

**University of Shendi
Faculty of Graduate Studies**

**Eco-taxonomic Survey of the Flowering Plants in Shendi
Locality, with special reference to traditional medical uses**

A thesis submitted to the University of Shendi in Fulfillment of the
Requirements for the M.sc Degree in Botany (Taxonomy)

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DEDICATION

To the spirit of my Father, to my Mother for all unconditional love and guidance shaped my life.

To my brothers and sister for their encouragement.

To my Husband, for his accompanying through the steps of this thesis.

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Above all I would like to thank the almighty Allah who enabled me finish my work in his will.

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ABSTRACT

The aim of the present study is to document the natural vegetation status and floristic composition in Shendi Locality and to provide a recent species list. The work-plan was designed to cover taxonomic qualitative assessment in the different vegetation units from the River Nile bank to the high terrace. A questionnaire was designed to assess the traditional use of medicinal plants by the locals. Three species commonly used by the locals as medicinal plants were selected for phytochemical analysis.

The results of flora survey identified 86 species belonging to 26 families. The floral assessment includes: updated scientific names, synonym, vernacular names and a brief description of the collected taxa. Reference is given to the local traditional uses of each species. Photographs are given to illustrate important morphological features of the plant. The distribution of the collected taxa varies within the different vegetation units. Karru soil is highly populated including 48 plant species followed by the Nile Bank 43 species. The High terrace contains 30 species and the aquatic flora of the area includes only 4 species. Most of the collected plants are annual herbs representing 47.7%; perennial herbs constituted 29%, while trees and shrubs represent 9.3% and 14% of the taxa respectively.

The questionnaire revealed that the percentage of people that use plants in medical remedies increase with the increase of their age. People above 55 years have high tenancy to cure locally by plants (26.7%). The major used plants include Hargel (*Solenostemma argel* (Del.) Hayne), Gared (*Acacia nilotica* L.), Helba (*Trigonella foenum-graecum* L.), Mahareb (*Cymbopogon*

schoenanthus L.), Tundub (*Capparis decidua* (Forssk.) Edgew) and Gum Arabic (*Acacia senegal* (L.) Willd).

Qualitative screening reveals the presence of important secondary metabolites and antioxidant activity in the selected three medicinal plants namely: Demsisa (*Artemisia absinthium* L.), Abu shoka (*Fagonia indica* L.) and Derrisa (*Tribulus terrestris* L.).

The study suggested recommendations that might advance eco-taxonomic and ethnobotanical knowledge that might promote improvement of the management of the natural vegetation in Shendi Locality.

الملخص

الهدف من هذه الدراسة توثيق ومعرفة مكونات النباتات الطبيعیه بمحلیة شندي وإعطاء قائمة باسماء اجناس النباتات الموجوده حاليًا بالمنطقة. صممت هذه الدراسة لتغطية الخواص التصنيفية النوعية لوحدات خضرية مختلفة ممتدة من ضفاف نهر النيل وحتى منطقة التروس العليا. كما صممت إستبانة لمعرفة الإستخدامات الشعبية للنباتات الطبية بواسطة السكان المحليين كما تم إختبار ثلاثة أنواع من النباتات الطبية المستخدمة للتحليل الكيميائي. نتائج المسح الطبيعي للفلورا تعرف علي ٨٦ نوع تنتمي الي ٢٦ عائلة وشملت دراستها كتابة الاسماء العلمية بالإضافة للاسماء المرادفة والمحلية ووصف دقيق للنباتات المجموعة وتم إعطاء مرجعية للإستخدام الطبي المحلي والشعبي لكل نوع مزود بالصور التي توضح أهم الصفات المورفولوجية لكل نبات. إن توزيع المعلومات الخاصة بكل نوع مختلف بإختلاف المناطق الخضرية كما وجد أن منطقة الكرو تحتوي علي أنواع كثيرة تشمل ٤٨ نوع نباتي بعدها جاءت منطقة ضفاف النيل والتي تشمل ٤٣ نوع ثم منطقة التروس العليا التي تشمل ٣٠ نوع ثم النباتات المائية الطبيعية في المنطقة وتشمل فقط ٤ أنواع. معظم النباتات التي جمعت أعشاب حولية وتمثل ٤٧.٧% نباتات معمره تمثل ٢٩% بينما وجد أن الاشجار والشجيرات تمثل ٩.٣% و ١٤% علي التوالي. أوضحت الإستبانة أن نسبة المستخدمين للنباتات في الإستطباب تزداد مع إزدياد أعمارهم وإن نسبة أعمار المستخدمين فوق سن ٥٥ سنة للعلاج محليا بالنباتات بلغت ٢٦% وأكثر هذه النباتات إستخداما الحرجل و القرص و الحلبة و المحريب و الطندب والصمغ العربي. أوضحت الدراسات النوعية وجود مركبات الأيض الثانوية والمواد ذات النشاط المضاد للأكسدة في ثلاثة نباتات طبية مختارة هي الدمسيسة و ام شويكة والضريسة. التوصيات المقترحة في الدراسة ربما تطور الفكر البيئي التصنيفي واعراق النباتات لتحسين التحكم في الغطاء النباتي الطبيعي بمحلية شندي .

CHAPTER ONE

INTRODUCTION AND LITERATURE REVIEW

1.1. General introduction

Sudan is considered as one of the largest countries in Africa, with an area of about 728,200 square miles (1.886 million km²). It exhibits a wide range of variation in its topography, climate, soil and hydrology; these characteristic variables are reflected in Sudan's peculiar ecological habitats, vegetation zones and consequently relatively rich flora (Hogan, 2012).

The long intervals since the last collections on the natural plants of the Sudan raise the high need for updated collections reflecting the actual picture of the current vegetation. In this respect, the semi desert belt is considered to be greatly affected by natural factors such as desertification and drought or human and/or animal interference such as overgrazing, firewood and charcoal production; hence the need for studying its vegetation is great.

Ethnobotany is a term used to describe how people of a particular culture and region make use of indigenous plants (Mathias, 2004).

Plants are well known as a major source of modern medicines. From ancient times humans have utilized plants for the treatment or prevention of disease, leading to the dawn of traditional medicine (Pratchyasakul, *et al.*, 2008).

Sudan is considered unique in the use of traditional herbal medicine. The country constitutes a blend of different cultures; each one has its own knowledge and use of medicinal plants. However, documentation of this

knowledge is still poor and many efforts are needed to trace and document this vital human knowledge before it disappears forever.

Selection of Shendi locality for the present study is based on its importance as one of economical centres of the Nile State, with productive agricultural areas and relatively rich natural vegetation. No specific taxonomic or ecological studies have been carried out in the region.

This research was, therefore initiated to document the present conditions of the natural vegetation in Shendi area; specific objectives include the following:

- To collect and identify reference material of the major plant species which will be a nucleus for a Herbarium at the Botany Department, Faculty of Sciences and Technology, University of Shendi, for research and teaching purposes as well.
- To provide a recent plant species list accompanied with important taxonomic information and to update the scientific (Latin) names of the plants, which have been subjected to great changes and modifications.
- To outline the major units of ecological zones within Shendi district and map the boundaries between the different zones.
- To document the traditional medical herbal knowledge before its extinction.
- To select three widely medically used plants for qualitative photochemical screening and antioxidant activity to investigate their potentiality in curing.

1.2. Literature review

1.2.1. Flora

No previous attempt has been carried out to study the flora of Shendi locality. The area is included in the Flora of Sudan compiled by Broun & Massey (1929), the work of Andrews (1950-1952-1956) who made the pronounced contributions which are considered (till present) as the main references covering the whole flowering plants of the country, the study of El Amin (1990) who updated the trees and shrubs of Sudan and Sahni (1964) collected 50 trees and shrubs from Northern Sudan. Crowfoot (1928) carried out a taxonomic study on the flowering plants of Northern and Central Sudan. Taxonomic studies in the Nile Bank included the work of Halwagy (1961) study on the Succession of vegetation on some islands and sand Banks in the Nile near Khartoum, Sudan; he collected 63 plant species (13 trees and shrubs, 50 under shrubs and herbs).

Ahti *et al.*, (1973) who studied the flora of the inundated Wadi Halfa reach of the Nile; reported 194 plant species in 66 families.

Gadelerb (2005) while studying the natural and cultivated vegetation in Kelli area - River Nile State recorded 24 trees and shrubs species belonging to 14 families and 99 herbaceous species belonging to 31 families.

Abdalla and El Ghazali (2010) studied the flora of Nile Banks in Khartoum State, he found 178 plant species (159 dicotyledonous and 19 monocotyledonous).

1.2.2. Ecology

Shendi locality is located in the semi- desert vegetation zone of Northern Sudan (Andrews, 1948). According to Harrison and Jackson (1958) referred to the area as *Acacia tortilis* - *Maerua crassifolia* desert scrub. In this zone *Maerua crassifolia* is usually present in considerable amount and in some places becomes abundant. *Acacia raddiana*, *Leptadenia pyrotechnica*, and *Salvadora persica* are locally abundant on sandy drainage lines, and *Capparis decidua*, *Ziziphus spina-christi* and *Balanites aegyptiaca* on clay drainage lines. *Acacia nubica* and *Calotropis procera* indicate heavy overgrazing.

The general surface of mixed soils, from being almost bare the extreme North West, comes to have an even cover of short annual grasses under increasing rainfall. *Aristida* spp. are usually dominant but are replaced by *Schoenefeldia gracilis* on clay soils. *Aristida hirtigluma* becomes abundant on stony soils. On sandy soils and under higher rainfall *Cenchrus setigerus* becomes abundant.

Considerable areas have a surface layer of soft wind-blown sand recently fixed by the perennial sand-binding grasses *Panicum turgidum* and *Lasiurus hirsutus*, which are also dominant on sandy drainage lines.

According to El Amin (1976) the uncultivated land near the River Nile are dominated by *Acacia nilotica* (L.) Willd, *A. seyal* Del. subsp. *seyal*, *A. albida* Del and *Zizyphus spina-christi* (L.) Dest. Distribution of tree species is in accordance to their water affinities. Away from the River Nile vicinity the natural vegetation is sparse: *Acacia tortilis* subsp *spirocapa* (A. Rich.) Brenan is dominated and associated with *A. ehrenbergiana* Hayne, *Balanites aegyptiaca* and *Capparis decidua* are reported in wadis and dry river courses.

The more recent contribution in the ecology and vegetation division of the area is part of the work of (White, 1983) who classified the area in Sahel regional transition zone, Semi-desert grassland and shrubland, on sandy and gravelly soils.

Phytochemistry is the study of phytochemicals, these are secondary metabolic substances found in plants. Many of these are known to provide protection against insect attacks and plant diseases. They also exhibit a number of protective functions for human consumers. Phytochemistry is widely used in the field of herbal medicine. Secondary metabolites are classified as: alkaloids, glycosides, tannins, phenolic compounds, volatile oils, terpenoids, saponins, steroids, resins and bitter principles (Mossa *et al.*, 1987). Plants are a source of large amount of drugs used medically as antispasmodics, emetics, anti-cancer, antimicrobials etc. A large number of plants are claimed to possess antibiotic properties in the traditional system and are also used extensively by the tribal people worldwide. It is now believed that nature has given the cure of every disease in one way or another. Therefore, the researchers today are emphasizing on evaluation and characterization of various plants and plant constituents against a number of diseases based on their traditional claims. A huge majority of modern pharmaceuticals are derived from plants found in their natural ecosystem. Although a synthesizing chemical for medicine is possible, it is much cheaper to derive them from naturally occurring sources.

1.2.3. Traditional uses of plants in medicines

Similar to other developing countries, traditional medical practices play an important role in Sudan. Herbal drugs are of major importance in Sudanese folk medicine. This was documented during comprehensive ethno-botanical investigations of El Kamali and Khalid (1996); El Ghazali *et al*, (1994) and El Kamali and El Khalifa (1999). These authors listed the most common herbal remedies of Sudan, based mainly on interviews with traditional healers. A number of systematic attempts have been made to verify the claimed antiparasitic uses of Sudanese plants and to detect and/or isolate their bioactive agents (Khalid *et al.*, 1986, 1989, 1998; El Kamali and El Khalifa 1997; El Tahir *et al.*, 1998, 1999).

There are many medicinal plants and traditional medical usage in Shendi area thus three medicinal plants have been selected for the study and investigation.

1.2.4. *Artemisia absinthium*

1.2.4.1. Distribution and Ecology

The genus *Artemisia* is the most widely distributed genera of the family Asteraceae, consisting of 522 small herb and shrub species native to the northern hemisphere, South America, Southern Africa and the Pacific Islands (Wright , 2002; Furlenmeir, 1983).

1.2.4.2. Botanical description

Wormwood (*Artemisia absinthium* Linn.) is perennial, hoary, silky pubescent, herbaceous aromatic plant. Stem is erect, angular or ribbed and of 0.3-0.9m long. Leaves ovate or obovate, 2.5-5cm, unequally 2-3-pinnatifidly cut into spreading linear or lanceolate, obtused segments, hoary on both surfaces, radical and lower cauline narrowed into winged

petioles. Heads of 6-8 mm diam, numerous but hardly crowded pedicels, hemispheric in drooping second racemose terminating the branches. Flowers yellow, raycorolla dilated below. Outer involucre bracts oblong, hoary, narrowly scarious, inner orbicular and broadly scarious. Receptacular hairs long straight. Anthers acuminate. Achenes elliptic oblong or somewhat obovoid, 1mm. long. Flowering takes place in the month of July and August (Nadkarni, 2000).

1.2.4.3. Phytochemistry

The chemical studies on *Artemisia* species indicate that all classes of compounds are present in the genus with particular reference to terpenoids and flavonoids. The rich accumulation of essential oils and other terpenoids in the genus is responsible for the use of various members for flavouring foods or liqueurs (Wright, 2002).

The phytochemistry and a number of chemical constituents from *Artemisia absinthium* have been reported previously. Flavonoids, tannins, glucosides, carotenoids, and phenolic compounds are major phytoconstituents of *Artemisia absinthium* (Nikhat *et al.*, 2013).

1.2.4.4. Ethno-botanic and human uses

Medicine: *Artemisia absinthium* is a herbaceous plant which has been used worldwide in folk medicine since ancient times (Erel *et al.*, 2012). Literature reveals the application of this herb as tonic, antimalarial, antihelmintic and antidiabetic, and in treating wounds, bronchitis, ulcers, and tuberculosis in traditional Anatolian medicine (Erel *et al.*, 2012); (Akalin, 1993). There are also several reports concerning the antimalarial, antioxidant, cytotoxic, antipyretic, analgesic, anti-diabetic, antimicrobial, and antifungal activities of different *Artemisia* species (Wright, 2002; Korkmaz and Gurdal, 2002; Tan *et al.*, 1998).

Food and Poison: Wormwood above ground parts have been used in flavouring alcoholic drinks but use was banned in many countries due to toxicity related to thujone. Thujone-free extracts have been used in very low concentrations in flavouring foods (Stockton, 2013).

1.2.5. *Fagonia indica*

1.2.5.1. Distribution and Ecology

It is found in India, Pakistan, China, Bangladesh and Egypt, also widespread throughout Northern and central Sudan. It is present abundantly in Shendi region (El Gazali *et al.*, 1994).

1.2.5.2. Botanical description

Fagonia is small, spiny, erect, under shrub, more or less glandular; branches slender, terete, triate, glabrous. Leaves opposite, 1- 3 foliate; petioles very variable in length, from 3 – 30 mm long, deeply striate, very slender; stipules 2 pairs of sharp slender thorns, sometimes exceeding 12 mm in length; leaflets linear, acute, sessile or with very short petiolules. It is a branching herb woody at the base, erect or prostrate (Rathore *et al.*, 2011)

1.2.5.3. Phytochemistry and Nutritional Value

Species of *Fagonia* have been found to contain saponins (Abdel- Khalik *et al.*, 2001), alkaloids (Sharawy and Alshammari, 2009), terpenoids (Perrone *et al.*, 2007), sterols (Shoeb *et al.*, 1994), flavonoids (Ibrahim *et al.*, 2008), proteins and amino acids (Sharma *et al.*, 2010), coumarins (Zhang *et al.*, 2008), trace elements (Fatima *et al.*, 1999).

1.2.5.4. Ethno-botanic and human uses

Medicine: reported to be a medicinal plant in scientific and folkloric literature and its medicinal values are well documented (Saeed, 1969). It

is astringent, febrifuge and prophylactic against small-pox. The plant is bitter and used for the treatment of fever, thirst, vomiting, dysentery, asthma, urinary discharges, liver trouble, typhoid, toothache, stomach troubles and skin diseases (Baquar, 1989).

Boiled residue of the plant in water is used to induce abortion. It is externally applied as a paste on tumors and other swellings of the neck. An aqueous decoction of the plant is a popular remedy for cancer in the indigenous system of medicine (Saeed, 1969).

1.2.6. *Tribulus terrestris* L.

1.2.6.1. Distribution and Ecology:

T. terrestris is native to warm temperate and tropical regions of southern Europe, southern and western Asia, throughout Africa, and Australia. *T. terrestris* is widely distributed in Africa, Southern Europe, China, Japan, Korea and western parts of Asia (Al Ali *et al.*, 2003; Sharifi *et al.*, 2003).

1.2.6.2. Botanical description

Annual or biennial, prostrate, densely appressed whitish silky pubescent herb. Stem hirsute to sericeous, branches spreading. Leaves paripinnate, 2.5 – 5 cm long; Stipules lanceolate to falcate, 3-5mm long; leaflets (40) 5-6 (-8) pairs orate to elliptic – ablong, 5-10 (-12) mm long, 3-8mm broad, in-equilateral, acute. Flowers yellow, 1-1.5 cm across; Pedicel up to 1.5 (-2) cm long. Sepals orate – lanceolate 5-6 mm long, c3mm broad, acute. Petals obovate, 6-8 mm long, 3- 4 mm broad, obtuse. Stamens 10, filaments c 3-5mm long, another versatile. Ovary ovoid, hirsute; style c 1.5mm long, stigmas decurrent. Fruit up to c 1 cm in diameter, 4-8mm long, mericarps densely crested and tuberculate on dorsal side, densely hairy to glabrescent, with 2 long patent and 2 short downwardly directed

spines (rarely all or lower 2 reduced to tubercles) (Josephine and Kanchana, 2013)

1.2.6.3. Phytochemistry and Nutritional Value

Tribulus terrestris contain a number of different substances including saponins, flavonoids, alkaloids, resins, tannins, sugars, sterols, and essential oil (Sahelian, 2003). Some steroidal saponins have previously been isolated from this plant. Many pharmaceutical preparations and food supplements with these saponins as the active compound have been commercially available (Kostova and Dinchev, 2005; Yang, 2006). Recently, more than fifty steroidal saponins have been isolated from this plant (Wang *et al.*, 1996).

1.2.6.4. Ethno-botanic and human uses

Medicine: *Tribulus terrestris* has also been used in folk medicine throughout history, as far back as the Greeks, for wide-ranging conditions as headache, nervous disorders, constipation, and sexual dysfunction. The fruits/berries are the parts most often used in traditional medicine (Sahelian, 2003).

Its fruits have been used in traditional Chinese medicine for treatment of eye problems, edema, abdominal distention, emission, morbid leucorrhoea, sexual dysfunction and veiling. It also has been used as a medicine in India, South Africa and Japan.

This plant has several advantages including antimicrobial, antibacterial, antioxidant and antitoxic activities used in the treatment of cardiovascular diseases, diabetes, tumors, articular pains and respiratory diseases (Nikolov, 2007).

Fodder: *Tribulus terrestris* is one such plant that is widely grazed by cattle, sheep and goats in the dry western parts of Beit Bridge, Zimbabwe

during the rain season. Drummond notes that it is regarded in some parts of South Africa, Sudan and Zimbabwe as a life-saving fodder for sheep and goats. Harvesting this plant and drying it during the wet season and then feeding it as a protein supplement during the dry season could improve animal production (Drummond, 1984).

Poison: The foliage of *T. terrestris* can, however, be toxic to livestock, especially sheep, when consumed in large quantities in excess of 80 percent of diet (Sahelian, 2003).

CHAPTER TWO

MATERIAL AND METHODS

2.1. Description of the Study Area

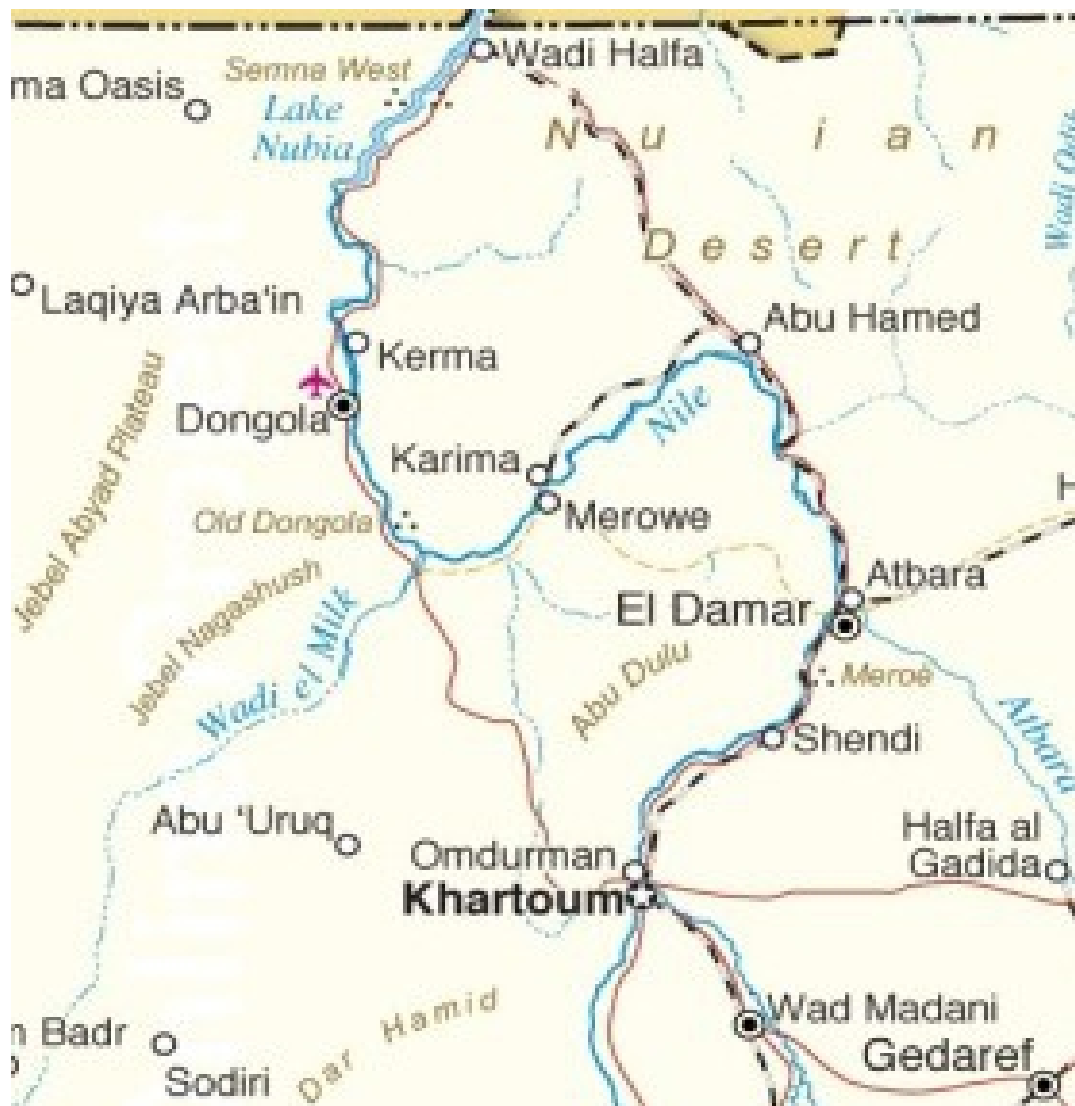
2.1.1. Geographical Location

Shendi Locality lies between the latitude 17° to 18° N and from longitude 23° to 24° E. It lies at altitude 360m above sea level (lies between Khartoum and Atbara) (Map 1). This locality extends along the Nile from Hagar El Asal in the South to Jebal Om Ali in the North. There are 25 seasonal valleys transversing the area the most famous Wadi El Aroos, Al Awateb and El Hawad (Metrology, 2012).

2.1.2. The Physical Environment

2.1.2.1. Geology and Soils

Soil is one of the most important factors that control plant growth. The area is formed of a sandy desert predominately of sand and gravel soils. There are some basal rocks and Nubian rocks composition which are covered with sand due to climate and wind erosion. In addition to sedimentary clays from Nile which differ due to its distance from it. Almost, this locality soil is sandy. The sandy soil is immature soil beside the dry climate and the presence of wind in summer (ARC, 2012). Sandy soils are characterized by low fertility and high infiltration rate, hence sparse vegetation and low grazing capacity. Alluvial soils constitute fine sand and silty deposits are found in the Nile Basin, khors and wadi-beds. These are deposition of rich organic and inorganic materials washed by the draining waters.



Map (1): Shendi Locality Geographical location (Google)

These soils are ideal for agricultural production and support dense natural vegetation for grazing animals.

2.1.2.2. Features of regional climate and weather

General characteristics of regional climate

The climatic changes that have taken place after the drought spells resulted in a considerable change in the biological and social conditions of the region.

According to the Sudan climatic classification, Shendi locality is regarded now as desert-semi-desert area due to drought and desertification cycles which began since 1985 (Surveying , 2012).

a. Rainfall

Shendi is regarded as the most rain fall amount in the River Nile State due to its location in the area between the poor savannah and desert region. The region receives 150-200mm. mean annual rainfall. Rains are inconsistent and erratic. Rainfall in Shendi locality begins in July (Metrology, 2012).

b. Wind

The area is continuously subjected to sand burial a result of sand storms blowing from the desert. These resulted in negative effect on the natural vegetation and cultivated areas (Khalifa and saleem, 1984).

The area is subjected to dry winds all the year round. In winter, the trade winds that blow in a northerly and north easterly direction are dominant in a rate of 12-19 kp.h. The South west monsoonal wind which causes the summer storms and rains is dominant in a rate of 10-19 Km p.h in summer (Metrology, 2012)

c. Temperature

It is one of the important natural factors affecting the life in general. Due to the semi-desert climate, the temperature in the area is high in summer. Minimum at about 44.1 C°. The average temperature which is more than annual rate 17 C°. In February it is 1.9°C. In September, the total temperature is more than the annual rate 2.7°C. May and June are the hottest months (Metrology, 2012).

d. Relative Humidity

The relative low monthly mean relative humidity values are connected with the prevailing dry north and easterly wind and the relatively moist south westerly wind which loses much of its moisture content when it reaches the region. Increase of relative humidity level near the River Nile is attributed to the river water vapour.

2.1.2.3. Water Supply Sources

1. Drainage Patterns and surface run-off

The surface run-off is the only source of water used in agricultural practices and for human and animal drinking in the area.

The most important source of water in the locality is the River Nile which runs along Shendi locality from south to north in addition to some khors that drain in the area after good rainy seasons from the Butana plain through the mountainous areas of the Nubian rocks e.g Jabel Om Ali, and El Maagil. Most of the populations inhabit the Eastern side of the Nile and depend on it in irrigation and during rainy. Also, there are some valleys used in the seasonal cultivation such as Wadi EL Aroos and EL Hawwad west of the River (NWC, 2012).

2.1.3. Social Setting and Production Systems

2.1.3.1. Population Composition

The population of Shendi according to (2007) estimates about 55.516 thousand people. The El Jaliyn is the largest tribes that inhabit the locality, along with El Shaigia, El Ababdp, Hassani, Bani Amer and other tribes (SO, 2012).

2.1.3.2. Pattern of Livelihood

1. Agricultural production

Greater part of Shendi population is dependent on agriculture as an economic source.

Agricultural system consists of: traditional cultivation and horticultural activities. The locality is regarded as one of the most important agricultural areas in the River Nile State. Farming is the main vocation for people in this locality. Shendi is the main source of onion (*Allium cepa* L.), potato (*Solanum tuberosum* L.) and fruits (ARC, 2012).

In the traditional cultivation which is practised in the seasonal water courses (Khors & Wadis) cereals in the form of Durra (*Sorghum bicolor* (L.) Moench), Wheat (*Triticum aestivum* L.) and Mays (*Zea mays* subsp. *mays*

L.) are cultivated. Also, there are some irrigated schemes like Gandato scheme, Kaboushia and Basabeer schemes which depend on River Nile for irrigation. Broad beans (*Vicia faba* L.) and Onion (*Allium cepa* L.) are the main crops in these schemes.

The horticultural activities are of two patterns: permanent irrigation pattern in which the River Nile and rainfall water are the main source of

irrigation and seasonal irrigation pattern which is closely linked to traditional cultivation in the seasonal water courses. The main horticultural crops in the area are fruits citrus and Mangoes.

Landowners are from the local people of Shendi District or from outside the District. Labour includes different groups from the locals and other groups of Sudanese and non Sudanese.

2. Pastoral Production System

Animal in this area depend on the natural vegetation which appear after the rainy season. Shepherds wander with their animal where weeds grow.

The most important domestic animals raised in the area are goats, sheeps, cattles and donkeys. Animals are bred in Shendi for daily consumption of their meats, milk and skin specially sheeps (MAR, 2012).

This system is formed of two categories: the rural herding of animals and the recently evolved urban livestock production. In the rural traditional pastoralism the stock-owners do not cultivate, and they move with their animals on a seasonal basis long or short distances from a grazing area to another. The Kbabeesh tribes experience a long distance movement between Shendi and the Butana Plain. In the rural herding system transhumant agro-pastoralism is also practised in the region. In this system the families cultivate some land and raise livestock. Some members of the household remain in their settlement areas with the milking herds, while others go off herding with the dry animals. This system is experienced by most stock owners in the region. The last pastoral system is the sedentary agro-pastoralism in which the livestock owners are living commonly around towns and major agricultural areas. The urban livestock agro-pastoral system is also practised in the private farms around Shendi.

The main source of livestock fodder in the region is provided by the natural vegetation which includes grazing and browsed palatable plant species. Due to the recent drought effect which resulted in drastic degradation and decrease in the natural vegetation cover, specific diversity and density, alternative feed sources are needed. These alternatives are supplemented in the form of cereal grain, crop residues (straw) and agro-industrial by-products (oil cakes).

3. Other activities

The work of some urban groups is concentrating on industrial soap factories, textile and fibre factories, school teaching, governmental jobs and trading activities. The major trading items are fruits and crops; there is also market for durra, wood, charcoal and cattles.

2.1.4. Vegetation

Moisture is an important and decisive factor for the variation of plant cover in northern Sudan (Ahti *et al.*, 1973).

Shendi locality lies in a dry area, so almost of its plants are weeds along Nile banks. The importance of vegetation is a necessity in soil fixation and protection from desertification. Vegetation supplies human with firewood and also plays important source of fodder for animals (NFC, 2012).

2.2. Vegetation Studies

The study was conducted during the seasons of 2012-2013 and 2013-2014. The trips were designed to cover both rainy and dry seasons. Qualitative assessment was carried out from information collected from field, lab and office works.

2.2. 1. Floristic Composition

Throughout the study area during the field work fresh plant specimens were collected from different areas in different condition. All species were collected in 4 duplicates, two to be preserved in the herbarium, the third for critical identification and the fourth for exchange with other herbaria. (Forman and Bridson, 1991). Whole plants and diagnostic parts of each species were photographed using digital camera (Digital Sony). The field data records were collected using a field book. The information include: serial numbers of specimens, scientific names, vernacular names, names of families, locality, date of collection, characters that cannot be collected for herbarium specimens such as nature of the bark, and characters that can be lost or changed by drying such as scent or color of flowers.

Species were firstly verified using keys in available taxonomic references namely: Broun & Massey (1929), Andrews (1952, 1952 and 1956), Sahni (1964), Elamin (1990) and Braun *et al*, (1991) Identified specimens were matched with already identified and authenticated herbarium specimens in the different herbaria in the Sudan and Herbarium catalogue, Royal Botanic Gardens, Kew(<http://apps.kew.org/herbcat/navigator.do>) for confirmation.

Updating of plant names was taken into account according to recent literature especially the plant list (<http://www.theplantlist.org>) and Herbarium catalogue, Royal Botanic Gardens, Kew (<http://apps.kew.org/herbcat/navigator.do>). The previous names were included in the text in the list of synonyms. The list of families covered in this study was arranged according to APGIII (2009). Genera were

arranged in an alphabetical order within the families and species of each genus were also arranged alphabetically.

The plant specimens were prepared using the standard techniques recorded by (Forman and Bridson, 1991), mounted, labeled and deposited at the herbarium of the Faculty of Sciences and Technology, Shendi University.

2.2.2. Ecological survey

Regular ecological surveys were carried out in an area approximately 1600 km² to map the different vegetation zones. The area was divided into four major zones. The zones were defined as Nile Bank (Zone annually inundated by flood (silty soil) immediately in the vicinity of the Nile), karru soil (Zone inundated in years of high flood (sand and silty soil)), High terrace soil (Zone not reached by the Nile (sand soil)) and Aquatic Zone.

The specimens represented karru soil were collected from different sites around Shendi locality such as Shendi Research Station Farm, selected fields of Gandatu Agricultural Scheme and land along River Nile bank. The specimens of high terrace soil were collected from the areas parallel to the high way road.

2.3. Phytochemical analysis

2.3.1. Sample collection

Plant sample used in this study were collected from Shendi area. Fresh aerial parts and seeds of *Tribulus terrestris* were collected from west of Shendi. Fresh aerial parts of *Fagonia indica* were collected from high

trace soils in Shendi. Fresh aerial parts of *Artemisia absinthium* were collected from the Nile Bank.

2.3.2. Extraction procedure

25 grams of the dry finely ground plant sample were extracted using petroleum ether (b.p, 40-60C) in a Soxhlet apparatus for 3 hours. The petroleum ether extract was filtered and completed to 30ml. The plant residue after extraction with petroleum ether was dried and then extracted with methanol 70% in the Soxhlet apparatus for 3 hours. The filtered methanol extracted was completed to 30ml. In a conical flask and the residual plant parts were further extracted with distilled water. They were covered with distilled water about 30ml and left overnight. These extracts (petroleum ether, metabolic and aqueous extracts were used for the following tests).

2.3.3. Qualitative Phytochemical screening

Analysis of chemical constituents was carried out using Alkofahi *et al.*, Method (1997) for alkaloid, glycosides, resin, flavonoid and anthracenosides; Pearson method (1976) for saponin and tannin, Seth and Sarin (2010) for terpenoids and Sofowora (1994) for phenols.

2.3.3.1. Detection of saponin

One ml of water was added to One ml of plant extract and was shaken in a test tube of 1.6cm diameter for 15 minutes. The occurrence of a foam column of least 1cm in length persisting minimum for 15 minutes indicated the presence of saponin.

2.3.3.2. Detection of tannin

The plant extracts solution was tested for presence of tannins by adding One ml of 5% FeCl_3 to 1ml of extract. A green blue color indicated the possible presence of tannins.

2.3.3.3. Detection of alkaloids

One ml of plant extract was acidified with 36% Hcl and tested by adding some drops of picric acid. Yellow precipitate refers to alkaloids.

2.3.3.4. Detection of glycosides

Two parts of fehling's reagent were mixed with plant extract, and left in a boiling water bath for 10 minutes. Appearance of red color indicates presence of glycosides.

2.3.3.5. Detection of flavonoids

One ml of 50% ethanol was added to 1ml 50% KOH, the solution was mixed with equal volumes of plant extract. Yellow color refers to presence of flavonoids.

2.3.3.6. Detection of resins

One ml of acidified distilled water with 36% Hcl added to 1ml of plant extract. Turbidity appearance, refers to the presence of resin.

2.3.3.7. Detection of phenols

One ml of extract was added of ferric chloride solution (FeCl_3), bluish green color is formed with presence of phenols.

2.3.3.8. Detection of terpenoids

Two ml of extract were mixed with 2ml of chloroform and 3ml concentrated sulphuric acid were carefully added to form a layer. A reddish brown coloration of the interface indicates positive result for the presence of terpenoids.

2.3.4.3.9. Detection of anthracenosides

Two ml of extract were added to One ml of 25% ammonia solution while shaking cherrish red color of the alkaline solution indicated the presence of anthracenosides.

2.4. Antioxidant activity

DPPH radical scavenging assay

The DPPH radical scavenging was determined according to the method of (Shimada *et al*, 1992), with some modification. In 96-wells plate, the test samples were allowed to react with 2,2-Di (4-tert-octylphenyl)-1-picryl-hydrazyl stable free radical (DPPH) for half an hour at 37°C. The concentration of DPPH was kept as (300µM). The test samples were dissolved in DMSO while DPPH was prepared in ethanol. After incubation, decrease in absorbance was measured at 517nm using multiplate reader spectrophotometer. Percentage radical scavenging activity by samples was determined in comparison with a DMSO treated control group. All tests and analysis were run in triplicate.

2.5. Traditional medical and herbal uses

Simple questionnaire was designed with 60 people for the traditional medical herbal uses. The interview was carried mainly among farmers, herders and aged inhabitants. The data collected from the questionnaires

which consist mainly to include questionnaires such as age, name of the used plants, the plants were and the method of application. The data collected from the questionnaires were analyzed using (SPSS) program.

CHAPTER THREE

Results and Discussion

This study consists of two main parts. In the first part the present natural vegetation and flora of Shendi locality are studied. It includes the floristic composition and ecological zonation of the natural vegetation.

The second part includes the traditional herbal knowledge of the local people in a form of a questionnaire. In addition qualitative phytochemical screening and antioxidant activity of three widely medically used plant species are carried out.

3.1. Natural vegetation studies

The field surveys of the study area reveal the presence of a total number of 86 species falling into 26 families. The class Liliopsida (Monocotyledons) is represented by two families and Magnoliopsida (Dicotyledons) is represented by 24 families.

3.1.1. Floristic Composition

The families in this study are arranged according to the APG III system. Genera within each family are arranged in alphabetical order and species within each genus are also alphabetically arranged. The information for each species in the text includes: the scientific up-dated latin name, synonyms, vernacular Arabic name common in the study area and a brief description of each taxon. Information related to the examined material is provided and includes: collection number, locality and date of collection. Brief local medicinal uses of some taxa are given when available from literature.

Cyperaceae

***Cyperus esculentus* L.** Sp. Pl. 45 (1753). (Plate 1)

Syn: *Cyperus tuberosus* Pursh Fl. Amer. Sept. 1: 52 (1813).

Sieda (Ar.)

Glabrous perennial herb; stolons very slender, bearing tubers at their ends, zonated by horizontal lines. Umbels compound or simple, 5-10-rayed; spikes of 4-30 spikelets. Pale-yellow to deep-brown, 6-30-flowered. Glumes obscurely keeled, prominently striate.

Material examined: 30, Nile banks, 28.3.2012

***Cyperus rotundus* L.** Sp. Pl. 45 (1753). (Plate 2)

Syn: *Chlorocyperus rotundus* (L.) Palla, Allg. Bot. Z. Syst. 6: 61 (1900).

Sieda (Ar.)

Glabrous perennial herb, stolons woody, creeping, with tuberous thickenings, culms triangular and smooth at the top, more or less bulbous at the base. Umbels, compound or simple, of 3-8 rays; bracts 2-4. Spikelets loosely spicate, 8-30-flowered but (50-60-flowered).

Material examined: 29, Nile banks, 28.3.2012



(Plate1) *Cyperus esculentus* L.



(Plate 2) *Cyperus rotundus* L.

Poaceae (Gramineae)

Aristida adscensionis L. Sp. Pl. 82 (1753). (Plate 3)

Syn: *Aristida adscensionis* var. *abortiva* A. Beetle *Phytologia* 28: 315 (1974).

Humra (Ar.)

Glabrous erect or spreading annual herbs with cylindrical, solid culms. Leaf-sheaths quite tight to the culms, ligule a short ciliolate rims, lamina linear. Upper glume distinctly emarginate, lemma about as long as or exceeding the upper glume, awns scabrous.

Material examined: 59, High terrace soils, 24.12.2013

Aristida funiculata Trin. & Rupr. Sp. Gram. Stipac.159 (1842). (Plate 4)

Syn: *Aristida funiculata* var. *brevis* Maire. Bull. Soc. Hist. Nat. Afrique N. 32: 218 (1941).

Gaw (Ar.)

Glabrous erect densely tufted annual herbs up to 30 cm. high with cylindrical, solid culms. Leaf-sheaths striate; ligules a short ciliolate rims, lamina linear, scabrous with white hairs on the base and along the margins. Panicles sheathed by the upper most leaf.

Material examined: 60, High terrace soils, 24.12.2013



(Plate 3) *Aristida adscensionis* L.



(Plate 4) *Aristida funiculata* Trin.&Rupr. Google

***Brachiaria eruciformis* (Sm.) Griseb.** Fl. Ross. 4: 469 (1853). (Plate 5)

Syn: *Echinochloa eruciformis* (Sm.) Koch: 437 (1848).

Panicum isachne var. *mexicanum* Vasey ex Beal: Grass. N. Amer. 2: 114 62 (1896).

Um Rekiabat (Ar.)

Loosely tufted annual; culms, slender, geniculately ascending. Leaf-blades linear to narrowly lanceolate, glabrous or pubescent. Spikelets elliptic, pubescent (rarely glabrous or villous), subacute; lower glume a tiny, upper lemma readily deciduous, smooth, shiny, obtuse.

Material examined: 61, Nile banks, 28.3.2012

***Cynodon dactylon* (L.) Pers.** Syn. Pl. 1: 85 (1805). (plate 6)

Syn: *Capriola dactylon* (L.) Kuntze Revis. Gen. Pl. 2: 764 (1891).

Cynodon dactylon var. *pilosus* Caro & E. A. Sánchez *Kurtziana* 5: 210 (1969).

Nageila (Ar.)

Glabrous erect or prostrate perennial herbs, with cylindrical solid culms, and underground stolon. Leaves usually conspicuously distichous on the barren shoots culms; laminas linear.

Material examined: 62, Nile banks, 28.3.2012



(Plate 5) *Brachiaria eruciformis* (Sm.) Griseb.



(plate 6) *Cynodon dactylon* (L.) pers

***Dactyloctenium aegyptium* (L.) Willd** Enum.Pl.: 1029 (1809). (plate 7)

Syn: *Aegilops saccharina* Walter Fl. Carol.: 249 (1788).

Chloris guineensis Schumach. &Thonn. Beskr. Guin. Pl.: 55 (1827).

Um Asabia (Ar.)

Glabrous prostrate to decumbent annual herbs, with compressed, solid striate culms. Leaf- sheath striate, ligule membranous, lamina linear. Spikelets spreading at right angles.

Material examined: 63, Nile banks, 28.3.2012

***Desmostachya bipinnata* (L.) Stapf** Fl. Cap. 7: 632 (1900). (plate 8)

Syn: *Briza bipinnata* L. Fl. Palaest. 12 (1756).

Cynosurus durus Forssk. Fl. Aegypt.-Arab. 21 (1775).

Halfa (Ar.)

A rhizomatous perennial. Leaves are coarse, narrow, and tough. Yellow leaf sheaths at the base. Seed ovoid, narrow, grooved.

Material examined: 64, Nile banks, 28.3.2012



(plate 7) *Dactyloctenium aegyptium* (L.)



(plate 8) *Desmosta chyabipinnata* (L.) Stapf.

***Dinebra retroflexa* (Vahl) panz.** Denkschr.Königl.Akad.Wiss.München 4: 270 1813 publ (1814). (plate 9)

Syn: *Dinebra retroflexa* var. *brevifolia* (Steud.) T.Durand & Schinz Consp. Fl. Afric. 5: 865 (1894).

Leptochloa arabica (Jacq.) Kunth. Révis. Gramin.1: 91 (1829).

Um Mamliha (Ar.)

Pubescent erect or ascending annual herbs, with compressed, hollow culms. Leaf, sheath pubescent, ligule short, lamminas linear. Spikelets loosely imbrica. Fruits caryopsis.

Material examined: 65, Karru soil, 7.3.2012

***Echinochloa colona* (L.) Link** Hort. Berol. 2: 209 (1833). (plate 10)

Syn: *Echinochloa colona* var. *glaucum* (Sickenb.) Simps. Min. Agr. Egypt. Bull. 93: 10 (1930).

Difera (Ar.)

Glabrous decumbent to ascending annual herbs, with compressed hollow strigte culms. Leaf- sheath glabrons, lamina with black or purple cross-bands, ligule absent. Panicles appressed to the axis. Spikelet stinged with purple.

Material examined: 66, Nile banks, 28.3.2012



(plate 9) *Dinebra retroflexa* (Vahl) panz.



(plate 10) *Echinochloa colona* (L.) Link

***Eragrostis japonica* (Thunb.) Trin** Mém. Acad. Imp. Sci. St.-Pétersbourg, Sér. 6, Sci. Math.1: 405 (1830). (plate11)

Syn: *Eragrostis japonica* var. *interrupta* (Lam.) Henrard: Blumea 3: 424 (1940).

Aish elfahr (Ar.)

Glabrous tufted erect annual herbs. Leaf-sheath glabrous at the mouth, laminae linear. Spikelets pale-green.

Material examined: 67, Karru soil, 7.3.2012

***Panicum hygrocharis* Steud** Syn. Pl. Glumac. 1: 72 (1853). (plate12)

Syn: *Panicum repentellum* Napper *Kirkia* 3: 127 (1963).

Arabic: Ein el Igla

Subglabrous perennial with long rhizomes and surface stolons; culms tough, erect or decumbent. Leaf-blades linear flat or rolled when dry, often stiff and pungent, distichous, ascending close to the stem, acute to acuminate. Panicle narrowly oblong, sparsely to moderately branched, the branches usually ascending.

Material examined: 68, Nile banks, 28.3.2012



(plate11) *Eragratis japonica* (Thunb.)Trin



(plate 12) *Panicum hygrocharis* Steud

***Panicum turgidum* Forssk.** Fl. Aegypt.-Arab. : 18 (1775). (plate 13)

Syn: *Panicum frutescens* Mez Bot. Jahrb. Syst. 57: 186 (1921).

Tomam (Ar.)

A cump-forming perennial culms stiff and woody, with clusters of branches at the nodes and with very unequal internodes. Leaf-blades, very variable in size, hairless, bluish-green. Inflorescence apanicle, very variable in size. Spikelets ovoid.

Material examined: 59, High terrace soils, 24.12.2013

***Phragmites australis* (Cav.) Trin ex Steud** Nomencl. Bot. ed. 2, 2: 324 (1841). (plate 14)

Syn: *Arundophra gmites* var. *flavescens* (Custer) Asch. Fl. Brandenburg 1: 837 (1864).

Bous (Ar.)

Perennial herb, with a stout creeping rhizome; culms erect, slender to very robust, often woody, many-noded, simple or branched. Leaf-sheaths overlapping, finally disarticulating from the culm, tough; ligule a densely ciliate rim; lamina lanceolate-linear. Panicles green or purplish, becoming yellowish-brown.

Material examined: 70, Aquatic, 7.3.2012



(plate 13) *Panicum turgidum* Forssk.



(plate 14) *Phragmites australis* (Cav.) Trin

***Sorghum arundinaceum* (Desv.) Stapf.** Fl. Trop. Afr. 9: 114 (1917). (plate 15)

Syn: *Holcus sorghum* subsp. *effusus* (Hack.) Hitchc. Proc. Biol. Soc. Wash. 29: 128 (1916).

Adar (Ar.)

Glabrous tufted erect annual grass, with cylindrical solid culms, leaf-sheath pubescent at the nodes, ligule short, scarious, lamina linear. Spikelets sessile awned.

Material examined: 71, Karru soil, 7.3.2012

PAPAVERACEAE

***Argemone mexicana* L.** Sp. Pl. : 508 (1753). (plate16)

Syn: *Argemone mexicana* var. *mexicana* Brako, L. & J. L. Zarucchi. (eds.) (1993).

El Khshkhash (Ar.)

Prickly glaucous erect herbs, with hollow cylindrical striate stems. Leaves alternate, semi-amplexicaul. Flowers bright yellow. Fruits capsule, prickly.

Material examined: 58, Nile banks, 28.3.2012

Medicinal uses: The leaves and fruits are used to treat psychotic excitement (Adjanohoun, *et al.*, 1993). The seeds are emetic and cathartic (Bebawi & Neugebohrn, 1991), and increase Potency (Kokwaro, 1976).



(plate 15) *Sorghum arundinaceum* (Desv.) Stapf



(plate 16) *Argemone mexicana* L.

Aizoaceae

***Trianthema portulacastrum* L.** Sp. Pl.: 223 (1753). (plate17)

Syn: *T. procumbens* Mill *Gard. Dict.* (ed. 8) no. 1 (1768).

Rabaa (Ar.)

Glabrous prostrate to decumbent, flesh, annual herbs, with hollow striate stems. Leaves opposite, orbicular, margin sinuate, purple, waxy. Flowers solitary, white, partly sheathed by the stems. Fruits capsule, dark brown.

Material examined: 1, Nile banks, 7.3.2012

Medicinal uses: the plant is used as astringent in abdominal diseases (Bebawi & Neugebohrn 1991). Whole plant used for scorpion sting treatment (El Ghazali *et al.*, 1994).

***Zaleya pentandra* (L.) C. Jeffrey.** Kew Bull.14: 238 (1960). (plate18)

Syn: *Trainthema pentandra* L. Mant. Pl.: 70 (1767).

Rabaa (Ar.)

A spreading prostrate or procumbent, rarely erect, slightly succulent herb. Leaf-blade oblanceolate, narrowly elliptic. Flowers sessile or subsessile, greenish.

Material examined: 2, Karru soil, 7.3.2012

Medicinal uses: Whole plant used for scorpion sting treatment (El Ghazali *et al.*, 1994)



(plate 17) *Trianthema portulacastrum* L.



(plate18) *Zaleya pentandra* (L.) C. Jeffery.

Amaranthaceae

***Aerva javanica* (Burm.f.) Juss. Ex Schultes.** Ann. Mus. Hist. Nat. 11: 131 (1808). (plate19)

Syn: *Iresine javanica* Burm.f. Fl. Indica 212 (1768).

Achyranthes javanica Pers. Syn. Pl. 1: 259 (1805).

Ras el- Shaeab (Ar.)

Erect or suberect perennial herbs or undershrub. Leaves, alternate, lanceolate or sometimes almost linear, flat. Flowers in terminal panicle of dense leafless long-cylindric spikes.

Material examined: 3, Karru soil, 21.3.2012

Medicinal uses: The fumigant of the whole plant is used as an aphrodisiac (ELGhazali *et al*, 1994.)

***Amaranthus graecizans* L.** Sp. Pl.: 990 (1753). (plate20)

Syn: *Amaranthus blitum* var. *nanus* Moq. Prodr. 13(2): 263 (1849).

Amaranthus angustifolius Lam. Encycl. 1: 115 (1783).

Lissan el Tair Sagir (Ar.)

Much-branched annual herb erect or decumbent. Leaves alternate, narrow-oblong to obovate, including the petiole, often pale beneath. Fruit rugose.

Material examined: 4, Nile banks, 28.3.2012



(plate19) *Aerva javanica* (Burm.f.) Juss. Ex Schultes.



(plate 20) *Amaranthus graecizans* L.

A. spinosus L. Sp. Pl. 991 (1753). (plate21)

Syn: *Amaranthus spinosus* var. *pygmaeus* Hassk. Cat. Pl. Bogor. 83. (1844).
A. spinosus var. *circumscissus*. Asch. & Graebn. Syn. Mittel-Eur. Fl. 5: 269 (1914).

A. spinosus var. *indehiscens*. Asch. & Graebn. Syn. Mittel-Eur. Fl. 5: 269 (1914).

Lissan el Tair Abu shoka (Ar.)

Erect annual herb. Leaves with a pair of large axillary spines. Spikes elongated, mostly paniculate at the ends of the branches, with often globose clusters of flowers in the leaf-axils. Calyx-segments with sharp spiny tips. Fruit membranous.

Material examined: 86, Nile banks, 28.3.2012

A. viridis L. Sp. Pl. ed. 2: 1405 (1763). (plate22)

Syn: *Amaranthus gracilis* Desf. Tabl. École Bot. 43 (1804).

Albersia caudata (Jacq.) Boiss Fl. Orient. 4: 992 (1879).

Lissan el Tair Kabir (Ar.)

Erect annual herb. Leaves alternate, long-petiolate, ovate or elliptic. Spikes linear, panicled towards the ends of the branches. Fruit as long as the perianth, not membranous, wrinkled.

Material examined: 5, Nile banks, 28.3.2012



(plate 21) *Amaranthus spinosus* L. Google



(plate 22) *Amaranthus viridis* L.

***Chenopodium album* L.** Sp. Pl. 219 (1753). (plate23)

Syn: *Chenopodium reticulatum* Aellen Bot. Not. 1928: 205 (1928).

Arg Abu El Efain (Ar.)

Erect annual herb, eglandular, sparsely whitish-mealy on the young shoots and inflorescence. Leaves rhombic-ovate or -elliptic, acute or subacute at the apex, the margin with several coarse teeth on each side. Inflorescence a terminal panicle, often rather small and irregular with small clusters of flowers. Sepals

Material examined: 06, Nile banks, 28.3.2012

Molluginaceae

***Glinus lotoides* L.** Sp. Pl. 463 (1753). (plate 24)

Syn: *Glinus lotoides* var. *dictamnoides* (Burm. f.) Maire Fl. Afrique N. 8: 276 (1962).

Trbaa (Ar.)

Tomentose prostrate or procumbent annual herbs with hollow, cylindrical stems. Leaves obovate, densely stellate-tomentose. Flowers in axillary clusters. Fruits loculicidal capsule.

Material examined: Nile banks, 28.3.2012, 56



(plate23) *Chenopodium album* L.



(plate 24) *Glinus lotoides* L.

Nyctaginaceae

Boerhavia repens L. Sp. Pl. 3 (1753). (plate25)

Syn: *Boerhavia angustifolia* Span. Linnaea 15: 342 (1841).

Shokal el khail (Ar.)

Glabrous prostrate spreading annual herbs, with hollow cylindrical stems. Leaves opposite lanceolate, apex acute. Flowers axillary. Frut an indehiscent achene.

Material examined: 57, Karru soil, 21.3.2012

Polygonaceae

Persicaria glabra (Willd.) M.Gómez. Anales Inst. Segunda Enseñ. 2: 278

(1896). (plate 26)

Syn: *Polygonum glabrum* willd. Sp. Pl. 2: 447 (1799).

Timsahiya (Ar.)

Erect glabrous perennial herb. Leaves oblong-lanceolate, ocrea large, membranous. Spikes dense.

Material examine: 56, Nile banks, 28.3.2012



(plate 25) *Boerhavia repens* L.



(plate 26) *Persicaria glabra* (Willd.) M.Gómez.

Portulacaceae

Portulaca oleracea L. Sp. Pl. 445 (1753). (plate 27)

Syn: *Portulaca intermedia* Link ex Schltld. Bot. Zeitung (Berlin) 11(38): 667 (1853).

Rigla (Ar.)

Annual herb, with spreading or prostrate succulent branches. Leaves alternate, fleshy, flat, spatulate-oblongate, rounded at the apex; stipules minute. Flowers yellow.

Material examined: 73, Karru soil, 21.3.2012

Medicinal uses: used as antibacterial, anti-inflammatory and anthelmintic, (WHO & IMM 1990), whole plant used as antiphlogistic, hemorrhoids, antidiabetic, emollient, calmativ, antiscorbutic, vermifuge (Boulos 1983).

P. quadrifida L. Mant. Pl. 73 (1767). (plate 28)

Syn: *Portulaca quadrifida* var. *formosana* Hayata. J. Coll. Sci. Imp. Univ.

Tokyo 30(1): 37 (1911).

Lagb El Homar (Ar.)

Prostrate or decumbent succulent annual herb. Stems glabrous. Leaves opposite. Flowers small, petals yellow. Fruit conical, brown capsules.

Material examined: 74, Karru soil, 21.3.2012



(plate 27) *Portulaca oleracea* L.



(plate 28) *Portulaca quadrifida* L.

Tamaricaceae

***Tamarix nilotica* (Ehrenb.) Bunge.** Tent. Gen. Tamr. : 54 (1852) (plate 29)

Syn: *Tamarix gallica* var. *nilotica* Ehrenb.

Tarfa (Ar.)

Glabrous glaucous shrubs or small trees, with short internodes and rough fissured bark. Leaves half-clasping, ovate. Flowers white, crowded in spikes. Fruits capsule.

Material examined: 82, Nile banks, 28.3.2012

Zygophyllaceae

***Balanites aegyptiaca* (L.) Delile.** Descr. Egypte, Hist. Nat. 221 (1813). (plate 30)

Syn: *Ximenia aegyptiaca* L. Sp. Pl. 1194 1753.

Heglig, Lalob (Ar.)

Tree, bark vertically fissured. Leaves grey-green. Flowers yellow-green. Fruit green at first, turning yellow, broadly oblong-ellipsoid.

Material examined: 83, High terrace soils, 26.5.2012

Medicinal uses: Bark and fruits anthelmintic and purgative (El Ghazali *et al*, 1987). Gum mixed with maze meal porridge to treat chest complains (Kokwaro, 1976).



(plate 29) *Tamarix nilotica* (Ehrenb.) Bunge.



(plate 30) *Balanites aegyptiaca* (L.) Delile.

***Fagonia indica* Burm. F.** Fl. Indica 102(1768). (plate31)

Syn: *Fagonia aucheri* Boiss. Diagn. Pl. Orient. 1: 62 (1843).

Fagonia indica var. *aucheri* (Boiss.) Boiss. Fl. Orient. 1: 908 (1867).

Umm shoewaika; Abu shoka (Ar.)

Spiny annual herb. Leaves opposite 1 to 3, foliolate. Flowers rose or lilac.

Material examined: 84, High terrace soils, 26.5.2012

Medicinal uses: The maceration of the whole plant is used as anti-spasmodic. The powdered fruits mixed with sour milk are taken instantly as anti-purgative (El Ghazali, *et al.*, 1997).

***Tribulus terrestris* L.** Sp. Pl. 387 (1753). (plate 32)

Syn: *Tribulus lanuginosus* L. Sp. Pl. 1: 387 (1753).

Derrisa (Ar.)

Pubescent prostrate spreading annual herbs with hollow, cylindrical, faintly striate stems. Leaves unequally pinnae. Flowers yellow. Fruits nutlets, depressed, each carpel with 2 long spines and few tuberos.

Material examined: 85, Nile banks, 28.3.2012

Medicinal uses: The extracts of the plant used as antispasmodic. Fruits used as a tonic in spermatorrhoea, neurasthenia, astringent, for oral inflammation, deterrent, diuretic, also for dysentery and pain of bladder (Boulos, 1983).



(plate31) *Fagonia indica* Burm. F., Google



(plate 32) *Tribulus terrestris* L.

Euphorbiaceae

Euphorbia forsskalii **J.Gay** Hist. Nat. Iles Canaries 2(3): 240 (1847).
(plate33)

Syn: *Euphorbia aegyptiaca* Boiss. Cent. Euphorb. 13 (1860).

Umm lebaina (Ar.)

Pubescent prostrate spreading annual herbs, with cylindrical stems, and alternating branches. Leaves opposite, oblong, base unequal. Flowers axillary. Fruits capsule.

Material examined: 31, Nile banks, 28.3.2012

Euphorbia hirta **L.** Sp. Pl. 454 (1753). (plate 34)

Syn: *Euphorbia Pilulifera* var. *arechavaletae* Herter Anales Mus. Nac. Montevideo II, 1: 71(1911).

Um Labun (Ar.)

Yellowish pilose erect or decumbent annual herbs, with hollow cylindrical stems. Leaves opposite, lanceolate or oblong, finely serrate. Flowers terminal and axillary. Fruits capsule, trigonous.

Material examined: 32, Nile banks, 28.3.2012



(plate 33) *Euphorbia forsskalii* J. Gay



(plate 34) *Euphorbia hirta* L.

***Chrozophora plicata* (vahl) A.Juss.ex Spreng** Syst. Veg. 3: 850 (1826).
(plate 35)

Syn: *Chrozophora burmanni* Spreng. Syst. Veg. 3: 851 (1826).

Chrozophora obliquifolia (Vis.) Baill Étude Euphorb. 322 (1858).

Taroob (Ar.)

Stellate tomentose spreading woody prostrate or ascending shrubs, with solid, cylindrical stems. Leaves ovate or rhomboid, apex rounded. Flowers pink in small racemes. Fruits capsules, red-purple.

Material examined: 33, Nile banks, 28.3.2012

***Ricinus communis* L.** Sp. Pl. 1007 (1753). (plate 36)

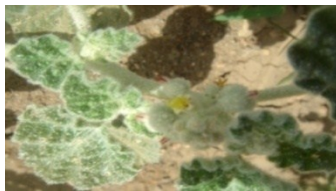
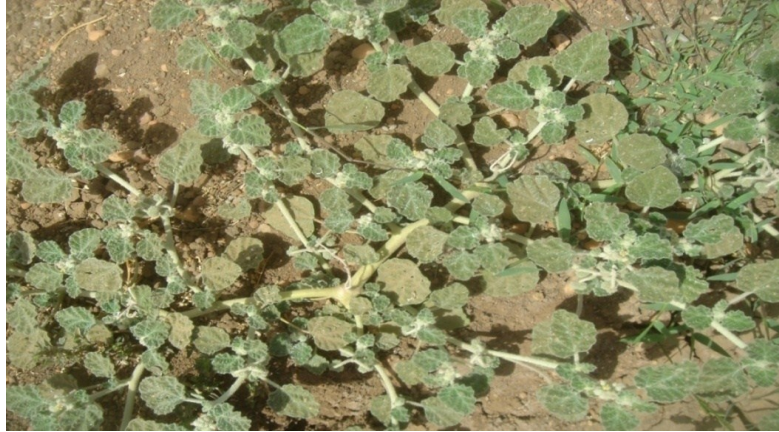
Syn: *Cataputia major* Ludw. Ectypa Veg. t. 7 (1760).

Khiriwi (Ar.)

Perennial shrub. Leaves alternate, pamentely lobed with serrated margins. Flowers clustered on terminal spikes, red female above white male flowers. Fruits spiny round capsules. Seeds brown.

Material examined: 34, Nile banks, 28.3.2012

Medicinal uses: Castor oil is more commonly used as a laxative. It is also used to stimulate lactation. Additionally, castor oil is applied to the skin for softening calluses, removing growths and warts, and for alleviating symptoms of arthritis (Boulos, 1983).



(plate 35) *Chrozophora plicata* (vahl) A.Juss.ex Spreng



(plate 36) *Ricinus communis* L.

curbitaceae

Citrullus colocynthis (L.) Schrad Linnaea 12: 414 (1838). (plate 37)

Syn: *Citrullus colocynthis* var. *insipidus* Pangalo Trudy Prikl. Bot. 23(3): 73 (1930).

Handal (Ar.)

Scabrid trailing annual herbs with hollow sulcate yellowish stems and simple tendrils. Leaves thick, deeply and variously divided. Fruits berry

Material examined: 27, High terrace soils, 24.12.2013

Medicinal uses: Plant for constipation, and painful mensuration (Wren, 1989). Water extract with sugar for snake and scorpion bites (El Ghazali, 1986). Fruits for diabetes and blennorrhagia (Adjanooun *et al*, 1993).

***Cucumis melo* L.** Sp. Pl. 1011 (1753). (plate 38)

Syn: *Cucumis chate* L. Syst. Nat. (ed. 10) 2: 1279 (1759).

Ar. Hmad

Setose prostrate trailing annual herbs with hollow striate stems and simple tendrils. Leaves ovate, 5 lobed, base cordate. Flowers yellow. Fruits berry.

Material examined: 28, Karru soil, 7.3.2012

Medicinal uses: Fruits expectorant, emetic, seeds vermifuge, digestive, refrigerant and antitussive (Boulos, 1983).



(plate 37) *Citrullus colocynthis* (L.) schrad



(plate 38) *Cucumis melo* L.

Fabaceae (Leguminosae)

Acacia ehrenbergiana Hayna. Bot. Surv. S. Afr. 44: 1-150 (1979).
(Plate39)

Syn: *Acacia flava* (Forssk.) Schweinf Bot. Surv. S. Afr. 44:1-150 (1979).

El Salam (Ar.)

Shrub. Leaves compound with 8to 12 pairs of opposite oblong leaflets.
Flowers yellow heads.

Material examined: 36, High terrace soils, 26.5.2012

Acacia nilotica(L.) Delile. Ross, J.H. Mem. Bot. Surv. S. Afr. 44: 1-150
(1979). (Plate 40)

Syn: *Acacia arabica* (Lam.) Willd. Sp. Pl. 4: 1085 (1806)

Garad; Sunt (Ar.)

Spinescent trees with spherical crown and blackish or black-brown stem.
Leaves biparipinnate alternate, stipules spinescent. Flowers axillary heads.
Fruits pod flat, straight regularly and constricted between seeds, tomentose.

Material examined: 37, Nile banks,28.3.2012

Medicinal uses: Bark, leaves and gum to treat haemorrhage, cold, diarrhea, ,
dysentery, ophthalmia. Roots to cure toothache, as a diuretic; pods, seeds,
roots for dysentery, various parts to heal different infections; as astringent
for ophthalmia, for oral and throat infections (Maydell,1986).



(Plate 39) *Acacia ehrenbergiana* Hayna



(Plate 40) *Acacia nilotica* (L.) Delile

Acacia oerfota (Forssk.) Schweinf Wood J.R.I. Kew Bull. 37: 451-3 (1983). (Plate 41)

Syn: *Acacia nubica* Benth London J. Bot. 1: 498 (1842)

Mimosa oerfota Forssk. Fl. Aegypt. -Arab. 177 (1775).

Laout (Ar.)

Shrub. Leaves rhachis mostly. Flowers white, cream or greenish. Seeds usually flinty grey globose or sometimes ellipsoid.

Material examined: 38, High terrace soils, 26.5.2012

Acacia tortilis subsp. *raddiana* (Savi) Brenan in F. T. E. A. :117(1959)
(Plate 42)

Syn: *A. raddiana* Savi *Sopra* Brenan in F. T. E. A.: 1(1830)

El Seyal (Ar.)

Trees are wedge or parasol-shaped. Bark grey to black. Leaves rhachis short. Flowers dirty white. Pods contorted or spirally twisted. Seeds olive to red brown.

Material examined: 40, High terrace soils, 26.5.2012



(Plate 41) *Acacia oerfota* (Forssk.) Schweinf



(Plate 42) *Acacia tortilis* subsp. *raddiana* (Savi) Brenan

Acacia tortilis subsp. *spirocarpa* (A. Rich.) Brenan in F. T. E. A. :117(1959) (Plate 43)

Syn: *Acacia spirocarpa* A. Rich. Tent. Fl. Abyss. 1: 239 (1847)

Sammr (Ar.)

Flat topped spinescent shrubs or small trees. Spines mixed, some white straight slender, others grey recurved. Leaves 7-15 pairs of pinnae, leaflets 3-10 pairs. Flowers white . Fruits pod yellowish brown, pubescent, spirally twisted, slightly constricted between seeds.

Material examined: 39, High terrace soils, 26.5.201

Indigofera oblongifolia Forssk. Kew Bull.Addnl.ser.1:1-166.Indigofera.in Tropical Africa. (Plate 44)

Syn: *Indigofera paucifolia* Wight. Numer. List n. 5454 (1831)

Dahasir (Ar.)

Stiff- branched undershrub or shrub, grey-glaucous or silvery. Stipules linear-lanceolate, glaucous beneath minutely pubescent and silvery on both surfaces particularly beneath. Flowers scarlet, in many-flowered dense axillary racemes.

Material examined: 41, Karru soil, 21.3.2012



(Plate 43) *Acacia tortilis* subsp. *spirocarpa* (A. Rich.) Brenan.



(Plate 44) *Indigofera oblongifolia* Forssk.

***Mimosa pigra* L.** Cent. Pl. I. :13 (1755) (Plate 45)

Syn: *Mimosa hispida* Willd Bot. Gard. 37 (2): 184-314(1950)

Sit El Mustahiya – Shagrt El Fas (Ar.)

Shrub, The stem is greenish in young plants but becomes woody as the plant matures. Leaves are bright green and bipinnate. Flowers are mauve or pink

Material examined: 42, Nile banks, 28.3.2012

Medicinal uses: Roots stimulant; various parts are used for colds, toothache, ophthalmia, obesity, antidote for snake bites (Maydell, 1986), antipretic and anticonvulsions (Adjanohoun *et al.*,1991).

***Rhynchosia minima* (L.) DC.** Gillett, J.B. et al. (1971). (Plate 46)

Syn: *Rhynchosia microphylla* Wall. Numer. List n. 5497 (1831).

Adan El Far (Ar.)

Perennial climbing or prostrate herb. Stems glabrous to velvety. Standard yellow, obovated, pubescent, glandular, wings yellow, keel greenish-yellow. Pods oblong-falcate wide, narrowed at the base, very fine puberulous and glandular, 2 seeded. Seeds brown.

Material examined: 43, Karru soil, 21.3.2012



(Plate 45) *Mimosa pigra* L. Google



(Plate 46) *Rhynchosia minima* (L.) DC.

***Parkinsonia aculeata* L.** Sp.PI. 1: 375 (1753) (Plate 47)

Syn: *Parkinsonia thornberi* M.E.Jones ILDis Schery, R.W. (1951).

Sasaban Abu Shoka (Ar.)

Shrub or tree. Leaves, small obovate-oblong or oblong leaflets. Flowers bright yellow. Fruits, linear

Material examined: 44, Nile banks, 28.3.2012

Medicinal uses: Bark, leaves, flowers and seeds are antipyretic (Maydell, 1986).

***Prosopis juliflora* (Sw.) DC.** Prodr. A. P. de Candolle 2: 447 (1825) (Plate 48)

Syn: *Acacia cumanensis* Willd Burkart, A. J. Arnold Arbor. 57 (4): 450-525 (1976).

Mesquite (Ar.)

Spinescent shrubs or small trees. Bark dark – brown fissured; spines pairs stout, yellow. Leaves biparipinnate. Flowers axillary spikes. Fruits pod, straight or slightly curved .

Material examined: 45, Nile banks, 28.3.2012



(Plate 47) *Parkinsonia aculeata* L.



(Plate 48) *Prosopis juliflora* (Sw.) DC.

***Senna alexandrina* Mill.** in Lock, Kew Bull.43(1988); (Plate 49)

Syn: *Cassia senna* L. Sp. Pl.: 377 (1753).

Sannamaka (Ar.)

Glabrous undershrubs with solid cylindrical stems. Leaflets 4-6 paired elliptic to lanceolate, broad, apex acute. Flowers yellow. Fruits flat, without crest on each side.

Material examined: Nile banks, 28.3.2012, 46

Medicinal use: The leaves and the fruits are laxative (Kokwaro, 1976), (Boulos, 1983).

***Senna italica* Mill .,** Gard. Dict.ed.8, No .2(1768). (Plate 50)

Syn: *Cassia italica* (Mill.) Lam. ex Andr., F.P.S.II:117, fig. 49 (1952);

Sanasana (Ar.)

Glabrous, erect, annual herbs, with solid cylindrical stems. Leaflets obovate, apex apiculate. Flowers yellow. Fruits flat, undulated on both sides.

Material examined : 47, Karru soil, 7.3.2012

Medicinal uses: The powdered roots mixed with cumin, fenugreek and Mahlab are used as antirheumatic (El Ghazali *et al.*, 1994). The decoctions of the leaves are drunk, to cure gonorrhoea (Kokwaro, 1976).



(Plate 49) *Senna alexandrina* Mill.



(Plate 50) *Senna italica* Mill.

***Sesbania sesban* (L.) Merr.** Gillett, J. B. et al. (1971)

(Plate 51)

Syn: *Aeschynomene sesban* L. Adams, C.D. (1972)

Sesaban (Ar.)

Tall shrub or small tree copiously branched. Leaflets oblong, but usually smaller. Flowers yellow.

Material examined: 48, Nile banks, 28.3.2012

***Tephrosia apollinea* (Delile) DC.** Thulin, M. 68: 1- 223 (1983).

(Plate 52)

Syn: *Galega apollinea* Delile Sanjappa, M. (1992)

Amayoga (Ar.)

Annual or perennial herb. Leaves grey-green, oblong-elliptical. Flowers purple. Fruits linear pods.

Material examined: 49, Karru soil, 14.3.2012



(Plate 51) *Sesbania sesban* (L.) Merr.



(Plate 52) *Tephrosia apollinea* (Delile) DC.

Rhamnaceae

Ziziphus spina-christi (L.) Dcsf. Fl. Atlant. 1: 201(1798). (Plate 53)

Syn: *Rhamnus spina-christi* L. Sp. Pl. 1: 195 (1753).

Sider (Ar.)

Spiny shrub or tree; branchlets pale, glabrous. Leaves pale, glabrous or slightly pubescent beneath on the nerves. Flowers greenish-yellow in subsessile sometimes dense cymes. Fruit fleshy, subglobose.

Material examined: 75, Karru soil, 21.3.2012

Medicinal uses: Roots antigonorrhoeal. Bark antispasmodic (ElGhazali *et al*, 1987; 1994). Wood for serpent bites; leaves astringent, anthelmintic, antidiarrhotic, for abscesses,; fruits antibyretic (Boulos, 1983).

Brassicaceae

Farsetia stylosa R.Br. Narr. Travels Africa 12, 216 (1826). (Plate 54)

Syn: *Forsetia ramosissima* E. Fourn Bull. Soc. Bot. France 11: 57 (1864).

Tahaei (Ar.)

Annual or short-lived perennial herb, with branched and ascended stems. Leaves linear to linear-elliptic. Flowers white to mauve or brownish-yellow. The fruit is a siliqua with winged seeds.

Material examined: 14, High terrace soils, 24.12.2013



(Plate 53) *Ziziphus spina-christi* (L.) Dcsf.



(Plate 54) *Farsetia stylosa* R.Br.

Capparaceae

***Capparis decidua* (Forssk.) Edgew** J. Linn. Soc., Bot. 6: 184 (1862).
(Plate55)

Syn: *Capparis decidua* Pax *Nat. Pflanzenfam.* 3(2): 231(1891).

Tundub (Ar.)

Spinescent glabrous much branched straggling deciduous shrubs or small trees up to 5m. high. Flowers pink. Fruits berry, globose.

Material examined: 16, High terrace soils,26.5.2012

Medicinal uses: Various parts antipyretic, antirheumatic (Maydell,1986), analgesic (El Ghazali *et al.*, 1986; 1987; Maydell,1986).

***Maerua crassifolia* Forssk.** Fl. Aegypt.-Arab. cxiii (1775). (Plate 56)

Syn: *Maerua arabica* J.F.Gmel Syst. Nat. 827 (1791).

Maerua uniflora Vahl Symb. Bot. 1: 36 (1790).

Sarih (Ar.)

Tree with rounded crown. Leaves, ovate to lanceolate. Flowers, with twisted green sepals, long white stamens, petals absent. Fruits irregularly cylindrical pods.

Material examined: 15, High terrace soils, 26.5.2012



(Plate 55) *Capparis deciduas* (Forssk.) Edgew



(Plate 56) *Maerua crassifolia* Forssk.

***Capparis oblongifolia* Forssk.** Fl. Aegypt.-Arab. : 99 (1775). (Plate 57)

Syn: *Maerua oblongifolia* (Forssk.) A. Rich Tent Fl. Abyss. 1: 32, t. 6 32 (1847)

Dabag (Ar .)

Hoary glabrous straggling woody shrubs. Leaves elliptic-oblong, apex acute and base cuneate. Flowers fragrant, gynophores white. Fruits torulose.

Material examined : 17, Nile banks,5.4.2012

Cleomaceae

***Cleome gynandra* L.** Sp. Pl. 671 (1753). (Plate 58)

Syn: *Gynandropsis gynandra* (L.) Briq Annuaire Conserv. Jard. Bot.

Genève 17: 382 (1914).

Tamalaika (Ar.)

Glabrous to pubescent erect annual herbs up to 60 cm. high with hollow, cylindrical striate stems. Leaves 3-7 foliolate, the smaller leaves 3-foliolate. Flowers white to purplish. Fruits capsule.

Material examined : 18, Karru soil, 14.3.2012



(Plate 57) *Maerua oblongifolia* (Forssk.) Googel



(Plate 58) *Cleome gynandra* L.

Malvaceae

Abutilon figarianum Webb *Fragm.* Fl. Aethiop.-Aegypt. 52 (1854).
(Plate 59)

Syn: *A. impressum* Hochst. ex Mattei Boll. Reale orto Bot. Palermo n. s., 1: 95 (1915)

A. webbianum Mattei Boll. Reale orto Bot. Palermo n. s., 1: 6 (1915)

Hambouk (Ar.)

Tall perennial herb, with more or less zigzag branches. Leaves broadly ovate, acute to acuminate at the apex, cordate at the base, crenate, stellate-pubescent above, more densely beneath. Flowers yellow, usually without a purple centre, solitary or paired on each peduncle. Fruit carpels 3 seeded.

Material examined: 50, Nile banks, 28.3.2012

A. pannosum (G. Forst.) Schlecht Bot. Zeitung (Berlin) 9: 828 (1851).
(Plate 60)

Syn: *Sida mutica* Delile *Descr. Égypte*, Hist. Nat. 60: 633 (1813).

Hambok (Gargadan) (Ar.)

Stellately pubescent erect perennial herbs or undershrubs, with solid cylindrical stem. Leaves orbicular, 3-10 cm. in diameter, apex acute, base cordate. Flowers yellow with dark centre. Fruits capsule.

Material examined: 51, Nile banks, 28.3.2012



(Plate59) *Abutilon figarionum* Webb Fragm.



(Plate 60) *Abutilon pannosum* (G.Forst.)Schlecht

***Corchorus depressus* (L.) Stocks** Proc. Linn. Soc. London 1: 367 (1848).

(Plate 61)

Syn: *Corchorus humilis* Munro Icon. Pl. Ind. Or. 3(4): 5, t. 1073(1846).

Um shiteh (Ar.)

Glabrous prostrate to decumbent spreading woody perennial herbs, with solid, cylindrical stems and strong tap roots. Leaves elliptic or obovate-elliptic. Flowers solitary or paired. Fruits capsule, sessile, beaked.

Material examined: 52, Karru soil, 7.3.2012

***Corchorus fascicularis* Lam.** Encycl. 2: 104 (1786). (Plate 62)

Syn: *Corchorus brachycarpus* Guill. & Perr. Fl. Seneg. Tent. 89 (1831).

Khudra; Mulukhia (Ar.)

Glabrous erect or decumbent annual or perennial herbs, with hollow, cylindrical stems and lax branches. Leaves oblong, not tailed at the base. Flowers yellow. Fruits capsules, shortly beaked, borne in clusters.

Material examined: 5, Karru soil, 7.3.2012



(Plate 61) *Corchorus depressus* (L.) Stocks



(Plate 62) *Corchorus fascicularis* Lam.

***Corchorus olitorius* L.** Sp. Pl. 529 (1753). (Plate 63)

Syn: *Corchorus catharticus* Blanco Fl. Filip. 442 (1837).

Khudra; Mulukhia (Ar.)

Glabrous erect annual herbs, with hollow, cylindrical stems and often woody at the base. Leaves lanceolate or ovate-lanceolate, apex acute. Flowers yellow. Fruits capsule, stout, abruptly narrowed to an entire beak, usually 5 valves with distinct transverse ridges inside.

Material examined: 54, Karru soil, 7.3.2012

Medicinal uses: The plant is used for gastor-duodenal ulcers and for vomiting (Adjanohoun *et al*, 1991). Scraping from the roots are put into hollow teeth to stop them from aching (Kokwaro, 1976).

***Abelmoschus ficulneus* (L.) Wight & Arn.** *Cat. Ind. Pl.* 14 (1833). (Plate 64)

Syn: *Hibiscus ficulneus* L. Sp. Pl. 2: 695 (1753).

Wakat el-Khala (Ar.)

Annual herb; stems tomentose when young, nearly glabrous later. Leaves palmately-lobed, hispid, unequally toothed,. Flowers axillary, white. Capsule ovoid, tomentose, covered with viscid points when green; seeds globose.

Material examined: 55, Karru soil 7.3.2012



(Plate 63) *Corchorus olitorius* L.



(Plate 64) *Abelmoschus ficulneus* (L.) Wight & Arn.

Sapindaceae

Cardiospermum halicacabum L. Sp. Pl. 366 (1753). (Plate 65)

Syn: *Cardiospermum acuminatum* Miq. Linnaea 17: 579 (1843).

Shar ELarose (Ar.)

Glabrous annual climbers with hollow, angular stems and paired simple tendrils originating from the apex of the peduncles. Leaves bright-green biternate, with deeply inciso-pinnatifid ovate. Flowers axillary. Fruits capsule bladderly.

Material examined: 76, Karru soil, 21.3.2012

Apocynaceae

Calotropis procera (Aiton) Dryand. Hortus Kew. 2: 78 (1811). (Plate 66)

Syn: *Asclepias procera* Aito Hort. Kew. 1: 305(1789).

Calotropis heterophylla Wall Numer. List n. 8217 (1847).

Usher (Ar.)

Branched shrub with milky latex. Leaves opposite, sessile, ovate. Flowers white. Fruits green follicle. Seeds with tuft of long hair at one side.

Material examined: 7, Nile banks, 28.3.2012

Medicinal uses: Latex for Jaundice and antidote for scorpion bites (El Ghazali *et al.*, 1987). Leaves for asthma and sunstroke (Boulos, 1983).



(Plate 65) *Cardiospermum halicacabum* L.



(Plate 66) *Calotropis procera* (Aiton) Dryand.

***Leptadenia arborea* (Forssk.) Schweinf.** Arab. Pfl.-Nam. 167 (1912). (Plate 67)

Syn: *Leptadenia heterophylla* (Del.) Decne. Ann. Sci. Nat., Bot., sér. 2, 9: 270-1 270 (1838).

Lawis (Ar.)

Twinning shrub. Leaves varying from lanceolate to ovate. Flowers greenish white. Fruits oblong follicle with numerous seeds with tufts of hair.

Material examined: 8, Karru soil, 12.3.2012

Medicinal uses: Stems and leaves antidote for snake bites (El Ghazali *et al.*, 1994).

***Leptadenia pyrotechnica* (Forssk.) Decne.** Ann. Sci. Nat., Bot. II, 9: 269 (1838). (Plate 68)

Syn: *Sarcostemma pyrotechnicum* (Forssk.) Schult. Syst. Veg. 6: 116 (1820).

Markh (Ar.)

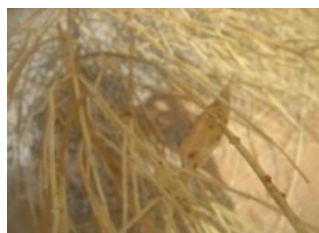
Shrubs, bark smooth, grey, branches pale-green, whip-like. Leafless but rarely with small leaves on the young shoot. Flowres small.

Material examined: 9, High terrace soils, 26.5.2012

Medicinal uses: Stems and leaves antidote for snake bites (El Ghazali *et al.*, 1994).



(Plate 67) *Leptadenia arborea* (Forssk.) Schweinf.



(Plate 68) *Leptadenia pyrotechnica* (Forssk.) Decne.

Laminaceae

Ocimum basilicum L. Sp. Pl.: 597 (1753). (Plate 69)

Syn: *Ocimum album* L. Mant. Pl. 1: 85 (1767).

Rehan (Ar.)

Pubescent erect much branched annual herb, with solid yellow-brown stems. Leaves opposite, elliptic, margin entire. Flowers white or tinged with purple. Filaments of upper stamens with a tooth near the base. Fruits nutlet. Seeds oval, globose, glabrous and black.

Material examined: 35, Aquatic ١٢.٤.2012

Medicinal uses: Plant used for fever, cough, worms, stomach complains, gout, tumor of eyes, as ointment for sclerosis of spleen and liver (Boulos, 1993). A decoction of the roots is used for stomach pains (Kokwaro, 1976). The leaves are used to treat acute conjunctivitis (A djanohoun *et al.*, 1993).

Convolvulaceae

Convolvulus arvensis L. Sp. Pl. 1: 153 (1753). (Plate 70)

Syn: *Convolvulus arvensis* var. *angustatus* Ledeb. Fl. Altaic. 1: 225 (1829).

Aliga (Ar.)

Perennial herb, hairy. Leaves lanceolate. Flowers pinkish white. Fruits globose capsules with black seeds.

Material examined: 2, Karu soil, 21.3.2012



(Plate 69) *Ocimum basilicum* L.



(Plate 70) *Convolvulus arvensis* L.

***Ipomoea aquatica* Forssk.** Fl. Aegypt.-Arab. 44 (1775). (Plate 71)

Syn: *Ipomoea natans* Dinter & Suess. Mitt. Bot. Staatssamml. München 4: 112 (1952).

Hantot El Maa (Ar.)

Glabrous trailing or prostrate perennial herbs, with hollow woody cylindrical striate stems. Leaves reniform. Flowers bright red. Fruits capsule glabrous. Seeds glabrous.

Material examined: 25, Aquatic, 12.4.2012

***Merremia emarginata* (Burm. f.) Hallier f.** Bot. Jahrb. Syst. 16(4–5): 552 (1893). (Plate 72)

Syn: *Convolvulus reniformis* Roxb. Fl. Ind., ed. 1832 1: 481 (1832).

Mattat (Ar.)

Perennial; stems prostrate from a woody root, rooting at the nodes, sparsely hairy or glabrous. Leaf-blade orbicular or ovate- reniform, emarginate at the apex, cordate at the base, coarsely crenate, glabrous or sparsely pilose. Flowers axillary, solitary, peduncle very short. Corolla yellow with pale or dark base and with midpetaline areas sometimes purplish or red- flushed, tubular- campanulate, glabrous. Capsule globose. Seeds glabrous, dark brown.

Material examined: 26 , Karru soil 21.3.2012,



(Plate 71) *Ipomoea aquatica* Forssk.



(Plate 72) *Merremia emarginata* (Burm. f.) Hallier f.

Solanaceae

***Datura innoxia* mill.** Gard. Dict. ed. 8 5 (1768). (Plate 73)

Syn: *Datura guayaquilensis* Kunth. Nov. Gen. Sp. 3: 8 (1818).

Sakaran (Ar.)

Erect softly grey-pubescent herb or undershrub. Leaves entire or repand-dentate, ovate, densely pubescent on both surfaces. Flowers white, pendulous. Corolla 10-toothed. Capsule globose, pendulous, spiny, dehiscent irregularly.

Material examined: 77, Karru soil, 7.3.2012

Medicinal uses: Leaves for cough and abdominal colic (El Ghazali *et al.*, 1994).

***Datura stramonium* L.** Sp. Pl. 179 (1753). (Plate 74)

Syn: *Datura bernhardii* Lundstr. Acta Horti Berg. 5(3): 89 (1914).

Sakaran (Ar.)

Glabrous erect branched annual herb or undershrubs, with hollow angled, striate stems. Leaves ovate, apex acuminate, base unequal. Flowers white, erect. Fruits capsule, erect 4 valved, ovoid spiny.

Material examine: 78, Karru soil, 7.3.2012

Medicinal uses: Leaves used for epilepsy and fuctional psychosis (Adjanohoun *et al.*, 1993). Fruits remedy for aching ears (Kokwaro, 1976).



(Plate 73) *Datura innoxia* Mill



(Plate 74) *Datura stramonium* L.

***Solanum coagulans* Forssk.** Fl. Aegypt.-Arab. 2: 47 (1775). (Plate 75)

Gubbien (Ar.)

Spinescent ascending to prostrate glaucous woody perennial herbs, with solid cylindrical stems. Leaves alternate ovate, broad, apex acuminate or obtuse Flowers violet. Fruits globose, yellow, berry.

Material examined: 79, Karru soil, 7.3.2012

***Solanum incanum* L.** Sp. Pl. 1: 188 (1753). (Plate 76)

Syn: *Solanum bojeri* Dunal. Prodr. 13(1): 344 (1852).

Gubbien (Ar.)

Shrub covered with woolly hair. Leaves alternate, greenish grey, ovate with wavy margins, unequal at the base. Flowers purple with yellow stamens. Fruits yellowish berries.

Material examined: 80, Karru soil, 7.3.2012

Medicinal uses: The fresh roots are used against sexual impotence, dysentery, asthma, snake bites and treatment for poisoning (Adjanohoun *et al.*, 1993), also squeezed on snake bites to combact the snake vernom (El Ghazali, 1986). The leaves are used for dermatosis and menorrhagia. (Adjanohoun *et al.*, 1993).



(Plate 75) *Solanum coagulans* Forssk.



(Plate 76) *Solanum incanum* L.

***Solanum americanum* Mill.** Gard. Dict. (ed. 8). 5 (1768). (Plate 77)

Syn: *Solanum nigrum* L. Sp. Pl. 1: 186 (1753).

Einab al Diib (Ar.)

Herb or undershrub; branches glabrous or pubescent. Leaves entire or sinuate-dentate, ovate, obovate or lanceolate, slightly pubescent. Flowers white, in few-flowered umbellate cymes at or above the nodes. Fruits berry black, glabrous.

Material examined: 81, Karru soil, 7.3.2012

Asteraceae (Compositae)

***Artemisia absinthium* L.** Sp. Pl. 848 (1753). (Plate 78)

Syn: *Absinthium majus* Geoffr. t. 121 (1764).

Demsesa (Ar.)

Herbaceous, perennial plant with fibrous roots. The stems straight, tall, grooved, branched, and silvery-green. Leaves are spirally arranged, greenish-grey above and white below. Flowers pale yellow, tubular, and clustered in spherical bent-down heads. Fruit a small achene.

Material examined: Nile banks, 28.3.2012, 19

Medicinal uses: Antimalarial, antihelmintic and antidiabetic, and in treating wounds, bronchitis, ulcers, and tuberculosis in traditional Anatolian medicine (Erel *et al.*, 2012).



(Plate 77) *Solanum nigrum* L.



(Plate 78) *Artemisia absinthium* L.

***Eclipta prostrata* (L.) L.** Mant. Pl. 2 286 (1771). (Plate 79)

Syn: *Verbesina alba* L. Sp. Pl.: 902 (1753). *V. prostrate* L., Sp. Pl.: 902 (1753)

Tamar el Ghanam (Ar.)

Erect or decumbent scabrous herb covered with appressed hairs. Leaves opposite, sessile or subsessile, lanceolate. Flowers heads solitary, white. Seeds coneshaped, flattened, dentate at the apex, rugose, brown achenes without pappus.

Material examined: 20, Karru soil, 14.3.2012

***Pulicaria undulata* (L.) C.A.Mey.** 79 (1831). (Plate 80)

Syn: *Pulicaria crispa* (Forssk.) Oliv. 96 (1873). *Aster crispus* Forssk., 150 (1775).

Rabul (Ar.)

More or less whitish -tomentose or occasionally nearly glabrous much-branched herb. Leaves sessile, denticulate-crisped, alternate. Flower head yellow, single, terminal on paniculate branches. peduncles tomentose; involucre bracts inconspicuous, yellowish green; involucre hemispherical; very short yellow ray flowers and disc flowers.

Material examined: 21, Nile banks, 28.3.2012

Medicinal uses: The flowering branches are used for preparing sneezing powder for sternutatory (Boulos, 1983).



(Plate 79) *Eclipta prostrata* (L.) L.



(Plate 80) *Pulicaria undulata* (L.) C. A. Mey.

***Sonchus oleraceus* (L.) L.** Sp. Pl. 794(1753). (Plate 81)

Syn: *Sonchus angustissimus* Hook.f. Bot. 7: 203 (1864).

Molaita (Ar.)

Glabrous erect annual herbs, with hollow cylindrical striate stems. Leaves pinnatifid, usually aculeate-denticulate, sessile, base amplexicual auriculate. Flowers head yellow. Fruits achene.

Material examined: 22, Karru soil, 7.3.2012

Medicinal uses: Whole plant iused to treat anaemia (Adjanohoun *et al.*, 1993). Infusion of roots and leaves used as a tonic and febrifuge (Bebawi & Neugebohrn 1991).

***Xanthium strumarium* subsp. *brasilicum* (Vell.) O. Bolòs & Vigo** Bot., 17(1): 90 (1988) (Plate 82)

Syn: *Xanthium brasilicum* Vell: (1827)

Ramtouk (Ar.)

Scabrous annual herbs. Leaves broad, unequally denate, base cordate. Flowers greenish-yellow. Fruits oval, globose; armed with hooked spines.

Material examined: 23, Nile banks, 28.3.2012

Medicinal uses: Fruits possess antiallergic and anti-inflammatory properties, used for furunculosis, impetigo, ulcers, urticaria, scrofula, goiter rheumatism, arthralgia, headache, chronic catrrhal rhinitis, sore throat and dysentery. (WHO & IMM, 1990).



(Plate 81) *Sonchus oleraceus* (L.) L.



(Plate 82) *Xanthium strumarium* subsp. *brasiliicum* (Vell.) O.Bolòs & Vigo.

Boraginaceae

Echium rauwolfii Del. Descr. Egypte, Hist. Nat. 195 (1813). (Plate 83)

Syn: *Echium dalmaticum* Tausch Flora 14: 20 (1831).

Echium tinctorium Viv. Pl. Aegypt. Dec. 24 (1830).

Shok El Gmrey (Ar.)

Annual erect much-branched herb; root slender, purple; stems covered with copious spreading bristles. Upper stem-leaves sessile, linear-oblong, small, with bulbous-based bristles; lower stem-leaves oblanceolate, narrowed into a short petiole. Flowers blue or white, in bracteates scorpioid spikes.

Material examined: 10, Karru soil, 7.3.2012,

Heliotropium bacciferrum Forssk. Fl. Aegypt.-Arab. 38 (1775). (Plate 84)

Syn: *Heliotropium bacciferum* var. *fartakense* (Sw.) Kazmi J. Arnold Arbor. 51(2): 163 (1970).

Heliotropium fartakense Sw Mitt. Inst. Allg. Bot. Hamburg 10: 207 (1939).

Danb el Agrab (Ar.)

Perennial herb, covered with white bulbous-based bristles. Leaves with strongly undulate margins, oblanceolate broad, setulose-scabrous on both surfaces. Flowers white, small, in dense short scorpioid cymes.

Material examined: 11, Karru soil, 21.3.2012



Echium rauwolfii Del. (Plate 83)



(Plate 84) *Heliotropium bacciferrum* Forsk.

***Heliotropium sudanicum* F.W.Andr** Kew Bull. 8: 440 (1953). (Plate 85)

Danb el Agrab (Ar.)

Branched annual herb, stem sulcate, hispid with simple hairs, branched at the base. Leaves alternate, ovate, obtuse or acute at the apex, gradually narrowed towards the base, often unequal-sided wide, densely tuberculate and hispid on the nerves beneath, less densely or above; petiole, hirsute like the stems. Inflorescences axillary or terminal, dense, many-flowered, curved cymes, often in pairs, rachis and very short pedicels hirsute.

Material examined: 12, Karru soil, 21.3.2012

***Heliotropium supinum* L.** Sp. Pl. 130 (1753). (Plate 86)

Syn: *Piptoclaina supina* (L.) G.Don Gen. Hist. 4: 364 (1837).

Danb el Agrab (Ar.)

Hairy much-branched herb, decumbent from a woody base. Leaves shortly petiolate, more or less crenate, elliptic, 2.5cm. long, 1.0cm. broad, appressed- pilose between the nerves above, villous beneath. Flowers small, few, softly villous, in rather lax spikes. Nutlets 1-2, dark brown with a lighter brown border.

Material examined: 23, Karru soil, 21.3.2012



(Plate 85) *Heliotropium sudanicum* F.W.Andr.



Heliotropium supinum L. (Plate 86)

The flora of the study area includes a varying range of species within the different families. Fabaceae (Leguminosae) come to be the largest family represented by 14 species; followed by Poaceae (Gramineae) 13 species; Malvaceae 6 species; Amaranthaceae, Asteraceae (compositae) and Salicaceae 5 species; Boraginaceae and Euphorbiaceae 4 species; Apocynaceae, Capparidaceae, Convolvulaceae and Zygophyllaceae 3 species; Aizoaceae, Cucurbitaceae, Cyperaceae and Portulacaceae 2 species; while Brassicaceae (Cruciferae), Cleomaceae, Lamiaceae, Molluginaceae, Nyctaginaceae, Papaveraceae, Polygonaceae, Rhamnaceae and Sapindaceae are monophytic families. This result can be considered as normal in a semi-desert environment. The families Fabaceae and poaceae are usually widely distributed in any floristic study round the world.

From the 86 taxa representing the flora of study area 22 species (25%) are reported as medical plants.

Almost no records for Shendi region were noted in taxonomic works and no previous attempt has been carried out to evaluate the vegetation status of the area.

3.1.2. Zonal pattern of Natural Vegetation

The study area can be divided into four main vegetation units. It must be understood that the boundaries between the units and the changes from one unit to the other are gradual. The first unit (I) includes the aquatic plant which are scattered in the Nile. The other units run parallel to the river Nile in the following sequence: the Nile Bank (II), Karu soil (III) and the High terrace soil (IV). Each unit is characterized with vegetation composition which reflect its soil composition (Table 1).

3.1.2.1. The aquatic vegetation unit (I)

A very thin vegetation cover develops in this unit. Species collected from this unit must be well adapted to these adverse conditions. They are well developed perennial herbs.

3.1.2.2. Nile Bank vegetation unit (II)

The unit consists of the natural vegetation in the edge of the Nile Bank and the narrow strip along the river. It includes 43 plant species.

The soil has been enriched by alluvial silt deposited during the annual flood of the Nile. The unit is usually cultivated by vegetables and some crops like Vegetables and Cowpea (*Vigna unguiculata* (L.) Walp.).

The natural vegetation is formed of a woody layer dominated by *Mimosa pigra*. and *Tamarix nilotica*. The chief woody associates are *Acacia nilotica*, *Parkinsonia aculeata* and *Sesbania sesban*.

Perennial grass cover is formed main of patches of *Desmostachya bipinnata*. It also includes: *Cynodon dactylon*, *Dactyloctenium aegyptium* and *Brachiaria eruciformis*. The herbaceous ground cover is dominated by *Persicaria glabra* associated by a large number of species which are mostly weeds of cultivation.

3.1.2.3. Karru soil unit (III)

This unit is characterized by more soil stabilization. Soils are fine textured and are not submerged by water except by the unusual high floods which occur very rare. The unit is relatively densely vegetated (48 plant species). Most of the lands in this unit are reserved for agricultural production using

small water pumps. The woody natural vegetation is formed of scattered shrubs of *Maerua oblongifolia*, *Chrozophara Plicata*, *Indigofera oblongifolia* and *Zizphus spina -christi*.

The grass cover is formed of *Cynodon dactylon* and *Dactylocetenium aegyptium*. Ground herbaceous cover is mainly weeds of cultivation. The main cultivated crops are Faba bean (*Vicia faba* L.), Wheat (*Triticum aestivum* L.), Zea maize (*Zea mays* subsp. *mays* L) and Onion (*Allium cepa* L.)

¶.1.2.4. High terrace soils vegetation unit (IV)

This unit includes the sandy and gravelly deposits outside the Nile valley and the rock out crops. It is part of the semi-desert plain which is generally devoid of vegetation. The woody vegetation is dominated by *Acacia tortilis*. ssp *spirocarpa* in the flat Plain. *Balanites aegyptiaca*, *Acacia tartilist* ssp. *raddiana* and *Zizphus spina-christi* are common in Khor beds.

Acacia ehenbergiana forms stand on rocky out crops. *Maerua crassifolia* and *Capparis decidua* are common on alluvial soil in areas protected against grazing. *Leptadenia pyrotechnica* and *Acacia oerfota* are frequent species on environmentally suitable habitats.

The grass cover is dominated by *Panicum Turgidum* associated with *Aristida adsensionis* and *A. funiculata*. The herbaceous flora is formed mainly by rejected unpalatable species: *Seena alexaudrina*, *Senna italica* and *Tephrosia apollinea*. Common associates are *Tribulus terrestris* and *Fagonia indica* in khor beds.

Table (1) list of plant species found in Shendi area and their distribution

Family	Scientific Name	Local Name	Locality				Life Form
			I	II	III	IV	
Aizoaceae	<i>Trianthema portulacastrum</i> L.	Raba	-	+	+	-	AH
	<i>Zaleya pentandra</i> (L.) C.Jeffrey	Raba	-	+	+	-	AH
Amaranthaceae	<i>Aerva javanica</i> (Burm.f.) Juss. ex Schultes	Ras el- Shaeab	-	+	-	+	PH- USH
	<i>Amaranthus gracizans</i> L.	Lissan el Tair Sager	-	+	+	-	AH
	<i>Amaranthus viridis</i> L.	Lissan el Tair Kabir	-	+	+	-	AH
	<i>Amaranthus spinosus</i> L.	Lissan Tair Abu shoka	-	+	+	-	AH
	<i>Chenopodium album</i> L.	Arg Abu El Efain	-	+	+	-	AH
Apocynaceae	<i>Calotropis procera</i> (Aiton) Dryand	Usher	-	+	+	+	Sh-T
	<i>Leptadenia arborea</i> (Forssk.) Schweinf.	Lawis	-	+	-	+	PH
	<i>Leptednnia pyrotechnica</i> Forssk (Decne)	Markh	-	-	-	+	Sh
Boraginaceae	<i>Echium rouwolfii</i> Del	Shok Gumri	-	-	+	-	AH
	<i>Heliotropium bacciferum</i> Forssk.	Danb el Agrab	-	-	+	+	PH
	<i>H.sudanicum</i> F.W.Andr	Danb el Agrab	-	-	+	+	PH
	<i>H. supinum</i> L	Danb el Agrab	-	-	+	+	PH
Brassicaceae	<i>Farsetia stylosa</i> R.Br	Tahaei	-	-	-	+	AH
Capparaceae	<i>Capparis decidua</i> (Forssk.)Edgew	Tundub	-	-	-	+	T
	<i>Capparis oblongifolia</i> Forssk	Dabag	-	+	+	-	Sh
	<i>Maura crassifolia</i> Forssk	Sarah	-	-	-	+	T
Cleomaceae	<i>Cleome gynandra</i> L.	Tamaleka	-	+	+	-	AH

Compositae	<i>Artemisia absinthium</i>	Demsesa	-	+	-	-	PH
	<i>Eclipa prostrate</i> (L.)L.	Tamar el Ghanam	-	+	-	-	AH
	<i>Pulicaria undulata</i> (L.) C.A.Mey	Rabul	-	-	+	+	AH
	<i>Sonchus oleraceus</i> L.	Molaita	-	+	-	-	AH
	<i>Xanthium strumarium</i> subsp. <i>brasilicum</i> (Vell.) O.Bolòs & Vigo	Ramtouk	-	+	+	+	AH
Convolvulaceae	<i>Convolvulus arvensis</i> L.	Alaiga	-	-	+	-	PH
	<i>Ipomoea aquatic</i> Forssk	Hantot El Maa	+	-	-	-	PH
	<i>Merremia emarginata</i> (Burm. f.) Hallier f	Mattat	-	-	+	-	PH
Cucurbitaceae	<i>Citrullus colocynthis</i> (L.) schrad	Handal	-	-	+	+	AH
	<i>Cucumis melo</i> L.	Hmad	-	-	+	+	AH
Cyperaceae	<i>Cyperus rotundus</i> L.	Sieda	-	+	+	-	PH
	<i>Cyperus esculentus</i> L.	Sieda Maea	+	-	-	-	PH
Euphorbiaceae	<i>Euphorbia forsskalii</i> J.Gay	Umm lebaina	-	+	+	-	AH
	<i>E .hirta</i> L.	Um Labun	-	+	+	-	AH
	<i>Chrozophora plicata</i> (Vahl) A.Juss.ex Spreng	Tarob	-	+	+	-	Sh
	<i>Ricinus communis</i> L.	Khirwi	-	+	-	-	PH
Laminaceae	<i>Ocimum basiticum</i> L.	Rehan	+	-	-	-	AH
Leguminosae	<i>Acacia ehrenbergiana</i> Hayna	Salam	-	-	-	+	T
	<i>Acacia nilotica</i> (L.) Delile	Garad; Sunt	-	+	-	-	T
	<i>A.oerfota</i> (Forssk.) Schweinf	Laout	-	-	-	+	T
	<i>A.tortilis</i> subsp. <i>spirocarpa</i> (A. Rich.) Brenan	Sammr	-	-	-	+	T
	<i>A.tortilis</i> subsp. <i>raddiana</i> (Savi) Brenan	Seyal	-	-	-	+	T
	<i>Indigofera oblongifolia</i> Forssk.	Dahasir	-	-	+	-	Sh
	<i>Mimosa pigra</i> L.	Sit El Mustahiya	-	+	-	-	T

	<i>Rhynchosia minima</i> (L.) DC.	Adan El Far	-	-	+	-	PH
	<i>Parkinsonia aculeata</i> L.	Sasaban Abu Shoka	-	+	-	-	T
	<i>Prosopis juliflora</i> (Sw.) DC.	Mesquite	-	+	+	+	T
	<i>Senna atexandrina</i> Mill.	Sanmaka	-	+	+	+	PH
	<i>Senna italica</i> Mill	Sanasana	-	+	+	+	AH
	<i>Sesbania sesban</i> (L.) Merr.	Saisaban	-	+	-	-	T
	<i>Tephrosia apollinea</i> (Delile) DC.	Amayoga	-	-	+	+	PH
Malvaceae	<i>Abutilon figarionum</i> Webb Fragm.	Hambouk	-	+	+	-	PH
	<i>A. pannosum</i> (G.Forst.) Schlecht.	Hambouk	-	+	+	-	PH
	<i>Corchorus depressus</i> (L.) Stocks.	Um shiteh	-	-	+	+	PH
	<i>C. fascicularis</i> Lam.	Khudra; Mulukhia	-	-	+	-	AH. PH
	<i>C. olitorius</i> L.	Khudra; Mulukhia	-	-	+	-	AH
	<i>Abelmoschus ficulneus</i> (L.) Wight & Arn.	Wakat el-Khala	-	-	+	-	AH
Molluginaceae	<i>Glinus lotoides</i> L.	Trbaa	-	+	-	-	AH
Nyctacinaceae	<i>Boerhavia repens</i> L.	Shokal el khail	-	-	+	-	AH
Papaveraceae	<i>Argemone mexicana</i> L.	El Khshkhash	-	+	-	-	PH
Poaceae	<i>Aristida adscensionis</i> L.	Humra	-	-	-	+	AH
	<i>A. funiculata</i> Trin.& Rupr	Gaw	-	-	-	+	AH
	<i>Brachiaria eruciformis</i> (Sm.) Griseb	Um Rekiabat	-	+	-	-	AH
	<i>Cynodon dactylon</i> (L.) Pers	Nageela	-	+	+	-	PH
	<i>Dactyloctenium aegyptium</i> (L.)Willd	Um Asabia	-	+	+	-	AH
	<i>Desmostachya bipinnata</i> (L.) Stapf	Halfa	-	+	-	-	PH
	<i>Dinebra retroflexa</i> (Vahl)Panz	Um Mamliha	-	+	-	-	AH
	<i>Echinochloa colona</i> (L.) LinK	Difera	-	+	-	-	AH

	<i>Eragrostis japonica</i> (Thunb.) Trin.	Aish elfahr	-	+	-	-	AH
	<i>Panicum hygrocharissteut</i> Steud	Ein el Igla	-	+	-	-	AH
	<i>Panicum turgidum</i> Forssk.	Tomam	-	-	-	+	PH
	<i>Phragmites oustralis</i> (Cav.) Trin. ex Steud.	Bous	+	-	-	-	PH
	<i>Sorghum arundinaceum</i> (Desv.) Stapf	Adar	-	+	-	-	AH
Polygonaceae	<i>Persicaria glabra</i> (willd.)M.Gomez	Timsahiya	-	+	-	-	PH
Portulacaceae	<i>Portulaca oleracea</i> L.	Rigla	-	-	+	-	AH
	<i>P.quadvifidal</i> L.	Lagb El Hemar	-	-	+	-	AH
Rhamnaceae	<i>Ziziphus spina- christi</i> (L.) Desf.	Sider	-	-	+	+	Sh-T
Sapindaceae	<i>Cardiospermum halicacabum</i> L.	Shar ELarose	-	-	+	-	AH
Solanaceae	<i>Datura innoxia</i> mill.	Sakaran	-	-	+	-	AH
	<i>D.stramonum</i> L.	Sakaran	-	-	+	-	AH
	<i>Solanum coagulans</i> Forssk.	Gubbien	-	-	+	-	PH
	<i>S.incanum</i> L.	Gubbien	-	+	-	-	Sh
	<i>Solanum nigrum</i> L.	Einab al Diib	-	-	+	-	AH
Tamaricaceae	<i>Tamarix senegalensis</i> DC	Tarfa	-	+	-	-	Sh-T
Zygophyllaceae	<i>Balanites aegyptica</i> (L.) Delile	Lalob	-	-	-	+	T
	<i>Fagonia indica</i> L.	Abu shoka	-	-	-	+	AH
	<i>Tribulus terrestris</i> L.	Derrisa	-	-	+	+	AH

I = Aquatic, II = Nile bank, III= Karu soils, IV= High terrace soils

AH = Annual herb PH = Perennial herb USh = Under shrub Sh = Shrub T= Tree

As shown in (Fig 1) most of the collected plants includes annual herbs representing 47.7% and perennial herbs consist of 29%, while trees and shrubs form 9.3% and 14% of the taxa respectively.

The distribution of the collected taxa varies within the different vegetation units. Karru soil is highly populated including 48 plant species. Followed with the Nile Bank 43 species. The High terrace contains 30 species. The aquatic flora of the area includes only 4 species (Fig 2).

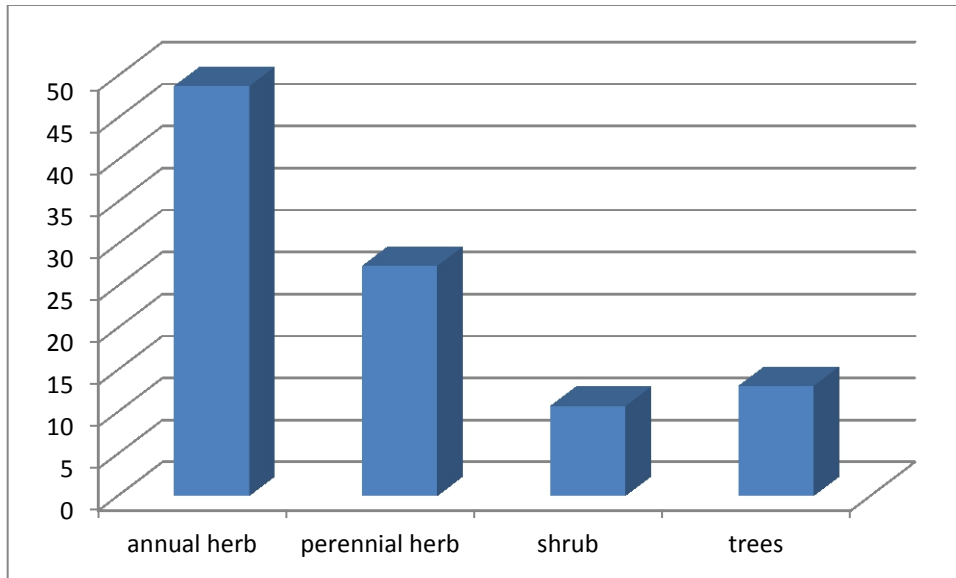


Figure (1): Plant life forms percentages in Shendi area

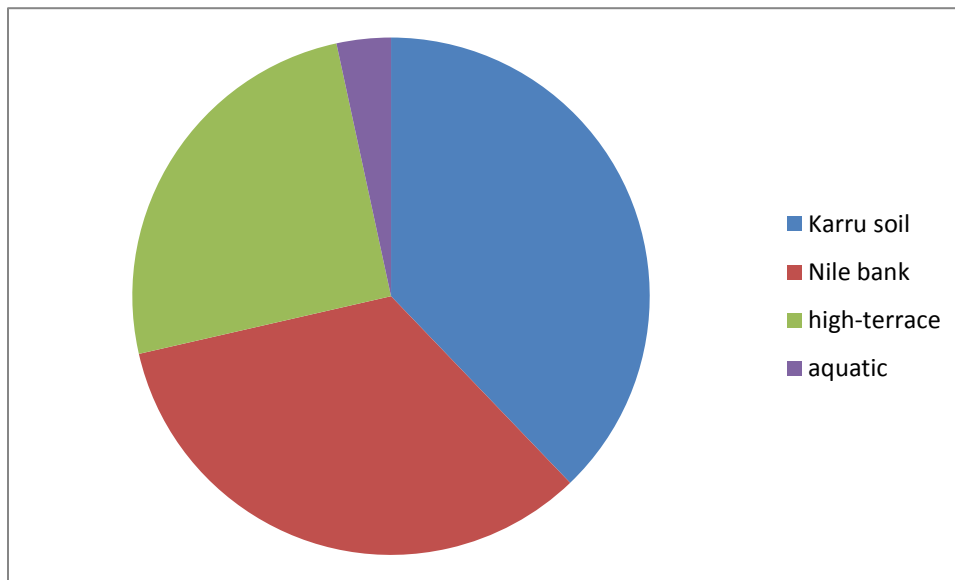


Figure (2): Percentage of plants collected from the different vegetation zone in Shendi area

Figure (3) present the similarity between the vegetation units of the study area. It is clear that there is on similarity between the aquatic flora and any of the other units. The highest similarity is recorded between the Karru soil and the Nile Bank (33%).

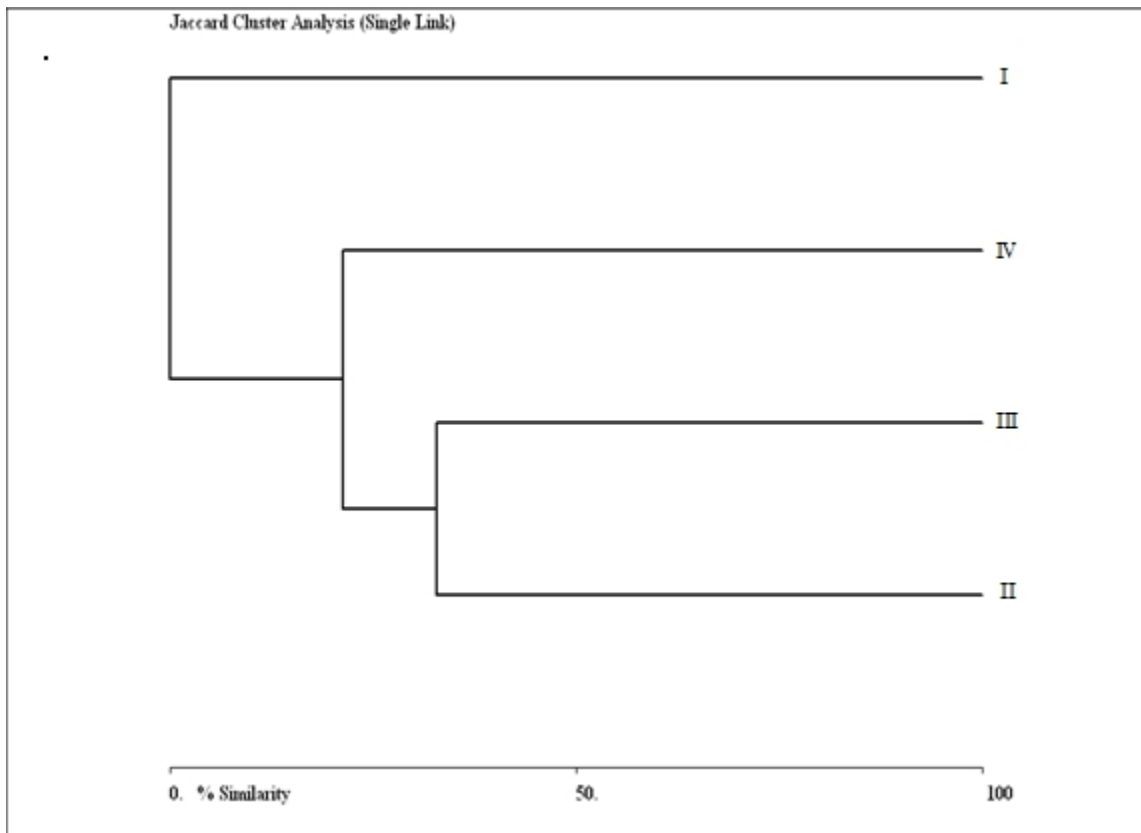


Fig (3): The similarity between the vegetation units of the study area

It is clear from the floristic composition and vegetation study that there is a positive correlation between the habitat and the vegetation performance.

The correlation appears in the presence of the best morphological quantitative characteristics of the species which are found nearest to the water. Increase of the natural vegetation in the Nile Bank and the karru soil may be attributed mainly to the annual deposition of the fertile alluvium soil, high relative humidity records and increase in the moisture content of the soil. Also the floods may carry some seeds of plant species different from those in the adjacent units as *Argemone Mexicana* which invades the area recently. Most of the recorded species near the water are weedy plant and the woody cover is relatively two. The area is largely cultivated, heavily grazed or modified by human activities (Kamain). *Acacia nilotica* appears as a stable well established species and still covers a relatively large area in the Nile Bank. It can be considered as a main source of fire woody and charcoal productions. *Acacia Seyal* according to EL Amin (1990) vegetation mapping and Halwagy (1961) had been reported as a widely distributed species along the banks of the Nile. It seems that this species has been completely removed due to human interference mainly in the form of Agricultural schemes construction.

The un cultivated area in the high terrace vegetation units is atypical desert to semi-desert. Intensive grazing and the effect of the Sahelian drought which struck the region have contributed to deterioration of the natural vegetation in the area. This effect can be observed in the woody species in the form of the deformed and stunted growth of *Maerua crassifolia* which is highly affected by animal browsing *Prosopis juliflora* which had been introduced to Sudan to stabilize the mobile sands and recently started to

dominate the area even in the Nile bank and Karru soils and replaces the natural woody species of the region. The annual and ephemeral vegetation after the rainy season is devoid of weedy plant due to extreme dryness and heavy grazing. Most of the weedy species are confined to the areas near the railway and the high way leading to Khartoum on Atbara. The persisting species are almost rejected or unpretend to animals such as Umm shoewaika (*Fagonia indica*), Sanmaka (*Senna alexandrina* Mill.) and Amayoga (*Tephrosia apollinea* (Delile) DC.) perennial species are mainly confined to the Wadis, Khor beds and depressions.

3.2. Traditional Medicinal plants in Shendi area

3.2.1. Medically used plant species by the locals

The questionnaire distributed among people in Shendi area revealed that, the percentage of people who used plants in medical remedies increase with the increase of their age. People of age above 55 years were found to have high tenancy to cure locally by plants (26.7%).

The percentage of the people in the sample agreed with the local remedies was 91.7% and these who though it is effective are (72.7%), cheap (9.1%) and safe (14.5%). They gained their knowledge from history and their own experiences, appendix (2).

Forty six plant species are reported by the people in the area as medicinal plants to cure different diseases (Table 2).

The highest percentages obtained by (30%) Hargel (*Solenostemma argel* (Del.) Hayne), (28%) Gared (*Acacia nilotica*), (26%) Helba (*Trigonella foenum-graecum* L.) and (25%) Mahareb (*Cymbopogon schoenanthus* (L.). The lowest percentages recerded by Tundub (*Capparis deciduas*), Gum Arabic (*Acacia senegal* (L.) Willd), they represent 1.7% of the total sample.

Most of the medicinal plants reported in this study were also mentioned by Ibrahim (1996), and Al Ghazali *et al*, (1994). Some of the plants used by the local people in the area are not part of Shendi flora.

Table (2): list of the plant species reported by Shendi locals and their traditional remedies and uses

Scientific Name	Local Name	Uses	%of user
<i>Acacia ehrenbergiana</i>	Salam	The stem smoke is used to cure rheumatoid and joint ache.	3.3
<i>Acacia nilotica</i>	Garad; Sunt	It used for fever and chest diseases as past, steaming and syrup and as ground on wounds	28.3
<i>Acacia Senegal</i>	Gum Arabic	It is used for healing renal diseases.	1.7
<i>Acacia seyal</i> Del. subsp. seyal	Talih	The stem smoke is used to cure rheumatoid and jointache.	1.7
<i>Acacia tortilis</i> subsp. <i>raddiana</i>	Seyal	Ground leaf is used as paste for healing wound and abscess and stem smoking for rheumatoid and joint pains	3.3
<i>Adansonia digitata</i>	Tabaldy	Soaked fruits are used for healing dysentery.	1.7
<i>Allium sativum</i>	Toum	It is used for healing blood pressure hypertension. Also it is mixed with honey for healing jaundice.	13.3
<i>Aloev era</i>	Sabar	Stem is used for healing tumors and gelatinous substance for healing tonsillitis and head cortex.	3.3
<i>Artemisia absinthium</i>	Demsesa	The leaf powder is used for curing diabetes and the boiled leaves for healing renal pebbles and diseases and stomachache	11.7
<i>Artemisia vulgaris</i>	Sheeh	It is used for stomachache and gynopathy.	1.7
<i>Azadirachta indica</i>	Neem	Stem and leaves are used for healing toothache and soaked leaves for healing malaria	3.3
<i>Balanites aegyptica</i>	Lalob	The fresh and soaked fruit are used for healing diabetes. Also, it is used for healing tapeworms (<i>Taenia spp</i>) and as laxative.	16.7
<i>Calotropis procera</i>	Ushar	Leave are used for joint pains and the milky substance	5

<i>Capparis deciduas</i>	Tundub	It is used for healing renal diseases.	1.7
<i>Cinnamomum verum</i>	Grfa	Boiled phloem is used for healing diabetes and menstrual pain (menorrhagia).	1.7
<i>Citrullus colocynthis</i>	Handal	The fruit is used to cure rheumatoid and joint ache and seed is used for healing diabetes	8.3
<i>Coriandrum sativum</i>	Kaspara	Ground fruits are used for healing chest, stomachache and headache.	3.3
<i>Croton zambesicus</i>	Um Glagla	The boiled fruit is used as syrup for healing ruinous inflammation, mineral, cough, stomachache and malaria.	11.7
<i>Cymbopogon schoenanthus</i>	Mahraib	Boiled leaf is used as syrup for curing urinary tract, renal inflammation and stomachache	25
<i>Fagonia indica</i>	Abu shoka	It is used as paste for healing tonsillitis and abscess	8.3
<i>Grewia tenax</i>	Gedam	Fruit juice is used for healing anemia.	1.7
<i>Haplophyllum tuberclata</i>	Hza	All the parts of plant are used boiled or ground to cure gynopathy, malaria and stomachache. The smoke is used for healing chest diseases and nose congestion.	10
<i>Hibiscus sabdariffa</i>	Karkady	It is used boiled, hot or cold, for healing cough, flue and inflammation of chest and hypertension.	8.3
<i>Hordeum vulgare</i>	Shaeer	It is used as juice for renal and urinary problems.	5
<i>Hyphaene thebaica</i>	Dom	The fruit soaked and used to cure typhoid and blood pressure	6.7
<i>Indigofera oblongifolia</i>	Dahasir	Leaves ore ground used to cure finger wounds in foot	1.7
<i>Lawsonia inermis</i>	Henna	Leaves are used for healing headache.	3.3
<i>Lepidium sativum</i>	Rashad	Seeds are used for healing intestine inflammation.	3.3
<i>Leptadenia</i>	Marakh	The stem smoke is used to cure rheumatoid and joint ache.	8.3

<i>pyrotechninica</i>			
<i>Lupinus termis</i>	Termis	Fruits are used for healing diabetes.	1.7
<i>Mentha viridis</i>	Nanaa	Disinfectant for healing ever acidity and stomachache	17.5
<i>Moringa oleifera</i>	Moringa	It is used soaked leaves for healing headache, blood diseases (haematitis), diabetes and stomachache. Also, it is used for healing urinary tracts because it contains calcium	11.7
<i>Nigella sativa</i>	Cumon	It is dropped in rose pockets. fruits are used for healing chest diseased mixed with honey and sesame oil	15
<i>Panicum turgidum</i>	Tomam	The stem smoke is used to cure rheumatoid and joint ache.	6.7
<i>Pennisetum typhoides</i>	Dokhn	It is eaten for healing rheumatism.	1.7
<i>Phoenix dactylifera</i>	Palah	The fruit is used as laxative.	1.7
<i>Psidium guajava</i>	Guava	Leaves are boiled for healing lung inflammation.	1.7
<i>Punica granatum</i>	Roman	Powder for stomachache and over acidity and dysentery	10
<i>Ricinus communis</i>	Khrwa	Oil, powder and ground leaves are used for healing breast, wounds and abscess. It is used as paste	3.3
<i>Senna atexandrina</i>	Sanmaka	It is used boiled for stomachache , acidity and relaxant mixed with sesame oil	18.3
<i>Solenostemma argel</i>	Hrgel	Leaves are used soaked in gynecology, stomachache, diabetes, and urinary, tract inflammation.	30
<i>Sonchus oleraceus</i>	Molaita	Leab is eaten fresh for healing diabetes and stomachache.	10
<i>Tamarindus indica</i>	Aradib	Its juice is used for healing malaria	5
<i>Trigonella foenum-graecum</i>	Halba	The boiled fruit is used for healing diabetes stomachache and gynopathy. It is also used as laxative tablets, healing of abscess and dermatitis.	26.7
<i>Zingiber officinale</i>	Zingiber	It is used heated for stomachache	6.7
<i>Zizphus spina-christi</i>	Sider	The fruit is eaten to heal The stem smoke is used to cure rheumatoid and joint ache.	15

3.2.2. Chemical Analysis

3.2.2.1. Qualitative phytochemical creening

Three plants namely: *Tribullus terrestris*, *Fagonia indica* and *Artemisia absinthium* are chemically analyzed, using three extracts: ether, methanol and water.

The results in table (2) show that anthracinosides is not detected in all plants tested in this study; this is also supported by the previous workers.

In *Tibullus terrestris* leaves and fruits alkaloids, glycosides, flavonoids, resins, tannin, saponin, phenols and terpenoids are present. Most of the studied parameters are detected in methanol extract. Water extract contains both saponins and flavonoids. While tannin and phenols are detected in all extracts of leaves, terpenoids are found in all extracts of fruits.

The chemistry of *T. terrestris* has been extensively studied and the occurrence of saponins, flavonoids, alkaloids, lignanamides and cinammic acid amides has been reported in different works (Saleh *et al.*, 1982; Bourke *et al.*, 1992; Ren *et al.*, 1994). This plant is extremely rich in substances having potential biological significance, including: saponins, flavonoids, alkaloids and other nutrients (Wang *et al.*, 1997). The quantities and presence of these important metabolites depend on the various parts of the plant used. The fruit and root of *T. terrestris* contains pharmacologically important metabolites such as phytosteroids, flavonoids, alkaloids and glycosides (Wu *et al.*, 1996). A good number of various saponins and their different derivatives have also been identified in *T. terrestris*, of which diosgenin, gitogenin and chlorogenin are in the leaf tissue. The presence of spirostanol and furostanol saponins is a characteristic feature of this plant,

the latter being considered to be biogenetic precursors of their spiro analogs (Mahato *et al.*, 1982).

Fagonia indica aerial parts contain alkaloids, glycosides, flavonoids, resins, tannin, saponin, phenols and terpenoids. Except flavonoids all the studied parameters are detected in methanol extract. In water extract only saponin is present.

Fagonia indica has been found to contain saponins (Abdel- Khalik *et al.*, 2001), alkaloids (Sharawy and Alshammari, 2009), terpenoids (Perrone *et al.*, 2007), sterols (Shoeb *et al.*, 1994), flavonoids (Ibrahim *et al.*, 2008), proteins and amino acids (Sharma *et al.*, 2010), coumarins (Zhang *et al.*, 2008), trace elements (Fatima *et al.*, 1999).

The leaves of *Artemisia absinthium* plant extracts resulted in the presence of alkaloids, glycosides, flavonoids, resins, tannin, saponin, phenols and terpenoids. The tested parameters are detected mostly in water and methanol extracts. In water extract only saponin is detected.

The result was totally agreed with that of (Nikhat *et al.*, 2013) who reported that flavonoids, tannins, glucosides, carotenoids, and phenolic compounds are major phytoconstituents of *Artemisia absinthium*.

Table (3): Qualitative phytochemical results in the studied plant species

Plant Species		<i>Tribulus terrestris</i>						<i>Fagonia indica</i>			<i>Artemisia absinthium</i>		
Part of plant used		Leaves			Fruits			Aerial parts			Leaves		
Extract		Ether	Methanol	Water	Ether	Methanol	Water	Ether	Methanol	Water	Ether	Methanol	Water
Test	Alkaloids	-	+	-	-	+	++	-	+	-	-	+	+
	Glycosides	-	+	-	-	±	-	-	+	-	-	+	-
	Flavonoids	-	-	++	-	-	++	±	-	-	-	-	-
	Resins	-	-	-	-	+	-	+	++	-	-	+	++
	Tannins	+	++	+	-	+	-	-	+	-	+	++	+
	Saponins	-	+	+	-	+	++	-	++	+	-	+	-
	Phenols	+	++	+	-	+	-	-	++	-	-	++	+
	Terpenoids	-	+	-	+	+	±	±	++	-	-	+	++
	Anthracenosides	-	-	-	-	-	-	-	-	-	-	-	-

3.2.2.2. Antioxidant activity

The potential antioxidant activity of *Tribullus terrestris* leaves and fruits, *Fagonia indica* aerial parts and *Artemisia absinthium* leaves in different extracts was determined on the basis of the scavenging activity of the stable free radical DPPH (2,2-diphenyl-1-picrylhydrazyl). All tests exhibited weak antioxidant abilities to reduce DPPH radicals ranged from 10% to 32% RSA (table4). This might be according to glycoside presence as whole glycosides. The highest affection was obtained by *Artemisia absinthium* leaves in methanol extract (38%); this can be considered as moderate antioxidant abilities, it might be due to presence of glycoside as aglycon.

Table (4): DPPH assay of different extract in the studied plant species

Plant species	Used part	Extract	%RSA \pm SD(DPPH)
<i>Tibullus terrestris</i>	Leaves	Ether	10 \pm 0.32
		Methanol	32 \pm 0.43
		Water	13 \pm 0.04
	Fruits	Ether	26 \pm 0.27
		Methanol	14 \pm 0.46
		Water	18 \pm 0.13
<i>Fagonia indica</i>	Aerial parts	Ether	32 \pm 0.71
		Methanol	19 \pm 0.42
		Water	27 \pm 0.08
<i>Artemisia absinthium</i>	Leaves	Ether	10 \pm 0.35
		Methanol	38 \pm 0.37
		Water	12 \pm 0.11

Recommendations:

It is recommended that this study should be followed by detailed ecological, taxonomical and ethnobotanical studies of the natural plants in Shendi Locality. Other important recommendations include:

1. Management of the area should be on basis of thorough knowledge of plants as a resource for the benefit of man and his domestic animals.
2. More ethnomedical studies are important for the safety of the traditional use of plants as illness remedy.
3. Conservation of natural vegetation, especially palatable species for grazing or browsing, must be a target.
4. Environmental educational programmes and awareness for the protection of the cultural landscape of the study area is needed.

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Websites

- <http://apps.kew.org/herbcat/navigator>. do.
- <http://www.theplantlist.org>

Reoprts

- ARC: Agricultural Research Corporation Shendi (2012)
- ASA: Agricultural Sector Administration Shendi (2012)
- NEC: National Electricity Corporation Shendi (2012)
- NFCp National Forestry Corporation Shendi (2012)
- NWC: National Water Corporation Shendi (2012)
- MAR: Ministry of Animal Resources Shendi (2012)
- MPE: Ministry of Public Education Shendi office Shendi (2012)
- SO: Statistical Office Shendi (2012)

Appendix (1): Statistical analysis of the questionnaire

Frequencies Tables

Table (1): Age groups:

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 20-30	14	23.3	23.3	23.3
31-40	15	25.0	25.0	48.3
41-55	15	25.0	25.0	75.0
>55	16	26.7	26.7	100.0
Total	60	100.0	100.0	

Table (2): Agreement of people to the usage of medicinal plant

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Yes	55	91.7	91.7	91.7
No	5	8.3	8.3	100.0
Total	60	100.0	100.0	

Table (3): Sources of informations to use the medical plants

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Experience	30	50.0	54.5	54.5
	Trusted sources	15	25.0	27.3	81.8
	Other	10	16.7	18.2	100.0
	Total	55	91.7	100.0	
Missing	System	5	8.3		
Total		60	100.0		

Table (4): Reasons for using medicinal plants

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Effectiveness	40	66.7	72.7	72.7
	High drugs prices	5	8.3	9.1	81.8
	un availability of the drug	2	3.3	3.6	85.5
	Other	8	31.3	14.5	100.0
	Total	55	91.7	100.0	
Missing	System	5	8.3		
Total		60	100.0		

Table (5): Tendency toward medicinal plants

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High	30	50.0	54.5	54.5
	Average	24	40.0	43.6	98.2
	Low	1	1.7	1.8	100.0
	Total	55	91.7	100.0	
	Missing System	5	8.3		
	Total	60	100.0		

ppendix (2): plant similarity

Table (1): Clusters

Step	Clusters	Distance	Similarity	Joined 1	Joined 2
1	3	67.1641769	32.8358231	1	2
2	2	78.6885223	21.3114777	1	3
3	1	100	0	1	4

Table (2): Similarity

Similarity Matrix	I	Ii	Iii	Iv
I	*	32.8358	21.3115	0
Ii	*	*	11.2903	0
Iii	*	*	*	0
Iv	*	*	*	*