PHARMACOGNOSTIC STANDARDIZATION OF THE LEAF *CUSSONIA BATERI* SEEMANN (ARALIACEAE)

Supported by tetfund TERTIARY EDUCATION TRUST FUND

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Received: September 21, 2022 **Accepted:** November 12, 2022

Abstract:

Cussonia bateri seeman (Araliaceae) commonly known as octupus cabbage tree is used traditionally in the treatment of infection, inflammation, malaria, epilepsy, wound healing and mental disorder. Despite having these important medicinal values, little information is available on the standardization parameters of the plant. For this reason, this present work was carried out to provide a comprehensive report on the quality control and standardization parameters for quality and purity. The preparation of the fresh and powdered samples of leaf was carried out according to WHO guideline on method of assessing crude drug. The macroscopic and organoleptic evaluation that was carried out revealed that the leaf is greenish yellow in colour, odourless, bitter in taste, obvate in shape, rugose in texture, serrulate leaf margin and acute leaf apex. The microscopy shows the presence of epidermis, xylem, phloem subsidiary cells and stomata. Chemo-microscopy revealed the presence of cellulose and lignified cell wall, suberin, mucilage, starch, inulin and druse shaped calcium oxalate. The physicochemical parameters were: moisture content (11.5±0.10), total ash value (11.76±0.15), acid insoluble ash (2.67±0.17), water soluble ash (7.00±0.00), Alcohol extractive value (28.00±3.30), and water extractive value (37.2±3.34). This is the first study providing complete pharmacognostic profile of the leaf of *C. bateri* and it will be useful for correct identification and authentication of the plant for future studies.

Keywords: *Cussonia bateri*, Macroscopic, Microscopy, Physico-chemical parameters, standardization

Introduction

Cussonia bateri belongs to the family Araliaceae, it is commonly called octopus cabbage tree. In Nigeria, it is locally known as *gwabsa* and *takandar giwa* in Hausa, *Burmalahi* in Fulani and *Shigo* in Yoruba.It is a dicotyledous, medium-sized deciduous tree, which grows up to 10-13m in height.it can be grown both in tropical and sub-tropical regions if Sub-Sahara Africa, Yemen and has a convulated compacted trunk, has hard bark (Burkil, 1985). The plant has digitate leaves (5-8 ovate-elliptic leaflets) with small greenish white flowers contained in clusters of narrow spikes up to 50cm long.Fruits are fleshy and turn purple to white on maturation (Zanoni,1999). *Cussonia bateri* and its macerated stem bark are used as a purgative, an aphrodisiac and an external lotion in Mali (Diallo, 2001). The seeds are used as additive in soup because of its pleasant aroma and sweet taste (Nwokonkwo, 2013). In Nigeria and Ghana, decoctions of the root and stem bark are used for menorrhagia, rheumatism, as an emetic, as purgative agent, poison antidote and occasionally in cases of epilepsy (Adeniji, 2000). Decoction of the root bark is used for gonococci infections in Cameroon and Tanganyika. The powdered stem bark is used for conjunctivitis, while the young plants are used for diarrhea in Ivory coast and Volta (Brunken, 2008). The fresh twigs are used to perform magical rites for oedema, paralysis and sleeping disorders (Huchings, 1989). Medicinal plants have played a key role in the world health. In recent decades, in spite of the great advances in the modern medicine plants still make an important contribution to health care (Nikam *et al.*, 2012, Calixto, 2000). According to an estimate of the World Health Organization (WHO), about 80% of the world's population still use herbs and other traditional medicine for their primary healthcare needs. Proper identification and establishing pharmacognostic standards are very important parameters for evaluation of medicinal plants.

Materials and Methods

Collection, Identification and Preparation of the Plant Material

The fresh leaves of *C. bateri* were collected from *Kudingi* forest, Kudingi village Sabon Gari Local Government Area Zaria, Kaduna State in March 2021. The plant was first taxonomically authenticated at the Herbarium Unit of the Department of Botany, Ahmadu Bello University Zaria, Nigeria with a Voucher specimen number of 0900287. The leaves were dusted, cleaned, air-died and pulverized to powder using a clean mortar and pestle. The powdered leaf sample was stored in an air-tight container for subsequent use.

Macroscopical Evaluation

The following features were used for the macroscopic identification of the leaf; Leaf base, lamina, shape, venation, margin, apex, surface, texture, colour and taste. (WHO, 2011)

Microscopical Evaluation

The microscopical evaluation of the anatomical section of the fresh and powdered sample of the leaf was carried out

using standard methods (Evans, 2009). The prepared sections were cleared using 70% Sodium hypochlorite solution and mounted on a microscope slide, using dilute glycerol. This was then observed under the light microscope (Rating 85, 65V) and appropriate images (using x100 mag.) were taken and documented.

Chemo Microscopic Examination

The presence of the cell wall materials and cell inclusions of the powdered leaf such as cellulose cell wall, lignin, starch, suberin, tannins and calcium oxalate, calcium carbonate, gums and mucilage were observed using standard methods (Evans, 2009).

Physicochemical Parameters

Physicochemical analysis such as water and alcohol soluble extractives, total ash, acid insoluble ash, water soluble ash and moisture content were also determined following the standard procedures outlined by Evans (2009).

Results

Pharmacognostic evaluation of plants is an important step that provides valuable information in terms of their morphological, microscopical and physical characteristics. The macroscopical, microscopical and physical evaluation of the fresh and dried leaf of *C. bateri* revealed features that are important and can be applied in establishing the identity of the plant, which is the first step in the study of crude drug.

Table 1. Macroscopic/Organoleptic features of *C. bateri*

Macroscopic/Organoleptic	Physical characteristic
Color	Greenish yellow
Shape	Obvate
Odour	Odourless
Taste	Bitter
Texture	Soft
Leaf margin	Serrulate
Leaf apex	Acute

From the results above, *Cussonia barteri* at maturity was about 8.00-10.00cm in height, the leaf of *C.bateri* is greenish yellow. obvate shape, odourless, bitter. Rugose in texture, has a serrulate leaf margin and acute leaf apex. These macroscopic/Organoleptic features are in lined with the findings of Majid *et al.,* (2021) that reported similar morphological features in the standardization of *Aralia cachemirica* (Araliaceae) this could be the general characteristics of the family. According to the World Health Organization (WHO), the macroscopical evaluation of a medicinal plant is the first step towards obtaining the identity and the degree of purity of that plant sample and should be accomplished before any tests are undertaken (pandey, 2014)

Microscopical Examination

The microscopical examination of the fresh leaf and section of the leaf revealed some diagnostic features such as the calcium oxalate crystals which are druse in shape in the form of crystal sheath arranged along the midrib vein (plate V).epidermal cells, stomata (Anisocytic stomata) and subsidiary cells were observed (plate II,III,IV,V and VI).

Plate I*:* The Image of the plant at Kudingi village Zaria not in its natural habitat

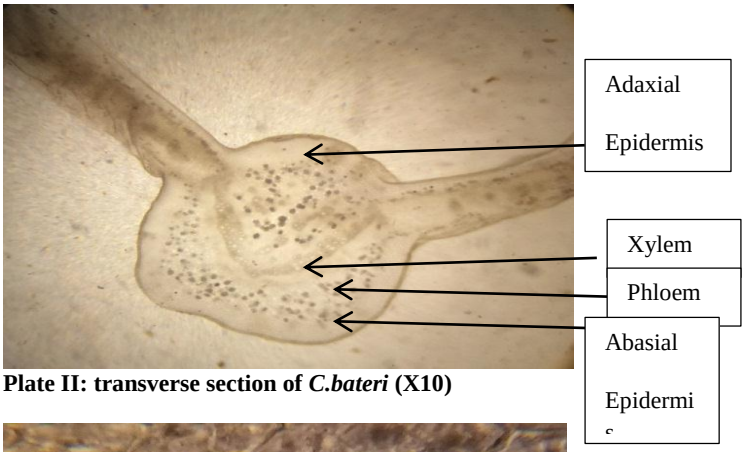


Plate II: transverse section of *C.bateri* (X10)

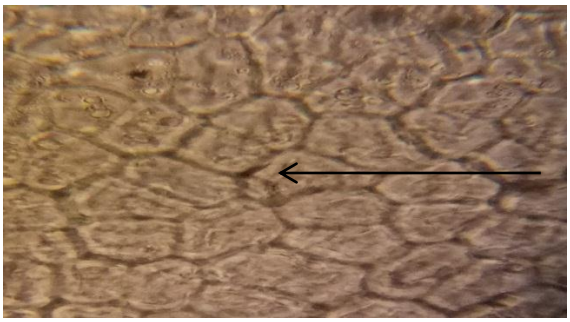


Plate III: Upper epidermal tissue of the leaf of *C.bateri*(X10)

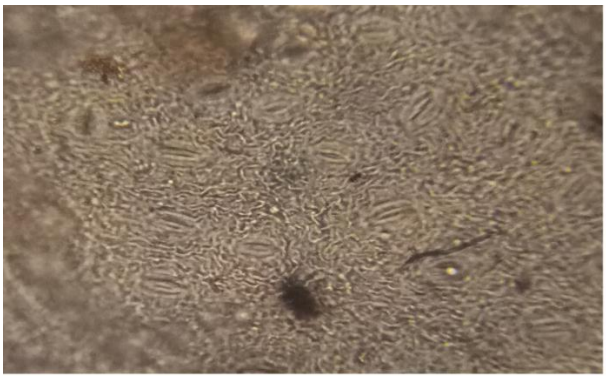
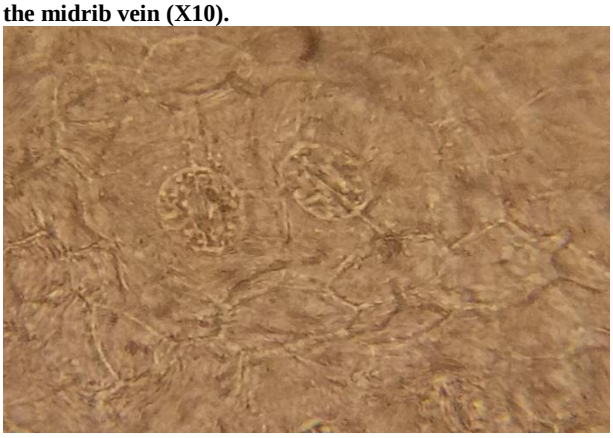


Plate IV: lower epidermal tissue of the leaf of *C.bateri* (x10)

Plate V: Calcium oxalate crystals (druse) arranged along the midrib vein (X10).



PlateVI: Anisocytic stomata (X10)

The microscopical examination of the transverse section, longitudinal section and powdered sample of *C. barteri* leaf revealed the presence of important diagnostic features such as epidermis (abaxial and adaxial), vascular bundles (xylem and phloem) calcium oxalate crystals (druse shaped), Anisocytic stomata, subsidiary cells, upper and lower epidermal cells. This result is in agreement with the finding of Majid *et al.*, (2021) in the standardization of Aralia cachemirica (Araliaceae) and Prasanth *et al.*, (2016) in the standadisation of Aralia racemosa (Araliaceae). Microscopical evaluation of the plant's material is crucial for the detection of the source of plant materials. The anatomical attributes are employed as a criterion for unknown species, genera and some families and also gives the idea of diagnostic features of a plant such as cork cells, cortex, secondary phloem, and fibers which forms the vital factors for the quality control and standardization of herbal drugs (Srimant, 2018).

Determination of physicochemical constant of the leaf of C.bateri

The physical constants of the leaf of *C.barteri* showed that the average moisture contents using loss on drying method was calculated to be 11.5% and the percentage yield of total ash, acid insoluble and water soluble matter were recorded in percentage values as 11.76%, 7% and 2.76% respectively. The extractives obtained were 37.2% and 28.00% for water and alcohol solvents respectively

Table 2. Summary of numerical standard of *C.bateri*

Parameter	Value obtained (%w/w)± SEM
Moisture content	11.5±0.10
Total ash value	11.76±0.15
Water insoluble ash	7.00±0.00
Acid insoluble ash	2.67±0.17
Water extractive value	37.2±3.34
Alcohol extractive value	28.00±3.30

Key: SEM = Standard Error of Mean.

Physicochemical and microscopical studies are carried out on herbal crude drug sample in order to establish appropriate data that may be utilized for identification and establishment of the purity and standard of the plant sample and those supplied in powdered form for purity and quality assurance (Kumar *et al.*, 2011).

Chemomicroscopical examination of powdered C.bateri.

The chemo-microscopical features identified were cellulose cell wall, lignin, cutin/suberin,
inulin, aleurone grain and calcium oxalate crystals, (cell inclusions), tannins, andcalcium carbonate (cell constituents).

Table 3: Summary of the result of chemo-microscopical analysis.

Tests	Observation	Inference
Test for Cellulose	Blue stained color on the primary cell wall	Cellulose Present
Test for Lignin	Red colour on the secondary cell wall of xylem vessels and the middle lamella	Lignin Present
Test for cutin	Orange-red colour on the cuticle that overlays the cell wall of epidermal cells	Cutin Present
Test for Gums & mucilage	Red colour on the cell wall	Gums and Mucilage Present
Test for starch	Blue-black stain on the chloroplasts	Starch Present
Aleurone grains	Yellowish brown colour on the dry	Aleurone Present

	vacuole which forms the aleurone layer	
Calcium oxalate crystals	Dissolution after the addition of HCL	Calcium oxalate Crystals Present
Calcium carbonate	Dissolution with effervescence	Calcium Carbonate Present
Inulin	Aggregation of brownish red crystals on the cell wall	Inulin Present
Tannins	Appearance of greenish black colouration on the vacuole within the plant cell	Tannin Present

Chemo-microscopical evaluation of powdered leaves of *C. barteri* revealed the presence of cellulose cell wall, lignified cell wall, mucilage, tannins, starch, cutin, calcium oxalate crystals, inulin, Aleurone grains and calcium carbonates as shown in table 3. Investigations of the powdered plant material provides a comprehensive structural information of raw medicinal drugs by discovering the identified histological characters in the drugs. The powdered examination of herbal material is based on the cytomorphological parameters in the case of cell inclusions, starch grains, and calcium oxalate crystals (Brisht *et al.*, 2017).

Conclusion

The leaf of *Cussonia barteri* has several medicinal properties but with no reported data on their pharmacognostic parameters. Some pharmacognostic parameters for leaf of *Cussonia barteri* were established for the first time in this study to the best of my knowledge and these data could be used as a diagnostic tool for the standardization and proper identification of this plant.

Some pharmacognostic standards of the leaf of *C. barteri* were established as a guide towards its proper identification, quality and purity as a crude drug for proper pharmaceutical utilizations.

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