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A Look at Some Medicinal Plants from Sudan-Mini Review

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ABSTRACT

Sudan has large area, with multi- culture, habits rich biodiversity and medicinal plants, although was divided in 2011 into two countries still rich with valuable medicinal plants. The objective of the present mini review is to indicate and document some medicinal plants from Sudan and reflect their valuable uses in treating some indigenous and tropical diseases. The present mini- review gave a look at some of these plants, mentioning their families, distribution, their local names, their habits, the plant part used for treating diseases and mode of treatment. The medicinal and Aromatic Plants Research Institute (MAPRI) of the National Centre for Research (NCR) plays major role in medicinal and aromatic plants investigation, determination, valuation and documentation in Sudan and contributes with local healers in different regions of Sudan, the rediscovering of these plants is highly needed with contribution of overseas pharmaceuticals companies as natural products have less side effects than industrial drugs.

Keywords: *Diseases; Medicinal plants; Sudan; Trees, shrubs and herbs*

INTRODUCTION

Sudan was considered as the largest country in Africa (2.5 million sq. km.) which was approximately one million square miles[1]. In 2011, Sudan split into two countries with one third of the country being proclaimed a new state named "Republic of South Sudan" leaving behind the remaining area retaining the older name "the Republic of Sudan"[2,3]. The Sudan is generally a very flat country, most of its parts range between 400 and 450 m above mean sea level (AMSL)[4]. The Red Sea Hills , the foothills of the Ethiopian mountains on the east, the Imatong, Dongotana Mountains and the Nile-Congo watershed on the south and Jebel Marra on the west. In the center, the Nuba Mountains and the Ingasana Hills are the only prominent mountainous areas[4].

The medicinal and Aromatic Plants Research Institute (MAPRI) of the National Centre for Research (NCR) is exerting efforts for collecting, conserving, studying and documenting indigenous medicinal and aromatic plants in Sudan.[5-8], with this unique history and vast variety of climate and flora, traditional medicine together with use of medicinal plants became an important part of the cultural heritage of Sudan[9-11].

The pasture is composed of a predominantly annual grasses with some forbs[12-14]. The annuals constitute 80% and perennials 20% of the forage plant composition in Sudan[12-15]. The reliance on indigenous medicinal plants often can be attributed to a lack of medical doctors and unaffordable prices of pharmaceutical products, as well as people's faith in the benefits of traditional medicine[3,16]. The herb *Aristolochia bracteolata* (umglalagil), has been used to cure malaria in traditional medicine , however it has negative effect on the kidney[16].

The roots of *Balanites aegyptiaca* contain steroidal sapogenins having strong detergent properties which form very stable foam in water solutions , whereas the bulb contains sugars and saponins[17], exhibit anti-inflammatory and immune-boosting properties as well as antibacterial effects. An investigation of antiplasmodial activity of selected Sudanese plants revealed that most plants from the family *Meliaceae* showed highly potent antiplasmodial activity[18]. *Khaya senegalensis* (Mahogany), *Azadirachta indica* (Neem) and *Trichilia emetic* (Dabkar) showed IC_{50} values less than 5 µg/ml[18,50]. Four Sudanese medicinal plants were investigated for their anticancer and antioxidant activity to discover some new medicinal plants that can be used

for treatment of cancer diseases[19]. The extracts of *Hibiscus sabdariffa*, *Halexylon salicornietum* and *Sonchus oleraceus L.* showed low active against Chemiluminescence assay, *Prosopis juliflora (SW).* DC has shown a very high activity against Chemiluminescence assay[19].

The selection of medicinal plants in this mini review was carried out according to their availability in different locations, the utilization of local healers in different regions in Sudan and their economic value in traditional medicine.

The present mini-review aimed to document some medicinal plants, the traditional application for treating the local diseases in Sudan in period 2015-2018.

Some Sudanese trees as source of traditional medicines

Adansonia digitata (Tabaldi) grows in western Sudan and south of the Blue Nile, a refreshing juice is made from its fruits and used as antidiarrheal[9]. *Grewia tenax* (Gedium) grows in western Sudan[3,9], a refreshing juice is made from the fruit for treating anemia whereas *Balanites aegyptiaca* (Heglig) grows in central and western Sudan and its fruits used as laxative, anthelmintic and treatment of diabetes[3,9]. *Acacia senegal* (Arabic gum and Hashab) (Table 1) grows in the Eastern, central and western Sudan and applied for kidney diseases[3,9]. Other Acacias as *Acacia seyal* (Talih) grown in southern Sudan, the stem acts as fumigant and used for rheumatic pain as well as fumigation of the body (sauna)[3,9], a perfume and a deodorant[3,9] whereas, *Acacia nilotica* (Grad, Sunt), grown along the Nile banks and applied for treatment of diarrhea and Stomach pains[8,17].

The bark of *Boscia Salicilfolia* (Tella), that grown east and south of Blue Nile, is used for treating cough and malaria[20]. *Ozoroa insignis* (Tugul), grown in the same region, has roots applied for curing pharyngitis[20]. The roots of *Terminalia brownii* (Arza, Sobag), distributed in south east Blue Nile and south Kordofan, are macerated for treating cough[20], and the bark decocted for curing jaundice,[3,20]. *Cola nitida* (Goro), has fruits used as Stimulant, dyeing and water purification[21].

Some tree species were recorded as highest potent antibacterial activities (inhibition zone 30 mm or more), namely: *Acacia nioltica* (Grad, Sunt), Adansonia *digitata* (Tabaldi), Ziziphus spina-christi (Seder, Nabag), Eucalyptus *globules* (Ban), *Kigelia Africana* (Umshotoor) and *Dichrostachys cinerea* (Kadad)[3,22]. *Terminalia laxiflora* (Daroat) stem and stem bark are used as antiseptics for mouthwash to prevent gingivitis and thrush[3,23]. *Hyphaene thebaica* (doum), Palmae, contain saponins, tannins, catechins, flavonoids, terpenoids and ketones[22,24]. Moderate to high doses of *Sclerocarya birrea* (Hommaid) stem-bark aqueous extract (25 to 800 mg/kg b.w) induced a dose-dependent, significant reduction in the blood glucose concentrations of fasted streptozotocin-treated diabetic rats[3,25]. The bark powder of *Albizzia anthelmintica* (Umtakarnii) is used as anthelmintic which coincides by the pharmacological validation of Galal[26,27] and Koko[28,29].

Shrubs and herbs utilized in traditional medicine

Croton zambesicus Muell. (Croton) Euphorbiaceace, is a Guineo-Congolese shrub species widely spread in tropical Africa[30], the roots were used in Sudan for menstrual pain[30], aperients[31] and antimalarial and antidiabetic[32], the seeds decocted for treatment of cough and malaria[33,34]. The calyx (sepals) of *Hibiscus sabdariffa* (karkade) were used to reduce the hypertension and lowering blood pressure[35 -37]. *Sesamum indicum* (Simsim) *Pedaliaceae* has been found to protect the liver from oxidative damage[38]. The oil has been used for healing wounds for thousands of years, it is anti-viral and anti-inflammatory[38,39].

Sudanese plants as antitumor

Ambrosia maritima L., *Ammi visnaga* L., *Aristolochia bracteolata* L. and *Lawsonia inermis* L., are widely used in folk medicine in Sudan for the treatment of diseases such as solid mass tumor conditions[40].

Economical medicinal plants from Sudan

The most important medicinal plants in Sudan from economic point of view and have contribution to Sudanese national income according to Bank of Sudan (2007-2017) were (Table 1) *Acacia nilotica* (Sunt)[3], *Acacia Senegal* (Hashab)[7], *Acacia seyal* (Talih)[3], *Adansonia digitate* (Tabaldi) [3], *Aloe sankitana* (Sabar)[1], *Aristolochia bracteolate* (Um galgil)[23], *Azadirachta indica* (Neem)[43], *Balanites aegyptiaca* (Heglig) [44], *Boswellia papyrifera* (Tarag tarag) [3], *Carcica papaya* (Papya)[45], *Cassia acutifolia* (Senna)[47], *Citrullus colocynthis* (Handal)[48], *Cuminum cyminum* (kammun)[46], *Cymbopogen proximus* (al-Yaman Maharaib)[49], *Haplophyllum tuberculatum* (komesht en-nebi)[50], *Hibiscus sabdariffa* (Karkade)[36], *Hyphaene thebaica* (Doum)[22], *Grewia tenax* (Gudaim)[3], *Lawsonia inermis* (henna)[1], *Nigella sativa* (Al Haba Alsoda black cumin)[25], *Ocimum basilicum* (al-raihan)[51], *Ocimum santicum* (Habaq)[52], *Phoenix dactylifera* (Nahkeel, Date palm) [53], *Ricinus communis* (Kharwee) [55], *Salvadora persica* (Arāk, miswaak)[54], *Sesamum indicum* (Simsim)[38], *Solenostemma argel* (Hergel)[22], *Tamarindus indica* (Aradeeb) [56], *Terminalia brownii* (Arza, Sobag)[20] and *Waltheria indica* (Melochia)[57]

Table 1. Comparative review of some traditional medicinal plants of Sudan

Plant name/family/voucher no.	Vern name	Habitat in Sudan	Growth habit	Plant part	Disease treated	Mode of treatment	Reference
Acacia fistula (L) Del. Leguminosae	Sofair	Sinnar, Blue Nile	Tree	Heartwood	Stem fumigant is used for rheumatic pain	Smoke	Abu elgasim *et al*[15]
Acacia nilotica (L.) Willd. ex Del. Leguminosae G/56/83	Sunt	River banks	Tree	Fruit	Stomach ache	Powder mixed with floor	Issa *et al*[3]
					colds and pharyngitis	Mix with oil	Khalid *et al*[1]
Acacia nubica Benth. Leguminosae	El Ifein	Arid and semi- arid areas	Shrub	Fruit	Tooth cavity	Paste	Doka and Yagi[29]
Acacia oerfota (Forsk) Schweinf. Mimosaceae	Laot	Arid and semi-arid areas	Shrub	Root	Teeth ache	External (filling tooth cavity) External (inhalation)	Musa, *Et al*[41]
					Headache		
Acacia senegal (L.) Willd. Leguminosae G/110/83	Hashab	North and south Kordofan	Tree	Gum	Stem exudates (gum) are used as a demulcent, anti-diarrhoea and anti-ulcers	Infusion	El-kamali, *et al*[7]
Acacia seyal Del. Leguminosae M/21/76	Talih	Sinnar, Blue Nile, South and North Kordofan	Tree	Heartwood	Stem fumigant is used for rheumatic pain.	Smoke fumigant	Issa, *et al*[3]
Adansonia digitata L. Malvaceae W/20/95	Tabaldi/gongolase	North Kordofan and Bule Nile	Tree	Fruit	Giardiasis diarrhoea and amoebic dysentery.	Decoction	Issa *et al*[3]
							Khalid *et al*[1]
				Leaves	Eaten as salad	Cutting	
Aloe sankitana, Asphodelaceae	Sabar	North and East Sudan	Small shrub	Leaves	Skin diseases, constipation, fever, tonsillitis, hemorrhoids and inflamed colon	Leaf exudation	Khalid *et al*[1]
Ambrosia maritima Asteraceae	Damesisa	Widely tropical and sub-tropical regions	Herb	Seeds	Diarrhea and pneumonia	Powder	Yagi, *et al*[42]
Ammi visnaga L. (Apiaceae)	Khella	Northern and central regions	Herb	Seeds	vitiligo, psoriasis, cardiovascular disorders, mild obstruction of the respiratory tract in asthma	Decoction	Dirar *et. al*[40]

Aristolochia bracteolata Lam. Aristolochiaceae G/7/84	Um galgil	Semi- desert Areas	Herb	Whole plant	Malaria. intestinal worms, skin itch, and insect bites	Infusion of dried leaves	Mohieldin, *et al*[23]
Azadirachta indica, Meliaceae	Neem	Whole Sudan	Tree	Fruit and seed	Malaria, skin diseases, bronchitis	Extraction of oil from seed Extraction of oil from seed	Koul *et al* [43]
Balanites aegyptiaca, Zygophyllaceae	Heglig	Central and western Sudan	Tree	Fruit and seed	Jaundice, dysentery and constipation, yellow fever, syphilis, and epilepsy		Chothani and Vaghasiya [44]
Boscia Salicilfolia, Capparidaceae	Tella	Alangasana	Tree	Bark	Cough and malaria	Maceration	Abdalla, *et al*[20]
Boswellia papyrifera (Caill. ex Delile) Hochst., Burseraceae, K/12/96	Tarag tarag	Central and western Sudan	Tree	Bark	Diabetes	Maceration	Issa *et al*[3]
Carcica papaya, Caricaceae	Papya	East, Central and South Sudan North Kordofan	Tree	Fruit	Wound, dengue fever, Diabetes inflammations and cancer	Maceration	Sudhakar[45]
Cassia absus L., Caesalpiniaceae,	Habat el-Ain		Herb	Fruit	Eye troubles	Applied on eye	EL-Kamali, *et al*[7]
Cassia acutifolia (DELL.) Leguminosae	Senna	North and Central Sudan	Small shrub	Dried leaflets and pods	Purgative. As its actions centre on the lower bowel so it is suitable in habitual costiveness.	Applied on infected areas Extraction of oil	Ramchander, *et al*[47]
Citrullus colocynthis, Cucurbitaceae	Handal	Central, west Sudan	Small herb Tree	Fruits and seeds	type II diabetes	Decoction	Barghamdi *et al*[48]
Cola nitida Sterculiaceae	Goro	Widely tropical and sub-tropical regions		Fruit	Stimulant dyeing and water purification		Elhardallou[21]
Croton zambesicus Muell. Arg. (Syn. Name: C. amabilis Muell. Arg.), Euphorbiaceace.	Croton	widely spread in tropical regions	Shrub or small tree	Leaves Roots	menstrual pain and aperients antimalarial	Decoction and infusion	Mohamed *et al*[34]

Cuminum cyminum, Apiaceae	Kammun	Central Sudan	Small shrub	Leaves flower, Fruit and seed	Inflammation, muscle spasms, , jaundice, diarrhea, and flatulence, poultice and suppository	Extraction of oil	Singh *et al*[46]
Cymbopogen proximus, Poaceae	al-Yaman Maharaib	East and Central Sudan	Small herb	Leaves	Nephrolithiasis, Microbial infections, Oxidative stress	Oral and Decoction	Samy [49]
Haplophyllum tuberculatum,(Forssk.) A.Juss, Rutaceae	komesht en-nebi	Northern and eastern Sudan	Small herb	Aerial parts leaves and stems	Fever, allergic rhinitis, ear and eye problems Fever, cough	Applied externally	El-Tahir *et al*[50]
Eucalyptus globules, Myrtaceae	Ban	Blue Nile	Tree	Leaves and seeds	Hypertension	Applied externally Decoction	Issa et al[3]
Hibiscus sabdariffa L. Malvaceae Cultivated	Karkade	annual crop grown successfully in tropical and subtropical regions	Deep rooted herbs	Fruits, flowers and leaves			Girma, *et al*[36]
Hyphaene thebaica Mart Arecaceae/ Palmae K/81/96	Doum	Sandy and dry areas	Tree	Fruits	diabetes	Infusion	Abdalla andAbdallah[22]
Grewia tenax (Forssk.) Fiori, Malvaceae, G/105/83	Gudaim	Darfur and Kordofan	Shrub	Fruits and bark	Wounds, Anemia	Poultice applied to wounds	Issa *et al*[3]
Kigelia Africana, Bignoniaceae	Umshotoor	Blue Nile and south Kordofan	Tree	Fruits and leaves	Inflammation and cancer	Applied externally	Issa *et al*[3]
Lawsonia inermis, Lythraceae	Henna	Darfur, Kordofan, Khartoum	Shrub	Leaves	Women beauty Skin and hair	External application	Khalid *et al*[1]
Nigella sativa L. Ranunculaceae	Al Haba Alsoda black cumin	Widely tropical and sub-tropical regions	Herb	Seeds	Evil eye headache, fever	Oil and seed	Yagi and Yag[25]
Ocimum basilicum, Lamiaceae	Al-raihan	Nahar Elnil, Khartoum, Senar Nahar Elnil,	Herb	Leaves	Catarrh, bronchitis, cough	Oil extraction	Rubab *et al*[51]

Ocimum santicum, Lamiaceae	Habaq	Khartoum, Algzeria	Herb	Leaves root	Eye care, Malaria fever, Skin care	Eye drop, Decoction	Joshi *et al*[52]
Ozoroa insignis Anacardiaceae	Tugul	Alangasana	Tree	Root	Insecticidal activity pharyngitis	Maceration	Abdalla, *et al*[20]
Phoenix dactylifera, Arecaceae	Nahkeel. Date palm	Northern Sudan	Tree	Fruits	Diabetes, Cancer, mutagenesis. diarrhea	Eating fruits	Ahmed *et al*[53]
Ricinus communis, Euphorbiaceae	Kharwee	Northern and eastern Sudan	Small tree	Seeds and roots	Inflammation, cancer	Caster seed oil	Marwat *et al*[55]
Salvadora persica, Salvadoraceae	Arāk, miswaak	Northern Sudan	Small tree	Stem	Toothbrush	Stem as toothbrush Oil	Kumar *et al*[54]
Sesamum indicum L. Pedaliaceae	Simsim	Widely tropical and sub-tropical regions	Herb	Seeds	Fever and headache		Abushama *et al*[38]
Solenostemma argel (Del.) Hayne Asclepiadaceae	Hergel	Semi-desert areas	Herb	Leaves	Bronchitis, neuralgia, sciatica, and wounds	Crushed and application	Abdalla andAbdallah[22]
Sonchus oleraceus Asteraceae	Jaeed	Not available in large areas	Herb	leaves	Antitumor And anticancer	Decoction	Elnour. *et al*[19]
Tamarindus indica, Fabaceae	Aradeeb	Blue Nile, south Kordofan	Tree	Fruits	Diarrhea, dysentery	Decoction	Zohrameena *et al*[56]
Terminalia brownii Fresen *Combretaceae* M/8/79	Arza Sobag	Alangasana South Kordofan	Tree	Root bark	Cough Jaundice	Maceration Decoction	Abdalla, *et al*[20] Issa *et al*[3]
Waltheria indica Sterculiaceae Malvaceae	Melochia	Most of Sudan	Herb	Leaves	Diabetes	Decoction	Kannan *et al*[57]
Ximenia Americana Olacaceae Y/17/014	Beu,ok Jabl fungur	Alangasana South Kordofan	Tree	Root bark	Antiseptic after child birth, Rheumatic pain	Maceration Mixed with salt	Abdalla, *et al*[20] Issa *et al*[3]

Sudan is a large country with varied climatic conditions, soil properties, and vegetation type and multi ethnic groups with areas still virgin and need to be rediscovered, rich with huge number of medicinal plants for different ailments and diseases. Attention of scientists and drug companies should be concentrated on this area of the world to keep the heritage of medicinal plants in Sudan. However the mentioned medicinal plants have excellent contribution in the national economy of Sudan especially the gums (Arabic gum, Tarag tarag and Sobag. As well as the annual production of Simsim, Karkade and Date palm.

Conflict of interest

The author declares that there is no conflicts of interest.

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