



*Ibrahim, B. A¹., Ibrahim, G¹., Danmalam, U.H¹., Nuhu, A¹ and Usman, H².

¹Department of Pharmacognosy and Drug Development, Ahmadu Bello University Zaria-Nigeria

²Department of Biological Science, Federal University Gusau-Nigeria

*Correspondent author: ibrahimbaisha@yahoo.com Tel: + 2348066967338

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ABSTRACT

Ludwigia abyssinica belongs to the family Onagaraceae, it is native to South America, well distributed in Africa and traditionally used in the treatment of generalized back pain, various skin infections, gastrointestinal and wound disorders. The objective of the study is to establish some important pharmacognostic profile of *L. abyssinica* leaves with the hope of assisting in its proper identification as well as standardization for quality and purity. Evaluation of the fresh and powdered sample of the leaves was carried out to determine the micromorphological, chemomicroscopic and some physicochemical parameters of the plant. The microscopy revealed the presence of anomocytic type of stomata in both adaxial and abaxial epidermis with irregular epidermal cells and deeply wavy anticlinal walls on the upper epidermis and with sinuous anticlinal walls and polygonal shaped epidermal cells on the lower epidermis. Chemomicroscopic characters present include; cellulose cell wall, lignified cell wall, tannins, starch, calcium oxalate and cutin. The physicochemical parameters evaluated include: moisture content (7.00%), total ash (7.80%), water soluble (4.67%), acid insoluble (2.33%), ethanol extractive value (17.00%), and water extractive value (19.70%). Quantitative leaf microscopy, had shown that on the average stomata number (8.00), stomatal index (12.12%) on upper epidermal layer while on the lower epidermal layer the stomatal number and index were (20.00) and (16.80%) respectively, palisade ratio (13.00), vein islet number (12.00), and vein termination number (11.00). The results of this investigation may be useful for the compilation of a suitable monograph on *L.abyssinica*.

Keyword: *Ludwigia abyssinica*, Pharmacognostic Evaluation, Leaves, Phytochemicals

1.0 INTRODUCTION

Plant materials are of wide use in traditional systems of medicine in several communities of the developing world, and may be the only resources available for the treatment of different infections (Tagboto and Toronson, 2001). Pharmacognosy is a simple and reliable tool, by which complete information of the crude drug can be obtained (Padmavathi *et al.*, 2011; Soniet *et al.*, 2011). Today with the present surge of interest in the phyto-therapeutics, the availability of genuine plant material is becoming scarce.

Since crude plant drugs form the basis for the manufacture of numerous medicinal preparations, accurate determination of drug identity forms an essential part of its study. It becomes extremely important to make an effort towards standardization of the plant material as medicine. The process of standardization can be achieved by stepwise pharmacognostic studies (Thomas *et al.*, 2008).

Ludwigia abyssinica belongs to the family Onagaraceae it is a native of South America but is now well distributed in Africa (Van

der Burg, 2004). It is locally called 'Allayyahunfadama' in Hausa. It is an aquatic herb growing in ditches, shallow marshy areas, river banks and slow moving streams (Grubben, 2004). The plant is used traditionally in the treatment of generalized back pain, various skin infections, cough, skin diseases, sores, diarrhoea, dysentery, cholera, gastrointestinal and wound disorders (Oyedejiet *al.*, 2014; Mainenet *al.*, 2009). Ethanol extract of *L. abyssinica* leaves was reported to be active against a broad spectrum of bacterial and fungal species (Oyedejiet *al.*, 2011).

However, literature review reveals no pharmacognostic study on this plant and hence the objective of the present study is to establish some important pharmacognostic profile of *L. abyssinica* leaves with the hope of assisting in its proper identification as well as standardization for quality and purity.

2.0 MATERIALS AND METHODS

2.1 Collection, Identification and Preparation of the Plant Material

The plant material of *L. abyssinica* was collected at "Yankarfi" village, SabonGari Local Government Area of Kaduna State, in May, 2015. The plant was taxonomically authenticated at the Herbarium unit, Department of Biological Sciences, Ahmadu Bello University Zaria, Nigeria with Voucher specimen number 801. The leaves were dusted, cleaned and all foreign matter removed, it was then air-dried and comminuted to powder form, stored in an air-tight container for subsequent use.

2.2 Microscopic Evaluation

The microscopic evaluation of the anatomical section and powdered sample of the leaves was carried out using standard methods (Brain and Turner, 1975; Evans, 2009). The transverse section across the

midrib of the fresh leaf of *L. abyssinica* was prepared. Leaf epidermis (upper and lower) were peeled. The prepared sections were cleared using 70% chloral hydrate solution and boiled on a water-bath for thirty minutes to remove obscuring materials. The cleared sample was mounted on a microscope slide by using dilute glycerol. This was then observed under the microscope and the diagnostic features were noted and documented (WHO, 2011). Prepared sections were cleared using 70% chloral hydrate solution and boiled on a water-bath for thirty minutes to remove obscuring materials. The cleared sample was mounted on a microscope slide, using dilute glycerol. This was then observed under the microscope and appropriate images were taken and documented. The micrometric evaluation of some of the diagnostic features was also conducted.

2.3 Quantitative Leaf Microscopy

Quantitative leaf microscopy to determine palisade ratio, stomata number, stomata index, vein – islet number and veinlet termination number was carried out on epidermal peelings and examined under microscope with aid of Camera Lucida (Brain and Turner, 1975; Kokate, 2003).

2.4 Chemomicroscopic Examination

The histochemical detection of cell walls and contents of the powdered leaves such as cellulose cell wall, lignin, starch, cutin, tannins and calcium oxalate, calcium carbonate etc. was carried out using standard method (Evans, 2009; Kokate, 2003).

2.5 Physicochemical Parameters

Powdered sample was subjected to physicochemical analysis such as water and alcohol soluble extractives, total ash, acid insoluble ash, water soluble ash and moisture content were determined (Evans, 2009).

3.0 RESULTS



→ *L. abyssinica* Plant

Plate I: Picture of *Ludwigia abyssinica* in its Natural habitat

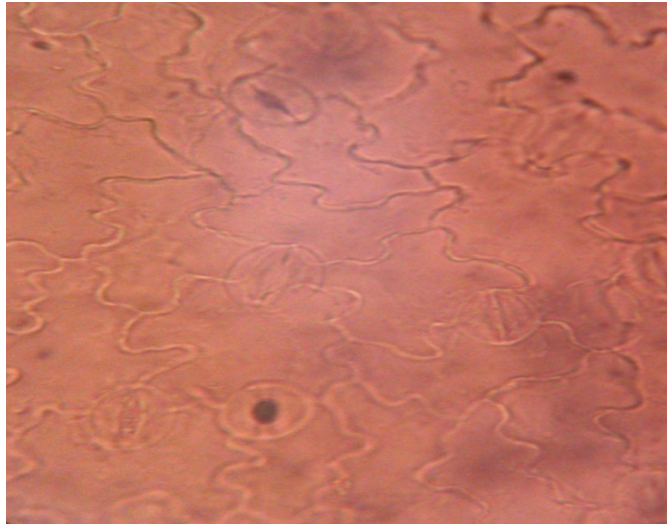
3.1 Microscopical Evaluation of the Leaf of *Ludwigia abyssinica*

Microscopical examination of the leaf of *L. abyssinica* revealed the presence of some

important diagnostic characters on transverse section across the midrib, both upper and lower epidermal layers, as shown in Table 1, Plate II, III, and IV below.

Table 1: Microscopic Features of the Upper and Lower Epidermis of the Leaf of *L. abyssinica*

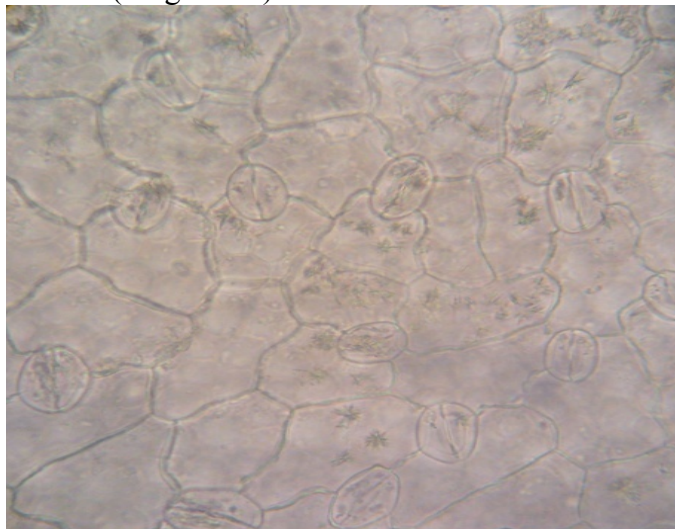
Surface	Character	Observation
Upper	Epidermal cells	
	Shape	Irregular
	Anticlinal walls	Deeply wavy
	Stomata	
	Type	Anomocytic
Lower	Size	(18.35µm×13.60µm)
	Frequency	Few
	Epidermal cells	
	Shape	Polygonal in shape
	Anticlinal walls	Sinous
	Stomata	
	Type	Anomocytic
	Size	(14.13µm× 09.74µm)
	Frequency	Numerous



AnomocyticStomata

Subsidiary cell

Plate II: Photomicrograph of the Upper Epidermal Layer of *L. abyssinica* Leaf showing some features (Mag. $\times 100$)



AnomocyticStomata

Epidermal cell

Plate III: Photomicrograph of the Lower epidermal Layer of *L. abyssinica* Leaf showing some features (Mag. $\times 100$)

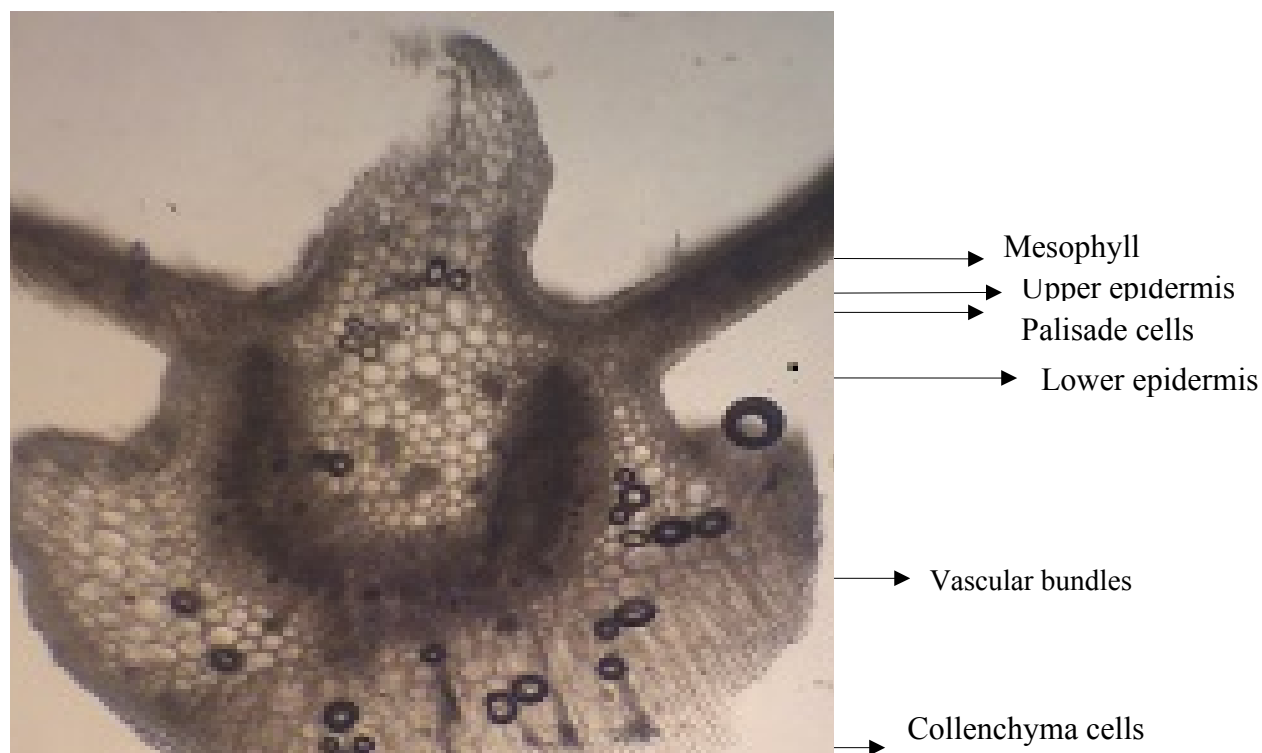


Plate IV: Micrograph of the Transverse Section through the Midrib of the Leaf of *L. abyssinica* showing some Features; x100.

3.2 Quantitative Microscopy on the Leaf of *L. abyssinica*

On the average, the quantitative microscopy gave: stomatal number (20.0), and index (16.8), palisade ratio (13.0), vein islet (12.0) and vein termination number (11.0) were determined and recorded (Table 2).

Table 2: Quantitative Microscopical Values for the Leaf of *L. abyssinica*

Evaluative Parameter	Values
	Lower – Mean* – Upper
Palisade ratio	11.05 – 13.00 – 14.95
Vein islet number	10.20 – 12.00 – 13.80
Veinlet termination number	09.35 – 11.00 – 12.60
Upper epidermis	
Stomatal number	6.80 – 8.00 – 9.20
Stomatal index	10.30 – 12.12 – 13.94
Lower epidermis	
Stomatal number	17.00 – 20.00 – 23.00
Stomatal index	14.28 – 16.80 – 19.32

*Average Mean Value of five counts

3.3 Chemomicroscopical Studies of the Powdered Leaves of *L. abyssinica*

Chemomicroscopical examination of the powdered leaves of *L. abyssinica* revealed

the presence of cellulose cell wall, lignified cell wall, tannins, starch, calcium oxalate, calcium carbonate and cutin

3.4 Determination of physical constants of powdered Leaves of *L. abyssinica*

The result of average moisture contents using loss on drying method was calculated to be 7.0% and the percentage yield of total ash, acid insoluble and water soluble matter

were recorded in percentage values as 7.8%, 2.33% and 4.67% respectively. The extractives obtained were 17.0% and 19.7% for alcohol and water solvents respectively (Table 4).

Table 4.4: Physicochemical Constants of *L. abyssinica* Leaf Powder

Parameters	Values (%w/w) \pm SEM*
Moisture content	7.00 \pm 0.43
Total ash value	7.80 \pm 0.31
Acid Insoluble ash	2.33 \pm 0.17
Water Soluble ash	4.67 \pm 0.00
Ethanol Extractive value	17.00 \pm 0.33
Ethanol Extractive value	19.70 \pm 0.33

*Average values of three determinations

4.0 DISCUSSION

In this report, various microscopical and physicochemical standards have been developed, that will help for proper identification and standardization of *L. abyssinica*.

One of the simplest and cheapest methods to establish the accurate identity of plant material is microscopic analysis (Singh *et al.*, 2010). Microscopical examination of the leaf of *L. abyssinica* revealed the presence of some important diagnostic characters on both upper and lower epidermal layers these includes: anomocytic type of stomata on both upper and lower epidermal layer, with irregular cell and deeply wavy anticlinal walls on the upper epidermis and with sinuous anticlinal walls and polygonal shaped epidermal cells on the lower epidermis (Plate II and III). The transverse section of the leaf through the midrib tissue were examined and revealed different anatomical features namely upper and lower epidermal cells, mesophyll cells, vascular bundle enclosed phloem and xylem tissues (Plate IV). These characteristics are common among members of the Onagraceae (Kadiri and Olowokudejo, 2010). Anatomical features of the internal structures of plant drugs provides an important diagnostic

features for the identification of both entire and powdered crude drugs and detection of adulterants in plant materials (Ghani, 1990). Macro and microscopical evaluation of crude drugs are aimed at identification of right variety and search for adulterant in plant materials (WHO, 1996). The stomatal index of upper surface was found to be (10.30 – 12.12– 13.94) and that of the lower surface was found to be (14.28 – 16.80– 19.32) (Table 2). This result is in line with the statement of Kadiri and Olowokudejo (2010) who stated that the stomatal index has been useful in diagnosis of some of the species; generally it ranges from 8.7% to 36.7% in the genus *Ludwigia*. Physicochemical parameters such as moisture content, total ash content, water soluble ash content, acid insoluble ash content and extractable matter content serve an important role in standardization and quality control by means of purity, stability and photochemical composition of plant drugs (Bharat and Parabia, 2010). The moisture content for *L. abyssinica* powdered leaves was found to be 7.0%. The general requirement of moisture content in crude drug is that, it should not be greater than 14% (BHP, 1990) and the value observed in this research work was within the accepted

range. Determination of the moisture content helps prevent degradation of drug during storage. The lower the value, the less likelihood of degradation of drug and suggests better stability of product. Moisture is considered an adulterant because of its added weight as well as the fact that excess of it promotes mold and bacterial growth (Prasad *et al.*, 2012).

Total ash value (7.8%) represents both the physiological and non-physiological ash from the plant. The non-physiological ash is an indication of inorganic residues after the plant drug is incinerated. The acid insoluble ash values (2.3%) obtained in this study indicated that the plant was in good physiological condition and it contained little extraneous matter such as sand, silica and soil. The total ash value is used as criteria to judge the identity and purity of drugs (WHO, 1996; Prasad *et al.*, 2012). Extractive values are useful to estimate the chemical constituents present in the crude drug and are a measure to determine the solubility of phytoconstituents from the crude drug in a given solvent (Thomas *et al.* 2008). This study indicated that the water had higher extractive value of (19.7% w/w) compared to ethanol which had extractive value of (17% w/w).

5.0 CONCLUSION

The standards established in this study will help minimize the adulteration and proper identification of samples of *L. abyssinica*. The results of this investigation may be useful for the compilation of a suitable monograph on *L. abyssinica*.

6.0 REFERENCES

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