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Phytochemical screening and thin layer chromatography of the leaves of *Khaya senegalensis* (dry zone mahogany) Meliaceae

Ali A. Sani[1*], Taiwo E. Alemika[2], Sholy Zakama[3], Jennifer M. Wagami[1], Mustapha Barau[4] and Mohammed Ilyas[5]

[1]*Department of Pharmaceutical Chemistry, Faculty of Pharmacy University of Maiduguri, Maiduguri. Nigeria.*
[2]*Department of Pharmaceutical Chemistry, Faculty of Pharmaceutical Sciences, University of Jos, Jos. Nigeria.*
[3]*Department of Ethnopharmacy & Drug Development, Faculty of Pharmacy, University of Maiduguri, Nigeria.*
[4]*Department of Chemistry, College of Science and Technology, Kaduna Polytechnic, Kaduna, Nigeria*
[5]*Department of Pharmaceutical and Medicinal Chemistry, Ahmadu Bello University, Zaria. Nigeria.*

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Abstract
Phytochemical constituents of the leaves of *Khaya senegalensis* (dry zone mahogany) were determined in petroleum ether, chloroform, acetone and ethanol extracts. The screening revealed the presence of flavonoids, carbohydrates, glycosides, saponins, tannins, alkaloids and anthraquinones. Saponins and cardiac glycoside are present in all the extracts; Flavonoids are present in chloroform, acetone and ethanol extracts. Carbohydrates are present in ethanolic, chloroform and acetone extracts. Tannins are present in petroleum ether and ethanolic extracts while alkaloids are present in petroleum ether, ethanolic and acetone extract. There are no phlobatannins in any of the extracts with only the ethanolic extract containing anthraquinones. Thin layer chromatography revealed the separation of the components of the extracts with iodine vapour locating their spots. From the result obtained, *Khaya senegalensis* (dry zone mahogany) contains a remarkable number of phytochemical components with potential bioactivity.

Keywords: Phytochemical Screening, TLC, *Khaya senegalensis*

INTRODUCTION

A medicinal plant is any plant in which one or more of its organs contain(s) substance(s) that can be used for therapeutic purpose or as precursors for pharmaceutical synthesis. (Sofowora, 1984). Natural products refer to those substances found in nature which comprise of whole plants and herbs, anatomical parts such as vegetable saps, extracts, secretions with other constituents thereof, whole animals, anatomical parts such as glands or organs, extracts, secretions and other constituents which have not had changes made in their molecular structure as found in nature. Crude drugs are vegetable or animal drugs which consist of natural substances that have undergone no other process than collection and drying (Tyler *et al.*, 1990).

Developing nations of the world such as Nigeria have not placed enough emphasis on the development of local technologies unlike the more advanced countries of the world. It is a fact that most developed countries placed much interest in the development of the basic sciences and these

* Corresponding author. *E-mail address*: aliaudusani@gmail.com *Tel*: +234 (0) 8035890984, 8055297698
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efforts have paid off and being used to develop technologies in turn with results for the improvement of the quality of life and the advancement of these countries. Basic scientific talents are not adequately developed; there is therefore stagnation of the relevant scientific research, neglect of local technologies, mass exodus of research scientists and trained hands. (Simon, 1998).

In different aspects of studies, there are challenges faced in production and use of herbal medicines. Most of the herbal drugs in use are based on the rediscovery of old users and formulations. The knowledge of old users and formulations filtering out, thus the search for nature's cure, continues to grow. Biotechnology and nanotechnology may permit the monitoring and switching on and off, the day to day chemical processes occurring in plants. (Ezugwu *et al.*, 1999).

Description of plant: Botanical Name: *Khaya senegalensis* (Keay, 1989).

Common names: Hausa – madachi; Fulani – dalehi, kahi; Tiv – ha; Kanuri – kagam; Itsekri – okpe; Yoruba – oganwo; Igbo – ono; Common English Name – African mahogany

Its distribution extends from Senegal to Eastern Sudan and Uganda. Other geographical locations include Australia, Cuba, India, Indonesia, Puerto Rico, Singapore, South Africa and Vietnam.

The timber of this species was the first known of the African Mahoganies and was first exported from Gambia to Europe in the early part of the 19th century (Wikipedia.org 2007). The timber of Khaya is called African mahogany, the only timber widely accepted as mahogany besides that of the true mahogany of the genus Swietenia. *Khaya senegalensis* also known as the African dry zone mahogany is also used for its non timber parts. In West Africa, Fulani herdsmen prune the tree during the dry season to feed cattle. In addition, the bark of *K. senegalensis* is often harvested from natural population as well as plantation and used to treat many diseases. The seed of K. senegalensis has an oil content of 52.5% consisting of 21% palmitic acid, 10% stearic acid, 65% oleic acid, and 4% unidentifiable acid. (Wikipedia 2010.org/wiki/khaya).

Khaya senegalensis also has other parts that are very effective in the treatment of various diseases. The bitter bark has a considerable reputation in its natural range as a fever remedy. The bark is also used as a vermifuge, taenicide, depurative and for treating syphilis. Bark extract is used for treatment of jaundice, dermatosis, scorpion bite, and allergy, infection of the gum, hookworm, bleeding wounds and as a laxative (Wikipedia.org). *Khaya senegalensis*, a member of the family Meliaceae, is a plant commonly used by the local people of Nassarawa state of Nigeria for the treatment of dysentery, mucous diarrhea and wound infections.

The leaves and the bark of the plant were screened for their phytochemical properties and antimicrobial activity. Ethanol was used for extraction of the active compounds. The test organisms were *Staphylococcus aureus, Streptococcus feacalis, Escherichia coli* and *Candida albicans*. This study demonstrated the potentials of *Khaya senegalensis* as a source of antimicrobials that could be harnessed for use in the Health care delivery process (Mensah *et al.*, 2009).

EXPERIMENTAL

Sample was collected from the premises of the University of Maiduguri, Borno State. It was collected on the 15th of January 2009. Sample was identified by Dr E. Rabo, the Head of Department of Biological Sciences, University of Maiduguri.

Sample was dried in the Pharmaceutical Chemistry Laboratory of the Faculty of Pharmacy, University of Maiduguri. Sample was powdered and approximately 500g was carefully weighed and poured in a clean dry maceration bottle (Sani *et al.*, 2007). This was

successively extracted with the solvents to exhaustion. Extraction was by cold maceration. The saturated solvents were decanted filtered and evaporated to dryness.

RESULTS

The extract was tested for the presence of phyto-constituents. The result is as presented in Table 1 below.

In TLC analysis, extracts were spotted on silica TLC plates and run in appropriate solvent system. After drying spots were viewed under UV lamp at 254 and 366 nm, and exposed to iodine vapour. The results are presented in Table 2 below.

Table 1: Phytochemical Screening

Constituent	Test	Petroleum ether	Ethanol	Chloroform	Acetone
Flavonoids	Shinoda's	-	+	+	+
	Sodium hydroxide	-	+	+	+
Carbohydrates	Molisch's	-	+	+	+
	Barfoed's	-	+	+	+
	Fehling's	-	+	+	+
Glycosides	Lieberman-Burchard	+	+	+	+
	Salkowski	+	+	+	+
	Keller-Kiliani	+	+	+	+
Saponins	Froth	+++	++	+	++
Tannins	Ferric chloride	+	+	-	-
Phlobatannins	Hydrochloric acid	-	-	-	-
Anthraquinones	Borntrager's	-	+	-	-
Alkaloids	Dragendorff's	-	+	-	+
	Mayer's	-	+	-	+

+ Present - Absent

Table 2: TLC Profile of Extracts

Extract	R_f values	Day light	UV 254nm	UV 366nm	Iodine vapour
Ethanol	0.23	Bluish green	Green	-	Light green changed to greenish black
Chloroform	0.42	Light yellow	Yellow	-	Light yellow changed to brown
Petroleum ether	0.25	Bluish green	Blue	-	Blue colour changed to bluish black
Acetone	0.65	Light yellow	Yellow	-	Yellow to yellowish brown

Solvent system:- chloroform:methanol (9:1); Adsorbent used: silica gel G

DISCUSSION

Khaya senegalensis (dry zone mahogany) is a plant that is known to be used widely in traditional medicine. The leaves are normally used for the treatment of feverish conditions, headache and diseases like leprosy, syphilis and an aphrodisiac. The use of the plant to treat such diseases by traditional practitioners is based on assumptions of its pharmacological activity.

Phytochemical screening of this plant has revealed and confirmed the presence of important components that have very good pharmacological actions against various diseases.

The use of different solvent to extract the constituents of the leaves of *Khaya senegalensis* is very important as different solvents have the ability to dissolve and extract different constituents. Petroleum ether usually plays a role of defatting the powered leaves and also extracts constituents like glycosides and saponins. Ethanol revealed constituents such as anthraquinones and alkaloids in addition. Phytochemical screening showed that chloroform extract does not contain tannins, anthraquinones and

alkaloids. This shown the inability of chloroform to dissolve and extract such constituents from the powdered leaves. Acetone extract shows the present of Saponins, alkaloids, carbohydrates and glycosides. All the extracts had no phlobatannins in them. This has revealed that petroleum ether, ethanol, chloroform and acetone cannot extract phlobatannins or the plant doses not have the constituent contained in it.

Thin layer chromatography (TLC) is a technique applied in phytochemical study in the separation of components of an extract. From the results obtained in this study, petroleum ether extract, ethanol extract, acetone extract and chloroform extract separated leaving spots on different areas of the plate. The ultraviolet light view mainly revealed unsaturation and aromaticity of the sample separated. TLC is also used to determine the degree of purity of a drug or extract. It also indicates the presence of any form of contamination or adulteration.

Petroleum ether and acetone left two spot on the plate with a tailing. Tailing on plate indicate the presence of impurities in the extract. Deposit of a high concentration of the extract on a spot indicates more than one constituent with probably similar molecular weights. Ethanol extract left three distinct spots on the plate before the solvent front. Chloroform extract left one spot on the plate.

CONCLUSION

From the results obtained, it can be said that *Khaya senegalensis* (dry zone mahogany) can exhibit desired pharmacological actions against diseases due to the presence of constituents like flavonoids, glycosides, carbohydrates, tannins, saponins, and alkaloids, which are important in production of pharmaceuticals.

REFERENCES

Keay, RWJ (1989) Trees of Nigeria (A revised edition of Nigeria Trees) oxford University press, New York, USA. Pp 318-323.

Mensah, J.K., Okoli, R I. and Turay, 1 A. A.,2: Phytochemical Analysis of Medicinal Plants Used for the Management of Hypertension. *Ethnobotanical Leaflets* 13: 1273-87.

Sani, A. A., Ilyas M. and Haruna, A. K. (2007): Phytochemical Screening of the leaves of *Lophira lanceolata* (Ochanaceae) *Life Science Journal.*; **4**(4), 75-79

Sofowora A. (1984) Traditional medicine practices in West Africa, (2nd Edition). Spectrum books limited. Ibadan, Nigeria. Page 9-25.

Tyler, V. Z., Braddy L. R. Robbers, J. E. (1988) Pharmacygnosy 8th Edition Lea and Feibiger, Philadelphia. Pp. 85-90.