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# Assessment of Proximate, Mineral and Anti-nutritional Compositions of *Myrianthus arboreus* Leaves

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**Abstract:** This study investigates the proximate, mineral and anti nutritional compositions of fresh *Myrianthus arboreus* leaves. Standard laboratory procedures and spectrophotometric method were employed for the analysis. The results obtained were; moisture content (59.55%), ash content (3.58%), crude fibre (13.15%), crude protein content (4.03%), fat content (2.57% and carbohydrate was estimated to be (17.13%). Mineral analysis shows that *Myrianthus arboreus* leaves contain considerably high concentrations of calcium, magnesium, phosphorus and potassium. Similarly, *Myrianthus arboreus* leaves contains anti-nutritional contituents at varying concentrations; tannin (3.91mg/g), saponins (4.62mg/g), oxalates (0.07mg/g), glycosides (1.45mg/g) and phytates (1.86mg/g). In conclusion, the results of this study indicates that *Myrianthus arbreus* leaves contained essential nutrients, mineral elements and anti-nutritional constituents with significant biological roles at physiological concentrations.

**Keywords:** Minerals, Nutrients, Anti-Nutrients, Composition and *Myrianthus arboreus*

## 1. Introduction

The knowledge of the importance of leafy vegetables and their uses is crucial for the survival of many African communities and most parts of the world. They can serve as affordable sources of micronutrients and could therefore contribute to the reduction of malnutrition and therapeutic purposes globally [1-3]. Plants have long being recognized as the cheapest and most abundant potential sources of vitamins and minerals. Thus, several ethno-botanical studies reported information on the medicinal properties of leafy vegetables such as anti-diabetic, anti-histaminic, anti-carcinogenic, hypolipidemic and antibacterial activities [4]. The plant *Myrianthus arboreus* is one of these leafy vegetables with potential benefits. The different parts are used for medicinal purposes worldwide. It is a dioecious tropical tree up to 15-metre high with spreading branches from a short stem. It belongs to the family, Cecropiaceae which is mostly found in the forest area of West and Central Africa occurring in rainforest, semi decidous and swamp forest [5].

***Figure 1.*** *Picture of M. arboreus with bright green color and racially arranged leaf vein (cited at www.wikipaedia/Myranthus arboreus).*

Also, several investigatios on the different parts have being carried out to ascertain the acclaimed uses. However, this paper intend to assess the proximate, mineral and anti nutritinal compositions of *Myianthus arboreus* leaves.

# 2. Materials and Methods

Fresh leaves of *Myrianthus arboreus* was obtained from Ogbor hill in Abia state. It was identified and authenticated in the Department of Biological Science, Botany unit, Kogi state University, Anyigba, Nigeria.

The fresh leaves were washed with distlled water to eliminate any contaminant without squeezing to avoid moisture loss and air dried to remove leftover moisture. The leaves were divided into two portions, one for chemical analysis and other for proximate and anti-nutreint analysis. The latter portion was ground to fine powder using mortal and pestle and kept in air tight container until when needed.

### *2.1. Determination of Proximate Composition of Myrianthus Arboreus Leaves*

The estimation of moisture, ash, protein, fat and crude fibre content were determined in accordance with the laboratory procedures of [6] on dry weight basis.

#### *2.1.1. Determination of Moisture Content*

A clean petri dish was dried to a constant weight in an oven, cooled in a desicator and weighed ($W_1$). 5g of the fine powder of *Myrianthus arboreus* leaves was accurately weighed into the clean petri dish and then reweighed ($W_2$). The $W_2$ containing the sample was dried in an oven to contant weight ($W_3$). The percentage moisture content was calculated thus,

$$\% \text{ moisture} = \frac{W_2 - W_3}{W_2 - W_1} \times 100 \quad (1)$$

Where; $W_1$ = initial weight of empty dish
$W_2$ = weight of dish and 5g of sample before drying
$W_3$ = final weight of dish and 5g of smaple after drying

#### *2.1.2. Determination of Ash Content*

A crucible was dried in an oven, cooled in a desicator and weighed ($W_1$). 2g of the fine power of sample was placed in $W_1$ and reweighed ($W_2$), it was then ignited and transferred to a muffle furnance which was set at 550°C. The sample was left in the furnace for six hours to ensure proper ashing. The crucible containing the ash was then removed, cooled in a desiccator and weighed ($W_3$). The percentage ash content was calculated thus:

$$\% \text{ ash content} = \frac{W_2 - W_3}{W_2 - W_1} \times 100 \quad (2)$$

Where; $W_1$ = weight of empty crucible
$W_2$ = weight of crucible and sample before ashing
$W_3$ = final weight of crucible and smaple after ashing

#### *2.1.3. Determination of fat Content*

A clean dried 500cm$^3$ round bottom flask containing few anti-bumping granules was weighed ($W_1$) with 300cm$^3$ petroleum ether for extraction and poured into the flask fixed to soxhlet extraction unit. The round bottom flask and a condenser were connected to the soxhlet extractor and cold water circulation connected. The heating was adjusted until the solvent was refluxing at a steady rate for six hours. The solvent was recovered and the oil dried in an oven for an hour. The round bottom flask and oil was then weighed ($W_2$). The lipid content was then calculated as follows:

$$\% \text{ Fat conten} = \frac{W_2 - W_1}{\text{weight of sample}} \times 100 \quad (3)$$

Where $W_1$= weight of round bottom flask
$W_2$ = Weight of round bottom flask and oil.

#### *2.1.4. Determination of Crude Fibre*

5g of sample was weighed into a round bottom flask, 100cm$^3$ of 0.25M sulphuric acid solution was added and the mixture boiled for 30 minutes and quickly filtered. The insoluble matter was washed several times with water to remove acid. It was then transferred into the flask and 100cm$^3$ of 0.31M Sodium hydroxide solution was added, and the mixture boiled for 30 minutes and filtered. The residue was washed with water until it was free of base, then dried to constant weight in an oven, cooled in a desicator and weighed ($W_1$). The weighed sample was incinerated in muffle furnance at 550°C, cooled in a desicator and reweighed ($W_2$).

Percent crude fibre was calculated as:

$$\% \text{ crude fibre} = \frac{W_1 - W_2}{\text{Weight of original sample}} \times 100 \quad (4)$$

Where W1= weight of sample before incineration
W2 = weight of sample after incineration

#### *2.1.5. Determination of Protien*

The crude protien was determined by Kjeldahl method [7] which involve the estimation of nitrogen and subsequent conversion to protien by multiplying by a factor 6.25.

#### *2.1.6. Determination of Carbohydrate by Difference*

The total carbohydrate was determined by difference using the method of [8]. The equation is given as:

Total carbohydrate = 100 – [% crude protein+% crude fat+% crude fibre +% crude total ash]

### *2.2. Determination of Mineral Elements in Myrianthus Arboreus Leaves*

The ash sample of the leaves of M. arboreus was digested in 5ml of concentrated hydrochloric acid in a glass petri dish. The mineral elements (Sodium (Na), Calcium (Ca), Potassium (K), Phosphorus (P), Magnesium (Mg), Manganese (Mn), Iron (Fe), Copper (Cu) and Zinc (Zn) of *M. arboreus* leaves were then determined spectroscopically using Shimadzu atomic absorption spectrophotometer [9].

### *2.3. Determination of Anti Nutritional Composition of M. Arboreus Leaves*

The anti-nutrients were determined by the method described by [10], saponins according to the procedures of

[11], oxalate, glycosides and phytate by the laboratory procedures of [12].

#### *2.3.1. Oxalate Determination*

1g of the sample was extracted in 100ml of distilled water and allowed to stand for 3 hours and filtered through a double layer whatman No. 1 filter paper. The absorbance of the filtrate was read on the spectrophotometer.

#### *2.3.2. Phytate Determination*

2g of sample was macerated in 100ml of 2% concentrated hydrolic acid for three hours. Then filtered with double layer Whatman No.1 filter paper. To 50ml of the filterate, 107ml of distilled water was added to give adequate acidity and 10 ml of 0.3% ammonium thiocyanate solution was added as indicator. This was titraed with standard Iron (III) chloride solution (0.00495g Iron per ml). The end point was slightly brownish yellow.

#### *2.3.3. Glycoside Determination*

To 1ml of the sample filtrate solution in test tubes, 4ml of alkaline picrate solution (1g of picrate and 5g of $NaCO_3$ in $200cm^3$ of distilled water) was added and incubated in a water bath for 15 minutes. The absorbance was read against a blank after colour development and the cyanide content extrapolated from the cyanide standard curve.

#### *2.3.4. Tannin Content Determination*

Tannins were determined using the method of Dawra et al (1988). 0.2g of the sample was macerated in solvent mixture (80ml of acetone and 200ml of acetic acid) to extract tannin. The n filtered using a double layer Whatman No.1 filter paper and absorbance of filtrate read spectrophotometrically at 720nm.

### *2.4. Statistical Analysis*

The raw data were obtained in triplicates and final values expressed as mean percentage and mg/g.

## 3. Results

### *3.1. Results for Proximate Composition of Myrianthus Arboreus Leaves*

Table 1 shows the percentage proximate compositions of moisture, ash, crude fibre, protein, fat and carbohydrate.

***Table 1.*** *Percentages of Proximate Compositions in Myrianthus arboreus leaves.*

| Parameters | Concentration (%) |
|---|---|
| Moisture Content | 59.55 ± 0.35 |
| Ash Content | 3.58 ± 0.11 |
| Crude Fibre | 13.15 ± 0.07 |
| Protein | 4.03 ± 0.04 |
| Fat | 2.57 ± 0.12 |
| Carbohydrate | 17.13 ± 0.24 |

Values are expressed as percentage mean, n=3

### *3.2. Results for Mineral Composition of Myrianthus Arboreus Leaves*

Table 2. shows the varying concentrations of the mineral elements in the leaves of the plant.

***Table 2.*** *Mineral Composition (ppm) in Myrianthus arboreus leaves.*

| Parameters | Concentration (mg/g) |
|---|---|
| Calcium | 0.083 |
| Iron | 0.025 |
| Magnesium | 0.059 |
| Sodium | 0.025 |
| Phosphorous | 0.070 |
| Potassium | 0.058 |

Values are expressed as mean, n=3

### *3.3. Results for Anti -Nutritional Composition of Myrianthus Arboreus Leaves*

Table 3 shows the tannins, saponins, oxalates, glycosides and phytate content of the leaves.

***Table 3.*** *Anti Nutritional Composition (mg/g) in Myrianthus arboreus leaves.*

| Parameters | Concentration (mg/g) |
|---|---|
| Tanins | 1.86 ± 0.09 |
| Saponins | 3.91 ± 0.03 |
| Oxalates | 1.45 ± 0.01 |
| Glycosides | 0.07 ± 0.04 |
| Phytates | 4.62± 0.00 |

Values are expressed as mean, n=3

## 4. Discussion

The result of the proximate, mineral and anti nutritonal compositions of *Myrianthus arboreus* leaves are presented in Tables 1, 2, and 3 respectively. In Table 1, the carbohydrate content (17.13%) of the leaves of *M. arboreus* was considerably within the range of (1.22%-18.90%) as reported for some selected Nigerian leafy vegetables by [13]. The protein content of the leaves of *M. arboreus* was (4.03%). This value was lower than that reported by [14] for some other leafy vegetables which are commonly consumed in Nigeria. However, the result can compare favorably with values in other traditionally consumed vegetables such as *Cnidoscolus aconitifolina* (2.96%), *Solanum nigrum* (3.10%), *Crassocephalum crepidiodes* (1.76%) and *Colocassia esculenta* (2.67%) respectively.

The crude fibre content value (13.15%) obtained was higher than the values reported for *Manihot esculenta* (3.73%), *Colocassia esculsenta* (3.30%), *Cerathotera sesamoides* (2.93%) and *Biden pinnata* (3.27%). This probably suggest that the leaves could aid digestion as it has being reported that some dietary fibre help to prevent constipation, gastrointestinal disorder, pile, diabetes and breast cancer [15, 16].

The values of the crude fat for the leaves of *M. arboreus* (2.57%) was low when compared to those of *Talinum triangulare* (5.90%), *Baseila alba* (3.71%), *Amaranthus hybridus* (4.80%) and *Calchorus africanum* (4.20%) [17].

Thus, the moderate amount of fat shows that the leaves are not source of lipid accumulation rather an energy source. However, caution should be taken with the consumption to avoid the risk of obesity and other related diseases [18].

Also, the ash content value (3.58%) of the leaves was lower than that reported for *Diplazium summattii* [19] and those of *Tridax procumbens* [20]. The knowledge of ash content gives an indication of the mineral composition of the leaves. The leaves had moderate moisture content of (59.55%)s which was lower than those reported for some other vegetables grown in South west, Nigeria like*: Lannea taraxacifolia* (79.77%), *Ocimum gratissium* (83.87%), *Vernonia amygdalina* (78.60%) and Biden pinnata (85.53%). However, the values were comparatively higher than those values reported for vegetables like Moringa oleifera (5.9%) and *Hippocratea* myriantha (6.93%) [21]. The moisture content of food is used as a measure of stability and susceptibility to microbial contamination [22]. The high moisture content found in the *Myrianthus arboreus* leaves agreed with the report that water is the most abundant component in all vegetables [23].

The result obtained in this study are in correlation with the report of Amata (2010), in that, all the parameters measured were present but in varying concentrations. Moisture, Ash and crude protein content were considerably lower and on the other hand the crude fibre was higher in the present study. Also, Amata (2010) reported more more parameters in the mineral element analysis. These differences could be attributed to the geographical location of the plant.

Furthermore, the mineral analysis of *M. arboreus* leaves (as shown in Table 2) indicated that calcium, magnesium, phosphorous and potassium were present in appreciable amount. Calcium is useful in sustaining strong bones, muscular contraction and relaxation, blood clotting [24].

Also, the value obtained for Sodium (0.025mg/g) and potassium (0.0582mg/g) for *M. arboreus* leaves were lower compare with the previous values reported for some selected Nigerian vegetable leaves [25]. These minerals (Sodium and Potassium) are important intracellular and extracellular cations responsible for the regulation of blood pressure and volume in the body [26]. Similarly, the result of Iron content (0.025mg/g) which could help in formation of blood, transfer of oxygen and carbondioxide from one tissue to another. Thus, the deficiency in iron leads aneamia and affects muscle metabolism and in chidren lead to impaired learning ability and behavioural problems.

The concentration of phosphorus in the sample is (0.0704mg/g). It is present in the blood and acts as buffers that disallows change in the acidity level of body fluid due to its ability to combine with extra hydrogen ion. It also aids the permeability of the cell membrane thereby allowing easy passage of nutrients.

In addition, the result for the anti nutritional composition of the leaves of M. arboreus (Table 3) showed that the leaves contain tannins, saponins, oxalates, glycosides and phytates. Moderate concentrations of these nutrients were observed; saponins (3.91mg/g), phytates (4.62mg/g) were glycosides (0.07mg/g), oxalate (1.45mg/g) and tannins (1.86mg/g). A threshold has been indicated for phytate as 2-5% and saponins 2-4.2% [27]. Although, these nutrients are beneficial at moderate levels, above these threshhold it can be deleterious. The present study shows concentrations of 4.62mg/g (phytate), 3.91mg/g (saponin) which are within the range of accepted limits.

The presence of Tannins in the leaves also agreed with the previous works of [28] as tannins are known to have antiviral, antibacterial, anti-tumor properties and curbing hemorrhages as well as restrict bare swellings.

# 5. Conclusion

This research work has provided useful information on the nutritional and elemental compositions of *Myrianthus arboreus* leaves. The study revealed that *M. arboreus* leaves have appreciable amount of nutrients such as calcium, potassium, iron, carbohydrate, fat, protein and anti-nutrients. This therefore, suggests that the leaves of *Myrianthus arboreus* could serve as a constituent of human diet, supplying the body with micronutrients which are electrolytes proffering significant roles in humans. Similarly, the knowledge of the concentration of anti -nutrients are key as excess of these could result in low bioavailability of these minerals and nutrients for physiological functions and thus resulting in varying abberrations due to their chelating effects.

Future studies on the leaves of *Myrianthus arboreus* could be to research into its antimicrobial, antihypertensive, antilipidemic and antidiabetic benefits in animals models.

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