



Preliminary Observations on the Uses of *Guiera Senegalensis* as a Traditional Medicinal Plants in Western Kordufan, Sudan

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Abstract

Millions of people in Africa depend on traditional medicinal plants for treatment of many diseases. *Guiera senegalensis* (Gs), which grows in abundance in semi-desert area of Western Sudan, has been used for treating specific diseases and wounds. This study presents the results on traditional uses of Gs as a medicinal plant in Ghubaysh village that is inhabited by nearly eighty thousands people. A survey was conducted on a randomly selected group (n=126), 66 were male (52.83%) and 60 females (47.61%). The participants' age ranged between 20-50 years. Gs extract, prepared by boiling the leaves or soaking them in water, is used for treating many diseases. On the other hand, the roots are dried, crushed into a powder that is used for treating wounds. The results showed that 73% out of the 126 participants used Gs as medicinal plant. 27% of participants who did not use Gs had experience preparing the plant extract or powder for treatment of diseases and wounds of household members. The common ailment treated by the leaves' extract is jaundice which represents more than 51.5% of conditions treated; and the 48.5% of the other diseases treated includes diabetes mellitus, hypertension, cough, arthritis, enteritis, diarrhea and malaria. Most people surveyed have used roots' powder of Gs for treatment of wounds, including diabetics wound, inflammation of skin, and injuries. Gs has also been used in cosmetics, and as animal feed and fuel. The success in treating diseases and wounds suggests presence of important beneficial medicinal components in Gs. In recently published work, we have reported the results of phytochemical screening of Gs leaves extract (alkaloids, flavonoids, terpenoids, tannin, carbohydrates, proteins, steroids, and saponins), and evaluated its toxicity using brine shrimp, and its antifungal activity. The medicinal extract of Gs leaves may be safe to use as a drink for treatment of various diseases as has been practiced for years in the villages of Western Sudan. It would be interesting to find out the ingredients in the root powder that promotes wound healing. In future studies, we would like to investigate what in the leave extract causes diuresis, and how it does that in the kidney nephron.

Keywords: Diseases, *Guiera senegalensis* (Gs), Leaves and roots, Traditional medicinal plant and Wound healing

I. Introduction

Traditional health care systems in many countries of the world, including those in Africa, have used medicinal plants since ancient times. Ancient civilization depended on plant extracts for the treatment of various ailments. Today, plant materials remain important sources of extracts and drugs for combating diseases, including infectious diseases. Millions of people in Africa and other developing countries depend on medicinal plants. Medicinal plants have active ingredients which are used for curing

of various human diseases, and also played an important role in the healing mechanism (Wadood et al., 2013). Documentation on the uses of medicinal plants through structured questionnaires will help preserve the ethno-medicine indigenous knowledge (Musa et al., 2011), and may excite pharmaceutical companies to explore the traditional medicinal plants worth in developing drugs for tomorrow (Gurib, 2006).

Guiera senegalensis (Gs) has been used as a medicinal plant in Western Kordufan, Sudan. The plant grows naturally and intensively in Ghubaysh area of Western Sudan, and is considered by the locals to be the most important medicinal plant in the area. Ghubaysh village, which named after the medicinal plant that generously grows in the area, is located in Western Kordufan province in Sudan. Gs generally occurs as a shrub that can grows to a height of 3 to 5 m (Figures 2a and 2b) as described by (Somboro et al., 2011). Gs' stem has several knots that elaborate outward branches that have short grey-green oval leaves (Somboro et al., 2011). These and other features that distinguish the plant have been used to describe Gs as a plant with silver-green color that is prominent in the brush land (Silva et al., 2008).

Several reports in the literature have described the use of Gs in traditional medicine for treatment of many diseases (Fiot et al., 2004). Gs extracts have been recognized as being useful against cough, respiratory congestion, and fever (Kerharo and Adam 1974). The Gs leave extract have been prescribed for treating cough, easing breathing and for treating lung and bronchial disorders (Diatta et al., 2007), and is also used against malaria (Azaset al., 2002). The branches, leaves, bark and roots of Gs are used for the treatment of stomach pains and dysenteric diarrhea (Aniagu et al., 2005). In addition to medicinal uses, Gs has also been used by Tukulor people of Senegal in diets prepared to enhance growth and increase body weight, reproductive capacity, and milk secretion in animals. Further, the plant extract has been applied as an antiseptic to help wound healing, and employed to help with stomatitis, gingivitis and syphilitic canker sores (Kerharo and Adam 1974).

We have recently reported the results of phytochemical screening of Gs leaves extract (alkaloids, flavonoids, terpenoids, tannin, carbohydrates, proteins, steroids, and saponins), and evaluated its toxicity using brine shrimp, and its antifungal activity (Alshafei et al. 2016). Alshafei et al. (2016) concluded that the medicinal extract of Gs leaves may be safe to use as a drink for treatment of various diseases as has been practiced for years in the villages of Western Sudan. Considering the importance of all of the above uses of Gs in different areas, we designed this study to collect survey data to document the traditional uses of Gs as a medicinal plant in Ghubaysh village of Western Sudan, where Gs grows naturally and in abundance. With particular reference, the study is interested in finding supportive evidence of the the traditional importance of Gs in wound healing and for treatment of jaundice and various diseases. We are also interested in documenting the other uses for Gs in its native areas.

II. Materials and Methods

The Study Area

Gs is growing in its natural habitat in Ghubaysh area of Western Kordufan, Sudan, where the study was conducted. The Gs plant generally occurs as a shrub that can grow to a height of 3 to 5 m. Figure 1 shows Gs shrub in the study area. As described by Somboro et al. (2011), the stem of Gs has several knots that elaborate outward branches that have short grey green oval leaves. These and other features that distinguish the plant have been used to describe Gs as a plant with silver-green color that is prominent in the brush land (Silva et al., 2008). Gs grows naturally and intensively in Ghubaysh area of Western Sudan, and is considered by the locals to be most important medicinal plant in the area. Ghubaysh village, which named after the medicinal , is located in Western Kordufan province in Sudan.



Figure 1: *Guiera senegalensis* in Ghubaysh of Western Kordufan, Sudan.

Study population

The population of Ghubaysh is estimated to be around 20,000. The economic status of the inhabitant is similar. The population relies on subsistence agriculture and livestock keeping. One hundred and twenty six patients (n=126) were randomly selected for the study. The participants were 64 were male (51%) and 62 females (49%). Care was taken to represent the inhabitant of the village young and old, males and females.

Survey data and analysis

Survey data was collected during March 2015. The main method of data collection for this study was structured mainly closed-ended questionnaire. The questionnaire was made flexible enough so it could be used for patients with different educational backgrounds, ages, and income level. The average interview time was planned not exceed half an hour.

The major areas for questioning were designed to obtain the following information:

1. Background information.
2. The diseases that are treated with *Guiera senegalensis* (Gs).
3. Which part of the plant used for treatment.
4. The methods that were used for treatment, dosage, and route of administration.

The survey was designed to collect data from people who were living in Ghubaysh village in Western Kordufan. Data that was collected include: case history, age, gender, carrier, education level, treatment with the plant extract or powder, and the frequency of treatments per day, the diseases that were treated with Gs leaves extract in woman, men, children, and animals. Also the questionnaire covered the side effects of this medicinal plant, and the uses of the plant in cosmetics, and as forage, fuel, etc. Survey data was organized and analyzed to give summaries of the various categories of interest. Data summaries were presented in tables and figures which are used as statistical presentation tools of the data summaries.

III. Results and Discussions

The results of survey data of the present study were represented in two tables, 1 and two; and three and two figures, 1 and 2. The gender distribution of the randomly selected 126 was 64 were male (51%) and 62 females (49%). Table 1 shows the age groupings of the participants. Age of the participants ranged between 20-50+ years. Only 29 (23%) of the participants were 50+ years of age, 20 males and 9 females. On the other hand, 13.5% of participants were between 40-49 years of age, 9 males (7.1%) and 8 females

(6.4%). The 30-39 years age group included 17(13.5%) participants of whom 6(4.8%) were males and 11(8.7%) were females. It could be observed from table 2 that the participants whose ages were between 20-29 years comprised the majority in this study: males 29 (23%), and 34(27%) females. This represents the youth, the educated and the university students, who are acquainted with the medicinal benefits of Gs.

Table 1. Age groups and gender distribution of participants in present study.

Age group years	Number per group (%)	Male%	Female%
50+	29 (23 %)	20(15.9%)	9(7.1%)
40-49	17(13.5%)	9(7.1%)	8(6.4%)
30-39	17(13.5%)	6(4.8%)	11(8.7%)
20-29	63(50%)	29(23%)	34(27%)
Total	126	64(51%)	62(49%)

Figure 1 presents the percentage of participants treated with Gs and not treated. From this table it could be observed that 92(73%) out of 126 patients who participated in this study have used this medicinal plant for treatment of different ailments: 42(33.3%) females (18 house keepers, 15 students and 9 employees), and 50(39.7%) males (21 farmers, 17 students, 10 employee, and 2 self-employed workers). The remaining participants, 34 (27%), did not use this medicinal plant but they have a good idea of its usefulness, and had experience about its preparation, uses for treatment, and the diseases that were treated.

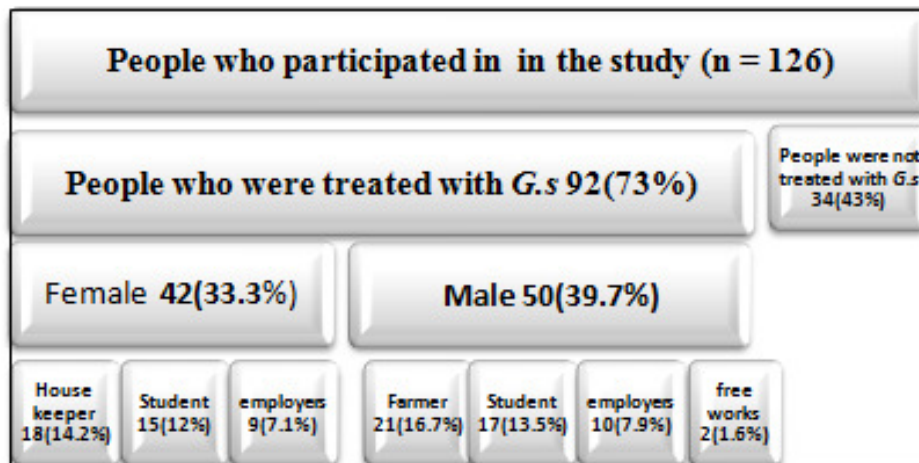


Figure 2: Classification of people treated with Gs

The data gathered in the present study revealed that the parts of the plant were used for treatment were the leaves and roots, which are used for treatment of many diseases. Of the 126 participants, 122 used the leave extract for treatment of various ailments. Fifty seven of the participants used the powder extract. Of those who used the leave extract, In this study, it was found that the common condition treated with the leave extracts was jaundice, which represent more than 52% of the complaints; the rest

(48%) of the diseases treated included diabetes mellitus, hypertension, , abdominal pain, joints problems, diarrhea, constipation, kidney diseases, and malaria as shown in table3, which shows the ailments treated, preparation method of the extract, and roots used for treatment. Wounds, including diabetics wounds, represents 59.7% conditions treated with Gs powder and ranked first followed by rectal injury in children (28%)

Table 2: Use of Gs extracts as traditional medicine in treatments of various ailments

Diseases and wounds	Extract methods
Uses of Gs leaves extract (n=122)	
Jaundice 65(52.3%)	Decoction of fresh leaves or soaked in water
Abdominal pain 15(12.3%)	Decoction of fresh leaves or soaked in water
Diabetes 9(7.4%)	Decoction of fresh leaves or soaked in water
Hypertension 7(3.1)	Decoction of fresh leaves or soaked in water
Diarrhea 3(2.4%)	Decoction of fresh leaves or soaked in water
Malaria 1(.8%)	Decoction of leaves used to bath the patient
Joints problems 3(2.4%)	Decoction of fresh leaves or soaked in water
Kidney diseases 8(6.5%)	Decoction of fresh leaves or soaked in water
Constipation 1(.8%)	Decoction of fresh leaves or soaked in water
Use of Gs roots powder(n=57)	
Dermatitis 2(3.5%)	Powdered roots
Wounds including diabetic wounds 33(57.9%)	Powdered roots
Rectum injury in children 16(28.1%)	Powdered roots
Passage way injury after parturition 6(10.5%)	Powdered roots

Uses of the leaves extract

This study found that there are two ways for using leaves, wet or dry, for treatment of diseases. Firstly, the process starts with decoction of leaves after cleaning them. Leaves were used for making a tea-like hot drink. For treatment of diseases, some groups used this tea twice a day for 7 days, and others continued to use it until they became well. The second method for preparation of the extract was done by soaking the leaves in water overnight, then the extract was drunk twice in a day for seven days or until the person became healthy. Moreover, some people used the leaves extract to wash all of their body to reduce the fever, especially for treating malaria and inflammation of the skin. In similar studies that described Gs use for treating malarial attacks, decoctions of leaves or mistletoe were prescribed at Ségué; and severe diarrhea and dysentery were treated by prescribing a decoction or maceration of leaves or bark at Ségué (Narayana et al., 2011). These observations on the use of Gs may be partly due to the better preserved ancestral practices in this region, which is more remote from developed urban centers. It seems that presence of flavonoids in the plant parts may account for its usefulness for treatment of aches and pains, and other systemic ailments. Further, Somboro et al. (2011) reported that terpene derivatives, found in abundance in all the plant parts, have marked biological activities. This might have justified the use of Gs extract by traditional practitioners to treat malaria attacks. This premise needs to be further investigated in future studies.

Use of the roots of Gs for treatment of wounds, and different skin conditions:

Most people surveyed in this study have used the roots of Gs for treatment of wounds, injuries, and different skin conditions, including inflammation of skin. It have been generally understood according to the results of the present study that wounds, ulcers, parturition injuries and inflammation of

the skin in both humans and animals are treated in this area of the Sudan by the bark of the roots, prepared by drying the roots under the direct sun light or in the shadow. The dried roots were then crushed into powder which was put directly on the wounds or the inflamed area of the skin for many days until the wounds heal. Several studies reported that Gs was used in traditional medicine to treat various illnesses. Our results agree with that observed by Fiot et al. (2004) who reported that the antimicrobial effects of Gs root extracts seems to encourage its use as a traditional medicine. Traditionally, the roots concoction is used to cure diarrhea, dysentery, and microbial infections (Fiot et al., 2004). The parts of the plants have been used externally as an antiseptic to promote healing of wounds, or for treatment of inflammation of the mouth, gum, and cancer canker sores associated with syphilis (Somboro et al., 2011). Sigleton (1999) documented that large degree of inhibition the test microbial isolates by all the Gs extracts offers a justification for their use by traditional medical practitioners in the treatment of microbial infections of boils and wounds. On the other hand, (Draughon, 2004) suggested that antibacterial effects of the extracts might have been to be related to the tannins, flavonoids and saponins present in the extract. We quantified the above mentioned compounds in Gs (Alshafei et al. 2016), however, we did not examine this premise.

Regarding other uses of Gs, one of the interesting findings in the present study was that 10 (8%) of participants, 6 (4.8%) females and 4 (3.2%) males have used soaked water of Gs as cosmetic to soften their skin, or for controlling dandruffs in their scalps.

Other uses of Gs, include the use of the plant as forage. All the 126 (100%) participants have used Gs as forages for ruminants. On the other hand, the wood from Gs has widely being used for building huts, and for fuel. This shows that Gs is very important plant to the local economy and welfare, and wellbeing of the inhabitants and their animals in these remote areas of Africa.

The most important side effects of this medicinal plant observed by 90 (71.4%) of the participants was that the extract has a diuretic effect as it increases production of urine. This is intriguing observation that provides a good topic for research in order to find out which ingredient in the Gs leave extract has this diuretic effect. This side effects presents an opportunity. Other minor side effects reported by only 0.8% of the participants are: stomach uncomfot, yellow color in urine, and nausea. However, 33 (27%) of the participants didn't report any side effect.

IV. Conclusion

In conclusion, this study documented the importance of *Guiera senegalensis* in Ghubaysh area of Western Kordufan, Sudan, where the plant is native, grows well and in abundance. The plant has been used as a medicinal plant, and was famous for its use against jaundice, abdominal pain, malaria, diabetic wounds, and skin inflammation. The plant is used as cosmetics, for treatment of dandruffs, as forage, building material, and as a source of fire wood. The importance of this plant to the livelihood of thousands of inhabitants is obvious but needs to be documented. This plant has the potential as source of drugs for humans and animals. The study showed that the uses of the plant as reliable traditional medicinal plant are evident, and that its economic importance to thousands of people in this area is clear. *Guiera senegalensis*, the traditional medicinal plant, is expected to have many beneficial biomedical and anti-inflammatory compounds whose biological effects and side effects need to be discovered through more specialized and methodologically designed scientific studies. Thus we hope to continue our researching on antimicrobial properties, anti-inflammatory properties of Gs, and on identification of the compounds that are related to the treatment of different diseases and wounds, especially diabetic wound in this particular region of sub-Saharan Africa. Further investigations on the multiple uses of Gs and its socio-economic value need to be done. These may include: The use of Gs as medicinal plant for humans and animals, as source of animal feeds, and as source of building material and fuel, and ingredients for cosmetics. It would be interesting to find out the ingredients in the root

powder that promotes wound healing. In future studies, we would to investigate what in the leave extract causes diuresis, and how it does that, and where in the nephron of the kidney it acts.

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Bibliography

- [1] AlShafei NK, Elshafie AE and Nour A (2016) . Antitoxic, Antifungal and Phytochemical Analysis of Medicinal Compounds of *Guiera senegalensis* Leaves in Sudan. *Plant Biochem Physiol* 4: 166. doi:[10.4172/2329-9029.1000166](https://doi.org/10.4172/2329-9029.1000166)
- [2] Aniagu SO, Binda LG, Nwinyi FC, Orisadipe A, Wambebe C, et al (2005). Anti-diarrhoeal and ulcer-protective effects of the aqueous root extract of *Guiera senegalensis* rodents. *J. Ethnopharmacol.*, 97(3): 549-554.
- [3] Azas N, Laurencin N, Delmas F, Di Giorgio C, Gasquet M, et al (2002). Synergistic in vitro antimalarial activity of plant extracts used as traditional herbal remedies in Mali. *Parasitol. Res.*, 88(2): 165-171. *Basic Appl. Sci.*, 5, 537.
- [4] Diatta W, Fall AD, Dieye AM, Faty S, Bassene E, et al (2007). Experimental evidence of cough activity of total alkaloids from *Guiera. senegalensis* Lam., In guinea pig. *Dakar Med.*, 52(2): 130-134.
- [5] Draughon FA (2004). Use of Botanicals as Biopreservatives in foods. *Food Technol.*;58 (21): P20-28.
- [6] Fiot J, Ollivier E, Timon-David P, Balanzard G (2004). *Guiera senegalensis* J. F. Gmel. (Combretaceae). *Recent Res. Dev. Plant Sci.*, 2: 267-277.
- [7] Gurib-Fakim, A (2006). Medicinal Plants: Traditions of Yesterday and drugs of tomorrow. *Mol. Asp. Med.* 27:1-93.
- [8] Kerharo J, Adam JG (1974). *La Pharmacopée Sénégalaise Traditionnelle. Plantes Médicinales et Toxiques.* Editions Vigot Frères, Paris, p. 1011
- [9] Musa MS, Abdelrasool FE, Alshiekh EA, Ahme, LA, Mohammed LE et al. (2011). Ethnobotanical study of medicinal plants in the Blue Nile State, South Eastern Sudan. *Journal of Medicinal Plants Research* Vol. 5 (17), pp42876-4297.
- [10] Narayana KR, Reddy MS, Chaluvady MR, Krishna DR (2001). Bioflavonoids classification, pharmacological, biochemical effects and therapeutic potential. *Indian J. Pharmacol.*, 33: 2-16.
- [11] Sigleton P (1999). *Bacteria in biology, Biotechnology and medicine.* John Wiley and sons, Ltd. New York p.40.
- [12] Silva O, Serrano R, Gomes E T (2008). Botanical characterization of *Guiera senegalensis* Leaves. *Microsc. Microanal.*, 14(5): 398-404.
- [13] Somboro, AA, Patel K, Diallo D, Sidibe L, Chalchat JC, et al. (2011). An ethnobotanical and phytochemical study of the African medicinal plant *Guiera senegalensis*, *Journal of Medicinal Plants Research* Vol. 5(9), pp. 1639-1651.
- [14] Wadood A, Ghufuran M, Jamal SB, Naeem M, . Khan A, et al (2013). Phytochemical Analysis of Medicinal Plants Occurring in Local Area of Mardan. *Biochem Anal Biochem* 2: 144. doi: [10.4172/2161-1009.1000144](https://doi.org/10.4172/2161-1009.1000144).