ABSTRACT
This study was done on the proximate composition of aqueous extract of *Curcuma longa* (Turmeric). The rhizomes were collected, washed in a tap water to remove adhering debris. Later, it was sliced into chips and dried for 7 days. The dried chips were grounded into fine powder using a blender. 20g of the grounded sample was weighed and extracted in 100ml of distilled water. The extract produced was subjected to proximate analysis. The proximate analysis was carried out as specified by (Onwuka, 2005). The percentage proximate composition results obtained from *Curcuma longa* (Turmeric) extract reveals each parameter to be; moisture content 4.0±0.3, ash content 4.6±0.7, crude fiber content 15.21±3.2, fat/ether extract 16.5±1.2, crude protein 0.1±0.02 and carbohydrate 56.3±4.3 at the end of the research work. This reveals that the plant extract is a good source of carbohydrates when compared with the recommended dietary allowance of 130g (Pamela *et al.*, 2005).

KEYWORDS: Proximate analysis, aqueous extract, *Curcuma longa* (Turmeric).

INTRODUCTION
In recent times, investigations of medicinal plants are getting importance among researchers both for human health and food industries (Dorman *et al.*, 2000). Foods preserved with natural additives have become popular due to greater consumer awareness and concern regarding synthetic chemical additives. Turmeric (*Curcuma longa*) is extensively used as spice, food preservatives and coloring material in some parts of the world, for example in India, China and South East Asia.
Various sesquiterperies and curcuminoids haven been isolated from the rhizome of *Curcuma longa*, attributing it with a wide array of biological activities, anti-inflammatory (Aggarel *et al.*, 2005) and anti-bacterial activity (Guptua *et al.*, 2005). This work sought to determine the percentage proximate constituent of turmeric extract in order to exploit its nutritional and medicinal potentials in the treatment of diseases that affect humans.

**MATERIALS AND METHODS**

**Sample Collection**

The turmeric plant was obtained from Arugo market along Onitsha road, Owerri, Imo state and was identified by Dr. Duru C. N., a Botanist in the Department of Biological Sciences, Federal University of Technology, Owerri, Imo state.

**Sample Preparation**

Fresh turmeric rhizomes collected were washed in a tap water to remove adhering debris sliced into chips and dried for 7 days. Dried chips were grounded into fine powder using a blender. 20g of the grounded sample were weighed out and dispersed in 100ml of distilled water. The mixture were stirred and allowed to stand for 48 hours. The sample was extracted using No. 1 Whatman filter paper into a conical flask. The extract produced which was grouped into three samples A, B, C with varying proportions were subjected to proximate analysis. The proximate analysis was carried out as specified by (Onuka, 2005).

**Determination of the Percentage Proximate Analysis (Onwuka, 2005)**

**Determination of Crude Protein**

**Procedure**

**Digestion:** 2g of sample was weighed out and placed in the kjehdahl flask, 5g of sodium sulphate, 0.5g of copper sulphate, 25ml concentrated sulphuric acid and a speck of selenium tablets were weighed out and added to the flask. Heat was applied in a fume board slowly at first undue frothing, the digestion continued for 45minutes until the digester became clear pale green. It was allowed to completely cool and 100ml of distilled water rapidly added to it. The digestion flask was rinsed 2-3 times and the rinsing was added to the bulk.

**Distillation:** The distillation apparatus was steamed up and 10ml of the digest was added into the apparatus through a funnel and it was allowed to boil. 10ml of sodium hydroxide was added using measuring cylinder to prevent ammonia from being lost. It was distilled into 50ml of 2% boric acid containing screened methyl red indicator.
**Titration:** The alkaline ammonium borate formed was titrated directly with 0.1N HCL. The titre value which is the volume of the acid used was recorded which was used in the formular below.

\[
\% N = \frac{(14 \times V_A \times 0.1)}{100 \times 100} \times W
\]

Where \( V_A \) = Volume of acid used
\( W \) = Weight of sample

\% crude protein= \( \% N \times \) conversion factor (6.25)

**Determination of Crude Lipids/ Fats**

In this method, the fat was extracted from the sample with petroleum ether and evaluated as percentage of the weight before the solvent is evaporated.

**Procedure**

100ml of petroleum ether of boiling point ranging from 40°C to 60°C was placed in a flask and 2g of the sample was weighed into a thimble and plugged with a cotton wool. The thimble with its content was placed into the extractor and the ether in the flask and then heated. As the ether vapour reaches the condenser through the side arm of the extractor, it condenses into a liquid form and then drops back into the sample in the thimble. The ether-soluble substances were dissolved and carried into solution through the siphon tube back into the flask for 6 hours. The thimble was removed and solvent distilled from the flask into the extractor. The flask was disconnected and placed in an oven at 650°C for 6 hours, cooled in a desicatior and weighed.

\[
\% \text{ Crude fat/ lipid} = \frac{\text{weight of flask + extract} - \text{tare weight of flask}}{\text{Weight of sample}} \times 100
\]

**Determination of Moisture Content**

2g of grounded sample was weighed into a dried silica dish and weighed in an oven at 65°C for 36 hours. The samples were allowed to cool in the desiccators and weighed. The drying and weighing continued until a constant weight was achieved.

The \% moisture content was calculated using the formular

\[
\% \text{ moisture content} = \frac{\text{weight of sample + dish before drying} - \text{weight of sample + dish after drying}}{\text{weight of sample}} \times 100
\]
DETERMINATION OF ASH CONTENT

Procedure
2g of dry sample was weighed and placed in a preheated crucible and placed in a muffle furnace at 400°C to 600°C for 4 hours. The crucible was placed in the desiccators and weighed.

The % ash was calculated with the formula

\[
\% \text{ ash} = \frac{\text{weight of crucible + ash} - \text{weight of crucible}}{\text{weight of sample}} \times 100
\]

Determination of Crude Fibre
2g of the sample with petroleum ether was defatted and boiled under reflux for 30 minutes with 200ml of a solution containing 1.25g of H₂SO₄ for 100ml of the solution. The solution filtered through layers of cheese cloth on a fluted funnel and washed with boiling water until the washing was no longer acidic. The residue then transferred to a beaker and boiled for 30 minutes with 200ml of a solution containing 1.25g of carbonate free NaOH per 100ml. The final residue filtered through a thin but closed pad of washed and ignited asbestos in a Gooch crucible and then dried in an electric oven and weighed. It was incinerated, cooled and weighed again.

\[
\% \text{ Crude fibre} = \text{the loss in weight after incineration} \times 100
\]

Determination of Carbohydrate Content
The total carbohydrate content was determined by the sum of percentage of moisture, ash, protein, lipids, fibre, and subtracted from them 100.

RESULTS AND DISCUSSION

RESULTS
The results of proximate analysis of the aqueous extract of turmeric and standard deviation of each proximate of the aqueous extract were presented below in Table 1A and Table 1B respectively.
Table 1A: Results For The Proximate Analysis.

<table>
<thead>
<tr>
<th>Proximate Content</th>
<th>% COMPOSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sample A</td>
</tr>
<tr>
<td>Moisture Content</td>
<td>60.00</td>
</tr>
<tr>
<td>Protein Content</td>
<td>0.20</td>
</tr>
<tr>
<td>Ash Content</td>
<td>4.60</td>
</tr>
<tr>
<td>Fiber</td>
<td>15.50</td>
</tr>
<tr>
<td>Ether/ Crude fat</td>
<td>16.80</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>46.60</td>
</tr>
</tbody>
</table>

Table 1B: Standard Deviation of Each of The Proximates.

<table>
<thead>
<tr>
<th>Proximate Content</th>
<th>% Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture Content</td>
<td>4.00 ± 1.60</td>
</tr>
<tr>
<td>Protein</td>
<td>0.17 ± 0.02</td>
</tr>
<tr>
<td>Ash</td>
<td>4.43 ± 0.12</td>
</tr>
<tr>
<td>Fibre</td>
<td>15.23 ± 0.20</td>
</tr>
<tr>
<td>Ether/ Crude fat</td>
<td>16.46 ± 0.28</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>56.25 ± 6.91</td>
</tr>
</tbody>
</table>

The result is in N ± SD. N is the mean of the triplicate sample while SD is the standard deviation.

The standard deviation of each of the proximate was calculated using the formula below

\[ S = \sqrt{\frac{\sum(x-x)^2}{N}} \]

When S = the standard deviation of a sample
\( \Sigma = \text{sum of} \)
\( x = \text{each value in the data set} \)
\( X = \text{mean of all values in the data set} \)
\( N = \text{number of values in the data set} \)

DISCUSSION

The proximate analysis showed the moisture content of turmeric extract to be 4.0 ± 1.60 (w/w). This result indicate high shelf life of the fresh plant, hence long storage can preserve the plant without deterioration. Moisture content is among the most vital and mostly used measurement in the processing, preservation and storage of food (Onwuka, 2005). The ash content of 4.43 ± 0.12 dry matter was obtained. Ash in food contributes to the residue remaining after all the moisture has been removed as well as the organic material (fat, protein, carbohydrate, vitamins, organic acids, etc) have been incinerated at temperature of about 500°C. Ash content is generally taken to be a measure of the mineral content of the original food (Onwuka, 2005).
Crude fiber in food or plant is an indication of the level of non-digestible carbohydrate and lignin. The crude fiber obtained from turmeric was 15.23% ± 0.20% dry matter. This level is considered appropriate because it aids absorption of glucose and fat. Although crude fiber enhances digestibility, its presence in high level can cause intestinal irritation, lower digestibility and decreased nutrient usage (Oladiji et al., 2005). Crude fiber is made up largely of cellulose together with a little lignin which is digestible in human (Onwuka, 2005).

The crude ether/fat content of turmeric obtained from this work was 16.46% ± 0.8% dry matter. Ether as fat content of food provides a very good source of energy and aids in transportation of soluble vitamins, insulates and protects internal tissues and contributes to important cell processes (Jones et al., 1985, Pamela et al., 2005). Turmeric contains moderate fat and it is advantageous to use it because a sample lower in fat can reduce the risk of coronary heart disease and lower the risk of hypertension.

The crude protein content of turmeric was 0.1% ± 0.20% dry matter. Thus considered minimal protein level when compared with other spices such as ginger (Bakhts et al., 2010). Turmeric is not a good source of protein but requires another supplement. The carbohydrate content of turmeric was 56.25% ± 6.91%. The rhizome is a good source of carbohydrate when compared with the Recommended Dietary Allowance of 1309 (Pamela et al., 2005).

**CONCLUSION**

This study showed that turmeric extract contains considerable amount of fat and high carbohydrate which are nutrients needed by the body. The protein content which is low from the result obtained requires supplementation with other spices that has high protein content. The ash content suggests that the plant is a good source of minerals.

**RECOMMENDATIONS**

It is recommended that further research work on turmeric should be done on the sample to cover the areas or parameters such as sensory analysis, phytochemical, anti-nutrients and free radical scavenging potentials, etc of the plant extracts in order to exploit its nutritional and medicinal usefulness in the treatment of diseases that affects humans.
REFERENCES


