

## A Review on the Taxonomy, Ethnobotany, Phytochemistry and Pharmacology of *Guiera senegalensis* J.F.Gmel. (Combretaceae)

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### Abstract

*Guiera senegalensis* (*G. senegalensis*) Family Combretaceae is shrubs or trees widely distributed in west and central Africa. In traditional medicine *G. senegalensis* used to treat malaria, dysentery and/or diarrhea, cough and/cold, abdominal pains, leprosy, hypotension and hypertension, diabetes, snakebites eczema, impotence, epilepsy, breast cancer, depressant and jaundice. Phytochemical screening investigated by scientists showed the presence of alkaloids, flavonoids, tannin, saponin, terpenoids/sterols and cardionolics mainly in leaves and roots of the plant. The biological activities showed positive results as anti-tuberculosis, anti-diarrhoeal, anti-plasmodia, analgesic and devoid of anti-inflammatory, antifungal, antioxidant anti-lipid peroxidation activity, anti-malaria and with low toxicity, antifungal, anti-acetylcholinesterase, antilipid peroxidation in rat's brain homogenate, erythrocytes hemolysis inhibitory activities and antitussive activities. The review revealed the importance of *G. senegalensis* as a natural therapy and recommend for further study and the work of the pharmaceutical formulation.

**Keywords:** *Guiera senegalensis*; Malaria; Diarrhea; Cough; Cold; Hypertension; Hypotension; Diabetes

### Introduction

Family Combretaceae is trees or shrubs, some time climbing plants [1], comprising about 20 genera and 500 species [2,3], these species distributed around the globe and central of diversity in Africa and Asia. *G. senegalensis* belongs to this family is widely distributed in west and central Africa on leached soils, fallows; as underwood in low savanna forests, mostly in sandy soils and on very dry sites; indicative of overgrazing [4]. *G. senegalensis* has numerous traditional medicinal applications, for instance, leaves for various internal diseases, prevention of leprosy, dermatoses, as tonic, infusions as diuretic, for stomach ache, cough and so on [4]. A range of phytochemical compounds have been isolated from different plant parts. Many of the uses have been subjected to some level of pharmacological screening, and tests on its antimalarial, anti-diarrhoeal, antibacterial, anti-cough, anti-inflammatory, anti-oxidant activity have been positive. Many of these tests, however, are still at a preliminary level, and need to be followed by more detailed research. Further toxicological studies are also warranted as it has been shown that most extracts when orally ingested seem to be relatively harmless, but when injected most extracts are toxic to varying levels. *Guiera senegalensis* is also a very important species in the crop-fallow cycle in the Sahelian zone, as well for its firewood production, and its presence should be monitored in order to prevent a decline of the species.

Phytochemical screening for *G. senegalensis* showed significant secondary metabolites namely anthraquinones, terpenoids, saponins, alkaloids, coumarins, mucilages, flavonoids, tannins and cardiotonic and cyanogenic heterosides were assayed in different organs of the plant, in leaves, fruits, roots and stem bark [5].

Many studies have been carried out to *G. senegalensis* to investigate its pharmacological properties; it showed significant results in different types of illness. The present review is an attempt to highlight the Morphology, Ethnobotany, Phytochemistry and Pharmacology activities of *G. senegalensis*, the thing that reflects its importance and encourage for further study on it (Table 1).

English name	Guiera
French name	Guier du Sénégal
Arabic name	Gubeish
<b>Scientific classification</b>	
Kingdom	Plantae
Phylum	Magnoliophyta
Class	Magnoliopsida
Order	Myrtales
Family	Combretaceae
Genus	<i>Guiera</i>
Species	<i>G. senegalensis</i>

**Table 1:** Classification of *Guiera senegalensis*.

*Guiera senegalensis* J.F.Gmel. is an accepted name, this name is the accepted name of a species in the genus *Guiera* (family Combretaceae). The record derives from World Checklist of Selected Plant Families (WCSP) (in review) (data supplied on 2012-03-23) which reports it as an accepted name with original publication details: Syst. Nat. 675 1791. (www.theplantlist.org.).

*Guiera glandulosa* Sm. is a synonym of *Guiera senegalensis* J.F.Gmel. This name is a synonym of *Guiera senegalensis* J.F.Gmel.

The record derives from WCSP (in review) (data supplied on 2012-03-23) which reports it as a synonym with original publication details: *Cycl.* 17: s.p. 1811. ([www.theplantlist.org](http://www.theplantlist.org).)

### Morphology

Small shrub up to 3 m high, with scattered black dots; branches pubescent. Leaves grey-green, single or opposite, oblong-elliptic,

mucronate at the apex, rounded or slightly cordate at the base. About 2 to 4 cm long by 1 to 2 cm wide, softly tomentose on both surfaces, with scattered black glands beneath lateral nerves fine. Flowers globose heads, yellow-greenish, resting on short axillary peduncles. Calyx of 5 lobes densely covered by black spots, corolla of 5 petals, the stamens are 10 on two rows of 5, all inserted on the calyx [4,6,7]. The ovary has a single box containing 4 to 6 eggs [8]. Fruit narrowly cylindrical, radiating, 3.5 cm long, densely clothed with very long silky hairs, making a fluffy head (Figure 1). Flowers Sept.-Jan.; Fruits Feb.-May [6]. Source of photos; Global Biodiversity Information Facility (GBIF).



**Figure 1:** Close view of *Guiera senegalensis*.

### Geographical distribution

*Guiera senegalensis* widely distributed in the savannah region of west and central Africa in Senegal, Gambia, Mali, Niger, Burkina Faso, Guinea-Bissau, Guinea, Nigeria, Chad, Mauritania and Sudan (Figure 2).

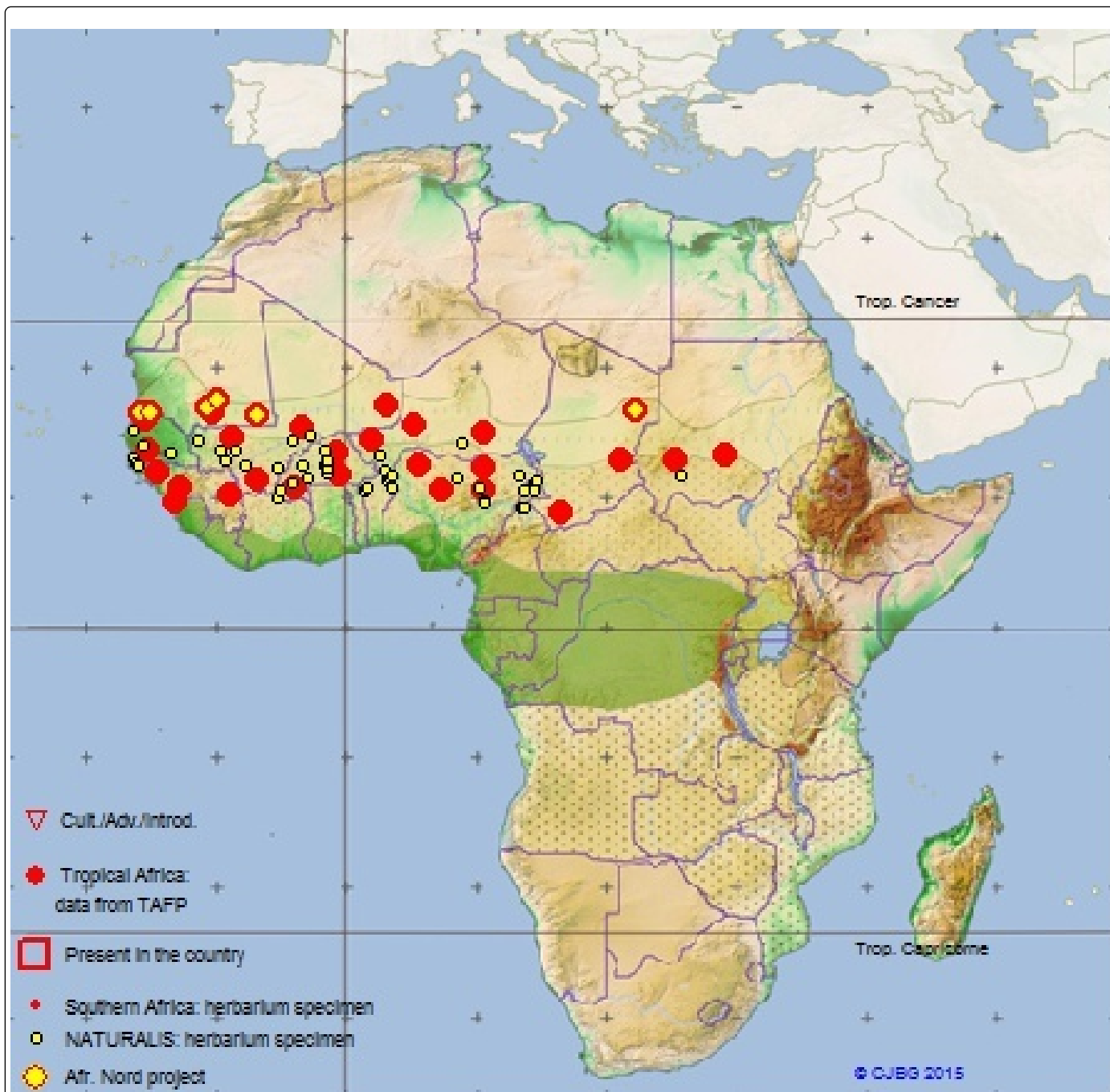
### Traditional medicine uses

*G. senegalensis* has been reported to have numerous traditional medicinal uses, many ethnobotanical studies have been conducted by many authors confirmed that *G. senegalensis* has a good reputation as medicinal traditional plant. It is reported that it is used to treat dysentery and/or diarrhea [4,7,9-14]. Many authors reported that *G. senegalensis* used in traditional medicine to treat Malaria and /or fever [5,7,11,14-22]. It is also reported as antileprosy [4,5,7,11,17,21], Abdominal pains [4,7,9,10], Epilepsy [7], depressant [23], cough and/or cold, [4,7,15,24,25], snakebite [11,26], Eczema [7], syphilis [5], hypertension and hypotension [11,24,25], diabetes [11,17], Impotence [5,7], Breast cancer and Jaundice [27,28].

### Phytochemistry review

Phytochemicals screening of different parts of *Guiera senegalensis* have been investigated by researchers. They found that leaves revealed the presence of alkaloids, flavonoids, tannins [7,24,29], saponins [24]

and terpenoids/sterols [7,29]. Also, it reported a new methoxylated naphthyl butenone, guieranone A (1) was isolated from the leaves of *Guiera senegalensis*. Its structure was elucidated as (2E)-1-(1,3,6,8-tetramethoxy-2-naphthyl) but-2-en-1-one, on the basis of spectroscopic data. Also isolated were two known naphthopyrones, 5-methyl-dihydroflavasperone (2) and 5-methylflavasperone [30]. The roots revealed the presence of steroids, saponins, alkaloids, terpenoids, tannins, flavonoids, cardionolic [11]. Guieranone A, a naphthyl butanone, three beta-carboline alkaloids and tetrahydroharman were purified from leaves and roots and Harmalan (dihydroharman) was isolated for the first time [31]. Four components, catechin, myricitrin, rutin and quercetin were evidenced and determined by HPLC from *G. senegalensis* [32]. Thirteen (13) components were identified for hexane-acetone (50:50) column fraction of hydroacetone extract and twenty one (21) compounds for hexane-acetone (50:50) column fraction of aqueous decoction extract [33]. Also, Methyl-dihydroflavasperone, a novel naphthopyran, was isolated from the chloroform extract of the leaf of *Guiera senegalensis* [34]. Mucilagin, tannins, flavonoids, alkaloids and amino acids are the so far known constituents of *Guiera senegalensis* [35,36]. From the methanolic extract of the dried leaves of this plant, flavonol aglycones as well as flavonol glycosides, some of them acylated, were isolated [37]. Four flavonoids from the leaves of *G. senegalensis*, namely catechin, myricitrin, rutin and quercetin have been isolated by Ficarra et al. [32].



**Figure 2:** Distribution of *Guiera senegalensis* in Africa.

### Pharmacological activities review

*G. senegalensis* has various pharmacological properties that have been reported by researchers. It showed positive effects from the methanolic roots extracts as anti-tuberculosis [38], and anti-diarrhoeal [10,11,39], also it exhibited significant result as ulcer-protective [39]. The aqueous and ethanolic leaves extract that at lower doses was not harmful to the liver and therefore can be exploited as it is served in the treatments of some illnesses [14]. Methanolic extract of leaves revealed positive result as anti-plasmodia, analgesic and devoid

of anti-inflammatory activities [5]. It is also reported that The gall *G. senegalensis* exhibited an interesting antifungal activity against all strains tested [33] while the leaves extract showed that it has no inhibition activity against all of the tested fungal strains [29], while Guieranone which isolated from the leaves of *G. senegalensis* exhibited potent activity against the fungus *Cladosporium cucumerinum* [30]. The extract of the leaves of *G. senegalensis* was found to detoxify (*in vitro*) venom from two snake species [40], Total alkaloid extract and beta carboline alkaloids presented an interesting antiplasmodial activity associated with a low cytotoxicity [31]. The extract (500 g) effectively

inhibited the formation of peroxides in sunflower oil and showed the highest antioxidative activity [41]. The chloroform extract of roots of *G. senegalensis* exhibited a pronounced ant-malarial activity while two alkaloids isolated from the active extract, Harman and tetrahydroharman, showed antimalarial activity and displayed low toxicity [18]. The gall of *G. senegalensis* by using hydroacetic extract showed the most potent antioxidant activity. And anti-lipid peroxidation activity [33]. It is also reported that gallotannins and tow condensed tannins exhibit interesting antioxidant properties [42]. The extract from galls of *G. senegalensis* possess effective anti-acetylcholinesterase, antilipid peroxidation in rat's brain homogenate and erythrocytes hemolysis inhibitory activities [43]. Leaf decoction of *G. senegalensis* was reported to possess an antitussive activity [44]. It was also reported that *G. senegalensis* the crude extracts possess *in vitro* anthelmintic activity against *Haemonchus contortus* in goat [9].

## Conclusion

This review reflected that *Guiera senegalensis* is widely used traditionally as therapy for different ailments and its Phytochemical screening revealed the presence of secondary metabolites in different parts of *G. senegalensis* in particularly leaves and roots in addition to its various pharmacological properties, accordingly the Authors recommend for further study and the work of the pharmaceutical formulation of *G. senegalensis*.

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