to melt thus making them more available and easier to extract. Ukom, Richard and Abasiekong (2018) reported similar values (0.45 to 1.45%) as fat content of cocoyam flour.

The flour samples had higher fibre content than the dough and paste with Colocasia esculenta flour having the highest fibre content. There was no significant difference (p>0.05) in the fibre content of the paste from the three cocoyam varieties. The values are comparable with those of Karim, et al., (2017) for fresh cocoyam elubo (2.30%) and boiled cocoyam elubo (3.80 to 3.83%). The inclusion of fibre in the diet is critical to human nutrition and contributes to maintaining a healthy peristaltic movement (Akinyele and Oloruntoba, 2013). The cocoyam samples differed significantly (p<0.05) in their carbohydrate content. In comparison to the dough and paste, the carbohydrate contents of the flour samples were much higher. In terms of variety, Xanthosoma sagittifolium had higher carbohydrate contents than the other two varieties. The values for the carbohydrate content of the flour samples compares with that of Karim et al., (2017) who reported values between 40.90 and 79.68% for pounded and steeped cocoyam flour.

The significant difference (p<0.05) observed in the mineral content of the cocoyam samples suggests that the processing methods had a significant effect on the mineral content of the cocoyam samples. Potassium varied in terms of variety and processing methods. Xanthosoma sagittifolium paste had the highest content (796.10 mg) of potassium. Among the flour samples, Colocasia esculenta had higher potassium content than the other varieties while for the dough, Colocosia antiquorum had the highest content of potassium. These variations can be attributed to both varietal differences and the effect of processing methods. Previous findings by Wada et al., (2019) reported lower values (120.93 and 129.87 mg) for Xanthosoma sagittifolium flour. Calcium varied substantially among the samples with Colocasia esculenta flour, dough and paste having higher contents of calcium than the other varieties. The values for calcium obtained in this study compares with the values (30.1 - 41.17 mg) reported by Ukom and Okere (2018) for Xanthosoma sagittifolium. Calcium is a nutrient that is necessary for the formation of bones and teeth, maintenance of healthy muscles and nerves and the promotion of immunological function (Rashida, et al. 2014). The variations in the iron content of the cocoyam samples may be attributed to varietal differences and the effect of processing. The highest content of iron (10.50 mg) was obtained in Colocasia esculenta flour. The dough and paste made from Xanthosoma sagittifolium had significantly higher iron content than those from the other varieties. Wada et al., (2019) reported iron content of 8.20 and 9.88 mg for Xanthosoma sagittifolium flour.

The sensory characteristics of foods are significant factors that determine the quality of foods and reflect the preference and level of acceptability of food products among consumers (Chen and Opara, 2013; Natabirwa et al., 2016). The soups cooked with the differently processed cocoyam varieties had significantly different mean scores for their sensory qualities. The soup made with dough from Colocasia esculenta had the highest mean rating of 7.50 for colour, 7.75 for taste, 7.00 for flavour and 7.05 for overall acceptability. In terms of colour and flavour, the soup made with Colocasia antiquorum dough compared favourably with that of Colocasia esculenta dough. The soup made with Colocasia antiquorum dough was rated highest (6.85) for thickness. No significant difference (p>0.05) was observed in the mean values for thickness and overall acceptability of the soups prepared with dough from the three cocoyam varieties. This suggests that soups prepared with cocoyam dough were the most acceptable. The findings revealed that preference for cocoyam soup was not based on the variety of cocoyam but on the method processing.
Conclusion
The findings of the study revealed that the processing techniques that were used had an effect on the proximate composition of the three different cocoyam varieties. The flour samples contained the lowest amounts of moisture and the highest ash, crude protein, fat, fibre and carbohydrate contents. A longer shelf life can be expected for each of the three forms of cocoyam flour due to their low moisture contents. The mineral composition of the samples varied based on the variety and processing methods with Colocasia esculenta having higher calcium contents for all the processing methods used in the study. The sensory qualities of the soups made with cocoyam flour were rated lower than the other soups. The soup prepared with Colocasia esculenta dough was the most acceptable in terms of colour, taste, flavour and overall acceptability. Soups made with dough from the three varieties were most acceptable to the consumers. Thus the use of dough from the three cocoyam varieties for soup preparation is advocated due to their high acceptability.

References


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