

PHARMACOGNOSTIC STANDARDIZATION OF THE LEAVES OF *FICUS KAMERUNENSIS* Warb (MORACEAE)

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ABSTRACT

Background: Standardisation of medicinal plants and herbal drugs by pharmacognostic procedures is still relevant despite the current modern techniques. The morphological and anatomical description of a medicinal plant is the first step towards standardization of the plant materials and should be carried out before the commencement of any experimental procedure for the detection of adulterations and impurities.

Methodology: Macroscopical, microscopical, physicochemical studies and preliminary phytochemical screening have been carried out on the leaves of *Ficus kamerunensis*. Qualitative leaf microscopy and physicochemical parameters of the leaves were evaluated. The leaf was screened for the presence of different classes of secondary

metabolites.

Results: The leaf was found to be simple petiolate with entire margin, pinnate venation and acute apex. Stomata of anomocytic type were observed in both upper and lower epidermis of the leaf of the plant. Unicellular covering trichomes were present at the upper epidermis surrounded by polygonal epidermal cells with wavy anticlinal walls. Some phytochemicals such as flavonoids, saponins and tannins were present with the absence of alkaloids.

Conclusion: This study could serve as a useful tool in the identification, evaluation and standardization of this plant species.

Keywords: *Ficus kamerunensis*, Macroscopy, Microscopy, Physicochemical, Phytochemical

INTRODUCTION

Pharmacognosy is the study of the physical, chemical, biochemical and biological properties of drugs, drug substances or potential drug substances of natural origin as well as the search for new drugs from natural sources¹. Herbal drugs play a significant role in health care, especially in developing countries². Despite the modern techniques, standardization and authentication of plant drugs by pharmacognostic procedures is more trustworthy. The morphological and anatomical description of a medicinal plant is the first step towards standardization of plant materials, which needed to be carried out before the commencement of any experimental procedure for the detection of adulterations and impurities³. According to WHO, standardization and quality

control of herbals is the process involved in the physicochemical evaluation of crude drug covering aspects, such as selection and handling of crude material, safety, efficacy and stability assessment of finished product, documentation of safety and risk based on experience, provision of product information to consumer and product promotion. Herbal materials are categorized according to sensory, macroscopic and microscopic characteristics⁴. An examination to determine these characteristics is the first step towards establishing the identity and the degree of purity of herbal materials. They are carried out before any further tests are undertaken⁵. The macroscopic identity of herbal materials is based on shape, size, colour, surface characteristics, texture, fracture characteristics and appearance of the cut surface.

However, since these characteristics are judged subjectively and substitutes or adulterants may closely resemble the genuine material, it is often necessary to substantiate the findings by microscopy and/or physicochemical analysis⁶. Microscopic inspection of herbal materials is indispensable for the identification of broken or powdered materials; the specimens are treated with chemical reagents.

An examination by microscopy alone cannot always provide complete identification, though when used in association with other analytical methods it can frequently supply invaluable supporting evidence⁷. Comparison with a reference material reveals, characteristics not described in the requirements, which might otherwise have been attributed to foreign matter, rather than normal constituents⁶.

Ficus is a genus of about 800 species and 2000 varieties of woody trees, shrubs and vines in the family Moraceae occurring in most tropical and subtropical forests worldwide⁸. In Africa, the plants are widely distributed in South Africa, Mozambique, Zimbabwe, Botswana, Nigeria, and Sudan⁹ and over 45 different species of *Ficus* recorded in Nigeria¹⁰. *Ficus kamerunensis* is an epiphytic shrub, strangling, sometimes and lianescent growing up to 20 m high producing copious white latex¹¹. Traditionally, the plant is used for the treatment of sexually transmitted infections, gastrointestinal, respiratory, inflammatory, cardiovascular disorders, ulcerative diseases, and cancers¹². However, there has not been a reported pharmacognostic study on the leaves of the plant.

MATERIALS AND METHODS

Plant Collection and Identification

The aerial parts of *F. kamerunensis* were collected in September 2013 from Samaru, Zaria, Nigeria. The plant was identified and authenticated by a taxonomist at the Herbarium of Department of Biological Sciences, Ahmadu Bello University, Zaria. Its voucher specimen number is 900308.

Macroscopical Examinations

The Macro-morphological features of the leaf were observed with naked eyes and under magnifying lens. They were described using terminologies in¹³.

Microscopical Examinations

Fresh leaves of the plant were studied transversely and longitudinally using surface preparation and sections. They were cleared and mounted on the microscope slide with dilute glycerol as described by¹⁴. Quantitative evaluations of the leaf microscopy has been carried out as described in¹³ and¹⁵.

Physico-chemical Parameters evaluation

The physicochemical parameters of the dried powdered leaves which includes; moisture content, ash values, extractive values were studied as outlined by the World Health Organization guideline¹⁶.

Preliminary Phytochemical Screening

The preliminary phytochemical screening of the powdered leaves were carried out as described by¹⁵ and¹⁷.

RESULTS

The macro-morphological features of the leaves of the plant appeared to be dark green coloured, with pinnate venation ovate shape and entire margin. It has a dimension of 9.2-6.7-4.2 cm X 5.4-3.9-2.4 cm. with an acute apex, cordate base, glabrous surface and petiole (2.9-2.4-1.9 cm). Micro-morphologically, features of the fresh leaves shows anomocytic stomata on both upper and lower epidermis but stomata were more in the lower epidermis. The epidermal cells were polygonal in shape with straight and wavy anticlinal walls. Numerous unicellular, uniseriate covering trichomes as well as parenchymatous mesophyll were observed.

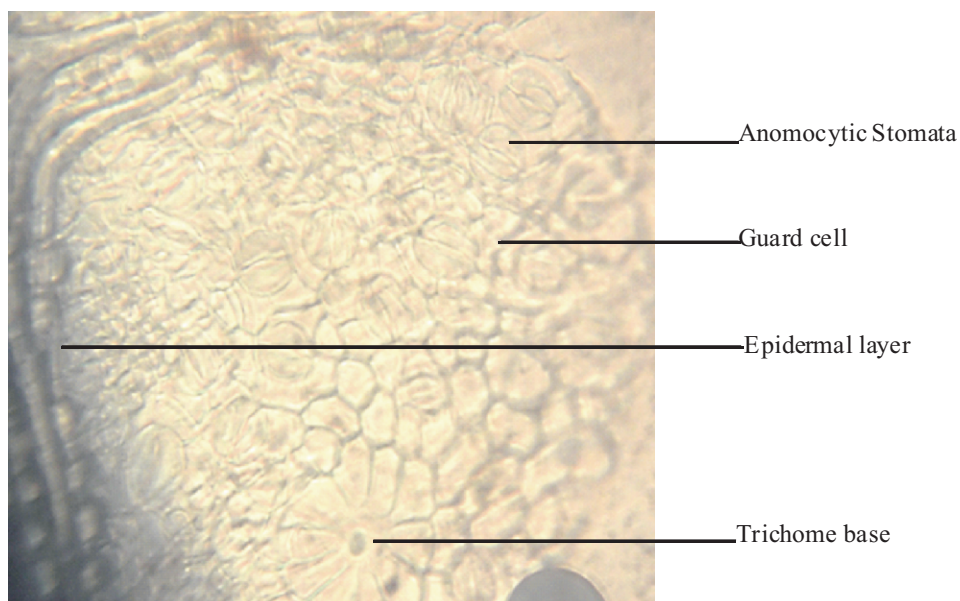


Figure 1: Lower Epidermal layer of *F.kamerunensis*

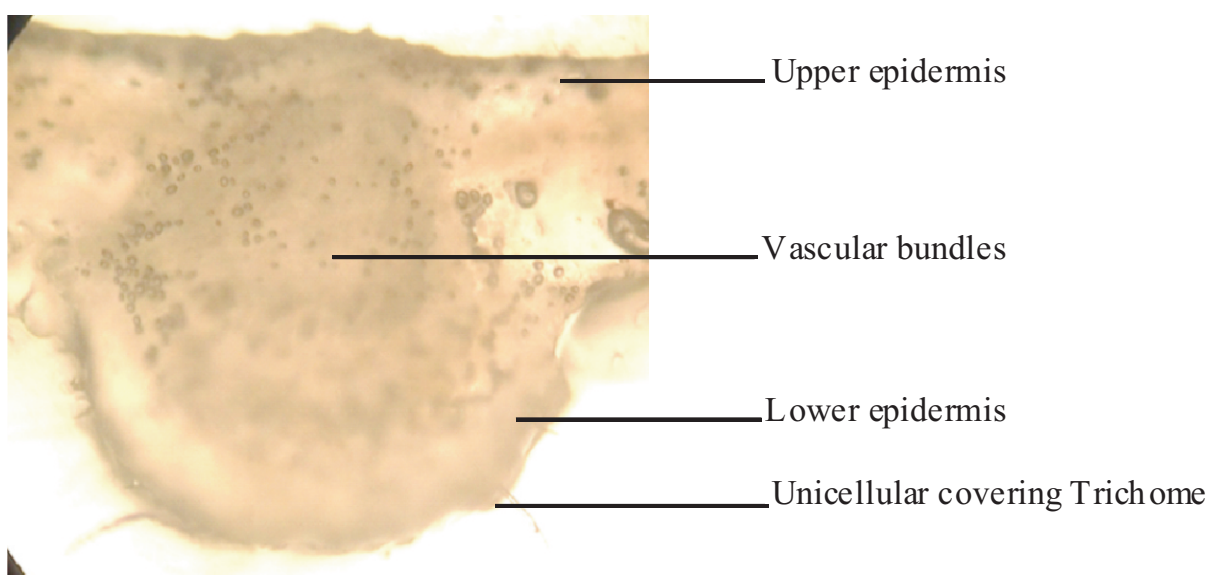


Figure 2: Transverse Section (T.S) through the mid rib of *F.kamerunensis*

The result of the qualitative leaf microscopy and physicochemical parameter were shown in table 1 and 2 respectively.

The preliminary phytochemical screening of the leaves of indicated the presence of anthraquinones, flavonoids, triterpenes, saponins, cardiac glycosides and tannins with absent of alkaloids.

Table 1: Quantitative leaf Microscopy of *F. kamerunensis*

Parameter	Mean \pm SEM
Stomatal number	47.2 \pm 0.58
Stomatal index	22.72 \pm 0.54
Vein termination number	16.40 \pm 0.51
Veinlet termination number	40.20 \pm 0.37
Palisade ratio	8.00 \pm 0.32

*Average of five determinations.

Table 2: Physicochemical parameters of the leaf of *F. kamerunensis*

Parameters	Values (% w/w)
Moisture Content	9.67
Total Ash	9.5
Acid Insoluble Ash	2.2
Water Soluble Ash	1.2
Ethanol Extractive Value	2.3
Water extractive Value	2.7

DISCUSSIONS AND CONCLUSIONS

Pharmacognostic evaluation of a plant or plant parts is considered an important step that provides valuable information in terms of its morphological, microscopical and physical characteristics. This is important in the study of crude drugs being the first step in establishing the correct identity of the plant. Macroscopically, the leaves features of the plant were in conformity with the characteristic features of some plant members of the genus *Ficus* such as *Ficus bengalensis* Linn as described by¹⁸.

Microscopical features of the transverse section of the fresh leaves are consistent with those of *Ficus hispida*¹⁹. The occurrence of anomocytic stomata on both the abaxially and adaxially is a diagnostic importance, likewise the result obtained from the

quantitative leaf microscopy which is being reported for the first time for the plant *F. kamerunensis*. The physicochemical parameters of the leaves of the plant were determined and can be used in development of a monograph for the plant.

The preliminary phytochemical screening of the leaves reveals the presence of anthraquinones, saponins, cardiac glycosides, triterpenes, flavonoids, tannins and absence of alkaloids, which is consistent with some members of the genus *Ficus* as reported by earlier studies²⁰⁻²².

Based on these pharmacognostic studies carried out, the results obtained could usefully aid in the identification, evaluation and standardization of *Ficus kamerunensis*.

REFERENCES

1. Abdel Hameed ESS (2009). Total Phenolic Contents and Free Radical Scavenging Activity of Certain Egyptian Ficus Species Leaf Sample. *Food Chemistry*. 144: 1271-1277.
2. Mulla, S. K., & Swamy, P. (2010). Preliminary pharmacognostic and phytochemical evaluation of *Portulacaquadrifida* Linn. *International Journal of PharmTech Research*, 2(3), 1699-1702.
3. Basudan O.A, Ilyas M, Parveen M, Muhisen H.M, Kumar R. (2005). A new chromone from *Ficus lyrata*. *Journal of Asian Natural Product Research*.7: 81-85.
4. Sarker SD and Nahar L. An introduction to natural products isolation. In *Natural products isolation* Humana press, 2012. p: 1-25
5. Fischer, E., & Armstrong, EF (1902). Representation of the ozone from the ozone zones of sugar. *Reports of the German Chemical Society*, 35 (3), 3141-3144.
6. Olanipekun, M.K, Kayode J. and Akomolafe, D.S. (2013): Ethno-Botanical Importance and Phytochemical Analysis of some Medicinal Plants commonly used as Herbal Remedies in Oye Local Government Area of Ekiti-State, Nigeria. *JOSR Journal of Agriculture and Veterinary Science*.Pg 28-31.
7. Ajayi, B. O., Adedara, I. A., & Farombi, E. O. (2016). Benzo (a) pyrene induces oxidative stress, pro-inflammatory cytokines, and expression of nuclear factor-kappa B and deregulation of wnt/beta-catenin signaling in colons of BALB/c mice. *Food and Chemical Toxicology*, 95, 42-51.
8. Berg CC. *Pollination of Rock Figs by wasps* (Ed). Oxford University Press, 1992. pp: 75-78.
9. Brain KR and Turner TD. *The Practical Evaluation of Phyto pharmaceuticals*, Wright-Scientifica, Bristol, 1975. pp: 75-85, 166.
10. Dutta AC. *Botany for Degree Students*. 6th (Ed). Oxford University press, 2003. p: 532.
11. Evans, W.C. *Trease and Evans Pharmacognosy* 16th (Ed). W.B. Saunders Elsevier, 2009. pp: 1-11.
12. Hamed, M.A. (2011). Beneficial effect of *Ficus religiosa* Linn. On high fat induced hypercholesterolemia in rats. *Food Chemistry* 129: 162-170.
13. Hutchinson, J., and Dalziel J. M. (1957): *Flora of West Tropical Africa*. Publishers Crown Agents for Oversea Government and Administration, Will bank. London. Vol. 1, Part 1, p. 1002.
14. Keay RWJ and Onochie CFA. *Nigeria Trees*. Vol I & II. Department of Forestry Research, Ibadan, 1964.
15. Kirtikar, KR and Basu BD. *Indian medicinal plants*. International Book Distributors, London, 1996. p: 531.
16. Poongothai, A., Sreena, K. P., Sreejith, K., Uthiralingam, M., and Annapoorani, S. (2011). Preliminary phytochemicals screening of *Ficus racemose* linn. Bark. *International Journal Pharmaceutical and Biological Sciences* 2:431-434.
17. Ravi Chandra, V. D., and Padmaa, M. P. (2011). Pharmacognostic and phytochemical investigation on leaves of *Ficus hispida* *International Journal of Pharmacy and Pharmaceutical Sciences* 3: 3.
18. Sofowora, A. (1993). *Medicinal plant and traditional medicine in Africa*. Spectrum Books Ltd, Ibadan Nigeria pp. 150-153.
19. Tyler, V.E. (1999) *Phytomedicines: Back to the future*. *Journal of Natural Product* 62:1589-1592.
20. Patil VV and Patil VR. *Ficus bengalensis* Linn. - An overview. *International Journal of Pharma and Bio Sciences*. 2010;6 (2):
21. W. H. O. (2011): *Quality control method for Herbal materials*, pp9-31.
22. W.H.O. (1996): *Quality Assurance of Pharmaceuticals: A Compendum of Guidelines and Related Materials, Good Manufacturing Practices and Inspection*. World Health Organization, Geneva. 2.