Trade of Sudanese Natural Medicinals and their role in Human and Wildlife Health Care

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Introduction

Sudan is considered to be the largest country in Africa (2,5 sq. km.) which is equivalent to approximately one million square miles, that is why it is some times referred to as the land of one million square miles. This great area lies between latitude 3-23° N. constituting a wide variation of climatic zones extending from desert and semi-desert in the North, equatorial short rainy season (semi-acrid and semi-humid) in the centre to equatorial long season (arid humid and equatorial humid) in the South. Thus the range of mean annual rainfall (m.a.r.) is expected to vary from zero to heavy (1400). Depending on the amount of rainfall, the type of soil and cultivation practices climatic zones are usually classified into four categories ranging from humid and rainy climate (Ferrasols & Nitosols type) to arid climate (Yermosols poor soil type).

This variation in climate, rainfall and soils has a direct impact on the immense diversity and variation in the vegetation of this country. Based on this variation of climate, Wickens (1991) has devided Sudan into eight vegetation belts.

It is estimated that Sudan encompasses more than 3156 species belonging to 1137 genera and 170 families (Broun & Massay 1929, Andrews, 1950, 1952, and 1956, and El Amin 1990).

Local Trade Structure: -

Medicinal and Aromatic plants and their derivatives are locally sold on special shops called Atareen. Trade on Sudanese medicinal and aromatic plants depends mainly on wild species, which may lead to the irregular supply. Furthermore, destructive and extensive collection of these plants by gatherers may lead to the extinction of some species (e.g. Barks of Mahogany and Balanites). Other factors such as desertification or over exploitation of certain land for irrigated scheme may result in interrupted supply as in the case of Gum Arabic and Senna, respectively.

The trade in medicinal and aromatic plants products that caters for the local market is carried by an informal trading sector. Plant products are collected from the wild by villagers and brought to a designated "local markets" in the various provincial regions. Brokers usually purchase on the spot large volumes of these botanicals. Their business assets are transportation mean and some cash to pay in order to purchase collected plants from villagers.

Collectors of wild medicinal plants may be either those who collect certain species in large quantities for export purpose or those who collect many assorted items in small quantities for the local market. The former group used to hire local male workers for collection and semi-processing (i.e. cleaning, sorting, grinding etc.) while the latter group consists of vendors and traditional healers who are mainly males.

The number of unknown of traditional healers (herbalists, bone–setters and spiritual practitioners) is large. Elderly religious men and women and some guardian of holy tombs and mosques usually practise traditional healing in Sudan. They usually purchase their material from collectors or they collect it themselves.

Most vendors of traditional medicine, within Khartoum area are of local inhabitants who have well-established retail or whole sale outlets. The most outstanding and nationally recognised house of expertise in Sudan is known as Timan. They are usually providing counselling to the patients in addition to dispensing these herbal preparations. These shops sell Sudanese herbs as well as imported plant material in addition to incense of special mixture called "Bakhour". Table 1 exhibits most commonly wildly

collected and traded medicinal and aromatic plants while Table 2 displaying the most commonly cultivated plants.

These vendors are usually located in the corners of the public market and outside mosques. Presently this activity is confined to male vendors who usually sell items already prescribed by the healers or sometimes in certain cases they can act as healers after counselling their patient and providing the appropriate advice for their clients for free.

Plants usually collected for export are Cassia *acutifolia, Hibiscus sabdariffa*, *Lawsonia inermis*, *Boswellia papyrifera*, *Cuminmum cyminum*, *Capsicum frutescence*, *Nigella sativa*, *Allium sativum* and *Coriandrum sativum*.

Medicinal plants in dried form have been exported to different African, Asian, European, North and South American countries since 1952. Twelve companies are currently involved in this export activity. Variation in marketed species and quantity of plant material exported is subjected to International demands.

It is recently observed that the demand for *Hibiscus sabdariffa*, Cassia *acutifolia* and *Boswellia papyrifera* has increased. Consequently new companies and individual exporters have joined the international market. The volume of exported Sudanese medicinal plants and their revenue (US dollar /metric ton) is shown in Table 3.

Wildlife medicinals are not very common in Sudan and there is no literature available addressing this subject. However, there is new interest in this market. Recently Ostrich (Strutachic *amellus*) and Gazelle (*Gazella dorcas*) have been exported with annual revenue of about 252,000 US $. Table 4 describes some of the most commonly used wildlife medicinals.

International Trade in Medicinal Plants:

Sudan imports a variety of plant species for use in traditional medicine in their crude form or as herbal teas. Plant materials are mainly imported from Egypt, Syria, India, China, Niger, Guatemala, Saudi Arabia and Tanzania as well as nearby other African countries. The estimates of plant material imported from these countries were more than 800 metric tons between the periods 1993 to 1996 and have exceeded one thousand metric tons in 1992. This cost the country about 900 thousands US$ annually. However, these figures do not cover the smuggled materials and imports through non-official channels.

Table 1. Wild species of Medicinal and Aromatic Plants Identified in Trade

Name of Plant	Part Used	Price US$
Acacia nilotica *	Fruits	**300**
Acacia Senegal	Exudate	**1100**
Acacia seyal *	Woods	**2100**
Adansonia digitata *	Fruit bulb	**1000**
Aloe sankitana *	Leaves juice	**-**
Azadirachta indica *	Fruits	**250**
Balanites aegyptiaca	Fruit kernel	**700**
Boswellia papyrifera	Exudate	**1500-400**
Carcica papaya **	Fruit Juice	**-**
Cuminum cyminum	Fruits	**1200**
Cassia acutifolia	Fruits & Pods	**1100**
Citrullus colocynthis *	Fruits & Seeds	**-**
Cymbopogen proximus *	Leaves	**-**
Hibiscus sabdariffa	Flower	**1000**
Hyphaene thebacia *	Fruits	**-**
Haplophyllum tuberculatum	Aerial Parts	**-**
Grewia tenax	Fruits	**-**
Lawsonia inermis	Leaves	**400**
Ocimum basilicum ** *Ocimum santicum*	Whole Plant	**-**
Phoenix dactylifera	Fruits	**350**
Salvadora persica	Stems	**2500**
Solenostemma argel	Leaves	**600**
*Ricinus communis***	Seeds	**-**
Tamarindus indica	Fruit bulb	**1000**
Terminalia brownii Fresen	Wood	**4000**
Waltheria indica *	Roots	**-**

*Species identified in local trade

** Species identified in international trade but no data available

Table 2. Cultivated Medicinal and Aromatic Plants Identified in Trade

Name of Plant	Part Used
Allium sativa	Bulb
Aloe sankitana	Leaves juice
Ammi majus	Seeds
Ammi visnaga	Fruits
Capsicum anum L.	Fruits
Capsicum frutescenses L.	Fruits
Cimunum cyminum	Fruits
Corinandrum sativum	Fruits
Cymbopogon tetragonolobe	Seeds
Hibiscus sabdriffa	Flower
Pimpinella anisum	Fruits
Trigonella foenum- graceum	Seeds

Table 3. Most Commonly Exported Medicinal Plants

Name of Plant	Quantity in Metric/ Tons	Price in Thousands of US Dollars
Acacia Senegal	25995.5	21533
Boswellia papyrifera	701	957
Carcica papaya **	113	36
Cassia acutifolia	1064	419
Hibiscus sabdariffa	18174.5	18174.5
Hyphaene thebacia *	73	20.6
Lawsonia inermis	1080	935.7
Phoenix dactylifera	155.5	53.3
Lupinus termis	209	7.2
Nicotiana rustica	341.2	52.8
Tamarindus indica	388.2	60.4

Table 4. Most Commonly Animals Organs Used as Medicinals

Scientific Name	English Name	Part Used	Uses
Hyaena hyaena *Croocuta crocuta* JA.Uen	Hyena Hyena	Fats (External)	Arthritis
Hystrix cristata Linnaeus	Porcupine	Meat (grilled)	Stomach troubles Alopecia
Vulpes pallida Crtezschmar) Canis mesomelas Schreber	Fox Jackal	Meat (cooked).	Asthma
Ceratotherium simum *Diceros bicarnis*	Rhinoceros	Horns.	Antidote for poison
Erythrocebus patas (Scherber) *Ceriopithecus aethiops* L.	Monkeys, Patas & Grivet	Meat (cooked).	Mental illness
Panthera leo	Lion	Fats and	To control ants.
Vivera civeta (Schreber)	Civet cat	Perfumes extracted	
Strutahioc amelus L.	Ostrich	Fats are used.	Arthritis
Camelus bactrianus	Camel	Tibia, hump, urine and milk	Infertility, hammeroids wounds etc.
Usupa epops	African Hoopoe	whole animal	Hemiplegia
Equus spp.	Donkey	**T**he milk	Whooping Cough
Gazella dorcas	Gazelle	The horn.**.**	Prepration of Cosmotics.

Traditional uses of Main Species Traded in Medicine:

Acacia nilotica (L.) Willd. ex Del. **(Mimosaceae)**
USES : The fruits are burned and the fumes are inhaled to treat colds and pharyngytis. The fruit macerates are used as anti-septic.

Acacia senegal (L.) Willd. **(Mimosaceae)**
USES : Stem exudates (gum) are used as a demulcent, anti-diarrhoea and anti-ulcers.

Acacia seyal Del. **(Mimosaceae)**
USES : Stem fumigant is used for rheumatic pain.

Adansonia digitata L. **(Bombacaceae)**
USES: The fruits are used as cold beverage, also are added to yoghurt for treatment of diarrhoea and amoebic dysentery.

Aloe sinkatana Rey. **(Liliaceae)**
USES: The leaf juice is used in treatment of skin diseases, constipation, anthelmintic and haemorrhoids. The leaves are also used to treat fever, diabetic, tonsillitis and inflammatory colon.

Ambrosia maritima L. **(Asteraceae)**
USES: The herbs are used in treatments of urinary tract infections and elimination of renal stones, whereas the leaves are used as anti-diabetic and anti-hypertensive.

Azadirachta indica J.Juss **(Meliaceae)**
USES: The leaves are used to treat skin diseases, helminthiasis and malaria.

Balanites aegyptiaca (L.) Del. **(Balanitaceae)**
USES: Fruits are uses to treat dysentery ,constipation. The seed oil is used to treat tumors and wounds.

Boscia senegalensis (Pers.) Lam. ex Poir **(Capparidacea)**
USES :- The roots are used to treat bilharzia, the leaves are used as a poultice for muscular pains whereas the fruits are used in treatment of tuberculosis.

Boswellia papyifera (Del.) Hochst. **(Burseraceae)**
USES: Manufacture of incense, an ingredient in plasters and fuming pastilles

Capsicum frutescence L. **(Solanaceae)**
USES: The fruits as food spice , stomachic whereas the fruit macerate is used as anti-rheumatic.

Citrullus colocynthis (L.) Schard. **(Cucurbitacea)**
USES: The fruits are used as anti-diabetic, purgative and for making tar, which is used as anti-scabies.

Croton zambesicus Mull-Arg. **(Euphorbiaceae)**
USES: The fruits are used as anti-malaria.

Cucurbita maxima L. **(Cucurbitaceae)**
USES: The seeds are used as anthelmintic and to treat skin diseases.

Cymbopogon proximus (Hochst.ex A. Rich) Stapf. **(Poaceae)**
USES: The leaves are used to treat gout, renal coliccs, helminthiasis, and inflammation of the prostate.

Grewia tenax (Forssk.) Fiori. **(Tiliaceae)**
USES: The fruits are used to treat malaria and ion- deficiency anaemia.

Guiera senegalensis J.F.Gmel. **(Combretaceae)** .
USES: The leaves are used as anti-hypertensive and anti-diabetic.

Hibiscus sabdariffa L. **(Malvaceae)**
USES : The sepals are used as hot and cold beverage and to treat hypertensive, colds, and fever and with other plants to treat malaria.

Khaya senegalensis (Desr.) A. Juss. **(Meliaceae)**
USES : The stem bark is used to treat malaria, hepatic inflammations and enteriogasteritis. The leaves are used to treat skin diseases and trachoma.

Lawsonia inermis L. **(Lytheraceae)**
USES: The leaves are used as anti-pyretic, for treatment of urinary tract infections, skin diseases and alopecia.

Nauclia latifolia Sm. in Rees **(Rubiaceae)**
USES: the roots are used for dysentery and as a tonic whereas the bark is used for abdominal colic.

Ocimum basilicum L. **(Lamiaceae).**
USES : The leaves and stems are used in treatment of jaundice, ascitis, spasm, parturition pain and scorpion stings.

Phoenix dactylifera L. **(Palmaceae)**
USES : The fruits are used to treat constipation branchial asthma and tonsillitis. The pollen grains are mixed with bee-honey and ginger to increase fertility.

Ricinus communis L. **(Euphorbiaceae)**
USES : The seed oil is used as purgative and hair tonic and the whole seed is ingested as contraceptive. The leaves are used as poultice in treatment of abscesses.

Salvadora persica L. **(Salvadoraceae)**
USES : The fruits are used to treat hypertension, stomach-pain, wounds, whereas the leaf-fibers are used to treat eye-infection.

Cassia acutifolia L. **(Caesalpiniaceae)**
USES : The fruits are used as laxative and to treat gastroenteritis.

Sesamum indicum L. **(Pedialiaceae)**
USES : The seed oil is used alone or in combination of other drugs to treat tumors, skin diseases, alopecia, cough, colds, tonsillitis and fever.

Solanum nigrum L. **(Solanaceae)**.
USES : The fruits are used for gastroenteritis and colic pains.

Solenostemma argel (Del.) Hayne **(Asclepiadaceae)**.
USES: The leaves are used as antispasmodic, carminative and as anti-diabetic.

Tamarindus indica L. **(Caesalpiniaceae)**
USES : The fruits are used in treatments of constipation, malaria and jaundice.

Terminalia brownii Fresen. **(Combretaceae)**
USES : The stems and branches fumigants are used to treat rheumatic and back pains.

Trigonella foenum-graceum L. **(Papilionaceae)**
USES : The seeds are used as antidiarrhoeal, anti-spasmodic, anti-amoeba dysentery and anti-diabetic. The seeds are also used as food additive and to increase secretion of lactating mothers and to facilitate expulsion of placenta.

Priority list of Threatened Medicinal plants.

Boswelia papyrifera. This tree forms pure stands on crests of basement complex hills or on stony soils of clay plain in the high Rainfall Savannah . The stem barks of a large number of trees are greatly damaged by the repeated unskilled incision to collect the gum.

Balanites aegyptiaca. This tree is widely distributed through Low rainfall Savannah and Semi-desert Vegetation Type. It dominate drier upper terrace soil of major wadis. The stems are widely used for furniture. In times of famine the leaves are boiled to remove the bitter taste and eaten as a vegetable.

Acacia seyal. It occurs in dark grey clay soil in Lowland plains of Low Rainfall Savannah. This is valuable timber tree and also widely used as a fumigant either for body decoration or as a medicine.

Terminalia brownii. It occurs in Lowland Plains in Low Rainfall Savannah. It is a valuable timber tree and is widely used as a fumigant either for body decoration or as a medicine.

Adansonia digitata. It occurs in Lowland plains, stream banks and foothills in the Low Rainfall Savannah. The bark is used as cordage, young leaves eaten as a vegetable whereas the seeds and pulp are edible.

Acacia senegal. It is abundant on better drained stony Basement Complex Soil in the High Rainfall Savannah. The stem bark is widely exploited by the repeated incision to collect the gum which is highly demanded for export. In addition, the gum is mixed with soot and used for brush hedges; the wood is used as sticks.

Khaya senegalensis. It occurs in lowland plains in High Rainfall Savannah. It is a valuable timber tree used commonly in expensive furniture. Also, the peeling practice of the stem barks led to the lost of tremendous number of trees.

Aloe sinkatana. It occurs in sandy lowland plains and khor beds in Semi-desert Vegetation Type. This xerophytic plant is increasingly decreasing due to its extensive use as ornamental where it is planted in gardens.

Salvadora persica. It occurs in sandy Lowland plains in Semi-desert Vegetation Type. The stems and even the roots are widely used as tooth-brush by a wide array of people.

Currently Sudan has two laws that control the trade in plants and animals. These are the Forests Act of 1989 and the Central Forests Act of 1933. The Provincial Forests Act of 1932 for plants and the Wildlife Ordinance 1935 were amended in 1986 for animals. The Forests Acts of 1932, 1933 and 1989 declared certain areas as reserved areas.

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Imported Plants Spices and Herbs 1996

Latin Name	Part used	Quantity in Tons	Value in $	Main Imported Countries
Carum carvi	Fruits	10	17,000	Egypt
Pimpinella anisum	Fruits	15	30,000	Egypt
Zingber officinalis	Rhizomes	90	75,000	China
Albinia officinalis	Rhizomes	120	10000	Tanzania China
Piper nigrum	Fruits	300	400,000	America - India
Syzygium aromaticum		120	10,000	China
Cinnamomum verum	Barks	80	150,000	India
Elettaria cardmomum	Fruits	60	145,000	America & Guatemala
Artemisia absinthium	Seeds	12	15,000	Egypt
Matricaria chamomilla	Flowers	Cartons	50,000	Egypt
Total		**852**	**472000**	

* **Source** 1996 Ministry of Commerce Import / Export Statistics

Herbs Used for Animal Treatment

Plant	Part used	Uses
Acacia albida (Mimosaceae)	Bark	Goat diarrhea
Acacia nilotica (Mimosaceae)	Fruits	For rinderpest / diharrea
Adonsonia digitata (Bombaceae)	Fruits	
Albizzia anthelmintica (Mimosaceae)	Bark	Anhelmintic
Albizzia sericocephala (Mimosaceae)	Bark	Swollen limbs
Anogeissus schimperi(Combretacae)	Bark	
Balanites aegyptiaca (Balantiaceae)	Fruits	Eye infection Trypanosomes
Bauhinia sp (Caesalpininacae)	Leaves	Cual of limbs
Cadaba farinosa Capparidacae)	Leaves	Deny (Calf ill, Bloat)
Cissus quadreangularis (Ampelidacae)	Whole Plant	Uterus post abortion, wounds
Cordia ovalis C.rothi C. sinensis (Boraginacae)	Roots & Stem Bark	Itchy skin, Retained placenta
Citrillus coloynthis (Cucurbitacae	Tar from Seeds	Scapies
Diospyros mespiliformis (Ebenacae	Bark	Aloric - Diarrhea
Euphorbia sp.(Euphorbiacae)	Whole Plant	Deny (Calf ill, Bloat)
Gardenia lutea (Rubiacae)	Fruits	Constipation, bloat in calves
Ipomoca aquatica (Convolaceae)	Leaves	For Nycol /lice
Maerua angoiensis (Capparidacae)	Roots	Bloat & pneumonia
Nauclea latifolia (Rubiacae)	Flowers & Bark	Swollen knees
Sarcocephalus latifolia(Rubiacae)	Leaves & Barks	Diarrhea, ill thrift
Sclerocarya birrea (Anacardiacae)	Leaves	Deny (Calf ill, Bloat)
Solanum incanum (Solanacae)	Green Roots	Deny (Calf ill, Bloat)
Sterculia setigera (Steruculacae	Bark	Anthrax
Tamarindus indica (Caesalpininacae)	Fruits	Pneumonia
Vitex doniana (Verbenacae)	Roots	Retained Placenta
Ziziphus spina-christi (Rhamnacae)	Roots & Barks	Liver disease, Trypanosomes