Some Physicochemical Characteristics of Defatted Flours Derived from African Walnut (Tetracarpidium conoform): An Underutilized Legume

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Abstract: The nuts of African Walnut were processed into flour and a portion defatted and the samples were analyzed for proximate composition, water absorption capacity, solubility, bulk density and rapid visco characteristics. Results showed that the flour is rich in protein and fat (21.6 and 47.7%) respectively. The defatted samples have higher solubility, water absorption capacity, peak viscosity breakdown values, final viscosity and set back values when compared with undefatted sample. This result indicates that defattting of African Walnut flour improves the pasting characteristics of the flour whose high protein content makes a good protein supplement.

Key words: Defatted flour, undefatted flour, legumes, Tetracarpidium conoform, protein deficiency

INTRODUCTION

In the developing countries legumes have high acceptability and utilization due to their importance as sources of dietary protein. African Walnut (Tetracarpidium conoform) has a long history as food plant and is grown by peasant farmers across West African rain forest. The climber bears capsules which are greenish in colour when young and greenish-yellow when fully ripe. They contain four shelled seeds (Willis, 1968). The seeds take 4-6 months to mature and are found in the local markets between the months of June and September. In Nigeria, it is traditionally eaten as nut after boiling (Akpuka and Nwankwor, 2000). African Walnut is included in the list of lesser known food stuff (Achievement, 1998), while Ogunsina and Ddebo (1983) and Osogie et al. (1986) reported that it is rich in protein (22.8-23.5%) and Fat (41.5-50). In the light of the nutritional values of Africa Walnut, (Tetracarpidium Conoform) the flour derived from the nut could serve as protein supplement in food formulation.

The present study aims at studying the physicochemical and pasting characteristics of defatted and undefatted flours derived from African Walnut.

MATERIALS AND METHODS

Sample preparation: Mature nuts of African Walnut were purchased from Oye Awhu market of Enugu State, Nigeria. The shells were removed and seeds milled in an attrition mill and dried in an electric oven at 40°C. One half of the sample was defatted using hexane while the other half remained undefatted.

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should be exploited as an oil seed. In this regard, it has been used for the generation of dry oil (Akpuaka and Nwankwor, 2000; Tchiegang, 2001).

**Effect of defatting on some functional properties of flour derived from *Tetracarpidium conophorum* (African Walnut):** The result of defatting on the solubility, water absorption capacity and bulk density of flour derived from African Walnut is shown on Table 2. The results indicated that solubility of the defatted was 18.4±1.6%, while that of defatted flour was 25.3±1.5%. The water absorption capacity of defatted and undefatted flour was 108±40% and 103±3.4%, respectively. The bulk density of defatted and undefatted flour was 563±0.11 and 0.31±0.13 (wt/vol). This results show that defatted flour had increased solubility and water absorption capacity when compared to undefatted flour. The use of any flour as food ingredients is depended on the water-flour interaction, which determines the rehydration of flour. The higher solubility percentage and water absorption capacity of defatted flour of *T. conophorum* may be attributed to the removal of the non-polar groups that interfere with the flour-water interaction (Nputong and Weldran, 2002).

**Effect of defatting on the pasting characteristics of flour derived from African Walnut:** Results of the Rapid Visco Analysis (RVA) indicated that defatted flour had a peak viscosity of 183±5.2, a breakdown value of 136.83±4.0 and a final viscosity of 531.25±8.4 (Fig. 1). Lower RVA values were obtained for undefatted flour, 32.25±3.5, 29.92±3.2 and 42.33±3.4, for peak viscosity, breakdown value and final viscosity, respectively (Fig. 2). The set back value, pasting time and pasting temperature for defatted and undefatted flour are shown in Table 3. Again defatted flour had higher set back value 394.42±6.1, compared to undefatted flour 12.42±3.4. The pasting time was 5.6 and 6 min, while the pasting temperature was 77.3°C and 80°C for defatted and undefatted flour, respectively.

The pasting characteristics of flour determine their best use in food processing which in most cases are dependent on the botanical species of plants (Okoli, 1998). The viscosity of starch paste after heating and stirring at a maximum temperature for 15 min define the stability of the starch granules and the ability of the

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**Table 1:** Proximate composition of *Tetracarpidium conophorum* (African Walnut)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Composition (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>9.5</td>
</tr>
<tr>
<td>Protein</td>
<td>21.6</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>16.9</td>
</tr>
<tr>
<td>Fat</td>
<td>47.7</td>
</tr>
<tr>
<td>Crude fibre</td>
<td>2.9</td>
</tr>
<tr>
<td>Ash</td>
<td>2.4</td>
</tr>
</tbody>
</table>

Values are means of three replicates

**Table 2:** Effect of defatting on the solubility (%), water absorption capacity (%) and bulk density (wt/vol) of flour derived from African Walnut

<table>
<thead>
<tr>
<th>Flour</th>
<th>Water absorption capacity (%)</th>
<th>Solubility (%)</th>
<th>Bulk density (wt/vol)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defatted</td>
<td>130±3.4</td>
<td>25.3±1.5</td>
<td>0.31±0.13</td>
</tr>
<tr>
<td>Undeferred</td>
<td>108±4</td>
<td>18.4±1.6</td>
<td>0.58±0.15</td>
</tr>
</tbody>
</table>

Values are means of three replicates

**Table 3:** Effect of defatting on the rapid visco characteristic of flour of *Tetracarpidium conophorum* (African Walnut)

<table>
<thead>
<tr>
<th>Flour</th>
<th>Set back value</th>
<th>Pasting time</th>
<th>Pasting temp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defatted</td>
<td>304.4±6.1</td>
<td>6.0</td>
<td>80.0</td>
</tr>
<tr>
<td>Undeferred</td>
<td>12.4±3.4</td>
<td>6.0</td>
<td>80.0</td>
</tr>
</tbody>
</table>

Values are means of three replicates

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![Fig. 1](image1.png)

**Fig. 1:** Peak viscosity, breakdown value and final viscosity of defatted flour of African Walnut (*Tetracarpidium conophorum*)

![Fig. 2](image2.png)

**Fig. 2:** Peak viscosity, breakdown value and final viscosity of undefatted flour of African Walnut (*Tetracarpidium conophorum*)

swollen starch to resist deformation and bustling during constant heating and stirring (Morris, 1990). On the other
hand, the set back value is a measure of recrystallization of gelatinizing flour (retrogradation) and is a function of amylose and amylopectin configuration (Okoli, 1998). The low peak viscosity, breakdown value and set back value of the undefatted flour indicate that the flour would be more stable when compared with defatted flour. This may be due to the fact that the granules of defatted flour may have been made weaker by the removal of fat. The high set back value of defatted flour has an implication for the use of the flour in preparation of foods when a gel of high rigidity is needed as in bread making. In such instances, undefatted flour of T. conophorum may be preferred.

Conclusions: It may be concluded from this study that defatted flour derived from African Walnut with high protein content, high water absorption capacity, high solubility and good pasting characteristic could be used as composite flour in preparation of bread and other confectionaries. The African Walnut could also be exploited as an oil seed.

REFERENCES