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ETHNOBOTANICAL SURVEY AND PHYTOCHEMICAL STUDIES OF *GUIERA SENEGALENSIS* LAM. IN MUBI LOCAL GOVERNMENT OF ADAMAWA STATE

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ABSTRACT

The Sudano-Sahelian species *Guiera senegalensis* is a small shrub found mainly in West Africa. It is well known in the Sahel, where it grows gregariously, forming abundant single-species colonies on fallow clay or sandy soils. Six (6) traditional medical practitioners were interviewed from different location in the study area (Mubi North and Mubi South L.G.A). The ethnobotanical survey revealed that various plant parts can be used to relief various sickness (Malaria, Fever, Dental absesse, e.t.c.) with the leaves (8) being the most frequently used part. New uses of plant part by traditional medical practitioners were recorded especially the use of decocted leaves to relief abdominal pains and migraines. Phytochemical analysis of most used part of the plant were carried out which revealed the presences of some major classes of secondary metabolites, namely; anthraquinones, terpenoids, saponins, alkaloids, flavonoids, tanins and cardiotrnic and cyanogenic glycosides. Further investigation should be carried out to extract the active component in *Giuera senegalensis* which will serve as a potential medicine for the phytotherapeutic arsenal.

KEYWORDS: Ethnobotany, Phytochemical, *Giuera senegalensis*, Decoction and Medicinal plants.

INTRODUCTION

Plants are the backbone of all life on earth and essential resource for human well-being. Through photosynthesis, plant provide all the food we eat which comes to us either directly or indirectly, air (oxygen) is brought by plants, as a byproduct of photosynthesis, plants

provides habitat for wild life and birds.[1] Plants also serve as the source of diverse products for our industries e.g. dyes, perfumes, textile fibers, building materials etc. Plants of the coniferous era provided the energy that is now used as oil, coal, and gas. One-quarter of all prescription drugs comes directly from or are derivatives of plants. Most of the drugs that are used in modern medicine were originally derived from plants, although many others came from fungi.[30]

Medicinal plants represent a rich source from which antioxidant and antimicrobial agents may be obtained, Plants are used medicinally and are source of many potent and powerful drugs.[41] Herbal medicine has been shown to be effective recently, the World Health organization (WHO) estimated that 80% of people worldwide rely on herbal medicines for some part of their primary health care and there are reports from various researchers on natural substances of plant origin which are biologically active with desirable antimicrobial and antioxidant properties.[19]

Guiera senegalensis Lam., very well known in its native area, generally occurs as a shrub that can grow to a height of 3 to 5 m according to habitat. Its stem presents numerous knots that send out branches. The ash-grey stem and branches have fibrous or pubescent bark and bear opposing, short petiolated oval leaves, sometimes mucronate, sometimes even cordate at their base, about 2 to 4 cm long by 1 to 2 cm wide.[39] These grey-green leaves, darker on their upper surface, display black spots on their lower surface and are slightly downy on both sides. These features lend the plant an overall silver- green colour that is conspicuous in brush land.[39,17] reports several recorded uses for *G. senegalensis* in traditional medicine to treat various illnesses. It is recognised as being active against cough, respiratory congestion and fever[21], and is prescribed as an anti-tussive[14], to ease breathing and to treat lung and bronchial disorders. It is also used against malaria.[4,6] It is often prescribed in combination with *Combretum micranthum* or *Combretum glutinosum*. The branches, leaves, bark and roots of *G. senegalensis* are also recommended for the treatment of stomach pain and dysenteric diarrhoea[5], syphilis, beriberi, leprosy and impotence.[22] It is also used in veterinary medicine among the Tukolor people in diets designed to increase body weight, reproductive capacity and milk secretion in animals.[21] It is used externally as an antiseptic healing preparation for wounds, stomatitis, gingivitis and syphilitic cankers. Some populations mix galls from *G. senegalensis* (gall nuts are frequently formed on the above-ground parts of the plant) with charcoal to make a highly diuretic powder prescribed in

serious cases of oligouria and even anuria, and in particular for cerebral malaria.[24,5] It has also been demonstrated that preparations made from galls possess antiviral properties.[25] Other people reduce the galls to powder with the pith from *Combretum aculeatum* stems and salt. This powder is diluted in water immediately before use and is prescribed for painful stomach cramps with mucous stools and vomiting.

A tea made from leaves is prescribed by the oral route to treat eczema (one liter per day), and is also used against attacks of fever, and to cure chest conditions and colds.[27] Fresh mashed or chewed or crush leaves when placed on a wound staunch bleeding.[7] Powdered dried leaves associated with Melanthera scandens are administered by the nasal route to treat headaches and sinusitis.[7] The leaves are also used as a poultice on tumours and against the Guinea worm.[7] Besides these uses in traditional medicine, some extracts of this plant have been found to possess pharmacological properties: antimicrobial[8,36], antifungal[38], antioxidant[13,9] and trypanocidal.[2] Effects on the central nervous system[3], on cancer cells[13] and as snake venom detoxicant[1] have also been described.

MATERIALS AND METHODS

Sample Collection and Identification

The leaves, stem, bark and roots bark of *Guiera senegalensis* was identified and authenticated by Baba Taina of Ministry of Environment, Department of Forestry, Mubi, and Mr. Mallum Sabastine of the Department of Botany, Adamawa State University, Mubi Adamawa State. The different organ of *G. senegalensis* (leaves, fruits, root bark and stem bark) was harvested at different locations (Victim and ADSU Ecological Garden).

Ethnobotanical Surveys

A survey was conducted among two (2) traditional medical practitioners at the three selected locations. In all, 6 traditional medical practitioners were questioned; an interview guide with eight questions was used to collect information from the traditional medical practitioners concerning knowledge of the plant and set modes of preparation.

1. What is the local name for *G. senegalensis*?
2. Is this plant used medicinally?
3. What diseases are treated with this plant?
4. Which part of this plant (leaves, fruits, flowers, stem bark, root bark, gall, mistletoe, total roots) is used in the treatment?

5. Is this remedy used fresh or dried? If used dried, how is it dried? Under the sun or shade?
6. How is the remedy prepared?
7. How much plant material must be used or prepared, in how much water, and for how long (decoction, maceration, hot steeping, digestion, etc.)?
8. Is *G. senegalensis* used alone for medicinal purposes? Or is it combined with other plants?

Phytochemical Analysis

Tests for phytochemistry were carried out on powders prepared beforehand from each plant organ using conventional test reagents. The extracts were analyzed for the presence of alkaloids, tannins, Flavonoids, Phenols, Saponins, Volatile oils. The methods described by[40,20,34] and[35] were adopted.

RESULTS

Ethno botanical Surveys

An Ethno-botanical survey of *G. senegalensis* was conducted in Mubi metropolis between September 2017 to January 2018. The survey revealed the different use of leaves, fruits, galls, mistletoes, roots and root barks for the treatment of various illnesses (Tables 1 to 3). It was observed that same part of the plant can used to treat various illnesses; however different parts can also be used to treat a single illness (e.g. *Plasmodium falciparum* and pain). In medicine the leaf (8) was the most used part followed by root and root barks (6) then the stem bark (4). The fruits, galls and mistletoe were the least used medicinally plant parts. The methods of preparation of medicine were mostly decoctions and macerations while powders were seldom.

Phytochemical Characteristic of the Part of Plant Used.

Phytochemical characteristics of the various part of plant used (leaf, root and stem) are summarized in table 4 and 5. Two solvent were used to prepare the extracts, from the aqueous extracts phytochemistry, only phenols (root extract), free anthracene (root extract) and cardenoid (stem extract) were found to be absent whereas in the ethanol extracts, flavonoid (leaf), cardiac glycoside (leaf, root and stem), phenols (root), reducing sugar (root), free anthracene (root and stem), cardonoid (leaf) and reducing compound (root and stem) were found to be absent.

Table. 1: Part of *G. senegalensis* Used in Traditional Medicine (Leaf).

	Illness	Treatment
	Malaria and Fever	Decoction of branches combined with leaves of *Azadirachta indica*. Mixture drank morning and evening for 2-3 days.
	Dental abscess	Tea made from leaves of *G. senegalensis* combined with leaves of *Prosopis africana* commonly called *akiye* used for mouthwash and exposure to hot vapours.
	Conjunctivitis	Juice from crushed leaves instilled into the affected eye.
	Diarrhea and dysentery in children	Decoction of leafy branches with the roots drink morning and evening
	Aches and pains in children	Washing every 2-3 days, morning and evening, witha decoction of leafy
	Epilepsy	Maceration for 24 h of ground leaves from *G. senegalensis* combined with fruits of *Tamarindus indica* and honey.
	Headaches with fever	Decoction of leafy branches used to bathe and expose the patient's head tohot vapors.
	Abdominal pain	The decoction thus obtained also used to treat poisoning. Mixture contraindicated in pregnant women, in whom it can induce abortion.

Table. 2: Part of *G. senegalensis* Used in Traditional Medicine (Root and Root Bark).

	Illness	Treatment
	Dental caries	Root used as toothpick for protection against dental caries. Root powdered and macerated is used as a mouthwash morning and evening.
	Diarrhoea and dysentery	Roots macerated to be drink for three days
	Aches and pains	Root decoction used for bathing.
	Fever	Decoction of roots drunk and used for bathing to treat night fever. Inhalation of vapours from decoction of fresh leaves for three days.
	Abdominal pain	Decoction of roots from plants growing on anthills, drunk
	Dysentery in children	Decoction of roots drink morning and night and bathing for morning and night,

Table 3: Part of *G. senegalensis* Used in Traditional Medicine (Stem).

	Illness	Treatment
	Abdominal pain	Decoction of the stem take morning and night
	Cough	Decoction of stem and fruit is drunk. A small piece of salt can be added.
	Many illnesses in children and infants: fever, malaria, vomiting, diarrhoea, Cough.	Decoction of stem and fruit is drunk.
	Wounds	Dried ground and powdered stem, placed on the wound. Healing properties.

Table. 4: Qualitative Determination of Phytochemical Groups of Aqueous Extracts of *Guiera senegalensis*.

	Photochemical	Leaf	root	Stem
	Tannin	+	+	+
	Saponin	+	+	+
	Flavonoid	+	+	+
	Cardiacglycoside	+	+	+
	Alkaloid	+	+	+
	Steroid	+	+	+
	Tepernoid	+	+	+
	Phenols	+	_	+
	Volatile oil	+	+	+
	Free anthraquinonens	+	+	+
	Reducing suger	+	+	+
	Free anthracene	+	_	+
	Cardenoid	+	+	_
	Reducing compound	+	+	+

Table. 5: Qualitative Determination of Phytochemical Groups of Ethanolic Extract of *Guiera senegalensis*.

	Photochemical	Leaf	root	Stem
	Tannin	+	+	+
	Saponin	+	+	+
	Flavonoid	_	+	+
	Cardiac glycoside	_	_	_
	Alkaloid	+	+	+
	Steroid	+	+	+
	Tepernoid	+	+	+
	Phenols	+	_	+
	Volatile oil	+	+	+
	Free anthraquinonens	+	+	+
	Reducing suger	+	_	+
	Free anthracene	+	_	_
	Cardenoid	_	+	_
	Reducing compound	+	_	_

Plate. 1: (a) stem and (b) leaf sample of *G. senegalensi*.

DISCUSSION

The ethnobotanical survey conductedat Mubi metropolitan revealed common uses *for G. senegalensis* by practitioners of traditional medicine. To relieve aches and pains, and to treat fever and malaria, decoctions of leaves and leafy branches were prescribed by practitioners of traditional medicine. These treatments are those already described in the literature for *G. senegalensis.*[23,17] According to[17] roots of *G. senegalensis* were used as toothpicks to prevent dental caries. Traditional medical practitioners also uses leafy branches combined with those of *C. micranthum* and unripe fruits of *Tamarindus indica* to relieve abdominal pain, the broadly ranging beneficial effects attributed to *G. senegalensis* make it suitable for the treatment of imperfectly diagnosed illnesses.

We see that different plant parts are used to treat the same illness, although marked differences in treatment protocols were used. Thus leaves and stem bark were used for their healing properties of wounds, these treatments are those already described in the literature for *G. senegalensis.*[23] Cough was treated using a decoction of fruits and leaves. For malarial attacks, decoctions of leaves were prescribed It is recognised as being active against cough, respiratory congestion and fever.[21] Severe diarrhoea and dysentery were countered by prescribing a decoction, or maceration of leaves or root bark, traditional medical practitioners prescribed a decoction of root bark to relieve aches and pains. The literature reports several recorded uses for *G. senegalensis* in traditional medicine to treat various illnesses.[17] and is prescribed as an antitussive[32,15,37,14], to ease breathing and to treat lung and bronchial disorders. It is also used against malaria.[4,6] It is often prescribed in combination with *Combretum micranthum* or *Combretum glutinosum.*[21] The branches, leaves, bark and roots of *G. senegalensis* are also recommended for the treatment of stomach pain and dysenteric diarrhoea[22,5], syphilis, beriberi, leprosy and impotence.[22] It is also used in veterinary medicine among the Tukolor people in diets designed to increase body weight, reproductive capacity and milk secretion in animals.[21] It is used externally as an antiseptic healing preparation for wounds, stomatitis, gingivitis and syphilitic cankers.[21] Other people use the stem powder with the pith from *Combretum aculeatum* stems and salt. This powder is diluted in water immediately before use and is prescribed for painful stomach cramps with mucous stools and vomiting.[21] A tea made from leaves is prescribed by the oral route to treat eczema (one litre per day), and is also used against attacks of fever, and to cure chest conditions and colds.[27] Fresh mashed or chewed or cut leaves when placed on a wound staunch bleeding.[7] Powdered dried leaves associated with *Melanthera scandens* are administered by the nasal

route to treat headaches and sinusitis.[7] The leaves are also used as a poultice on tumours and against the Guinea worm.[7]

Besides these uses in traditional medicine, some extracts of this plant have been found to possess pharmacological properties: antimicrobial[8,36], antifungal[38], antioxidant[13,10] and trypanocidal.[2] Effects on the central nervous system[3], on cancer cells[13] and as snake venom detoxicant[1] have also been described. Although the wide range of uses in traditional medicine is often mentioned in the literature, few ethnobotanical surveys[17] or complete phytochemical studies[18] have been published to date. I set out to conduct an ethnobotanical survey among the among three targeted traditional medicinal pratitioner, and to make a comparative phytochemical study of the different plant organs (leaves, root and stem bark) collected and used for traditional medicinal preparations. A correlation between the components characterised in the different plant organs and their traditional use could then be sought.

The assay results Table 4 and 5, these results are comparable. Phytochemical screening of plants varies from one place to another, which may be due to geographical variation, climate conditions and soil composition of the area. Thus, it is possible to have different chemical composition of the same plant under research in other areas.[14] The photochemical screening of aqueous and ethanol extracts in Table 4 and 5 shows that the plant contains classes of secondary metabolites which includes; tannins, phenols and volatile oils the chemical analysis tests we carried out confirmed the results of earlier work by.[23,17] Flavonoid, Cardenoid and Cardiac glycoside were found absent only in ethanol extract whereas present in aqueous extracts of the leaf as already recorded by.[18] These alkaloids possess an antimalarial activity and a low cytoxicity, which might account for the prescription of decoctions of leaves to treat malaria.[4] Total alkaloids extracted from leaves showed an antitussive activity.[15,14] The nature of the alkaloids present in the stem bark and fruits has not yet been studied.

Several studies of tannins compounds have been published.[23,21,29,11,18] The presence of tannins, in particular gallic tannins, might explain the use of *G. senegalensis* to treat respiratory tract disorders and cough.[33,11] Certain gallic tannins possess an antidiarrhoeal activity, which might account for the use of *G. senegalensis* to treat severe diarrhea and dysentery. It has been shown that 3, 4, 5-tri-Ogalloylquinic acid isolated from *G. senegalensis* displays an anti-HIV activity.[28]

Free flavonoids were present in leaf root and stem of the aqueous extract, but they were present in leaf and only present in root bark or stem bark of the ethanol extract. This result is at variance with earlier literature reports.[9,16,13,18] Flavonoids occurred in different forms. These are known to have vascular protective and venotonic effects, although their utility has been challenged by the Food and Drug Administration.[12] Even so, this diverse occurrence of flavonoids in the plant parts might account for its use for the treatment of aches and pains and its venolymphatic effects. In addition, we note that the antiviral effects of flavonoids extracted from *G. senegalensis* against several DNA and RNA viruses have been described.[31]

Free anthracene derivatives were present only in leaves and stem of aqueous extract but only present in leave of ethanol extract have been described.[31] This absence is consistent with the prescription of *G. senegalensis* to treat diarrhoea, as these substances are known to exhibit certain laxative properties.[12] Sterols were found in abundance. Carotenoids were present in leaf stem and root of aqueous while in the ethanol extract it is only presnt in the leaf and absent in the root and stem. These terpenoid derivatives are present in all the extract, which most often possess marked biological activities, might justify the prescription of *G. senegalensis* by traditional medical practitioners to treat malaria and its pernicious attacks as already recorded by.[18]

Although, all the plant organs formed some foam in both solutions, the foaming index, showing saponosides were present. This result confirms the findings of[23], who report foaming index for leaves and roots. Reducing compounds were present in abundance in all plant parts. The use of *G. senegalensis* to treat diarrhoea. Phenol compounds presenting anti-inflammatory, antimicrobial and anticoagulant properties were present in only leaves and stem in aqueous extract and present in all the plant part of ethanol. This might justify the use of the leaves of this plant by traditional medical practitioners as anticoagulant for the treatment of wounds.

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