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Full Length Research Paper

Phytochemical and pharmacognostic studies of the leaf and stem-bark of *Anthocleista vogelii* (Planch)

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The phytochemical screening of the powdered leaves and the stem bark of *Anthocleista vogelii* revealed the presence of carbohydrates, saponins, flavonoids, terpenes, sterols and phenols. Alkaloid was present in the leaves only. Moisture content, total ash value, acid-insoluble ash, water-soluble ash values and extractive values were also determined. Thin layer chromatography (TLC) analyses revealed seven spots for the leaf while the stem-bark revealed three spots using normal phase plates. The microscopic analysis of the upper and lower surfaces of the leaf revealed the presence of polygonal epidermal cells. The stomata distribution in the upper surface of the epidermis is more than that of the lower surface. The transverse section of the leaf indicated the presence of two layers of palisade cells, peculiar lignified astrosclereids scattered in the mesophyll. The transverse section of the stem bark showed diagnostic features such as the presence of astrosclereids, brachysclereids, macrosclereids, 3 or 4 layers of cork cells and medullary rays. The chemo microscopic analysis of the leaf and stem bark revealed the presence of lignin, cutin and oil globules. The result of this study revealed the chemical constituents and pharmacognostic profile of the plant. These are required in the preparation of a monograph in the plant.

Key words: *Anthocleista vogelli*, pharmacognosy, medicinal plants.

INTRODUCTION

The plant *Anthocleista vogelii* belongs to the family Loganiaceae. The tree is 20 to 30 ft high and 3 to 4 ft in girth with comparatively few widely spreading crooked branches and stout gnarled branchlets bearing the leaves in tuft at the ends. Bark is grey to pale brown, smooth to slightly fissure longitudinally, cream to pale brown, sometimes streaked with red. The leaves in mature trees are 30 to 60 cm long by 15 to 30 cm broad, obovate to oblanceolate, rounded at the apex tapering gradually to the base. Mid-rib very stout with 6 to 12 pairs of prominent upcurving lateral nerves running out close to the margin or more rarely, looped veins indistinct, stalk if present is 0.25 to 0.5 cm long with flaps at the base running partly round at the branchlet. This species is distinguished from all other species of *Anthoclesita* by its short orange or fawn-coloured flowers. The flowers are conspicuous, very stout upright branched inflorescence at the end of the shoots. The fruits are persistent with elongated calyx at the base. It is widely spread in tropical Africa, Cameroon, Sudan, and Sierra Leone. It is also found in the Northern, Western and Eastern Nigeria particularly in swampy areas near streams and closed forest. Locally, the plant is called “Kwari” in Hausa, ‘Apaoro’ in Yoruba, ‘Oriweni’ in Bini, and ‘Orimi’ in Benin (Keay et al., 1964.). The leaves and stem-bark are used for treating swellings in the body (anti-inflammatory). The root-bark and leaves are used in local medicine (Dalzel, 1937). The root decoction is drunk in Sierra Leone for chest pain, while the wood-ash is used for soap making while the wood is used as a quiver for arrows and packing cases.

The aim of this study is to establish the phytochemical and pharmacognostic characters of the leaf and stem bark of *A. vogelli* towards monograph development.

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Table 1. Phytochemical investigation of the leaf and stem bark of *Anthocleista vogelii*.

Test	Inference	
	Leaves	Stem bark
Carbohydrates	+ve	+ve
Reducing sugar	-ve	-ve
Tannins	-ve	-ve
Phlabotannins	-ve	-ve
Glycosides	-ve	-ve
Saponins	+ve	+ve
Flavonoids	+ve	+ve
Alkaloids	+ve	-ve
Terpenes	+ve	+ve
Sterols	+ve	+ve
Phenols	+ve	+ve

+ve, present; -ve, absent.

MATERIALS AND METHODS

Plant collection

The plant was collected by Muazzam Ibrahim from Zuba in Gwagwalada Council of Federal Capital Territory, Abuja Nigeria on the 8th of June 2006 by 9.00 am. The plant was identified by Mrs. Grace Ugbabe while a voucher specimen has been deposited in the herbarium unit of the National Institute for Pharmaceutical Research and Development (NIPRD) Abuja.

Processing of collected sample

The collected plant materials were air-dried for two weeks and then powdered using mortar and pestle. The powder obtained was stored in air tight polythene bags for use in phytochemical analysis and determination of pharmacopoeia standards. Extraction of 10 g each of the powdered leaves and stem-bark was done by cold maceration using 100 ml of water and filtered; the filtrate obtained was used for the phytochemical screening.

Phytochemical studies

Phytochemical screening of the leaf and stem-bark of *A. vogelli* was carried out according to procedures described in Trease and Evans (1989).

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 *A. vogelii* (leaves and stem-bark), were carried out as described by World Health Organisation's (1998) publication on quality of medicinal plants.

Microscopic studies

Fresh and powdered samples were used to determine the microscopic profile of the plant through the use of a compound microscope. Powdered samples, thin sections and whole leaf and stem bark were placed on a clean glass slide. Few drops of chloral hydrate solution was added and then gently heated on a blue flame from a small bunsen burner. This was done to clear the sample from colouring pigments that might prevent the clear observation of the histological features under the microscope. To avoid cracking of the slide and formation of chloral hydrate crystals the slide is repeatedly removed from the heat. Glycerol was then added as the mountant on the cleared specimen, covered with a glass slide and then viewed under the microscope. Observations were carried out using the ×100 and ×400 magnifications. The foregoing was carried out as described in the WHO publication (1998).

Chemo microcsopic studies

The presence or absence of certain cell contents, such as starch grains, calcium oxalate crystals, lignin, cutin, fats and oils, etc are of diagnostic importance. Chemo microscopic examinations were carried out on the leaf sections and stem-bark to determine presence or absence of these. Slide preparation and staining were carried to detect the presence or absence of cellular contents as stated by Evans (2009).

Thin layer chromatography

The TLC of the crude methanolic extracts of both leaf and stem-bark were also carried out using Ethyl-acetate: Hexane as the solvent system (mobile phase) and normal phase plates as stationary phase. The ultra violet (U.V) light and 1% vanillin in sulphuric acid were used as the detectors.

RESULTS

Phytochemical screening

Table 1 shows the result of the phytochemical screening of the stem-bark and leaf of *A. vogelii*. The result shows the presence of carbohydrates, saponins, flavonoids, terpenes, sterols and phenols in both the leaf and stem-bark. Reducing sugar, tannin, phlobatanins, glycosides

Table 2. Pharmacopoeia standards of the leaves and stem bark of *Anthocleista vogelii*.

Parameter	Leaf value (%)	Stem-bark value (%)
Moisture content	9.3	8.9
Total ash	5.5	2.5
Acid insoluble ash	0.5	1.0
Water soluble ash	4.0	1.5
Alcohol extractive	18.8	11.1
Water extractive	19.3	11.2

were found to be absent in both the leaf and the stem bark of the plant.

Pharmacopoeial standards

Table 2 shows the Pharmacopoeia standards of the leaves and stem bark of *A. vogelii.*

Thin layer chromatography

The partitions on the TLC plate of the crude methanolic extract of both the leaf and stem are as shown subsequently. 7 spots were detected after spotting the leaf extract while only 3 spots was seen in stem-bark extract.

Spots 2 and 3 of the leaf extract were observed with naked eyes while partition 1,4,5,6 and 7 of the same extract were observed under the UV light. Spots 1and 2 of the stem bark extract were observed after spraying with 1% vanillin in sulphuric acid while partition 3 of the same extract was seen with naked eyes.

Macroscopic analysis

The leaf is simple, about 14.2 to 67.7 cm long and 4.8 to 26.9 cm wide, light green on both the lower and upper surfaces. The petiole is about 5.7 to 11.8 cm long. The leaf surface was smooth while taste is bitter and has non - characteristic mild odour.

Microscopic analysis

The microscopic features of the leaf revealed the following: The upper epidermal surface of the leaf revealed the presence of nearly straight polygonal cells, a fair distribution of stomata. The lower epidermal surface of the leaf contained more straight polygonal cells with less stomata.

The transverse section of the mid-rib indicated the presence of 3 layers of palisade cells containing abundant oil globules below the upper epidermis. There are fewer oil globules in the spongy mesophyll, a layer of cutin on the epidermis, characteristic lignified astrosclereids scattered in the mesophyll. The leaf is a dorsiventral in arrangement; the vascular bundles arrangement is a closed one with several bundles joined together indicating meta and protoxylem, fibres, tracheids and central pith. Lignified fibres occurred alongside the collenchyma forming a loose ring.

The microscopic examination of the transverse section across the stem-bark of the plant revealed the presence of an abundance of astrosclereids and brachysclereids which are in clusters along with Macrosclerids which were less abundant when compared to brachysclereids which are also in clusters.

Chemo microscopic analysis

The chemo microscopic examination of both the stem-bark and the leaf revealed the presence of lignin, cutin and globules.

DISCUSSION

The determination of physical constants in pharmacognostic analyses of crude drugs can enable the detection of improper handling of the plant material. The moisture contents of 9.3 and 8.9%, respectively for leaves and stem bark of *A. vogelli* indicates the less chance of microbial degradation of the crude drug. Excess moisture in a plant may lead to the breakdown of essential constituents and the growth of micro-organism especially during storage of plant material. These values obtained in this study are within the acceptable standards for medicinal plants.

Another important parameter in the analysis of crude sample is the ash value determination. The evaluation of total ash can is used for the detection of foreign organic matter in the plant. The alcohol and water extractive values for the leaf were higher than that of the stem-bark indicating that the leaf has high percentage of ethanol and water soluble compounds than the stem-bark. These values are relevant when the chemical natures of medicinal components are not known and the values help

in extraction procedures. Determination of phytochemical profile of medicinal plants is an indication of the class of compound present in the plant. Various pharmacological activities are expressed by medicinal plants based on the type and amount of the secondary metabolites. For example the *in vitro* antiplasmodial activity of *Artemisia annua* has been attributed to its flavonoids content (Liu et al., 1992). Identification of the different phytochemical constituents of the plant is an indication of the active metabolites that give it its pharmacological activities. In standard publications such as British herbal Pharmacopoeia, African Pharmacopoeia and other such works, microscopical description of medicinal plants are included in the official monographs. This is the first time that the pharmacognostic profile of *A. vogelli* from is being reported Nigeria. The establishment of the diagnostic / microscopic features of the plant is a good aid in identifying the plant and guiding against adulteration. The results provided from this study are required in the preparation of a monograph on the plant.

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