Research Article **JHMR (2016), Vol. 1, Issue 03**

Journal of Herbal Medicine Research
(ISSN: 2474-106X)

Ethnobotanical importance and phytochemical analyses of some selected medicinal plants used in Ado-Ekiti Local Government Area, Ekiti State, Nigeria.

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ABSTRACT

The study investigated the ethnobotanical importance, phytochemical and proximate compositions of some selected medicinal plants such as Enantia chlorantha (Annonaceae), Momordica charantia (Cucurbitaceae), Telfaria occidentalis (Cucurbitaceae) and Morinda lucida (Rubiaceae) in Ado-Ekiti Local Government Area of Ekiti State, Nigeria. The review of the folk knowledge of the plants revealed that they were used in treating ailments such as gastrointestinal infections, malaria fever, typhoid, dermatitis, ringworm, jaundice, dysentery and used as antiseptic, digestive stimulant, blood tonic and blood booster. The qualitative screening of the plants revealed that all the plants contained a considerable amount of bio-active ingredients such as alkaloids, Saponins, tannins, flavonoids, cardiac glycosides, Terpenoids and total phenols. However, Momordica charantia has the highest number of alkaloids (20.68±0.27), Saponins (11.40±0.59) while Morinda lucida and Telfaria occidentalis have the lowest number of alkaloids (6.62±0.34) and Saponins (1.24±0.09). Similarly, Enantia chlorantha has the highest amount of flavonoids (15.56±0.00) and tannins (0.44±0.05). Morinda lucida stem bark has the lowest number of tannins (0.03±0.00) and flavonoids (0.94±0.00). Morinda lucida leaf has the highest amount of cardiac glycosides (0.07±0.03) while Morinda lucida stem bark and Momordica charantia does not have cardiac glycosides. Telfaria occidentalis has Terpenoids (0.09±0.00). Similarly, total phenols are high in

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How to cite this article:
Olanipekun et al.,. Ethnobotanical importance and phytochemical analyses of some selected medicinal plants used in Ado-Ekiti Local Government Area, Ekiti State, Nigeria. Journal of Herbal Medicine Research, 2016,1(3): 0007-0016.

eSciencePublisher
eSciPub LLC, Houston, TX USA.
Website: http://escipub.com/

Morinda lucida stem bark (0.58±0.00) while is low in Momordica charantia (0.21±0.00). The proximate composition showed that Telfaria occidentalis had the highest percentage of crude protein (31.49±1.32) and lowest percentage of crude fiber (9.08±0.27). Enantia chlorantha had the highest crude fat (5.17±0.24) and carbohydrates (50.31±1.56). Momordica charantia had the lowest percentage of total ash (2.67±0.16). Morinda lucida leaf had the highest percentages of moisture (10.10±0.14) and total ash (11.24±0.42) while Morinda lucida stem bark had the highest percentage of crude fiber (53.49±1.98) and lowest percentages of moisture (9.00±0.28), crude protein (5.70±0.14), crude fat (0.45±0.16) and carbohydrates (24.93±0.21).

Key words:
Medicinal plants, folk knowledge, ailments, phytochemicals, proximates

Introduction

It was estimated that there are between 200,000 and 700,000 species of tropical flowering plants that have medicinal properties, which are used as preventive and curative purposes (Akpulu *et al*., 1994). The use of medicinal plants in treating ailments is well known as been part of human culture especially in the rural areas of the developing country like Nigeria. The reason for this is that the commercially available orthodox medicines are becoming increasingly expensive and out of reach especially to the people in the rural areas (Lawal *et al*., 2012). Even without this seemingly obvious reason, more people living in the rural areas preferred and depended on plant materials for drugs because plants have been proved and they have been found effective in curing a wide range of diseases. Similarly, plants are cheap, available and do not need a special or skilled personnel before its preparation for use.

Nigeria is endowed with both domesticated and wild plants that are medicinal in nature. Like every other developing countries, the majority of Nigeria population depend on plants to meet their primary health needs (Oladunmoye and Kehinde, 2011). Although, the medicinal uses and applications of these various plants differ from one community to another and also from culture to culture.

The use of orthodox medicine by the primary health care services in treating diseases and ailments is known and fairly distributed especially in the rural areas. Antibiotics are scarce, toxic and expensive. Incidentally, in the recent times, the rate at which the use of antibiotic developed resistant against strains of diseased pathogens is alarming, synthetic drugs are no more effective and this has led to the emergence of the use of traditional medicine which is commonly referred to as alternative traditional therapy (WHO, 2001; Albinu *et al*., 2003; Albinu *et al*., 2004; Williams, 2000). There is therefore needs for continuous search for non resistance, effective and affordable antimicrobial drugs from plant sources. Fortunately, nature has a non-ending reserve of such sources. Plants are of natural origin, with discovering potentially and effective bioactive ingredients that can serve as a source of replacement to the use of antibiotic drugs (Pretorius *et al*., 2003; Moreillion *et al*., 2005). The efforts of scientists in establishing plants with promising antimicrobial properties is yielding fruitful results as a number of plants with high antimicrobial property have been elucidated (Oyagade *et al*.,1999; Adedayo *et al*., 2001; Perumal and Ignacimuthu, 2001).

The plants analyzed in this research work are ones that people in Ekiti-State have been using to treat different diseases such as diahoerea, dysentary, gastrointestinal diseases and urinary tract infections. The plants include *Enantia chlorantha* Oliv. belonging to the family Annonaceae, *Morinda lucida* Benth. belonging to the family Rubiaceae, *Momordica charantia* L. and *Telfaria occidentalis* Hook, f. both of which belongs to the family Cucurbitaceae.

Enantia chlorantha commonly called African yellow wood and it is called awopa in Yoruba land. It belongs to the family Annonaceae. It is an ornamental tree that has height of about 30m with dense foliage and a spreading crown. It is widely distributed along the coasts of west and central Africa; it is also very common in the forest regions of Nigeria (Adesokan *et al*., 2007). The outer bark is thin and dark brown and is fissured

geometrically while the inner bark is brown above and pale cream beneath. The stem is fluted and aromatic while the elliptic leaves are about 0.14-0.15m long and 0.05-0.14m broad. It was shown by several researchers that the stem bark of *E. chlorantha* possesses potentials at treating wide outbreak of bacterial diseases. Several diseases such as jaundice, urinary tract infections and typhoid fever were traditionally reported using *E. chlorantha* (Adesokan *et al*., 2007; Odugbemi *et al*., 2007; Adjanohoun *et al*., 1996; FAO, 2001).

Morinda lucida commonly called brimstone tree and also called oruwo in Yoruba. It is an evergreen shrub or small to medium sized tree up to 18m tall, with bole and branches often crooked, the bark is smooth to roughly scaly, grey to brown. The wood is yellow and it occurs throughout the tropics (Quattrocchi and Umberto, 2000).

Momordica charantia known as bitter melon, bitter squash or bitter gourd in English and called ejirin by the Yoruba people. It is a tropical and subtropical vine of the family Cucurbitaceae which is widely grown in Asia and Africa for its edible fruit which is extremely bitter. It is an herbaceous tendril-bearing vine which grows up to 5m/16ft in length. It has simple, alternate leaves 4-12cm/1.6-4.7 in across, with three to seven deeply separated lobes. Each plants bear separate yellow males and female flowers (BSBI, 2007).

Telfaria occidentalis is a tropical vine grown in West Africa as a leaf vegetable and for its edible seeds. Common names for the plant include fluted gourd, fluted pumpkin, and Ugwu. *T. occidentalis* is a member of the Cucurbitaceae family and is indigenous to Southern Nigeria (Akoroda, 1990).

There have been claims traditionally that plants have inherent bioactive properties which are not scientifically justified, hence, leading to the interest to carry out this work. This work will identify the secondary metabolites in these plants thereby providing scientific bases on the traditional claims and justifies their suitability and reliability.

Materials and methods

Study area

The study was carried out in Ado-Ekiti Local Government Area of Ekiti State of the South Western part of Nigeria. Ekiti State is an heterogeneous state consisting of various groups and tribes of people. Ado-Ekiti is located within longitudes 4°5' and 5°45' East and latitudes 7°15' and 8°5'. The major occupation is farming and they majorly cultivate yam, cassava, tobacco and cotton.

Experimental materials

The plant materials for this research work were collected from different places in the study area. *Morinda lucida* stem bark and leaves were collected at the back of Chemistry laboratory, Faculty of Science, Ekiti State University, Ado-Ekiti between September and October (rainy season) 2015. Also *Enantia chlorantha* stem bark, *Momordica charantia* leaves and *Telfaria occidentalis* leaves were purchased from Oja Oba market, Ado-Ekiti, Ekiti State. The plants were identified and authenticated at the Herbarium unit of Plant Science & Biotechnology Laboratory, Ekiti State University and voucher specimens were preserved at the Herbarium unit of Plant Science & Biotechnology Laboratory. The plant materials were air dried for 3 weeks until all water content was lost. They were ground into powder using an electric blender (Blender/Miller III, model MS-223, Taiwan, China). The powder was packed into Soxhlet Column and extracted with aqueous and ethanol. The solvents were filtered, squeezed off and evaporated off under reduced pressure in a rotary evaporator to obtain the crude extract. After concentrated preparation, the dried powdered extract was stored at 4°C.

Qualitative and quantitative analysis

The dry samples were subjected to analyses to determine the qualitative and quantitative bioactive composition of the samples. This was done using standard procedures according to (Harborne, 1973; Jaffe, 2003; Rajeev *et al*., 2012; Narayan *et al*., 2012; Harborne, 1998; Mahajan and Badujar, 2008; Obadoni and Ochuko, 2001). The bioactive compositions determined were Alkaloids, Saponins, Tannins, Flavonoids, Glycosides, Terpenoids and Phenols.

Determination of Alkaloids(Harbone, 1973)

5g of each sample (w) was weighed into a flask (conical or volumetric) and 200ml 0f 10% Acetic Acid in Ethanol was added, the mixture was shacked and allowed to stand for 4hours. It was filtered and the filtrate was evaporated to a quarter of its original volume. A few drops of conc. Ammonium hydroxide solution were added to precipitate the alkaloid. The precipitate was filtered through a weighed filter paper (w_1). The filter paper was placed in an oven and allowed

Table 1: List of selected medicinal plants used in treating various diseases in the study area

S/n	botanical name	family	common name	local name	part used
1	*Enantia chlorantha*	Annonaceae	African yellow tree	Awopa	Stembark
2	*Momordica charantia*	Cucurbitaceae	Bitter melon	Ejirin	Whole plant
3	*Telfaria occidentalis*	Cucurbitaceae	Fluted pumpkin	Ugwu	Leaves
4	*Morinda lucida*	Rubiaceae	Brimstone tree	Oruwo	Leaves and stembark

Table 2: Folk knowledge on the methods of preparation and dosage of plant used in treating various diseases in the study area

S/n	Botanical name	Diseases treated	Methods of preparation	Dosage	References
1	*Enantia chlorantha*	Malaria and fever	Decoction of stembark in water or alcohol	50ml taken two times daily	Ajaiyeoba *et al*., 2006; Agbaje and Onabanjo, 1991
2	*Momordica charantia*	Antiseptic, digestive stimulant, menstrual stimulator, and purgative.	Decoction and infusion of whole plant	100ml taken two times daily	Jiofack *et al*., 2010
3	*Telfaria occidentalis*	Blood Tonic and blood booster. Typhoid and dermatitis	Decoctions and infusions of leaves and leaves also cooked as vegetable	50ml taken 3-4 times daily	Jiofack *et al*., 2007
4	*Morinda lucida*	Leprosy, ringworm, fever, jaundice and dysentery.	Decoction of leaves and stem bark	30ml taken three times daily	Tor-Anyiin *et al*., 2003; Awe and Makinde, 1998

to dry at 60°C for 30-60min. And the filter paper was weighed again and the weight was recorded as (W_2).

% Alkaloids was calculated as:

$$\% \text{ alkaloids} = \frac{W_2 - W_{1x}}{W_1} 100$$

Determination of Saponins (Obadoni and Ochuko, 2001)

20g of each sample was weighed (W_0) into a conical flask and 100ml of 20% aqueous ethanol was added. The resulting content was heated in a hot water bath for 4hours with continuous stirring at 50°C and was filtered. 200ml of 20% ethanol was used to re-extract and both extracts were combined. The volume of extract was reduced to 40ml by evaporating in a water bath at 90°C. The concentrate was transferred into a 250ml separating funnel and 20ml of diethyl ether (petroleum ether) was added and shaken vigorously. The clear ether layer was discarded leaving the aqueous layer. Then 60ml of n-butanol was added to the aqueous layer in the separating funnel. The combined butanol layer was washed twice with 10ml of 5% aqueous NaCl. The remaining solution was collected in a weighed petri dish (W_1). The petri dish was dried in an oven at about 90°C. The petri dish was reweighed and recorded as W_2.

$$\% \text{ Saponin content} = \frac{W2 - W1}{W0} \times 100$$

Determination of Tannins (Jaffe, 2003)

1g of each sample was weighed in a conical flask, 10 ml of distilled water was added and agitate. It was left to stand for 10min at room temperature, and centrifuged at 2500rpm for 15mins. Then 2ml of supernatant was measured into a 10ml volumetric flask, 1ml of folin-ceocalteu reagent and 2ml of saturated Na_2CO_3 solution was added. The solution was diluted to 10ml with distilled water and incubated for 30min at room temperature. A standard was prepared using Tannic acid, the procedures 1 to 9 were repeated for tannic acid standard 20,40,60,80,100,120mg/l from stock of 500ppm (50mg of Tannic acid standard dissolve in 100ml of distilled water) excluding centrifugation, the absorbance of the above Tannic acid concentration was read off at a wavelength of 725nm. A calibration curve for the tannic acid standard was drawn, that is absorbance against concentration. The tannic acid concentration of the sample was obtained by tracing the absorbance of the sample down the concentration axis.

$$\text{Tannic Acid content (mg/kg)} = \frac{\text{Conc. obtained in mg/l x volume of sample x DF}}{\text{Sample weight}}$$

DF: Dilution factor. If not diluted, then DF = 1

Determination of Flavonoids (Mahajan and Badujar, 2008)

1.0g of each sample was weighed into a conical flask and 50ml of 80% methanol was added. Extraction was done by placing on a hot plate at low temperature for 30min while stirring allow cooling and then filtered into a 100ml volumetric flask. Made up to mark of 100ml with 80% methanol. Then 3ml of extract was pipette into a test tube. 0.1ml of 10% AlCl3 was added and 0.12ml Na-K tartar ate. 3ml of distilled water was added and shaken properly. The absorbance of the solution was read at 415nm. Procedures No 3 – No 9 was repeated for Rutin standards of concentrations 5, 10, 15, 20mg/l. A standard curve for the Rutin Standard was plotted and the concentration of the samples was determined by extrapolating the absorbance down the concentration axis.

$$\text{Total Flavonoids (mgRE/Kg)} = \frac{\text{Conc. Obtained x total volume of extract x DF}}{\text{Sample weight}}$$

DF: Dilution factor. If not diluted, then DF = 1

Determination of Cardiac glycosides(Harborne 1998)

5g of each powdered sample was boiled in 20ml of distilled water in a water bath and filtered. 10ml of the filtrate was mixed with 5ml of distilled water and shaken vigorously and filtered. The filtrate was placed into water bath and allowed to dry.

$$\% \text{ Cardiac glycoside} = \frac{W_2 - W_{1x}}{W_1} 100$$

Determination of Terpenoids (Narayan *et al*., 2012)

Weigh 0.1g of each powdered sample was weighed into a conical flask and 25ml of petroleum ether was added and allowed to extract with constant shaking for 15min and then filtered. The absorbance of the filtrate was read at 538nm. Linalool solutions in petroleum ether of concentrations 20, 40, 60, 80 & 100mg/l were also prepared. The absorbance of the Linalool standard at 538nm were read and a standard curve was plotted. The absorbance of the

samples on the standard graph were extrapolated to obtain the terpenoids concentration of the samples.

Terpenoid (mg/kg) = Conc. Obtained (mg/l) x total volume of extract x DF
Sample weight

DF: Dilution factor. If not diluted, then DF = 1

Determination of Total Phenols (Rajeev *et al*., 2012)

1.00g of each powdered sample was weighed into a conical flask and 10ml of ethanol was added and plugged with aluminium foil. The mixture was shaken vigorously and left to stand for 30min for proper extraction and was centrifuged to obtain clear supernatant. The supernatant was used for total phenolics assay. 1ml of the solution (supernatant)was pipetted into a test tube. 0.5ml 2N Folin-Ciocalteu reagent and 1.5ml 20% $NaCO_3$ solution were added and was made up to 10ml with distilled water and shaken vigorously and allowed to stand for 90min. The absorbance was read at 765nm. The following concentrations of Tannic acid standard 20, 40, 60, 80, 100, 120mg/l were prepared and the absorbance of the above Tannic acid concentrations were read. A calibration curve for the Tannic acid standard was drawn. That is absorbance against concentration. Extrapolate by tracing the absorbance of the sample down the concentration axis to obtain the concentration of the sample.

Phenol content mg/kg = Conc. obtained in mg/l x volume of sample x DF
Sample weight

DF: Dilution factor. If not diluted, then DF = 1

Proximate analysis

The dry samples were also subjected to proximate analysis to determine the presence of moisture, crude protein, crude fat, crude fiber, total ash and carbohydrate content of the plant extracts as described by the Association of Official Analytical Chemists (AOAC, 1990).

Moisture content was determined by drying 1g of sample in an oven at 105°C for 6hours. The difference in weight gave the moisture content.

Protein content was determined using the Kjeidahl using block digestion and steam distillation and the crude protein was calculated by multiplying the percentage Nitrogen content by the conversion factor of 6.25.

Lipid content was determined using soxhlet extraction method. And the percentage content of each extract was obtained.

The crude fiber content was determined using fibertec 2010 or m6 according to AOAC 1990 procedures.

Ash content was determined by furnace method. 3g of the sample was weighed into a porcelain crucible which was previously preheated and weighed. The crucible was inserted into a muffle furnace and regulated to a temperature of 63^0C. This was heated for 3 hours and allowed to cool to room temperature then reweighed.

The % carbohydrate content was determined as the Nitrogen free extracts; it was estimated as the difference between 100 and the sum total of the proximate composition of each sample.

Results and discussion

Four plants belonging to three families were collected and the folk knowledge of the plants were recorded, (Table 1). The folk knowledge revealed the parts of the plants that are commonly used for treating various diseases in the study. It was shown that the stem-bark and leaves are the most frequent part of the plants used in treating diseases. The use of combination of two to three or more plants has addictive and synergistic effects which often act sequentially at different stages of tackling diseases (Acharya and Shrivastava 2008, 2002; Olanipekun *et al*., 2013; 2016).

Table 2 shows the review on the indigenous and folk usage of the identified plants. It was revealed that different plants and their parts were extensively used in herbal preparation and administration to treat different ailments in the study area. During the administration of these herbal preparations, recipes that were considered to be potent are required to be taken once a day to avoid side effect like stomach disorders. Decoctions is mostly used as method of preparation. It was generally observed that the administration of plant decoctions rarely caused any noticeable side effects compared with orthodox drugs (Sofowora, 1993). Similarly, the residents of the locality had a long period of interaction with these species of plants, thus their closeness had given them the opportunity to develop their knowledge on the use of the plants.

Table 3 shows the qualitative composition of the medicinal plants. The qualitative analysis

revealed that all the phytochemicals tested were present in all the plants but in varying quantities. *Momordica charantia* shows relatively high content of alkaloids, saponins and flavonoids. *Telfaria occidentalis* has high alkaloids, tannins and phenols content while flavonoids are also high in *Enantia chlorantha.* The leaves of *Morinda lucida* have high contents of tannins and phenols as well. This supports the findings of Khan and Omoloso (1998). It should be noted that alkaloids are of importance as they have properties which makes them effective in preventing and tackling diseases (Kittakoop *et al*., 2014). Flavonoids are a group of plant metabolites thought to provide health benefits through cell signalling pathways and antioxidant effects. These molecules are also found in a variety of fruits and vegetables. Saponins are compounds that have characteristic foaming features, and as such may have anti-septic properties which prevents the growth of bacterial and other infectious organisms

Table 4 shows the quantitative compositions of the plants. *Momordica charantia* has the highest number of alkaloids 20.68±0.27 and Saponins 11.40±0.59 while *Morinda lucida* leaf has the lowest number of alkaloids 6.62±0.34 and *Telfaria occidentalis* has the lowest amount of Saponins 1.24±0.09. Similarly, *Enantia chlorantha* has the highest amount of tannins 0.44±0.05 and flavonoids 15.56±0.00 while *Morinda lucida* stem bark has the lowest number of tannins 0.16±0.00 and flavonoids 0.94±0.00. *Morinda lucida* leaf has the highest amount of cardiac glycosides 0.07±0.03 while *Morinda lucida* stem bark 0.00±0.00^{c} and *Momordica charantia* has does not possess cardiac glycosides (Table 4). Also, *Telfaria occidentalis* has the highest amount of Terpenoids 0.09±0.00. Similarly, total phenols are highest in *Morinda lucida* stem bark and are lowest in *Momordica charantia*. This result supports the findings of Adewumi and Adesogan 1984; Awe and Makinde (1998), Khan and Omoloso (1998); Edegar *et al.* (2002); Ejele *et al.*(2012) and Kittakoop *et al*.(2014); .

Mean follow the same alphabets in the same column are not significantly difference from each other.

The proximate composition of the selected medicinal plants shows that *Morinda lucida* leaf had the highest percentages of moisture content of 10.10±0.14 and total ash of 11.24±0.42. Also, *Telfaria occidentalis* had the highest percentage of crude protein of 31.49±1.32 and lowest percentage of crude fiber of 9.08±0.27 while *Enantia chlorantha* showed the highest proportions of crude fat of 5.17±0.24 and carbohydrates of 50.31±1.56 . *Morinda lucida* stem bark had the highest percentage of crude fiber of 53.49±1.98 and lowest percentages of moisture 9.00±0.28, crude protein 5.70±0.14, crude fat 0.45±0.16 and carbohydrates 24.93±0.21 respectively. However, *Momordica charantia* showed the lowest percentage of total ash of 2.67±0.16 (Table 5).

The presence of carbohydrates is responsible for the provision of energy when these plants are consumed and the protein content of the plants also provides great nutritional property in repairing any worn-out tissues in the body system. The moisture content of the plants aids in adequate metabolism, improves the digestion of food and body hydration, improves the freshness and the shelf life of food substance thereby promoting good growth. However, high moisture content subjects food contents to microbial spoilage, deterioration and short shelf life (Tressler *et al*., 1980; Adepoju and Onasanya, 2008; Fabricant and Farnsworth 2001). Adequate intake of dietary fibre lowers the serum cholesterol level, risk of coronary heart diseases, hypertension, constipation, diabetes, colon and breast cancer (Ishida *et al*., 2000; Rao and Newmark, 1998; Fasola *et al.,* 2011). Also, the crude fat content of the plant also provides energy and helps in the digestion of food. The ash content of the plant indicates the presence of minerals (Adebowale and Bayer 2002).

Conclusion

The results of the ethnobotanical study shows that there is high knowledge on the use of medicinal plants in Ado-Ekiti, Ekiti State. The result can serve as bases for the authentication of the plants as medicinal plants. The phytochemical and proximate analyses revealed the presence of various secondary metabolites and suggested that the plants can be used to cure various ailments such as diahoerea, dysentery and urinary tract infection similar to that of a synthetic drug.

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Table 3: The qualitative composition of the selected medicinal plants in the study area

Parameter	*Enantia chlorantha*	*Momordica charantia*	*Morinda lucida* (leaf)	*Morinda lucida* (stem bark)
Alkaloids	++	+	+++	+
Saponins	+	+	+++	+
Tannins	++	+	++	+
Flavonoids	+	++	++	+
Cardiac glycosides	+	+	+	+
Terpenoids	+	+	+	+
Total phenols	++	+	++	+

+ Means present in minute amount or quantity ++ Moderately present +++ Very high

Table 4: The quantitative composition of Telfaria occidentalis, *Enantia chlorantha, Momordica charantia, Morinda lucida* and *Morinda lucida* plants in the study area

Parameters (g/100g)	***Telfaria occidentalis***	***Enantia chlorantha***	***Momordica charantia***	***Morinda lucida*(leaf)**	***Morinda lucida*(stem bark)**
Alkaloids	9.74±0.16^{a}	7.75±0.02^{b}	20.68±0.27^{a}	6.62±0.34^{a}	6.74±0.08^{a}
Saponins	1.24±0.09^{c}	2.23±0.08^{c}	11.40±0.59^{b}	2.42±0.02^{c}	2.79±0.04^{b}
Tannins	0.19±0.00^{d}	0.44±0.05^{d}	0.15±0.00^{c}	0.16±0.00^{d}	0.03±0.00^{c}
Flavonoids	6.77±0.00^{b}	15.56±0.00^{a}	11.47±0.05^{b}	3.33±0.00^{b}	0.94±0.00^{c}
Cardiac glycosides	0.01±0.00^{e}	0.01±0.00^{d}	0.00±0.00^{c}	0.07±0.03^{d}	0.00±0.00^{c}
Terpenoids	0.09±0.00^{d}	0.01±0.00^{d}	0.03±0.00^{c}	0.00±0.00^{d}	0.01±0.00^{c}
Total phenols	0.29±0.00^{d}	0.17±0.01^{d}	0.21±0.00^{c}	0.22±0.00^{d}	0.58±0.00^{c}

Table 5: The proximate composition of Telfaria occidentalis, *Enantia chlorantha, Momordica charantia, Morinda lucida*(leaf) and *Morinda lucida*(stem bark) plants in the study area

Parameters %	***Telfaria occidentalis***	***Enantia chlorantha***	***Momordica charantia***	***Morinda lucida*(leaf)**	***Morinda lucida*(stem bark)**
Moisture	9.20±0.28^{c}	9.20±0.57^{d}	9.45±0.18^{c}	10.10±0.14^{d}	9.00±0.28^{c}
Crude Protein	31.49±1.32^{b}	14.89±0.89^{b}	7.08±0.10^{c}	21.66±1.56^{b}	5.70±0.14^{d}
Crude Fat	3.04±0.06^{d}	5.17±0.24^{d}	1.23±0.16^{d}	2.60±0.25^{e}	0.45±0.16^{e}
Crude Fiber	9.08±0.27^{c}	11.23±0.64^{c}	51.38±0.38^{a}	12.22±0.63^{c}	53.49±1.98^{a}
Total Ash	9.78±0.18^{c}	9.20±0.42^{d}	2.67±0.16^{d}	11.24±0.42^{bc}	6.43±0.34^{d}
Carbohydrates	37.41±1.23^{a}	50.31±1.56^{a}	28.19±0.21^{b}	42.18±0.23^{a}	24.93±0.21^{b}

NOTE: Means with the same letters along the column are not significantly different from each other.

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