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Pharmacognostic evaluation of the leaf of *Cochlospermum planchonii*, Hook. F (Cochlospermaceae)

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Abstract
The plant kingdom has contributed immensely to health care systems globally and in the development of traditional and modern drugs. The present study is to evaluate the Pharmacognostic features of the leaf of *Cochlospermum planchonii* which is claimed by the some tribes in Northern Nigeria to be effective in the management of pain, inflammation and other related diseases. Using standard pharmacognostic description of terms, the various features of both the fresh and powder leaf were observed macroscopically and microscopically. The fresh leaf is ovate with dentate margin, obtuse apex, glabrous surface and a recticulate venation that forms a simple leaf type. The characteristic microscopic features of the leaf observed were single fibre, parenchyma, prisms, rosette and unicellular non glandular trichome. Chemomicroscopy of the powder leaf confirmed the presence of starch grains, aleurone grains, calcium oxalate crystals, lignin, mucilages, cutin and cellulose. These parameters will help to establish the correct identity of the plant drug and check the occurrence of adulteration.

Keywords: *Cochlospermum*, *planchonii*, cochlospermaceae, macroscopy and microscopy

Introduction
For centuries, plants have been used empirically as drugs; initially as traditional preparations and recently as pure active compounds. Majority of people especially in Africa still depend on medicinal plants for their health care delivery. It has also been noted that one quarter of all medical prescriptions are formulations derived from plants or plant-derived synthetic analogs [1]. According to World Health Organization (WHO), 80 % of the world's population; primarily, the developing countries still rely on plant-derived medicines for their healthcare and this is due to high cost of western pharmaceuticals and health care and/or because traditional medicines are more acceptable from the cultural and religious background [2].
Cochlospermum planchonii is a low shrubby savanna plant which grows up to 2.5 m high. It is widespread in the tropical regions from Senegal to West Cameroun. It grows in the Northern part of Nigeria especially the peak area of Benue River Valley, Taraba, Plateau, Bauchi and Kaduna Sate [3, 4, 5]. The plant is employed in folk medicine in Nigeria and other West African countries for the treatment of different kinds of diseases and for other social and religious uses. The Hausas in Nigeria and some tribes in the Northern Sierra Leone use the stem bark in the production of fibres for making strings and ropes. The Chambas people in Sokoto State, Nigeria use the treated seeds as beads. The Nupe-Fulani in Nigeria and some tribes in Sudan use the root extract as a dye and for making tattoos, inks, mordant and stains. The leaf infusion is believed to bestow magical protection on the Fulanis. Some tribes in Nigeria also use the roots in cooking soup when palm oil is not available [6]. The present study is therefore aimed at evaluating the Pharmacognostic profile of the plant using standard definition of terms.

Materials and Methods
Plant collection, identification and preparation
Cochlospermum planchonii leaf was collected from the 'Babare' locality, in Jos North Local Government Area of Plateau state, Nigeria. The plant was identified in the field using the pharmacognostic descriptions and keys in official books. The identity of the plant was authenticated at the Department of Horticulture and Landscape Technology, Federal College of Forestry, Jos, Nigeria, and assigned Voucher specimen Number (FHJ 1011). The plant was collected and air dried at room temperature under shade until a constant weight was obtained for a period of three weeks. The plant was then pounded to powder using local pestle and mortar, sieved with a mesh of size-20 and stored in an air-tight container until when required for use.

Chemicals and reagents
All the solvents used in the study were of Analytical grade.

Macroscopy of the fresh leaf
The fresh leaf was observed for features like shape, margin, apex, surface, texture and venation in order to determine the leaf-type using a standard method [7].

Macroscopy of the powder leaf
The diverse features of the powder leaf were observed macroscopically using the standard description of terms such as colour, taste, texture and odour as described [7].

Microscopy of the Leaf
Fresh and powdered samples were used to determine the microscopic profile of the plant through the use of a compound microscope. Powder samples, thin sections and whole leaf were placed on a clean glass slide. Few drops of chloral hydrate solution was added and gently heated on a blue flame from a Bunsen burner. This was done to clear the sample from colouring pigments in order to have a clear observation of the histological features to be viewed under the microscope. To avoid cracking of the slide and formation of chloral hydrate crystals, the slide is repeatedly removed from the heat and glycerol was then added to the cleared specimen as mountant and the slide covered with a glass slide and then viewed under the microscope. Observations were carried out using the × 4 and × 10 magnifications. The method described [8, 9] was adopted with slight modifications.

Chemo microscopy of the Leaf
Chemo microscopic examinations were carried out on the powder leaf to determine the presence or absence of cellular contents of diagnostic importance such as starch grains, calcium oxalate crystals, lignin, cutin, fats and oils, etc. Slide preparation and staining were done according to a standard method described [10].

Quantitative microscopy of the Leaf
Quantitative leaf microscopy was carried out to determine parameters such as palisade ratio, stomata number, stomata index, vein-islet number and vein-termination number which are used to differentiate closely related drugs of the same family by a standard method described [10].

Pharmacopeia standards
Methods for the determination of pharmacopoeia standards such as the moisture content, total ash values, water soluble ash values, acid insoluble ash values and extractive values of the leaf of *Cochlospermum planchonii* were carried out as described [11].

Results

Table 1: Result of the Macroscopy of the Fresh Leaf of *Cochlospermum planchonii*

Parameter	Description
Margin	Dentate
Apex	Obtuse
Surface	Glabrous
Texture	Papery
Venetion	Recticulate
Leaf Type	Simple

Table 2: Result of the Macroscopy of the Powder Leaf of *Cochlospermum planchonii*

Parameter	Description
Tasteless	Characteristic
Odour	Characteristic
Colour	Green
Texture	Smooth

Table 3: Result of the Chemomicroscopy of the Powder Crude Sample of *Cochlospermum planchonii* Leaf

Test Reagent	Observation	Inference
1 % Picric acid	Aleurone grains were stained yellow in the cytoplasm of the cell	Protein present
5 % Iodine	Starch grains were stained blue black in both the vacuole and cytoplasm	Starch present
Phloroglucinol + Conc HCl	Lignified walls were stained red; fibres, xylem and Phloem tissues	Lignin present
50 % H_2SO_2	Bright crystals disappeared gradually	Calcium oxalates present
Ruthenium red (RR)	Walls containing Epidermal and parenchyma cells were stained light red	Mucilages present
5 % Ferric Chloride Solution	Epidermal and parenchymal cells were stained green-black in the cell sap and vacuole	Tannins present
Sudan red	Walls containing Epidermal and parenchymal cells were stained orange red	Cutin present
Clor-Zinc-Iodine	Walls containing Epidermal and parenchymal cells were stained blue-black	Cellulose present

Table 4: Result of the Quantitative Microscopy of the Fresh Leaf of *Cochlospermum planchonii*

Parameter	Range	Mean
Palisade ratio	124-128	126 ± 0.1
Stomata number	8-10	9 ± 0.3
Stomata index	2-4	3 ± 0.5
Vein-islet number	2-4	3 ± 0.2
Vein-termination number	1-3	2 ± 0.7

Table 5: Result of the Pharmacopeia standards *Cochlospermum planchonii*

Test	Leaf Powder (% w/w)
Moisture content	11.75±0.01
Total Ash value	1.80±0.05
Acid Insoluble Ash value	2.78±0.08
Water soluble Ash value	0.50±0.03
Alcohol Soluble Extractive value	27.68±0.09
Water Soluble Extractive value	19.31±0.03

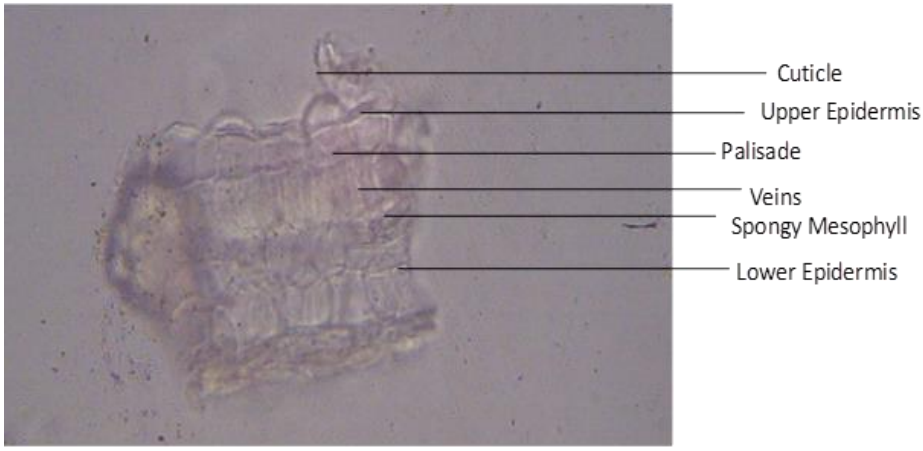

Plate 1: T.S of the Leaf of *C. planchonii*

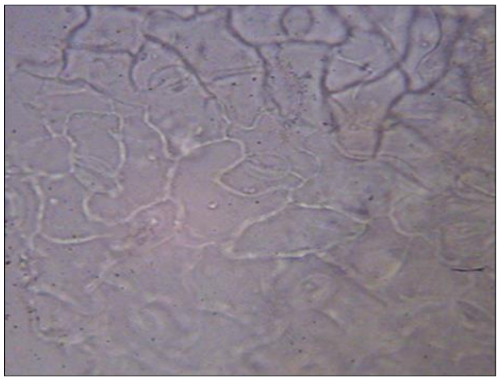

Plate 2: Upper Epidermis of the Leaf of *C. planchonii*

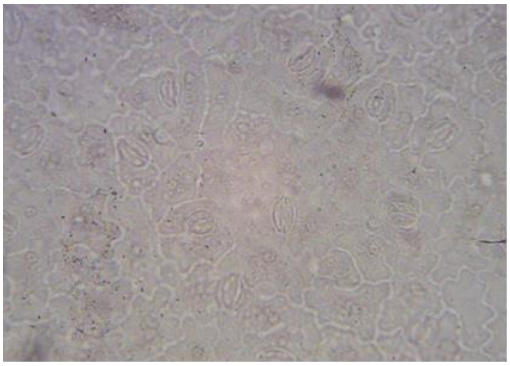

Plate 3: Lower Epidermis of the Leaf of *C. Planchonii*

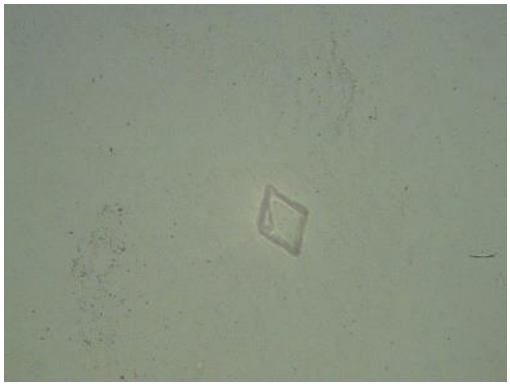

Plate 4: Prism

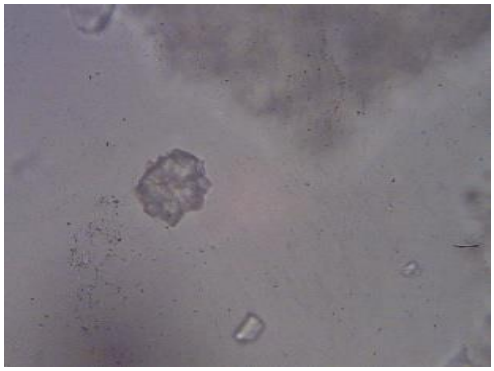

Plate 5: Rosette

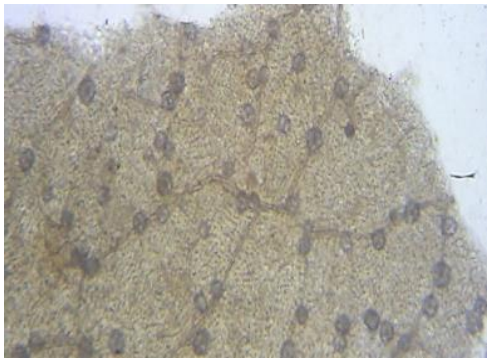

Plate 6: Starch grains

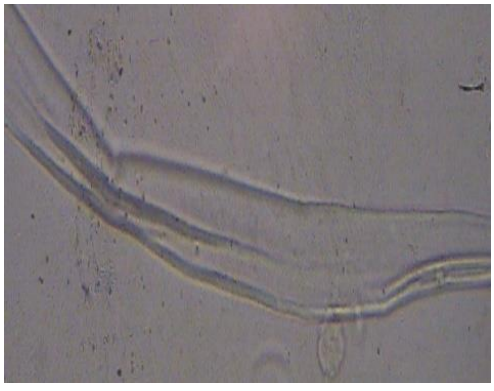

Plate 7: Fibre

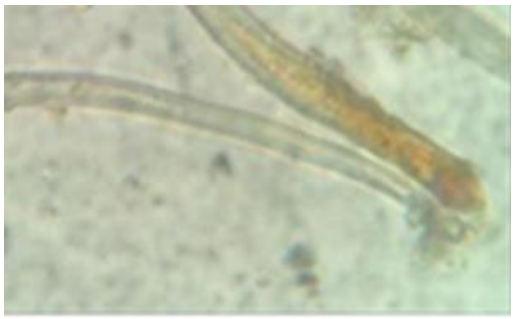

Plate 8: Trichome

Plate 9: Parenchyma

Discussion

The macroscopic features of the fresh and powder leaf of *Cochlospermum planchonii* were observed using the standard description of terms. Table 1 revealed the following: shape, ovate; margin, dentate; apex, obtuse; surface, glabrous; venation, recticulate; making it a simple type of leaf. Table 2 showed that the powder is green in colour, smooth to touch with a characteristic odour and taste.

Plate 1 shows the transverse section through the lamina of the leaf of *Cochlospermum planchonii*. Directly underneath the cuticle was found a single layer of cells that forms a protective boundary between the leaf and the external environment called the epidermis. In between the two epidermises are the mesophyll tissues which separated into the palisade layer and spongy parenchyma and were seen packed with chloroplasts; an organ responsible for photosynthetic processes. Within the veins of the leaf were found vascular bundles comprising of xylem and phloem which are responsible for the transportation of water and food within the leaf. This gave the leaf an EP_1 P SM EP_2 formation, a characteristic of a dorsiventral type of leaf arrangement. Plate 1 and Plate 2 revealed the upper and lower epidermises of *Cochlospermum planchonii* with wavy anticlinal walls. The upper epidermis was found to have fewer anomocytic stomata when compared to the lower epidermis. This result serves as a pharmacognostic diagnostic tool for the identification of the plant from other closely related species [11].

The characteristic microscopic features of the leaf of *Cochlospermum planchonii* observed in Plates 4, 5, 6, 7, 8 and 9 respectively were prisms, rosette, starch, fibre, unicellular non glandular trichome and parenchymatous cells. These features could be used pharmacognostically for identification and differentiation. Chemomicroscopy of the powder leaf of *Cochlospermum planchonii* in Table 3 showed the presence of starch grains, aleurone grains and calcium oxalate crystals in the cell and lignin, mucilages, cutin and cellulose on the cell walls. This result further confirms the presence of phytochemicals. The presence of these phytochemicals can also be used as a standard for the identification and detection of adulterants in the drug. Quantitative leaf microscopy of the fresh leaf of *Cochlospermum planchonii* depicted in Table 4 revealed a distant- range of parameters such as palisade ratio, stomata number, stomata index, vein-islet number and vein-termination number of 124-128, 8-10, 2-4, 2-4 and 1-3 respectively. The ratio between the upper and lower epidermis for these variables is constant and therefore, can be used to distinguish between closely related species of plants and also to check out adulterants [10].

Table 5 showed the quantitative values of the moisture content, total ash, water soluble ash, acid insoluble ash, alcohol extractive and water extractive values of 11.75 ± 0.01 % $^{w}/_{w}$, 1.80 ± 0.08 % $^{w}/_{w}$, 0.50 ± 0.03 % $^{w}/_{w}$, 2.78 ± 0.08 % $^{w}/_{w,}$ 27.68 ± 0.09 % $^{w}/_{w}$ and 19.31 ± 0.03 %$^{w}/_{w}$ respectively. The value of the moisture falls within the acceptable limit of between zero and fourteen percent for moisture content of crude drugs [12]. Moisture is an inevitable component of crude drugs, which must be eliminated as far as practicable. If the water content of a drug is high, the crude drugs can easily deteriorate due to the activity of fungi and other hydrolytic micro- organisms [13]. It can also be inferred based on the quantitative values of the ash that all traces of extraneous organic matter were removed giving the drug a high extent of purity [13]. The result of the extractive values implied that alcohol is a better extracting solvent than water that the Traditional Medical Practitioners are known to use for their decoction. This method of extraction is applied to drugs that the standard method of its extraction is not yet known. Extractive values are also useful for evaluation of crude drugs and give idea about the nature of chemical constituents present in them. The amount of extractive, a drug yields to a given solvent is often an approximate measure of a certain constituent or group of related constituents a drug contains. Less extractive value may also indicate addition of exhausted material, adulteration or incorrect processing during drying or storage [13].

Conclusion

The macroscopy, microscopy, chemomicroscopy, quantitative microscopy and pharmacopoeia standards of the leaf of *Cochlospermum planchonii* have been evaluated in this study and the results obtained can be used as a pharmacognostic standard for establishing the monograph of the plant.

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