

Phytochemical Analysis and Antimicrobial Activity of *Guiera senegalensis* Leaves Extraction

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DOI: [10.36348/sijcms.2022.v05i06.006](https://doi.org/10.36348/sijcms.2022.v05i06.006)

| Received: 11.07.2022 | Accepted: 20.08.2022 | Published: 30.08.2022

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Abstract

Guiera senegalensis generally occurs as a shrub or a small tree which belongs to the Combretaceae family and locally named in Sudan as “Gabeish”. It has medicinal properties such as anti-inflammatory, anti-oxidant, anti-asthmatic, potential anticancer, anti-anaphylactic and anti-microbial activities. The plant was collected from the traditional market in Omdurman. Prepared ethanolic extract of leaves were used to evaluate the phytochemical screening to detect the presence of flavonoids, alkaloids, tannins, phenol, saponins, carbohydrate, cumarins and absence of anthraquinones and triterpenes. The phytochemical contents revealed tannins (1.662), alkaloids (3.524), flavonoids (39.350) and biological study of leaves extract showed activity against *Escherichia coli*, *Staphylococcus aureus*, *Bacillus subtilis*, *Papillus subtilis* and *Candida albicans*.

Keywords: *Guiera senegalensis*, phytochemical, Anti-oxidant, Anti-inflammatory.

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INTRODUCTION

Guiera senegalensis is one of the medicinal plants used for the treatment and control of diseases which belongs to the combretaceae family and locally named in Sudan as Gabeish is widely spread in the western parts of the Sudan, especially in Kordufan [1]. It is also distributed in the savannah region of west and central Africa, Senegal, Nigeria, Chad, Gambia, Mali, Guinea, Guinea-Bissau, Niger, Burkina Faso, Mauritania and Ghana [2, 3]. It usually occurs as a shrub or a small tree of 3 to 5 m height relying on the habitat. Its grey to brown spindly bole consists of numerous knots that send out branches [3, 4]. The leaves are grey-green colour and oval shape which are 3 to 5 cm long and 1.5 to 3.0 cm broad are arranged opposite or sub opposite on the stem [2]. Flowers are yellowish up to 1cm crosses [5] and in heads suspended by 4 involucre bracts, 5 sepals persisting in fruit, 5 Petals, narrow-oblong, stamens 10, fruit elongate, radiating, densely grey-villous [6].

The *Guiera senegalensis* has extensively been used as a source of traditional medicine. The different parts of this plant have lots of useful properties- the roots are used for treatment of gonorrhoea, tooth and

stomach ache [7] wounds, injuries, and different skin conditions, including inflammation of skin [8]. The leaves are widely administered for pulmonary and respiratory complaints, for coughs, as a febrifuge, colic and diarrhea, syphilis, against dysentery, rheumatism, hypertension, eczema, beriberi, leprosy, gastroenteritis, beriberi, impotence, epilepsy, diuresis, expurgation, bronchitis, tuberculosis, fever, colds and asthma [4, 9]. It is moreover, used as a poultice on tumours and against the Guinea worm, kidney diseases, abdominal pain, joints problems, diabetes mellitus [8] and increasing high blood sugar levels [10]. The leaves in particular are used for treatment of headache and toothache. The bark is used for eyewashes. The dried powder of leaves associated with *Melanthera scandens* is administered by the nasal route to treat headaches and sinusitis [7].

The extracts of The *Guiera senegalensis* have been found to possess pharmacological properties such as antimicrobial, antifungal, and antioxidant. Besides these uses in traditional medicine for human, they are used in veterinary medicine among the Tukulor people in diets designed to increase body weight, reproductive capacity and milk secretion in animals [4].

Many phytochemical studies of different organs of the *Guiera Senegalensis* indicated the presence of bioactive compounds such as alkaloids, tannins, terpenoids, flavonoids, saponins, coumarins, mucilages, amino acids, ascorbic acid, anthraquinones, elastin, cardio tonic and cyanogenicheterosides [11, 12].

MATERIALS AND METHOD

Plant Material

The leaves of *Guiera Senegalensis* were collected from the traditional market in Omdurman, Sudan. The plant was identified and authenticated by a plant taxonomist from the Institute of Aromatic and Medicinal Plants- Khartoum, Sudan. The plant leaves stored were dried under laboratory condition and homogenized to fine powder.

Extraction of *Guiera Senegalensis* leaves

Eighty gram (80g) of the powdered plant leaves was soaked in 350ml of ethanol 80% which was thereafter closed with a rubber cork stopper and left for about five days. Then it was filtered and the filtrate was concentrated below 40°C with a rotary evaporator to obtain a dry mass. Dry mass of ethanol extract (~10.412 gm) gave a yield of (13.02%).

Preliminary Phytochemical Screening

The powder of dried leaves was subjected to continuous soxhlet extraction with ethanol. After concentration and drying of each extract in vacuum desiccator, identification of phytoconstituents was carried out using chemical test according to standard procedures as reported by H.Wagner[13], Sofowara [14], and Harborne [15].

Test for Phenol

The extract (500mg) was dissolved in 5ml of distilled water. To this, few drops of neutral 5% ferric chloride solution were added. A dark green colour indicated the presence of phenolic compounds.

Test for Terpenoids

2 ml of the organic extract was dissolved in 2ml of CHCl₃ and evaporated to dryness. 2ml of conc. H₂SO₄ was then added and heated for about 2 minutes. Development of a grayish color indicates the presence of terpenoids

Test for Flavonoids

The seed extract (3 ml) was added to a concentrated sulphuric acid (2 ml) and 0.5g of Mg. A pink or red coloration that disappears on standing (2 min) indicates the presence of flavonoids.

Test for Alkaloids

About 1 ml of the test extract sample in a test tube and adding few drops of dilute hydrochloric acid (HCl). Then six drops of Wagner's reagent were added.

The appearance of yellow or and reddish colour precipitate of alkaloids.

Test for Saponin

About 1 ml of the extract sample in a test tube. The extract was dissolved in 5 ml of distilled water. Shaken well and the development of stable foam shows the presence of saponin.

Test for Carbohydrate

About 5 ml of Fehling a solution and Fehling b solution was added to 0.5 ml of extract and heated. The formation of red and yellow precipitate indicates the presence of carbohydrates.

Test of Anthraquinolones

Five (5ml) of plant extract is shaken with 10ml benzene and 5ml of 10% ammonia solution is added. The mixture is shaken and the presence of pink, red or violet colour in the ammonical (Lower) phase indicates the presence of anthraquinolones.

Test of Flavonoid

The plant extract were extracted and treated with few drops of sodium hydroxide solution. Formation of intense yellow colour, which becomes colorless on addition of dilute acid, indicates the presence of flavonoid.

Test of Tannins

Extract solutions were treated with 5% ferric chloride solution. Formation of blue colour indicated the presence of hydrolysable tannins and formation of green colour indicated the presence of condensed tannins.

Test of Coumrin

0.5 g of the extract was dissolved in 10 ml distilled water in test tube and filter paper attached to the test tube to be saturated with the vapor after a spot of 0.5N KOH put on it. Then the filter paper was inspected under UV light, the presence of coumrins was indicated as the spot was absorbed the UV light.

Phytochemical Contents

The total phytochemical contents were conducted on ethanolic fraction using standard methods as described by Price *et al.*, [16] for Tannins and Kim *et al.*, [17] for flavonoids and Harbone [15] for alkaloids.

Antimicrobial Screening

The *Guiera senegalensis* leaves extract was tested for its antibacterial and antifungal activity in vitro by broth dilution method described with Isenberg [18], Zgoda *et al.*, [19] and National Committee [20] was applied with two Gram-positive bacteria *Staphylococcus aureus* (Sa), *Bacillus subtilis* (Bs) and two Gram - negative bacteria *Escherichia coli* (Ec) and *Pseudomonas aeruginosa* (Pa), and one fungal strains *Candida albicans* (Ca).

RESULTS AND DISCUSSION

Yield Percentage

The *Guiera senegalensis* leaves extract yield percentage was (13.02) calculated as follows:

$$\text{Yield percentage \%} = \frac{\text{weight of extract}}{\text{weight of sample}} \times 100$$

Phytochemical Screening

Phytochemical screening of Ethanol Successive extract *Guiera senegalensis* leaves shows presence of alkaloids, tannins, saponins, flavonoids, carbohydrates, steroids, coumarins, phenols was shown in table (1). However the confirmation of a bioactive compound was referred to as high presence (+++) on strong resemblance; moderate presence (++) on medium and (+) presence weak resemblance and (-) with no

resemblance appearance or no change of colour of the reactive solution.

Table 1: The phytochemical screening of *Guiera senegalensis* leaves extract

Class of compound	Results
Flavonoids	++
Tannins	+++
Alkaloids	++
Anthraquinones	-
Steroids	++
Triterpenes	-
Saponin	++
Cumarin	+
Carbohydrates	++
Phenol	+++

Phytochemical Contents

In this study estimated three secondary metabolism compounds are shown in table (2).

Table 2: estimation the some phytochemical contents of *Guiera senegalensis* leave extract

Phytochemical contents	Total contents (mg/100g)
Tannins	1.662
Flavonoids (mgCAE/g)	39.350
Alkaloids	3.524

Flavonoid Contents

flavonoids are phenolic compounds are the foremost necessary cluster of plant which have inhibitor potential considerably to possess inhibitor, anti-allergic, anticancer, as radical scavengers ^[21] and as metal chelators [22] Medicine and gastro protective properties. Our results showed that the *G. senegalensis* leaves extract in table (2) flavonoid contents were (39.350mgCAE/100g) higher than Ogbaba *et al.*, [23] study which were recorded as (1.352 mgCAE/100g). That indicated flavonoids contribution to anti-oxidant activity and other medicinal properties for this plant.

Tannin Contents

Tannins are plant polyphenols commonly found in plant extracts, often in high concentrations. In this study the tannin content were (1.662 mg/100g).

This result confirmed the ant-microbial activity of *G. senegalensis*.

Alkaloid Contents

The alkaloids are organic nitrogenous bases found mainly in plants, but also to a lesser extent in microorganisms and animals [24]. Our results showed that the *G. senegalensis* leaves extract have alkaloid contents (3.524 mg/100g). That alkaloids were responsible for antimicrobial properties in some ethno medicinal plants.

Antimicrobial Screening

The extract of *Guiera Senegalensis* leaves is effective against the entire microorganism assay which included Gram-negative and Gram-positive bacteria and fungi. Shown in Table (3) is the average of the diameters of the growth inhibition zones.

Table 3: Antimicrobial activity of standard drugs and *G. senegalensis* leaves extract

Name of compound	Minimal inhibition concentration ($\mu\text{g mL}^{-1}$)				
	Gram-negative		Gram-positive		Fungal species
	P.s	E.c.	B.s.	S.a	C.a
Chloramphenicol (1 mg /100ml)	18	25	20	22	-
Greseofulvin	-	-	-	-	500
<i>Guiera senegalensis</i> Extract(14 mg /100ml)	14	18	16	17	14

E.c = Escherichia coli, S.a = Staphylococcus aureus, B.s = Bacillus subtilis, P.s = Papillus subtilis, C.a = Candida albicans

ACKNOWLEDGEMENTS

The author of this work is thankful to all members of Department of Chemistry & Biochemistry, National Centre of Medicinal Plants for Development Studies for authentication of the plants investigated and

thankful to Dr. Salah Alnoaman Faculty of Education, Omdurman Islamic, University.

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