PHARMACOGNOSTIC STANDARDIZATION OF THE STEM BARK OF *Cussonia barteri* SEEMANN. (ARALIACEAE)

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Abstract: *Cussonia barteri (Seemann),* commonly called Octopus cabbage tree. It is known in Hausa as *Gwabsa*, Fulani as *Burmalahi* and Yoruba as *Sigo.* It is used traditionally in the treatment of infectious diseases, pain, gastrointestinal problems, malaria, inflammation and sexually transmitted diseases but with little knowledge on the pharmacognostic standards. The study established some important pharmacognostic standards of *C. barteri* stem bark with the aim of achieving its proper identification as well as standardization for quality and purity. The preparation of the fresh and powdered samples of the stem bark was carried out according to WHO guideline on method of assessing crude drugs. The macroscopic and organoleptic evaluation showed that the stem bark is brownish-grey in colour, well marked with longitudinal ridges and fissures, stem breaks with a short fracture which exhibit a thin cork and a broad fibrous layer, has a characteristic taste and smell. The microscopy shows the presence of epidermis, endodermis, xylem, phloem, cortex and pith. Chemo-microscopy revealed the presence of cellulose and lignified cell wall, suberin, mucilage, starch, inulin and clustered-type calcium oxalate. The physicochemical parameters were: Moisture content (7.86 ± 0.17), total ash value (11.40 ± 0.24), acid insoluble ash (2.30 ± 0.12), water soluble ash (6.33 ± 0.23), ethanol extractive value (13.67 ± 0.33), and water extractive value (17.67 ± 0.66). Micrometry showed calcium oxalate crystals (length 4.40 µm ± 0.25, breadth 3.00 µm ± 0.32), cork cells (length 6.40 µm ± 0.25, breadth 5.00 µm ± 0.32) and fibres (length 64.80 µm ± 2.13, breadth 7.00 µm ± 0.45). The study evaluated the pharmacognostic standards of *C. barteri* and the macroscopic, microscopic, as well as the physico-chemical parameters which will be useful for the compilation of a suitable monograph on *C. barteri* and guide towards its pharmaceutical utilization.

Keywords: *Cussonia barteri*, macroscopic, microscopic, physicochemical parameters, standardization

Introduction

Cussonia barteri, is a large evergreen tree, belonging to the family Araliaceae. The plant is commonly known as 'Octopus cabbage tree' while in Hausa as 'Gwabsa', Yoruba as 'Sigo' Fulani as 'Bumarlahi'. Its habitat is Sudano-Guinean to Guinean savannahs, on well-drained light soils. Resistant to fire, thanks to its thick, fireproof bark. It is distributed in Tropical Africa, from Senegal to Central African Republic (Michel, 2005). It is a tree that is up to 10 m high and 40 cm in diameter, with tortuous trunk, very thick cocky bark. A deciduous savannah tree; leaves and flowers spikes clustered at the ends of the thick branches with greenish-white flowers and whitish ripe fruits. Medicinal plants have played a key role in world health including developing countries. In spite of the great advances observed in modern medicine in recent decades, plants still make an important contribution to health care (Calixto and Barz, 2000). However, the use of herbal remedies is on the increase with concern and uncertainty about the quality, safety and efficacy of these remedies.

There is also the problem of incorrect diagnosis, imprecise dosage, and low hygiene standard, lark of regulation of herbal medicines in many countries, ineffective monitoring and control of the sales of unregistered products (De-Smet, 1995). It is therefore essential to lay down the pharmacognostic specifications of medicinal plants which are used as drugs.

Cussonia barteri ethno botanical survey showed that the stem bark is macerated and taken as a purgative, fever, applied as a lotion, for painful menstruation, an emetic for poisoning and measles prevention (Michel, 2005). The leaf and stem bark is used to treat urethral discharge in women, and are taken by men as an aphrodisiac (De Villiers *et al*., 2010). Leaf-decoction is used as an eye-wash for conjunctivitis, cataracts and epilepsy. Pulped up young shoots is eaten for diarrhea in Ivory Coast. It is also prescribed as a poison-antidote. However, no pharmacognostic standards on the stem bark of *Cussonia barteri* and hence the aim of the present study is to establish the pharmacognostic profile of *Cussonia barteri* stem bark.

Materials and Methods

Collection, identification and preparation of the plant material

The fresh stem bark of the plant *Cussonia barteri* was collected from Basawa, Sabon-gari Local Government Area of Kaduna State Nigeria, in the month of February, 2018. The plant was first taxonomically authenticated at the Herbarium Unit, Department of Biological Sciences, Ahmadu Bello University, Zaria Kaduna State, with a voucher specimen number 900287. The stem bark was dusted, cleaned, air-dried and was pulverized to coarse powder using a clean mortar and pestle. The coarse powdered stem bark sample was stored in an air-tight container for subsequent use.

Microscopic evaluation

The microscopic evaluation of the anatomical section and powdered sample of the stem bark were carried out using standard methods (Brain and Turner, 1975; 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 ×100 mag.) were taken and documented. The micrometric diagnostic features were also measured.

Chemo microscopic evaluation

The histochemical detection of cell wall components of the powdered stem bark such as cellulose cell wall, lignin, starch, suberin, tannins and calcium oxalates, calcium carbonate, gums and mucilages were carried out using standard methods Kokate (2003) and Evans (2009).

Physicochemical parameters

Physicochemical analysis such as moisture content, total ash, water soluble ash, acid insoluble ash, water and alcohol extractive values were also determined following the procedures outlined by Evans (2009) and WHO (2011)

Results and Discussion

Table 1 and Plates I – II depict the results of the macroscopic/organoleptic and microscopic features of *C. barteri* stem-bark.

Table 1: Macroscopic/organoleptic and microscopic features of *C. barteri* stem-bark

Macroscopic/Organoleptic	Physical characteristic
Colour	Brownish-grey
Stem bark height	6.00-8.00 cm
Stem width	3.00-6.00 cm
Thickness	0.50-1.50 cm
Taste and odour	Characteristics
Fracture	Fibrous
Texture	Rough
Transverse section	Epidermal layer, xylem, phloem, cortex and pith

Plate I: *Cussonia barteri* in its natural habitat

Plate II: *Cussonia barteri* stem bark

Chemo-microscopic examination of the powdered stem bark sample of *C. barteri* revealed the presence of cellulose cell wall, lignified cell wall, tannins, starch, calcium oxalate, suberin, mucilage and inulin (Table 2).

Table 2: Chemo-microscopic evaluation of *C. barteri* stem-bark powder

Constituents	Inference
Cellulose cell wall	+
Lignified cell wall	+
Mucilage	+
Suberin	+
Starch	+
Calcium oxalate	+
Calcium carbonate	-
Inulin	+

Present (+); Absent (-)

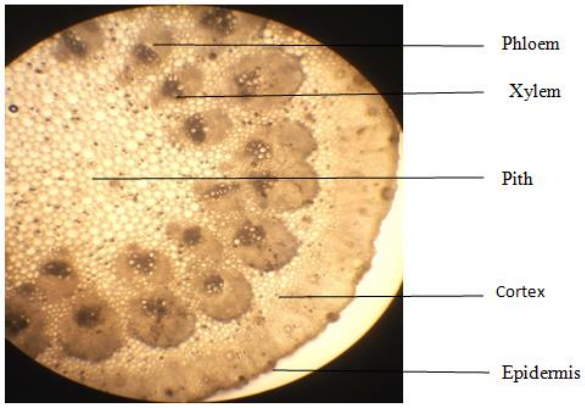

Plate III: Transverse section of *C. barteri* stem bark (×100 Mag.)

Table 3: Micrometric Evaluation of *Cussonia barteri* stem bark

Character	Observation Length	Width
Calcium oxalate crystal	4.40 µm ±0.25	3.00 µm ±0.32
Cork cells	6.40 µm ±0.25	5.00 µm ±0.32
Fibre	64.80 µm ±2.13	7.00 µm ±0.45

*Results expressed as Mean ± SEM from five observations

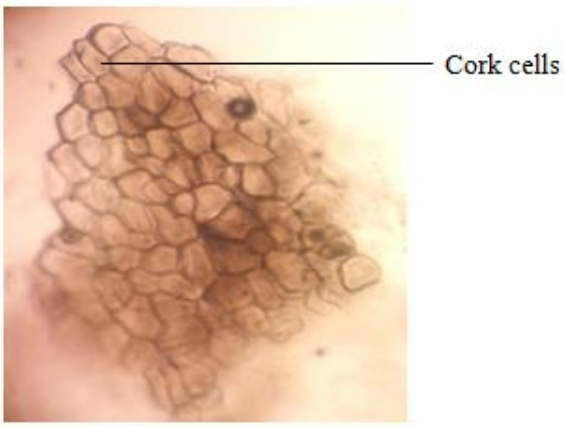

Plate IV: Cork cells of *C. barteri* stem bark (×100 Mag.)

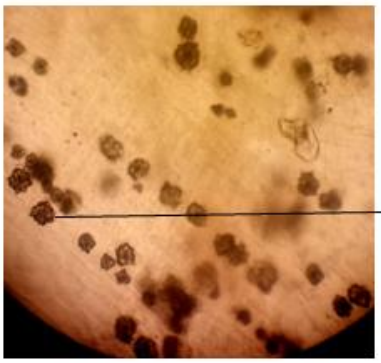

Plate V: Calcium oxalate crystals of *C. barteri* stem bark (×100 Mag.)

Plate VI: Fibres of *C. barteri* stem bark (×100 Mag.)

Table 4: Physicochemical constants of *C. barteri* stem-bark powder

Parameters	Values (%w/w) ± SEM
Moisture content	7.86% ± 0.17
Total ash value	11.40% ± 0.24
Acid Insoluble ash	2.30%± 0.12
Water Soluble ash	6.33% ± 0.23
Ethanol Extractives	13.67% ± 0.33
Water Extractives	17.67% ± 0.66

***** Results expressed as Mean ± SEM from five observations

From the results above, *Cussonia barteri* stem bark has a brownish grey colour, with a fibrous fracture; texture is rough and has a characteristics taste and odour (Plates I – VI). These macroscopic/Organoleptic features are in lined with the findings of Michel (2005), Pankaj *et al.* (2014), Shadma *et al.* (2012) that reported similar morphological features in some species of Araliaceae family and this could be a general characteristics found in the family. Also, the transverse section revealed the epidermal layer, xylem, phloem, cortex and pith.

The chemo-microscopy showed the presence of cellulose cell wall, lignified cell wall, suberin, mucilage, starch, inulin and clustered type calcium oxalate with the micrometry dimension of calcium oxalate (4.40 µm in length and 3.00 µm in width), Cork cells (6.40 µm in length and 5.00 µm in width) and fibres (64.80 µm in length and 7.00 µm in width) (Table 3). These findings are in lined with Shadma *et al.* (2012) and Michel, (2005).

Furthermore, the physicochemical parameters assessed the moisture content, total ash, acid insoluble ash, water soluble ash, alcohol and water extractive values (Table 4) revealed the moisture content (7.86%) is not high which indicated less chances of microbial degradation of the drug during storage. The general requirement of moisture content in crude drug is that, it should not be more than 14% (B. H. P, 1990) and the value obtained in this research work was within the accepted range. Total ash value (11.40%) 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 (2.30%) 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). The ethanol extractive value (13.67%) and water extractive value (17.67%) showed that both water and alcohol are potentials in the extraction of the active constituents. Tiwari and Mishra (2011) stated that solvent choice in research involving plant depend on phytochemicals to be extracted as well as the cost and easy access of the solvents.

Conclusion

The pharmacognostic standards for the stem bark of *Cusoonia barteri* will be useful for the compilation of suitable monograph and also serve as a basis for the detection of impurities and adulterants in the crude drugs that could further enhanced its medicinal and pharmaceutical utilization.

Conflict of Interest

Authors declare that there are no conflicts of interest.

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