NUTRIENT COMPOSITION OF MACROPHYTES HARVESTED FROM IN ONAH LAKE

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ABSTRACT

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Aquatic macrophytes play a fundamental role in the nutrient cycling of water bodies. Three species of macrophytes were harvested in their lush green condition from Onah Lake, monthly for six (6) months (December-May, 2012). They were transported in sterile polyethylene bags to the Fisheries Laboratory of Delta State University, Asaba Campus. Nutrient composition was determined from cut leaves and petioles of macrophytes. Data analysis revealed that the mean moisture content of macrophytes varied from 48.65±0.65 to 54.80±0.80%. The highest value on ash content was recorded for Ceratophyllum demersum (7.85 ± 0.85%) followed by records for Eichhornia crassipes (6.70 ± 0.70%) while Pistia stratiotes (1.65 ± 0.65%) took the least position. Ether extract was higher in Ceratophyllum demersum (2.70 ± 0.70%) than in Pistia stratiotes (1.15 ± 0.15%). The protein content of the macrophytes varied from 15.80 ± 0.80 to 21.65 ± 0.65%. The crude fibre content had its highest value in Eichhornia crassipes (13.90 ± 0.90%) followed by their value in Pistia stratiotes (12.60 ± 0.60%), while nitrogen free extract values varied from 1.95 ± 0.95 to 10.50 ± 0.50%. Observed Duncan Multiple Range Test (DMRT) values revealed that differences occurred among the parameters analyzed except for ether extract where there was no difference between values recorded for Eichhornia crassipes (2.65 ± 0.63%) and those recorded for Ceratophyllum demersum (2.70 ± 0.70%). However, ether extract values for both macrophytes were different from those of Pistia stratiotes (1.15 ± 0.15%). The study revealed that the harvested macrophytes were of high nutrient composition. They could be successfully used as one of the rich ingredients in fish feed preparation. It is therefore recommended that they be harnessed, conserved and used during fish feed compounding.

Keywords: Composition, Macrophytes, Nutrient, Onah Lake

INTRODUCTION

Macrophytes play fundamental roles in nutrient cycling of water bodies and provide suitable habitats for many other animals. They also influence physico-chemical properties and nutrients availabilities of water bodies (Pompêo and Moschini-Carlos, 2003). According to Gupta (2001) they grow profusely in lakes, ponds and other waterways all over the world where sometimes, they appear weedy. Macrophytes have been categorized as floating, submerged and emergent. For centuries, aquatic macrophytes were perceived as nuisance rather than for resource, because they block canals, hinder boat traffic and increase water borne diseases. In the recent past, different researchers explored the possibilities of using them as feed source for livestock (Deepa et al., 2009; Shah, 2010) and in medicine (Nagma and Sarwat, 2005). In Jammu and Kashmir (in western state of India) numerous species (Nymphoides, Rannunculus, Nymphaea, Hydriella, Azolla, Nelumbo and Trapa) have been identified from different water bodies (Bhat, 2002). According to Banerjee and Matai (1990), the following macrophytes (Allamania nodiflora, Azolla pinnata, Enhydra fluctuans, Eichhornia crassipes, Ipomoea reptans, Hydriella verticillata, Lemma minor, Limnanthemum cristatum, Limnophila heterophylla, Lippia germinata, Marsilea quadrifliria and Pistia stratiotes) which are rich in various nutrients have been suitable ingredients for livestock feed. Esteves and Suzuki (2010) who compared the nutrient qualities of water bodies and those of macrophytes present in them, reported that no relationships existed between them. Kasige and Takashi (2009) reported that the amount of nitrogen and phosphate, as well as the availability of underwater radiation were characteristically the most critical factors for the development of submerged macrophytes. They also reported that aquatic macrophytes differ widely in their chemical compositions, depending upon species, season and location. According to Shah et al., (2010) Nymphaea and Nymphoides possessed crude protein contents of 20% higher than those in Berseem hay, whose value and those of other conventionally used livestock feeds were 15-17%. They opined that Nymphaea alba had medicinal properties and a perusal of literature reveals that most plants contain traces of alkaloids and polyphenols within recommended ranges (Bondi and Alumot, 1987 and Banerjee and Matai, 1990). According to Boyd and Blackburn (1970), the proximate composition of dry specimens of (Alternanthera philoxeroides, Vellisneria americana, Hydriella verticillata, Naphar advena, Najas guadalupenerio, Eichhornia crassipes and Pistia stratiotes) revealed that they were much richer in ash than in forage species. However, the reverse was the case for their wet weight whose values would probably, be similar to those of most forage crops.
The present study identified aquatic macrophytes in Onah Lake. It also ascertained if the nutrient composition of such macrophytes were appropriate to be used as feed ingredients in fish feed preparation in the Asaba environment and beyond.

MATERIALS AND METHODS

Macrophytes collection and Preparation

Three species of macrophytes were harvested in their lush green condition from Onah Lake, on monthly basis for six (6) months (December-May, 2012). They were placed in sterile polyethylene bags and transported to the Fisheries Laboratory of Asaba Campus, Delta State University. Delta State where few leaves and petioles from each macrophyte was analyzed for proximate composition. The macrophytes were washed thoroughly in clean water, drained on filter paper, weighed and dried in an oven at 100°C to constant weight for dry matter determination. Dried samples were ground in the mill and preserved in sterile sachets. They were stored at room temperature until analyzed (AOAC, 2002).

Data analysis

Proximate composition of macrophytes, were evaluated by one way analysis of variance at P < 0.05 level of significance. Duncan Multiple Range Test (DMRT) was used to separate the means.

RESULTS

The moisture content of specimens varied from 48.65±0.65 to 54.80±0.80. The highest value was recorded in *Pistia stratiotes* (54.80 ± 0.80\(^a\)). Ash content recorded its highest value in *Ceratophyllum demersum* where the data observed (7.85 ± 0.85\(^a\)) was succeeded by *Eichhornia crassipes* with a value of (6.70 ± 0.780\(^a\)). The least data was recorded in *Pistia stratiotes* having a value of (1.65 ± 0.65\(^a\)). Ether extract of specimen was highest in *Ceratophyllum demersum* with a value of (2.70 ± 0.70\(^a\)) while the least was observed in *Pistia stratiotes* having a value of (1.15 ± 0.15\(^a\)). Protein content of samples varied from 15.80±0.80 to 21.6±50.65. The crude fibre content recorded its highest value in *Eichhornia crassipes* (13.90±0.90\(^b\)) followed by *Pistia stratiotes* with a value of (12.60 ± 0.60\(^b\)) while nitrogen free extract values varied from 1.95 ± 0.95 to 10.50 ± 0.50 Table 1. Analysis of variance revealed that there were significant differences (p<0.05) for all the parameters examined except for ether extract where no significant difference (p>0.05) was observed between *Eichhornia crassipes* (2.65±0.65\(^a\)) and *Ceratophyllum demersum* (2.70 ± 0.70\(^a\)). However, both macrophytes were significantly different (p<0.05) from *Pistia stratiotes* (1.15±0.15\(^b\)), Table 1.

Table 1: Mean comparison of nutrients found in macrophytes harvested from Onah Lake

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Eichhornia crassipes</th>
<th>Pistia stratiotes</th>
<th>Ceratophyllum demersum</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC (%)</td>
<td>48.65±0.65(^a)</td>
<td>54.80±0.80(^a)</td>
<td>51.70±0.30(^b)</td>
</tr>
<tr>
<td>AC (%)</td>
<td>6.70±0.70(^b)</td>
<td>1.65±0.65(^c)</td>
<td>1.15±0.15(^b)</td>
</tr>
<tr>
<td>EE (%)</td>
<td>2.65±0.65(^a)</td>
<td>1.65±0.65(^c)</td>
<td>1.15±0.15(^b)</td>
</tr>
<tr>
<td>CP (%)</td>
<td>21.65±0.65(^a)</td>
<td>15.80±0.80(^c)</td>
<td>19.65±0.65(^b)</td>
</tr>
<tr>
<td>CF (%)</td>
<td>13.90±0.90(^a)</td>
<td>12.60±0.60(^a)</td>
<td>11.70±0.70(^c)</td>
</tr>
<tr>
<td>NFE (%)</td>
<td>1.95±0.90(^a)</td>
<td>10.50±0.50(^a)</td>
<td>2.90±0.90(^b)</td>
</tr>
</tbody>
</table>

Means with the same superscript on the horizontal line are not significantly different (P>0.05). MC = Moisture content, AC = Ash Content, EE = Ether Extract Content, CP = Crude Protein Content , CF = Crude Fibre Content and NFE = Nitrogen Free Extract and ± =standard error of the mean.

DISCUSSION

The present study shows that *Eichhornia crassipes, Pistia stratiotes and Ceratophyllum demersum* were the only macrophytes found in Onah Lake. This observation indicates that the lake was poor in macrophytes when compared with the numerous species found in other water bodies (Banerjee and Matai, 1990 and Bhat, 2002). The moisture content of macrophytes are high. This observation is expected, arising from the fact that since the macrophytes inhabit aquatic environment, their moisture content was bound to be high. This assertion was also reported in other macrophytes (Boyd and Blackburn 1970; Banerjee and Matai, 1990 and Shah et al., 2010).

The range of crude protein (15.80±0.80 to 21.65±0.65) in this study shows that they are quite high. They are comparable with those of Shad et al, 2010 (17.10 to 21.87), but lower than those reported by Boyd and Blackburn 1970 (9.3 to 43.3), Banerjee and Matai, 1990 (8.7 to 25.8). Shah et al. (2010) was of the opinion that the protein content of macrophytes might vary with species, season of the year, locality and water distribution. This finding show that the harvested macrophytes were potentially, very rich sources of concentrated protein for human consumption and will be a conducive material for the preparation of feed for livestock and or fish. Ash content
was higher in *Ceratophyllum demersum* while the least was recorded in *Pistia stratiotes*. The observed range of ash content in the macrophytes indicates that the species are likely good sources of such minerals as calcium, potassium, iron, and magnesium as reported (Boyd and Blackburn 1970; Olagunju et al., 2012; Effiong and Fakunle, 2012).

Following the classification of fish, on the basis of their fat contents into lean fish (with fat content of less than 5%), medium fat fish (with fat content of 5-10%) and fatty fish (having fat content of more than 10% by weight) Suriah et al, (1995); the same criteria could also be used for macrophytes. Based on this classification, the macrophytes were classified as lean fat plants (Table 1) as also observed by Shah et al. (2010).

**CONCLUSION**

From the present study, it could be concluded that the high nutrient composition of the few macrophytes harvested suggests that they are composed of essential feed ingredient for fish nutrient. It is therefore advised that they be harnessed, conserved and used in compounding fish feed.

**REFERENCES**


