Comparative Studies of The Proximate Composition of Three Body Parts of Two Freshwater Prawns’ Species From Ovia River, Edo State, Nigeria.

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Abstract: The proximate composition of the whole prawn, exoskeleton and edible portion of *Macrobrachium vollenhovenii* and *M. macrobrachion* collected from Ovia River, Edo State, Nigeria were determined. All parameters analyzed were present in all the body parts of the two species, but the crude fibre was not detected in the exoskeleton of *M. macrobrachion*. The proximate composition of the body parts of *M. vollenhovenii* for whole prawn, edible portion and exoskeleton was: 93.12%, 94.13% and 94.17% dry matter; 7.09%, 5.87% and 5.97% Moisture; 25.33%, 20% and 34.67% Ash; 53.38%, 53.85% and 38.50% Crude protein; 11%, 15.67% and 4.67% Ether extract; 1%, 1% and 0.33% Crude fibre; 9.29%, 9.48% and 21.83% NFE; while for *M. macrobrachion* the values are: 92.66%, 92.37% and 94.43% Dry matter; 7.43%, 7.63% and 5.7% Moisture; 22.6%, 21% and 40.67% Ash; 77.33%, 79% and 59.33% Organic matter; 56.16%, 58.92% and 40.56% Crude protein; 10.33%, 10.67% and 6.67% Ether Extract; 1%, 1% and 0% Crude fibre; 10.18%, 8.41% and 12.10% NFE. There was no significant difference (P>0.05) in all the parameters analyzed for the two species except in the moisture content of the exoskeleton and the edible portion in the two species that showed a significant difference (P<0.05). Proximate composition results showed that these prawns can serve as an alternative source of high quality protein, energy and mineral supply for human consumption and for feed formulation for animals.

Key words: *Macrobrachium*, proximate composition, body parts.

INTRODUCTION

Shellfish provide high quality protein with all the dietary essential amino acids for maintenance and growth of the human body (Dong, 2001). Shrimps caught from fresh, marine and brackish waters and ponds of various types are becoming delicacies in Nigeria. They are eaten either whole (Shell and flesh) after drying or as flesh alone (when fresh) and the exoskeleton is used for animal feeds. Crustaceans constitute important nutritional component in the diet of rural and urban communities in Nigeria (Fasakin *et al.*, 2000) while some species are widely distributed, others are found in restricted areas and they are regarded as delicacies; Over 90% of crustaceans consumed in Nigeria are obtained from coastal artisanal and freshwater fisheries (Food and Agriculture organization/United nations Development Programme, (FAO and UNDP) 1989). The chemical composition and nutritional properties of aquatic crustaceans are important in their uses as sources of protein to significant proportion of the world population, particularly in developing countries where animal protein is expensive and beyond the reach of the poor man (Bello-Olusoji and Oke, 2005). It was reported that animal protein intake by Nigerians has been very low in recent times due primarily to decrease in per caput animal production and rising growth in the human population. Prawns/Shrimps have become the major source of animal protein to low income earners due to its low price and availability (Adeyeye, 1996). It is valuable in the diet because apart from supply of good quality protein and vitamins A and D, it also contain several dietary minerals such as calcium and Iron etc. which are beneficial to humans and animals (Abulude *et al.*, 2006). The importance of prawns in Nigeria has been enumerated by Balogun and Akegbejo-Simeon, 1992; Rosenbery, 1992 and Adeyeye 2000. Previous research efforts on prawns in many tropical Countries have focused on their biology, ecology, breeding cultural management and chemical composition especially in the Western part of the countries. The present study is intended to provide information on the chemical composition of body parts of some freshwater prawns in Ovia River, Edo State Nigeria.

MATERIALS AND METHODS

Prawn samples (*Macrobrachium vollenhovenii* and *M. macrobrachion* were purchased from fishermen at Ikoro fish landing site on Ovia River. The prawn samples were separated into three body parts: whole prawn, edible portion (flesh walking legs) and exoskeleton and these were oven dried at 85°C, ground in a Kenwood blender packed in polythene bags with labels and stored in a desicator for subsequent chemical analysis. Percent moisture, ash, crude fat and crude protein and NFE were obtained for all samples using methods described by Association of Official Analytical Chemist (AOAC), (1980). Triplicate samples (5g) were weighed, then incinerated in a thermolyne muffle furnace at 550°C overnight and total ash was calculated.
Crude protein was determined using a macro-Kjeldahl method with a Copper catalyst. Total lipid and oil extraction were determined by the method of Bligh and Dyeru, (1959). All analysis was carried out in triplicates.

RESULTS AND DISCUSSION

The mean weight composition of the prawns is as shown in Table 1.

**Table 1:** The weight Compositions of Palaemonid Prawn.

<table>
<thead>
<tr>
<th>Name</th>
<th>Whole Prawn</th>
<th>Edible portion (flesh)</th>
<th>Exoskeleton</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>M. vollenhovenii</em></td>
<td>41.64 ± 3.91 (35-48.88)</td>
<td>28.63 ± 8.72 (17.07-45.73)</td>
<td>4.99 ± 1.69 (2.73 – 8.29)</td>
</tr>
<tr>
<td><em>M. macrobranchion</em></td>
<td>29.63 ± 3.26 (24.69 – 35.78)</td>
<td>18.46 ± 0.83 (17.61 – 20.12)</td>
<td>2.12 ± 0.12 (1.91 – 2.34)</td>
</tr>
</tbody>
</table>

**Table 2:** Proximate Composition of Prawns analyzed (Dry Matter). (g 100g⁻¹).

<table>
<thead>
<tr>
<th>Parameter (%)</th>
<th>Whole prawn</th>
<th>Edible portion (flesh)</th>
<th>Exoskeleton</th>
<th>Whole prawn</th>
<th>Edible portion</th>
<th>Exoskeleton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>7.09 ± 0.54</td>
<td>5.87 ± 0.67</td>
<td>5.97 ± 0.42</td>
<td>7.34 ± 0.39</td>
<td>7.63 ± 0.64</td>
<td>5.57 ± 0.21</td>
</tr>
<tr>
<td>Ash</td>
<td>25.33 ± 1.53</td>
<td>20 ± 4.58</td>
<td>34.67 ± 4.16</td>
<td>22.67 ± 5.13</td>
<td>21 ± 2.65</td>
<td>40.67 ± 11.72</td>
</tr>
<tr>
<td>Crude protein</td>
<td>53.38 ± 4.38</td>
<td>53.85 ± 5.65</td>
<td>38.50 ± 2.31</td>
<td>56.15 ± 3.82</td>
<td>58.92 ± 4.49</td>
<td>40.56 ± 8.47</td>
</tr>
<tr>
<td>Ether extract</td>
<td>11.00 ± 0</td>
<td>15.67 ± 2.89</td>
<td>4.67 ± 2.08</td>
<td>10.33 ± 1.53</td>
<td>10.67 ± 2.30</td>
<td>6.67 ± 1.15</td>
</tr>
<tr>
<td>Crude fibre</td>
<td>0 ± 0</td>
<td>0 ± 0</td>
<td>0 ± 0</td>
<td>0 ± 0</td>
<td>0 ± 0</td>
<td>0 ± 0</td>
</tr>
<tr>
<td>NFE</td>
<td>9.29 ± 5.88</td>
<td>9.48 ± 4.84</td>
<td>21.83 ± 1.25</td>
<td>10.18 ± 0.63</td>
<td>8.41 ± 3.09</td>
<td>12.10 ± 11.35</td>
</tr>
</tbody>
</table>

*M. vollenhovenii* was larger than *M. macrobranchion*. Table 2 and Figures 1-6 shows the proximate composition of the prawn samples. All the results were expressed on a dry weight basis. Higher level of moisture content was noticed in the whole prawn and the flesh of *M. macrobranchion* than that of *M. vollenhovenii*. The ash content obtained from *M. macrobranchion* was 22.67 ± 5.13% (whole prawn) 21 ± 2.65% (flesh), 40.67 ± 11.72% (exoskeleton) and 25.33 ± 1.53% (whole prawn), 20 ± 4.58% (flesh), 34.67 ± 4.16% (exoskeleton) from *M. vollenhovenii* which were very high compared to other results of prawn species. *C. Africana* with 2.59 ± 0.025% and 1.34 ± 0.05% from *M. vollehovenii* (Bello Olusoji, 2006), (Crab) having B. niger 2.78% lipids (Fasakin et al., 2000). The ash content was high in the samples containing the exoskeleton with values ranging from 22.33 – 40g/100g. The ash content of any sample is a measure of the likely mineral content of such a sample. High ash content in freshwater prawns is due to the high level of chitin strengthened with a high level of calcium metal in the exoskeleton. This high level of ash has been observed in the exoskeleton of shrimps found in Lagos Lagoon (Adeyeye, 2000). Chitin is a linear polymer of acetyl D-glucosamine that has properties similar to cellulose in many respects (MacDonald, 1991). It is involved in various physiological processes (Finar, 1975). The structure of the glucosamine will show that it must have contributed to both the carbohydrate and protein values. The result of the proximate analysis (Table 2) shows that the protein content in the samples was high with respect to other nutrient composition. High level of protein was obtained in all the body parts of both species with the highest level occurring in the edible portion. The crude protein level of the whole prawn (53.38 ± 4.38%) and edible portion (53.85 ± 5.65%) of *M. vollenhovenii* was higher than that recorded for the exoskeleton protein (35.88%). This finding agrees with that of Ravichandran et al., (2009) with protein level of 41% (flesh) and 32.5% (shell) from *P. indicus*. The result of the protein content is higher than that obtained by Bello-Olusoji et al., (2006) with protein content for *C. Africana* was 18.98 ± 0.02%, *P. notialis* (20.57 ± 0.05) and *B. niger* (18.52 ± 0.01). The protein content of *M. vollenhovenii* and *M. macrobranchion* compares favourably with the protein content of other conventional feed stuff of animal origin. Thus, this high protein content may be valuable for food formulation as protein replacement for other expensive animal protein source in feed production. The ether extract for *M. vollenhovenii* was 11. ± 0, 15.67 ± 2.89 and 4.67 ± 2.08 whole prawn, edible portion and exoskeleton respectively and that of *M. macrobranchion* with 10.33 ± 1.53, 10.67 ± 2.30 and 6.67 ± 1.15 for the whole prawn edible portion and the exoskeleton respectively. These findings were quite high compared with findings of other scientists carried out on prawns and shrimp. The values were higher than the extract of other crustacean oil compared with *M. vollenhovenii* 7.62 ± 0.21%, *P. notialis* 3.90 ± 0.06% *C. Africana* 5.57 ± 2.05 but lower than *M. macrobranchion* 17.97 ± 0.09% (Fasakin et al., 2000, Bello-Olusoji and Oke, 2005). The little variation between this report and the work of these authors may be due to season and prawn sizes. The high fat content of the flesh of *M. vollehovenii* will allow them to contribute significantly as a source of non-visible oil to any diet they may be present. Crude fibre content observed in this study was quite low in the whole prawn and the flesh of both species but absent in their exoskeleton. This is contrary to the findings of Ravichandran et al., (2009) who recorded a higher level of 8.2% (flesh) and 8.7% (Shell) of *P. indicus*.
Carbohydrate (NFE) content of exoskeleton (21.83%) from *M. vollenhovenii* was higher than that of the whole prawn (9.29%) the flesh (9.48%) and shell (1.5%). This result is contrary to that from *P. indicus* whose NFE content was higher in the flesh (2.4%) than the level in the shell (Ravichandran et al., 2009). While the results of NFE in *M. macrobrachion* was in agreement with the findings of Ravichandran et al., (2009), with NFE in the exoskeleton (3.62%) lower than that of the whole prawn (10.18%) and the flesh (8.41%).

Comparison between whole prawn, flesh and exoskeleton shows that high level of protein, carbohydrate, ether extract, fibre and moisture content was reported in the whole prawn and flesh tissues. Likewise higher level of NFE was observed in the exoskeleton of *M. macrobrachion* and the ash content in the exoskeleton of both species studied.

Fig. 1: The moisture content of body parts of *M. vollenhovenii* and *M. macrobrachion* from Ovia River.

Fig. 2: The Ash content of body parts of *M. vollenhovenii* and *M. macrobrachion* from Ovia River.

Fig. 3: The crude protein content of body parts of *M. vollenhovenii* and *M. macrobrachion* from Ovia River.

Fig. 4: The Ether extracts content of body parts of *M. vollenhovenii* and *M. macrobrachion* from Ovia River.
Fig. 5: The Crude fibre content of body parts of *M. vollenhovenii* and *M. macrobrachion* from Ovia River.

Fig. 6: The carbohydrate content of body parts of *M. vollenhovenii* and *M. macrobrachion* from Ovia River.

**Conclusion:**

The results of this investigation reported that the flesh and *M. vollenhovenii* and *M. macrobrachion* shows maximum level of protein, carbohydrate, ether extract and moisture content was observed in the whole prawn and the edible portion. Likewise ash content was noticed in the exoskeleton of the prawns. This findings of minerals composition in the body parts reported that mineral content was high in exoskeleton samples than the whole prawn and the edible portion. The results indicated that both prawns are good sources of proteins, metabolically energy and average mineral supply based on the ash content and shell of both species these prawns can serve as an alternative source of high quality protein for human consumption and for feed formulation for animals.

**REFERENCES**


