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### RESEARCH ARTICLE

#### ASSESSMENT OF MINERAL, PROXIMATE AND PHYTOCHEMICAL COMPOSITION OF LEAF, STEM AND ROOT OF *Maesobotrya barteri* (BAILL) FROM SECONDARY FOREST IN AKWA IBOM STATE.

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#### Abstract

**Introduction:** This study was conducted to assess the mineral element, proximate, and phytochemical contents of the leaf, stem and root of *Maesobotrya barteri* (Baill) grown in a secondary forest habitat of Akwa Ibom State.

**Methods:** The dried and powdered leaf, stem and root of *M. barteri* were subjected to various sample preparation stages using standard laboratory procedures for determination of phytochemicals, mineral elements, and proximate composition in the test plant parts.

**Results:** The results showed that there were marked differences ( $P < 0.05$ ) in the phytochemical, mineral element contents and proximate value of the leaves, stems and roots of *M. barteri*. Tannin was the highest phytochemical compound in the leaf, stem and root of the test plant. Alkaloids, flavonoids, and saponins were present in moderate amount. Of all the macro elements examined, calcium and potassium had the highest values in *M. barteri*. Magnesium, sodium, and nitrogen contents were found in moderate proportions in leaf, stem and root of *M. barteri*. Similarly, the contents of micro elements showed the highest values of iron and zinc. Carbohydrate found in the leaf, stem and root of the test plant, respectively, had the highest proximate content, although, the dry matter content was also prominent in the analysis..

**Conclusion:** This study suggests that the phytochemical values and nutritional components of leaf, stem and root of *M. barteri* could be utilized as a good source of nutrient supplement, as well as source of useful pharmaceutical products.

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#### Introduction:-

Many indigenous plants are utilized as spices, food, ornamentals or medicinal plants [1, 2]. Proximate and elemental analyses of medicinal plants, edible fruits and vegetables play a crucial role in evaluating their nutritional significance [3, 4]. Assessment of nutritional components of plants can reveal the potential benefits of these plant species, since some medicinal plant species are also consumed as food along with their medicinal importance [3, 5]. These nutrients could be of crucial importance as certain inorganic mineral elements and proximate components are known to play pivotal roles in the maintenance of the body [6, 7]. Medicinal and aromatic plants contain

bioactive compounds which inhibit the activities of bacteria and other microorganisms [8]. These biological active chemical substances include among others, saponins, tannins, flavonoids, alkaloids, anthocyanin and steroids [8].

The presence of these bioactive compounds confer on these plants the medicinal properties from which important drugs could be prepared [9, 5]. Phytochemicals are secondary metabolites formed during the normal metabolic processes in plants [10]. There are many groups of phytochemicals that help the body in various ways through their mechanisms of action, which may be complementary and overlapping in nature, such as stimulation of metabolism, antibacterial and antiviral effects, and antioxidant effects [10, 11].

Although, plant material contains a variety of nutrients, there is less awareness that many plant parts also contain small proportion of potentially harmful substances, which are regarded as toxins or antinutrients [12, 13]. Since phytochemicals, nutrients and antinutrients are found in some levels in almost all edible plant materials, it is necessary to test for their presence in *Maesobotrya barteri*. Similarly, partial and temporal variation in distribution of nutrients and phytochemicals in plant parts require appropriate analysis to ascertain their utilization in nutrition and production of drugs.

*Maesobotrya barteri* Baill is a notable species belonging to the Euphorbiaceae family [14]. Phytochemicals such as tannins, saponins, cardiac glycosides, deoxy sugar and terpenes have been indicated as components of this species [15]. Its medicinal importance include, utilization for treatment of diarrhea, stomach ache, malaria and pain [16, 17].

Series of studies have been carried out on phytochemical, mineral and proximate compositions of various plants, however, this present study was conducted to evaluate the distribution of phytochemical, elemental and proximate contents in leaf, stem and root of *M. barteri* from the secondary forest of Akwa Ibom State, Nigeria.

## Materials and Methods:-

### Collection of sample:

Plant samples (leaf, stem and root) of *M. barteri* were collected from the test plant in a secondary forest habitat in Abak, Akwa Ibom State, Nigeria. Abak is located at coordinates of 4° 33' N and 7° 33' E. Akwa Ibom State has an Altitude of 106m AMSL (Above Mean Sea Level) and is located within the humid tropical rainforest Zone of South eastern Nigeria. The mean annual rainfall is about 2000mm, while the mean annual minimum and maximum temperature are 23°C and 31.7°C, respectively [18, 19].

### Determination of Phytochemicals:-

The dried and powdered plant material (leaf, stem and root) of *M. barteri* were subjected to various sample preparation stages using standard laboratory procedures for determination of phytochemicals (alkaloids, tannins, flavonoids, saponins, glycoside, phytate, oxalate and cyanide). Standard methods were used to determine the phytochemical contents in the test plant; alkaloid [20], tannin [21], flavonoids [22], saponin [23], cyanide [24, 25], phytate [26], and oxalate [27].

### Determination of Mineral Elements:-

Plant materials were rinsed with distilled water and dried. Pestle and mortar was used to grind the dried plant material of each sample into powder form. Sieving of the powdered sample to obtain a fine powdered form was carried out using a 0.002mm wire mesh. Each sample of the fine powdered plant material was kept in small bottles for analysis. The following mineral elements (magnesium, calcium, sodium, nitrogen, phosphorus, potassium, zinc, lead, iron, manganese, and copper) were determined using standard methods [28, 29]. Standard MicroKjedahl method was used to estimate the total nitrogen concentration in the plant dry matter. Phosphorus was determined spectrophotometrically by ammonium-vanadate-molybdate method, potassium by using a flame photometer and other elements by atomic absorption spectrophotometer.

### Determination of Proximate composition:-

The proximate compositions (moisture, lipid, crude protein, crude fibre, ash, dry matter, nitrogen free extract) of plant material were determined using standard method of [28].

**Statistical Analysis:-**

Standard errors of the mean values were calculated for the separate readings and data were subjected to analysis of variance (ANOVA) to compare the means at 0.05 confident interval [30].

**Results:-**

The leaf of *Maesobotrya barteri* recorded the highest contents of alkaloid, tannin, phytate and cyanide, while the root had the highest contents of flavonoid and glycosides. Similarity, the stem of *M. barteri* had the highest contents of saponin and oxalate (Table 1). The leaf of *M. Barteri* had the highest contents of magnesium, potassium, iron, manganese, copper, phosphorous and nitrogen. The highest contents of calcium, sodium and zinc were recorded in the root of *M. barteri* while the stem and leaf had the same proportion of lead (Table 2). The leaf of *M. barteri* had the highest contents of protein and lipid and lowest contents of ash, fibre and nitrogen free extract. The root of the test plant had the highest contents of moisture, ash, and nitrogen free extract, and lowest contents of protein, and dry matter while the stem had the highest contents of fibre and dry matter and lowest contents of moisture and lipid (Table 3).

**Table 1:- QUANTITATIVE COMPOSITION OF *Maesobotrya barteri***

Parameters (%)	ALK	TAN	SAP	FLAV	GLY	PHY	OXAL	CN
<b>Plant Parts</b>								
<b>Leaf</b>	2.52±0.21	12.56±0.27	0.59±0.02	0.36 ±0.02	2.87±0.44	0.062±0.03	0.22±0.05	
	0.007±0.02							
<b>Root</b>	1.26±0.12	6.02±0.40	0.73±0.04	0.95±0.04	3.92±0.50	0.025±0.01	0.09±0.02	
	0.003±0.01							
<b>Stem</b>	0.49±0.03	8.21±0.22	1.35±0.32	0.75±0.02	1.13±0.14	0.019±0.02	0.24±0.04	
	0.005±0.02							

Mean ± standard Error from 3 replicates.-

**Table 2:- Mineral Elements Composition Of *Maesobotrya Barteri***

Mineral	Ca PO4	Mg N2	Na	K	Fe	Mn	Zn	Pb	Cu
<b>Elements (Mg/100g)</b>									
<b>Plant Parts</b>									
<b>Leaf</b>	6.77±0.21	4.69±0.54	5.47±0.61	7.29±0.14	0.39±0.12	0.05±0.01	0.35±0.04	0.001±0.00	0.035±0.01
	0.39±0.10	4.21±0.13							
<b>Root</b>	8.43±0.36	3.79±0.10	6.51±0.36	6.74±0.20	0.27±0.61	0.04±0.01	0.43±0.10	0.000±0.00	0.019±0.00
	0.37±0.04	3.11±0.02							
<b>Stem</b>	4.39±0.20	3.31±0.33	4.26±0.45	5.66±0.90	0.19±0.45	0.03±0.01	0.37±0.03	0.001±0.00	0.021±0.00
	0.31±0.03	2.85±0.26							

Mean ± standard Error from 3 replicates.

**Table 3:- Proximate Composition Of *Maesobotrya Barteri***

Proximate Composition (%)	Moisture	Ash	Protein	Lipid	Fibre	DM	NFE
<b>C</b>							
<b>Plant Parts</b>							
<b>Leaf</b>	6.77±0.20	2.43±0.43	7.29±0.21	1.47±0.02	2.55±0.70	93.25±0.61	
	86.31±0.33						
<b>Root</b>	7.55±0.50	3.53±0.10	2.55±0.37	0.43±0.05	2.81±0.26	92.47±0.44	
	90.73±0.62						
<b>Stem</b>	5.89±0.72	2.85±0.40	3.31±0.49	0.39±0.06	3.01±0.88	94.13±0.50	
	90.49±0.52						

Mean ± standard Error from 3 replicates.

### Discussion:-

In this study, *Maesobotrya barteri* contained phytochemicals such as alkaloids, tannins, flavonoids, saponins, glycosides, phytate, oxalate and cyanide. In addition, the leaf had the highest content of this phytochemicals comparable with the root and stem. This result agrees with the work of [31, 32] that *M. barteri* contains high proportion of phytochemicals in the aerial parts of the plants. However in this study, tannin was the highest phytochemical from leaf, which contradict the reports of [32] that flavonoid was the most abundance phytochemical in the leaf extract of the species. The presence of these phytochemicals is a clear indication of its pharmacological relevance [33, 34, 35]. The presence of these bioactive compounds in the leaf, root and stem of this species corroborates the various medicinal uses both in synthetic and traditional practices [36]. Similarly, the low content of antinutrients such as phytate, oxalate and cyanide in the stem of this species as recorded in this study indicate that *M. barteri* could be utilized as chewing stick as reported by [37,8].

In this study, the leaf, stem and root of *M. barteri* showed the presence of mineral elements such as Ca, Mg, Na, K, Fe, Mn, Zn, Pb, Cu, P and N<sub>2</sub>. This implies that this species could be useful as supplements in human and animal nutrition. Mineral elements are needed in small proportions for the proper functioning of the human system, healthy growth and development [38, 39]. In general, quantitative and qualitative determination of mineral elements present in plant parts is important in ascertaining the specific part of nutritional significance as well as an indication for the concentration and type of minerals to be stipulated on the label of food [40, 41].

The proximate composition of the leaf, stem and root of *M. barteri* showed the presence of carbohydrate, protein, lipid and other proximate components. Carbohydrates found in the three parts of this plant were the highest proximate content. Carbohydrates hydrolysis in the body yield glucose, which can be utilized immediately or stored as glycogen in the muscles and liver for future use [40]. Proteins help in cell division, growth, body building and are immune-boosters as well as replace worn out tissues [42, 43]. Lipids are instrumental in regulation of blood pressure of cellular parts in the body and important in energy production (Anoliefo, 2006). Moisture is regarded as a universal solvent that dissolves other substances, carries nutrients and other materials round the body, thus creating a medium for effective cellular functions [40, 3]. The parts of fruits, grains and vegetables which remains undigested, hence cannot be absorbed by the human system is known as fibre. It plays a crucial role in regulating the level of palm cholesterol as well as prevents colon cancer and cardiovascular diseases [13, 40, 43].

### Conclusion:-

This study on distribution of phytochemicals, minerals and proximate contents of *M. barteri* would give new insight into potential use of their plant parts in pharmaceutical purposes, as well as in identifying new sources of nutritionally important compounds.

### Conflict of interest:-

There was no conflict of interest between the two authors.

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