

## Ethnobotanical Studies of flora of Jebel Aulia district, Khartoum state with emphasis to toxicity of the common medicinal plants

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**Abstract:** Ethnobotany is the scientific study of the relationships that exist between people and plants. Ethnobotanists aim to document, describe and explain complex relationships between cultures and plants, focusing primarily on how plants are used, managed and perceived across human societies. This includes use for food, clothing, currency, ritual, medicine, dye, construction, cosmetics.. Ethnobotanical studies are often significant in revealing locally important plant species especially for the discovery of crude drugs The documentation of traditional knowledge, especially on the medicinal uses of plants, has provided many important drugs of modern day. Out of the total flowering plants reported from the world, more than 50, 000 are used for medicinal purposes ( Govaerts, 2001 ). Extensive and intensive field trips were conducted to the study area during a course of two years from 2013 to 2015 representing several sites through Jebel Aulia district, Khartoum state. The study revealed a total of 117 species belonging to 100 genera and 45 families were recorded at Jebel Aulia locality. The family Poaceae was found to be the richest (13 species) followed by Ceasalpiniaceae, Euphorbiaceae, Mimosaceae (7 species) and Asteraceae (6 species). Herbs have dominated the vegetation of the study area (62. 40%) followed with trees (15. 40%), shrubs (8. 5%). Genus *Euphorbia* was considered as the most speciose (4 species) pursued with *Senna* and *Ipomea* which were represented by 3 species each. *Tribulus longipetalus* and *Cyperus alopecuroides* along with their Ethnomedicinal uses were documented for the first time. Fruits were the most commonly used plant part to prepare medicine followed with leaves and seeds. The main preparation methods of herbal remedies were infusion (25%) followed with decoction (14. 3%), edible (10. 7%) and pills (10. 7%). Oral administration was the most common route of herbal remedies within traditional medicine. Urinary tracts, kidney and abdominal complaints were the most frequent ailments traditionally healed. The source of medicinal plants was wild, (41. 66%), were cultivated (33. 34%) and (25%) were commercially bought from the market. *Senna alexandrina* was the most cited and important plant in the study area followed with *Ziziphus spina-christi*, *Acacia nilotica*, *Solenostemma argel* and *Cymbopogon proximus*. High informants consensus factor was indicated for Medicinal, furniture and food uses. *Ziziphus spina Christi*, *Acacia senegal*, *Allium sativum* and *Cinnamomum verum* have highest use-value ranging from (0. 062 to 0. 05). Cytotoxicity was evaluated using plants with high relative frequency of citation. The results revealed that LC<sub>50</sub> of water and ethanolic extracts of *Acacia nilotica* were more than 1000 µg/ml which considered not toxic and consequently safe at this dose. Whereas, water and ethanolic extracts of *Senna alexandrina* were less than LC<sub>50</sub> =256. 206 - 409. 6079 µg/ml. which is considered moderately toxic. Therefore, Senna extracts should be carefully used.

**Keywords:** Jabal Aulia, Khartoum State - plant toxicity - medicinal plants.

## دراسة تصنيفية للنباتات واستخداماتها العشبية في منطقة جبل أولياء، ولاية الخرطوم مع التركيز على سمية النباتات الطبية المحلية

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المخلص: علم استخدام النباتي هو الدراسة العلمية للعلاقات الموجودة بين الناس والنباتات. يهدف علماء استخدام النباتي إلى توثيق ووصف وشرح العلاقات المعقدة بين الثقافات والنباتات، مع التركيز بشكل أساسي على كيفية استخدام النباتات وإدارتها وإدراكها عبر المجتمعات البشرية. وهذا يشمل استخدام الطعام والملابس والعملية والطب والصيغ والبناء ومستحضرات التجميل.. غالبًا ما تكون الدراسات الاستخدام النباتي مهمة في الكشف عن أنواع نباتية مهمة محليًا خاصة لاكتشاف الأدوية الخام. وقد وثق توثيق الحافة المعرفية التقليدية، خاصة في الاستخدامات الطبية للنباتات. وقد قدم العديد من الأدوية المهمة في العصر الحديث. من إجمالي النباتات المزهرة المبلغ عنها من العالم، يتم استخدام أكثر من 50000 للأغراض الطبية (Govaerts, 2001). أجريت الدراسة في منطقة جبل أولياء لفترة 2013 إلى 2015. ولقد أسفرت الدراسة عن توثيق 117 نوع نباتي تتبع 100 جنس و45 فصيلة نباتية. وجد أن الفصيلة النجيلية من الفصائل في منطقة الدراسة حيث مثلت ب 13 نوع نباتي. تليها كل من الفصيلة البغمية والفصيلة اللبينية والفصيلة الطلحية بكل منها 7 أنواع نباتية ومن ثم الفصيلة المركبة حيث مثلت ب 6 أنواع نباتية. وفي تحليل الغطاء النباتي للمنطقة وجد أن النباتات العشبية سائدة بنسبة (62.40%) تليها الأشجار بنسبة (15.40%) والشجيرات بنسبة (8.5%). يعتبر جنس *Euphorbia* أكثر الاجناس من حيث عددية الأنواع اذ يضم 4 أنواع نباتية، يليه جنس *Ipomea* حيث يضم 3 أنواع نباتية. تم لأول مرة توثيق الاستخدامات الطبية لنباتي الضريسة والسعدة (ثمر بلادي) ومن ثم تم إدراجهما كنباتات طبية. وجد أن الثمار هي الجزء النباتي الأكثر استخداما في تحضير الادوية العشبية يليه كل من الاوراق والبدور. تعتبر طريقة النقع (25%) هي الطريقة السائدة في تحضير الادوية العشبية يليها طريقة الغلي (14.3%) وتليها طريقة الحبوب (10.7%) والاكل المباشر (10.7%). تعتبر طريقة الشراب عن طريق الفم هي الطريقة الشائعة في تناول الأدوية العشبية في الطب الشعبي. وجد أن التهابات المجاري البولية والكلية ومشاكل البطن هي أكثر الامراض الشائعة في المنطقة والتي تعالج عن طريق الطب التقليدي. ايضا تشير الدراسة الي أن مصدر الادوية العشبية كل من النباتات البرية بنسبة (66.41%) والمستزرعة بنسبة (33.34%) و(25%) من النباتات تشتري من الأسواق. ويعتبر نبات السنمكة *Senna alexandrina* ذو اهمية في منطقة الدراسة حيث يتردد كثيرا بين المعالجين أو المستبينين ويليها كل من *Ziziphus spina-christi* نبات السدر، *Acacia nilotica* السنط، *Solenostemma argel* الحرجل *cymbopogon proximus* والمحريب. كما أجمع المستبينون أن النباتات لها فوائد طبية ويكمن استخدامها في الغذاء والأثاث. تعتبر نباتات (*sativum Allium*) و (*Acacia senegal Cinnamomum verum* and *Ziziphus spina-Christi*) ذات أعلى قيمة من حيث الاستخدام في مدي من (0.05 to 0.062). تمت دراسة السمية لنباتات الأكثر ترددا من حيث الاستخدام، وتمت دراسة مستخلصاتها المائية والكحولية، حيث أثبتت دراسة السمية أن نصف الجرعة القاتلة للمستخلص الكحولي والمائي لنبات السنط أكبر من 1000 µg/ml وذلك يشير أن هذه المستخلصات غير سامة عند هذه الجرعة. بينما أن نصف الجرعة القاتلة للمستخلص الكحولي والمائي لنبات السنمكة هي (256.206 - 409.6079 µg/ml) وهي أقل 1000 µg/ml وهي تعتبر سامة نوعا ما وهذه النتائج تشير الاستخدام الحذر عند تناول نبات السنمكة في العلاجات العشبية.

الكلمات المفتاحية: جبل أولياء، ولاية الخرطوم - سمية النباتات - النباتات الطبية.

### Introduction:

Ethnobotanical and medicine plants study is located in Jebel Aulia, Khartoum state. Ethnobotany is the scientific study of the relationships that exist between people and plants. Wild plants were obviously utilized by the local community which demonstrating the close relationship among the locals and their

natural environment. The World Health Organization (WHO) reported that nearly 4 billion people (80% of the world population) initially use herbal remedies to resolve their health related issues. Additionally, 25% of the prescription drugs sold in developed countries comprised active ingredients of herbal origin. The documentation of medicinal plants of Sudan was performed by Medicinal and Aromatic Plants Research Institute (MAPRI), where the medicinal plants of certain districts were published ; Erkawit, Nuba Mountains, White Nile, North Kordofan, and of Angasana (El Ghazali, , 2003) respectively. Ethnobotanical study of medicinal and aromatic plants in jabel el dair national reserve, Northern Kordofan state was reported by (Haidar itali. , ( 2013). While, ethnoveterinary study in Gezira state was conducted by Haidar and Amel, 2013. Ethnopharmacology of Medicinal Plants used in North Kordofan was studied by (El Kamali, 2009).

### **Medicinal Plants:**

It is estimated that at least 265, 000 species of seed plants exist on earth. Only less than a half percent of these have been studied exhaustively for their chemical composition and medicinal value. Medicinal plants are plant or plant parts or its exudates having medicinal properties. In fact, it is the chemical constituents in plants that yield the medicinal prosperities (Maryum, 2004). The plants are potential source of medicines since ancient times. According to World Health Organization, 80% of the populations in the world depend on traditional medical practitioners for their medicinal needs (Elumalai itali. , (2009).

### **Sudanese Traditional medicine:**

Like other developing countries, Sudanese traditional medicine represents a unique blend of indigenous cultures with Islamic, Arabic and African traditions. Consequently, a variety of diseases - epidemic and endemic - are known. To face them, people have tapped the environmental resources, e. g. plants, minerals and animal products for the management of health. The documentation of medicinal plants of Sudan was performed by Medicinal and Aromatic Plants Research (MAPRI), where the medicinal plants of certain districts were published ; Erkawit, Nuba Mountains, White Nile, North Kordofan, and of Angasana.

Sudanese medicinal plants have been reported as a source of antibacterial and antiviral agents (Ietidal *et al.* , 2010). reported the Fasciolicidal properties of some of these plants. Comprehensive studies of antimicrobial properties of Sudanese medicinal plants. Ethnobotanical study of medicinal and aromatic plants in jabel el dair national reserve, Northern Kordofan state was reported by (Haidar itali. , 2013. While, ethnoveterinary study in Gezira state was conducted by Haidar and Amel, 2013. Ethnopharmacology of Medicinal Plants used in North Kordofan was studied by (El Kamali, 2009).

### Description of the Study Area :

The study area is confined to Jebel Aulia locality, Khartoum state. It is located between latitudes 16° and 15° N and longitudes 32° 51' and 32° 45' E. at the altitude ranges from 450 to 876 m. above the sea level. The total area of the district is approximately 1632 sq. km. The district is boarded by Khartoum locality in the north and east, White Nile State in the South, Omdurman locality in the West and Gezira state in the East.



Figure (1) Map showing the location of Jebel Aulia.

### Ethnobotanical Survey :

The ethnobotanical surveys were carried out during four different visits: June, July, October and December 2015 using semi-structured questionnaires. Conversations were held at informants' homes with the assistance of some known local people. Eightieths informants including 45 males and 35 females of about 1, 850, 000 total inhabitants were interviewed (Governmental Records from Management Unit of Jebel Aulia locality). Ten of the informants were male local herbal. The informants' ages ranged from 40 to 77 years with a mean age of 60 years. Informants were selected randomly and no appointment was made prior to the visits. They were asked about the plants.

### General Cytotoxic Bioassay (Brine shrimp lethality test BSLT):

Cytotoxicity of extracts was carried out against Brine shrimps (*Artemia salina* L.).

LC50 was determined from the 24 h counts. The general toxicity activity was considered weak when the LC50 values of crude extracts and pure substances were between 500 and 1000 µg/mL, moderate when the LC50 was between 100 and 500 µg/mL, and designated as strong when the LC50

ranged from 0 to 100 µg/mL but those with <20 µg/mL were considered to be very active. (Padmaja et al. , 2002). considered the LC50 values > 1000 µg/ml as non-toxic. From a pharmacological point of view, a good relationship has been found with brine shrimp lethality test to detect anti-tumor compounds in terrestrial plant extract.

#### **Sample pre-treatment:**

Plant samples were collected from their natural habitat. Then cleaned from dirt and shade dried with occasional shifting; the dried samples were separately ground into coarse powder using a mechanical grinder and then stored in airtight containers.

#### **Preparation of Crude Extracts:**

Extraction was carried out according to method described by Sukhdev et. al. , (2008) 50 grams of each species was soaked in absolute ethanol at room temperature. The resulting residues were filtered, pooled and evaporated to dryness under reducing pressure at 45°C to afford a green viscous syrup, Extracts allowed to air till complete dryness.

$$\text{Yield\%} = \frac{\text{Weight of Extract Obtained}}{\text{Weight of Plant Sample}} \times 100$$

#### **Preparation of the water extract:**

50 grams of each species was soaked in 500 ml of hot distilled water, and left till cooled down with continuous stirring at room temperature. Extracts were then filtered and freeze-dried in a deep freezer. Extracts were freeze – dried using freeze dryer (Free drier, Trivac, USA). Then afforded dry extracts were obtained. Yield percentage was calculated as mentioned above.

#### **Data Analysis:**

##### **Use value (UV):**

Use value (UV) is a good measure to estimate all the possible uses of a plant species without considering its RFC. UV gives us the relative importance of a species, considering the number of uses mentioned by an informant for a particular wild medicinal plant species. UV was calculated using standard protocols of (Savikin et al. , 2013).

$$UV = u/N$$

Where u is the number of informant's mentioning various uses of a species. UV is generally high i. e. near (1) if the number uses are high and near (0) if the use reports for a species is considerably low. UV does not provide any information on the single or multiple uses of species.

### Relative Frequency of Citation (RFC):

Local importance of each species was calculated by using the Relative frequency of citation (RFC) according to (Vitaliniitali. , (2013).

$$RFC = FC/N$$

Where FC is the number of informants who cited the use of the species N is the total number of informants.

### Informant consensus factor (ICF)

Informant consensus factor (ICF) was calculated to determine the homogeneity of the information for a particular plant to treat a particular ailment. ICF

values ranges from 0. 00 to 1. 00. High ICF value (approaching 1) of an ailment category is obtained when one or a few plant species are documented to be used for the treatment of that ailment by a large proportion of the informants, whereas a low ICF value indicates that informants disagree over which plant to use. ICF is calculated using the following formula:

### Informant Consensus Factor (ICF)

$$ICF = Nur - Nt/Nur - 1$$

Where Nur= number of use report inaparticular ailment (illness)

Nt = number of taxa used to treat that particular ailment by informants.

The fidelity level (FL) which is the percentage of informants claiming the use of a certain plant for the same major purpose, was calculated for the most frequently reported diseases or ailments as:

$$FL(\%) = \frac{N_p}{N} \times 100$$

where  $N_p$  is the number of informants that claim a use of a plant species to treat a particular disease, and N is the number of informants that use the plants as a medicine to treat any given disease.

**Table (1) List of medicinal plants used in traditional medicine by the Jebel Aluia tribe of southern Khartoum sated.**

Families and species names	Local name	Habit	Part used	Preparation	Administration	Medicinal use
Meliaceae <i>Azadirachta Indica</i>	Neem	Tree	Gum Branches Leaves	Decoction	Oral	The decoction is used for toothache, Branches for toothache. Leaves for treatment
Salvadoraceae <i>Salvadora Persica</i>	El arak	Shrub	Branches (twigs) and	Chewing	Oral	Fresh branches or 4 roots are chewed and used as toothbrush as

Families and species names	Local name	Habit	Part used	Preparation	Administration	Medicinal use
			Roots			it strengthens the teeth and gums.
Leguminosae <i>Senna Alexandrina</i>	Senna makka	Herbs	Seeds	Pills	Oral	Seeds are orally used as laxative
Asteraceae <i>Sonchus oleraceus</i>	Moleita	Herbs	Leaves	Edible	Oral	Leaves are rawly eaten for treatment of malaria
Zygophyllaceae <i>Tribulus Longipetalus</i>	Diraisa	Herbs	Fruits	Decoction	Oral	The decoction of fruits is used to treat urinary tracts and kidney infection.
Rhamnaceae <i>Ziziphus spina-christi</i>	Sidir Nabag	Tree	Leaves Bark	Poultice	External	Poultice is applied nourishing the hair. Used for magical or spiritual purposes
Leguminosae <i>Lupinus albus.</i>	Turmos	Herbs	Fruits	Edible	External	Fruits are used for treatment of Diabetes. For treatment and speedy recovery of bone fractures.
Liliaceae <i>Allium Sativum</i>	Thoom	Herbs	Bulbs	Edible oils	Oral	The bulb is taken orally as Anthelmintic(worm), Antihypertensive, and for treatment of tonsils and for lowering cholesterol The oil is used as lotion for nourishing the hair.
Myrtaceae <i>Psidium Guajava</i>	Gawafa		Leaves Fruits	Infusion Tea	Oral	The infusion of leaves is taken orally for treatment of diarrhea Fruits are eaten for the same purposes.
Rutaceae <i>Haplophyllum tuberculatum</i>	Elhazza		Whole Plant	Maceration Tea	Oral	The maceration is taken orally for treatment of inflammation of urine.
Apocynaceae	Hargal		Leaves	Infusion	Oral	The maceration is taken orally

Families and species names	Local name	Habit	Part used	Preparation	Administration	Medicinal use
<i>Solenostemma argel</i>			Aerial Parts	Tea		for treatment of colic and inflammation.
Leguminosae <i>Trigonella foenum graecum</i>	Helba		Seeds	Infusion Pills	Oral	The maceration or pills are used for treatment of abdominal pain and inflammations.
Cucurbitaceae <i>Citrullus Colocynthis</i>	Hundal	Herbs	Fruits	Powder	External	The paste is applied externally for nephritis and kidney stone.
Aipaceae <i>Ammi Visnaga</i>	Khilla	Herbs	Fruits	Infusion	Oral	Te maceration is used for Nephritis and kidney stone
Leguminosae <i>Acacia Nilotica</i>	Garad	Tree	Fruits – leaves	Fumigation Powder, infusion	Oral	Used for treating cold. Powdered leaves mixed with yogurt to treat diarrhea.
Combretaceae <i>Gueira Senegalensis</i>	Gubaish	Herbs	Leaves	Decoction	Oral	The decoction is orally taken for hypertension.
Lauraceae <i>Cinnamomum verum</i>	El Gerfa	Tree	Bark	Infusion Tea	Oral	The infusion is used as remedies against a variety of ailments particularly abdominal complaints. For boosting the memory.
Ranunculaceae <i>Nigella sativa</i>	El Haba El Sawdaa Elkamo On	Herbs	Seeds	Oils (lotion) Pills	Oral	Topically used for the treatment of hair loss and seeds were orally taken for blood pressure.
Poaceae <i>Cymbopogon Proximus</i>	El Maherb	Herbs	Whole Plant	Infusion	Oral	The infusion is used as remedies against a variety of ailments particularly abdominal complaints. Also used against intestinal worms.
Leguminosae <i>Acacia</i>	Shubahi	Tree	Gum	Maceration	Oral	The maceration is used to treat urinary



Families and species names	Local name	Habit	Part used	Preparation	Administration	Medicinal use
<i>Senegal</i>						tract and kidney stones, Renal colic.
Euphorbiaceae <i>Ricinus Communis</i>	Khiruwi	Shrubs	Seeds	Oil	External	Oil is carefully used as laxative. Seed oil is externally applied for nourishing the hair.
Cyperaceae <i>Cyperus Alopecuroide</i>	Sied	Herbs	Corms	Decoction	Oral	The decoction of corms is orally taken to treat inflammation of the urine.
Rutaceae <i>Citrus Aurantifolia</i>	Limone	Shrubs	Fruits	Juice	Oral	The juice of fruits is taken as a drink to treat sore throat. Also used as demulcent.
Apocynaceae <i>Calotropis procera</i>	Ushar	Shrubs	Latex	Paste	External	Latex of the plant is externally applied against scorpion sting.

Table (2) Medicinal plants with their corresponding use value

No	Family name and species name	Use value
1	Leguminosae <i>Acacia nilotica</i>	0.05
2	Leguminosae <i>Acacia Senegal</i>	0.062
3	Liliaceae <i>Allium sativum</i>	0.062
4	Aipaceae <i>Ammi visnaga</i>	0.025
5	Meliaceae <i>Azadirachta indica</i>	0.025
6	Apocynaceae <i>Calotropis procera</i>	0.012
7	Lauraceae <i>Cinnamomum verum</i>	0.05
8	.Cucurbitaceae <i>Citrullus colocynthis (L</i>	0.012
9	Rutaceae <i>Citrus aurantifolia</i>	0.037
10	Poaceae <i>Cymbepogon proximus</i>	0.037
11	Cyperuaceae <i>Cyperus alopecuroides</i>	0.037
12	Combretaceae <i>Guiara seagalensis</i>	0.012
13	Rutaceae <i>Haplophllum tuberculatum</i>	0.012
14	.Leguminosae <i>Lupinus albus</i>	0.037
15	Ranunculaceae <i>Nigella sativa</i>	0.037
16	Myrtaceae <i>Psidium guaiava</i>	0.025

No	Family name and species name	Use value
17	Euphorbiaceae <i>Ricinus communis</i>	0.037
18	Salvadoraceae <i>Salvadora persica</i>	0.037
19	Leguminosae <i>Senna alexandrina</i>	0.025
20	Apocynaceae <i>Solenostemma argel</i>	0.025
21	Asteraceae <i>Sonchus oleraceus</i>	0.025
22	Zygophyllaceae <i>Tribulus longipetalus</i>	0.025
23	Leguminosae <i>Trigonella foenum-graecum</i>	0.037
24	Rhamnaceae <i>Ziziphus spina-Christi</i>	0.062

Table (3) Ailments categories, the informant consensus factor, preferred species

Ailment categories	Informant consensus factor (ICF)	Preferred species
treat diarrhea	0.96	<i>Acacia nilotica</i>
treat urinary tract and kidney	0.94	<i>Acacia Senegal</i>
Antihypertensive, and for treatment of tonsils	0.94	<i>Allium sativum</i>
Nephritis and kidney stone	0.98	<i>Ammi visnaga</i>
<i>Toothache</i>	0.98	<i>Azadirachta indica</i>
against scorpion sting	1	<i>Calotropis procera</i>
boosting the memory.	0.96	<i>Cinnamomum verum</i>
nephritis and kidney stone.	1	<i>Citrullus colocynthis.</i>
Demulcent	0.97	<i>Citrus aurantifolia</i>
used against intestinal worms	0.97	<i>Cymbepogon proximus</i>
Inflammation of the urine.	0.97	<i>Cyperus alopecuroides</i>
<i>Hypertension</i>	1	<i>Guiara seagalensis</i>
inflammation of urine	1	<i>Haplophllum tuberculatum</i>
Treatment of Diabetes. For treatment	0.97	<i>Lupinus albus.</i>
Blood pressure.	0.97	<i>Nigella sativa</i>
The same purposes.	0.94	<i>Psidium guaiava</i>
carefully used as laxative	0.97	<i>Ricinus communis</i>
<i>Toothache</i>	0.97	<i>Salvadora persica</i>
Laxative	0.98	<i>Senna alexandrina</i>
Inflammation	0.98	<i>Solenostemma argel</i>
<i>Malaria</i>	0.98	<i>Sonchus oleraceus L.</i>
Treat urinary tracts and kidney infection.	0.98	<i>Tribulus longipetalus</i>
abdominal pain and inflammations	0.97	<i>Trigonella foenum-graecum</i>
magical or spiritual purposes	0.94	<i>Ziziphus spina-christi</i>

Table (4). ICF for ethnobotanical uses of plants in the study area

Use category	Species (nt)	Use –reports (Ur)	ICF (nur - nt / nur-1)
Medicinal	24	41	0.4
Food	19	29	0.3
Fire wood	5	6	0.2
Forage	28	30	0.07
Fence	7	8	0.1
Charcoal	4	5	0.2
Construction	7	8	0.1
Furniture	5	8	0.4
Commercial	14	5	0.07
Forage	28	30	0.07
Fence	7	8	0.1
Charcoal	4	5	0.2
Construction	7	8	0.1
Furniture	5	8	0.4
Commercial	14	5	0.07

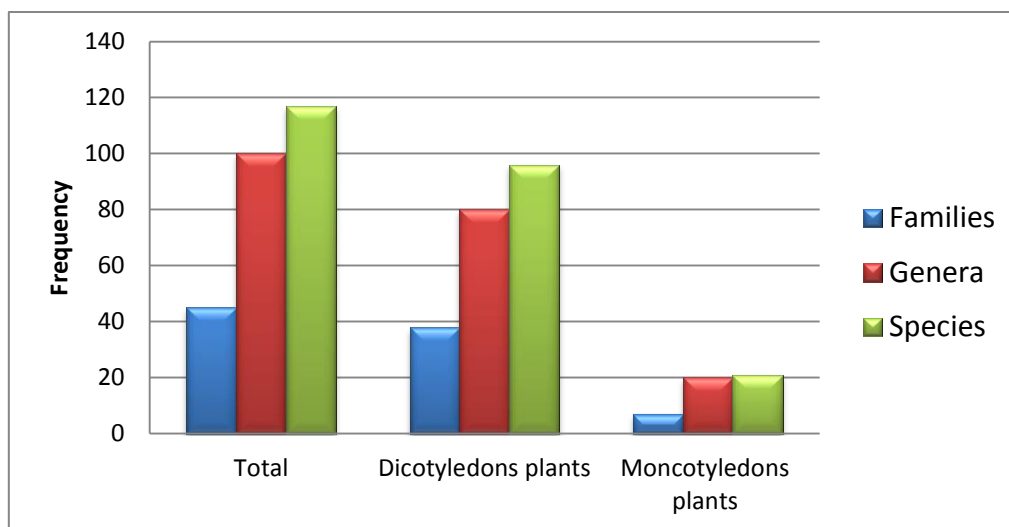


Fig. (2) Floristic spectrum of the study area.

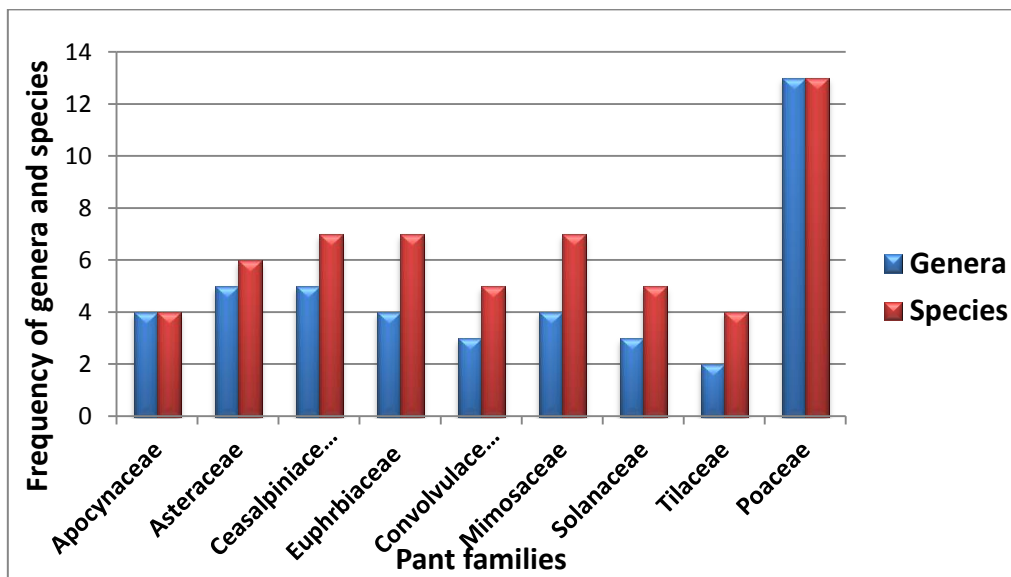


Fig. (3) Most represented plant families in the study area.

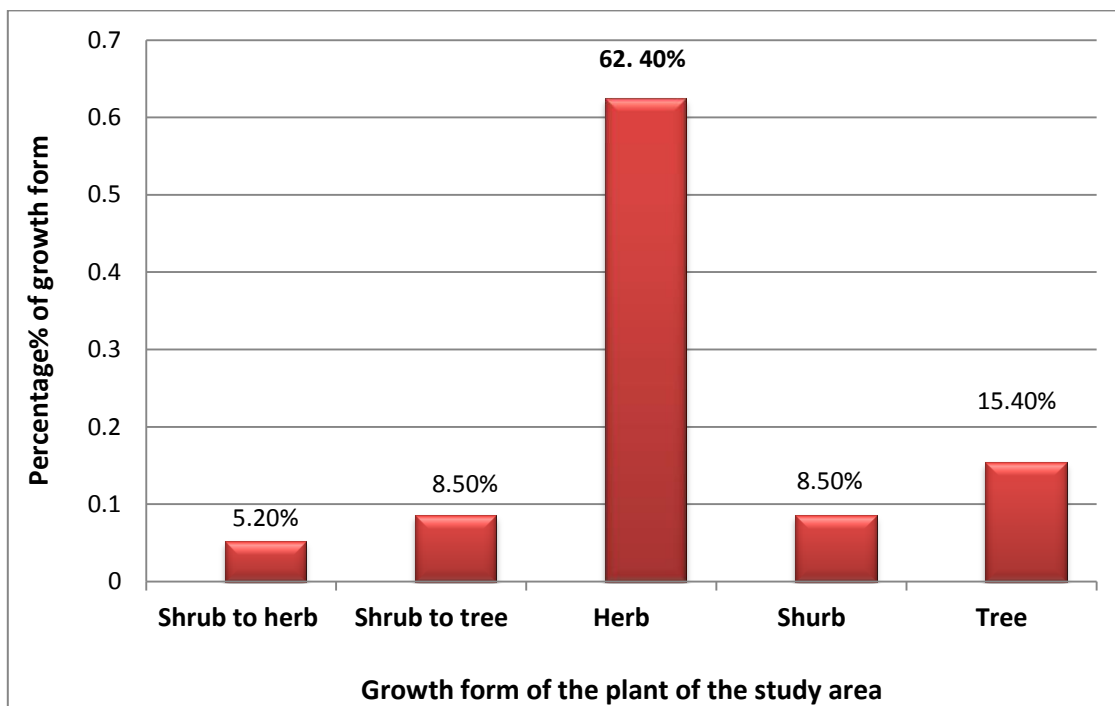


Fig. (4) Relative spectrum of growth form of the palnts in the study area.

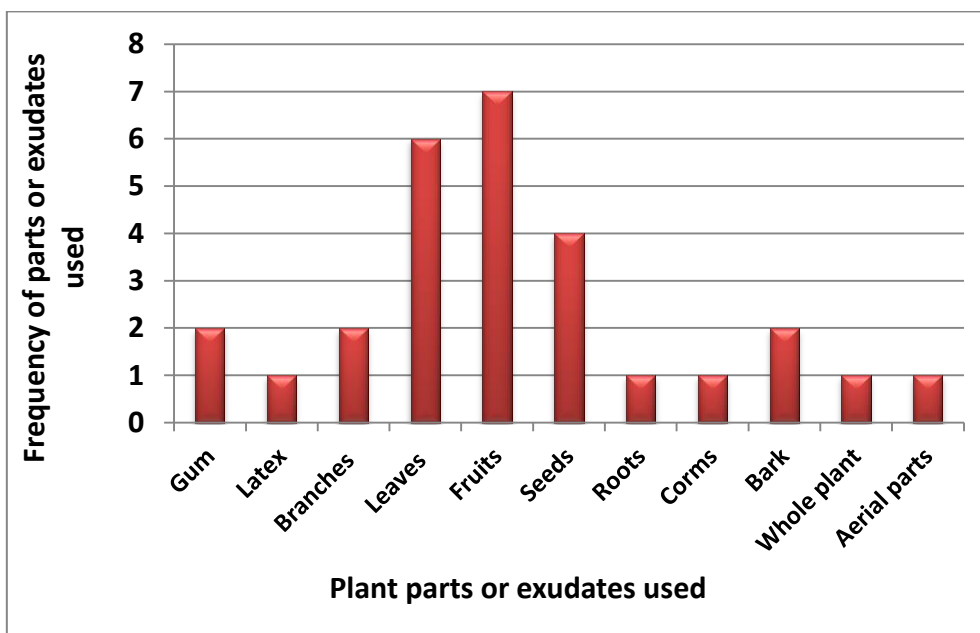


Fig (5) Frequency of plant parts or exudates used in the study area.

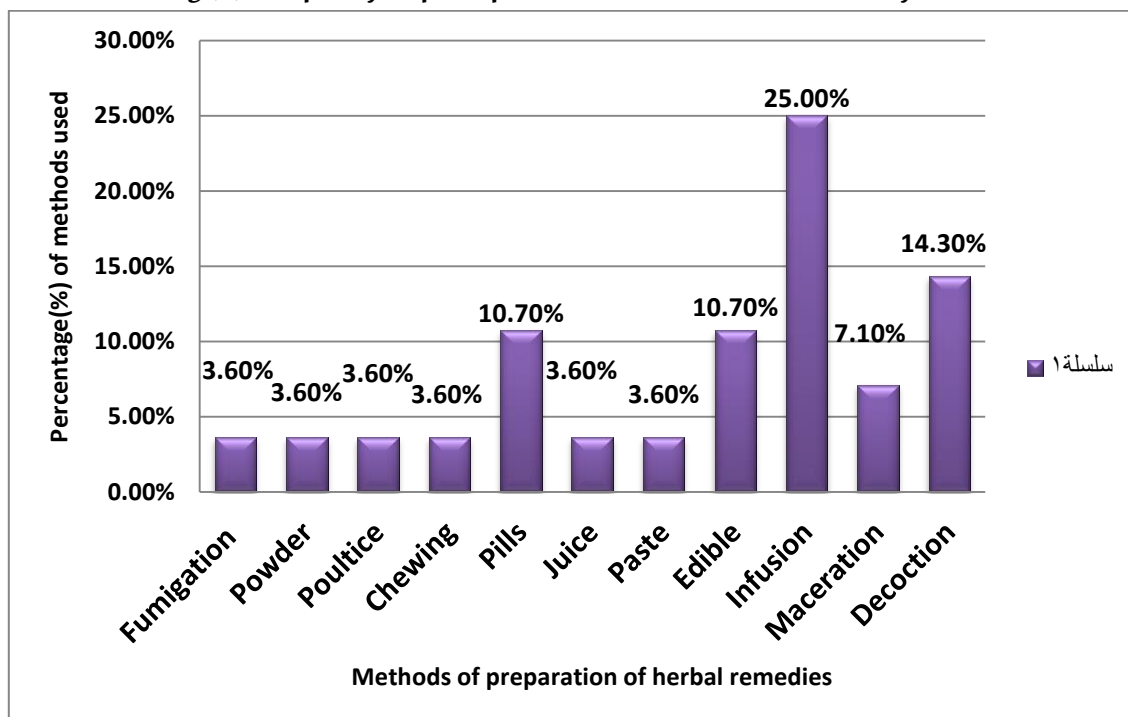


Fig (6) Methods of preparation of herbal remedies in the study area

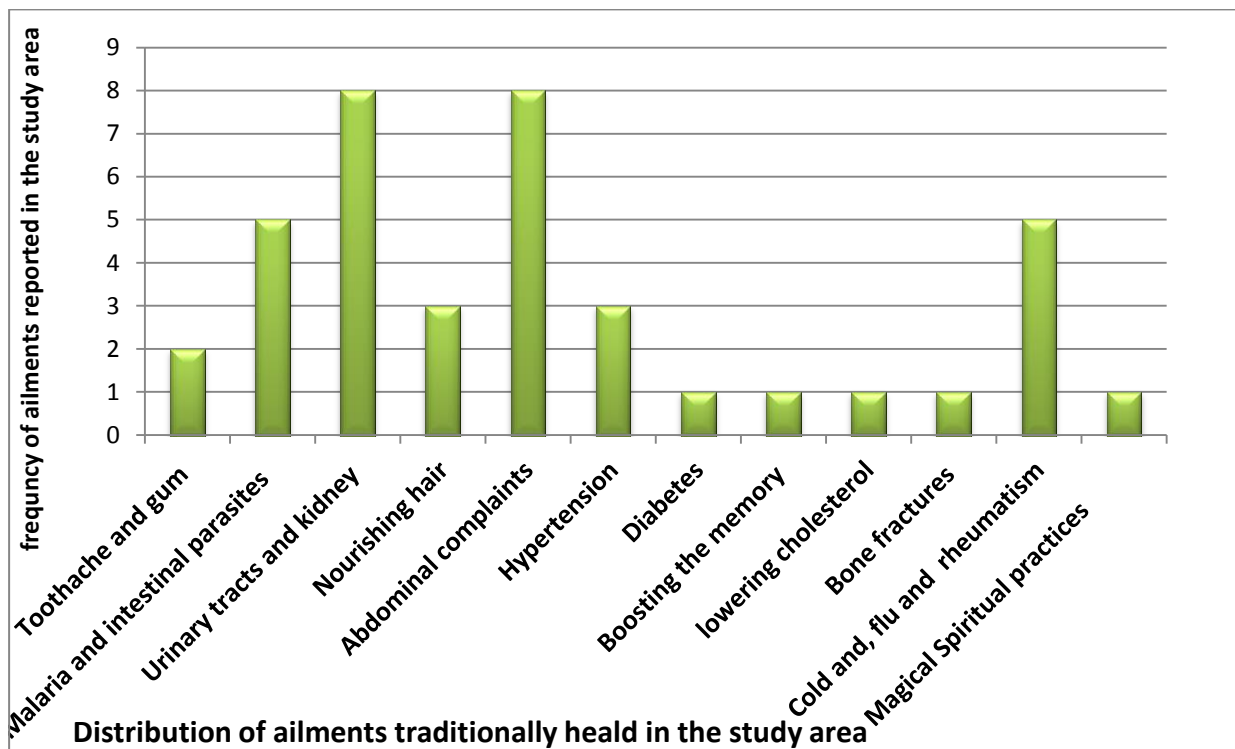


Fig. (7) Ailments treated in the study area.

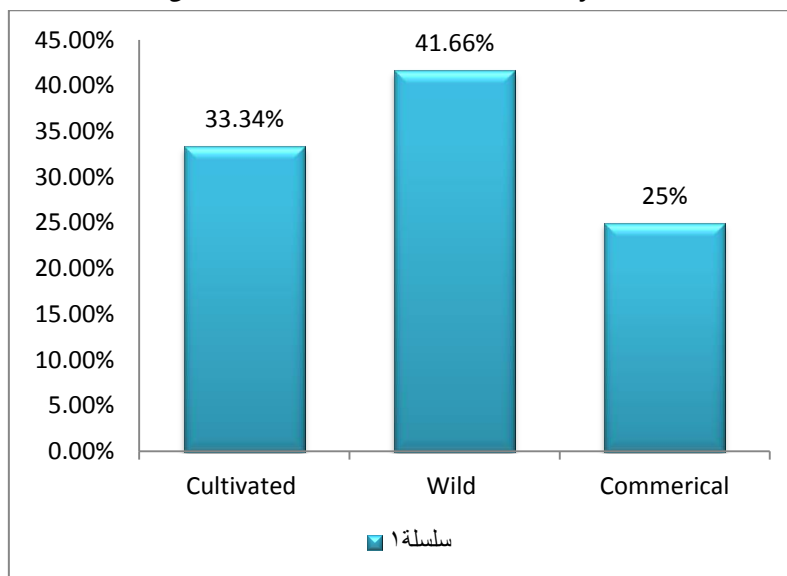
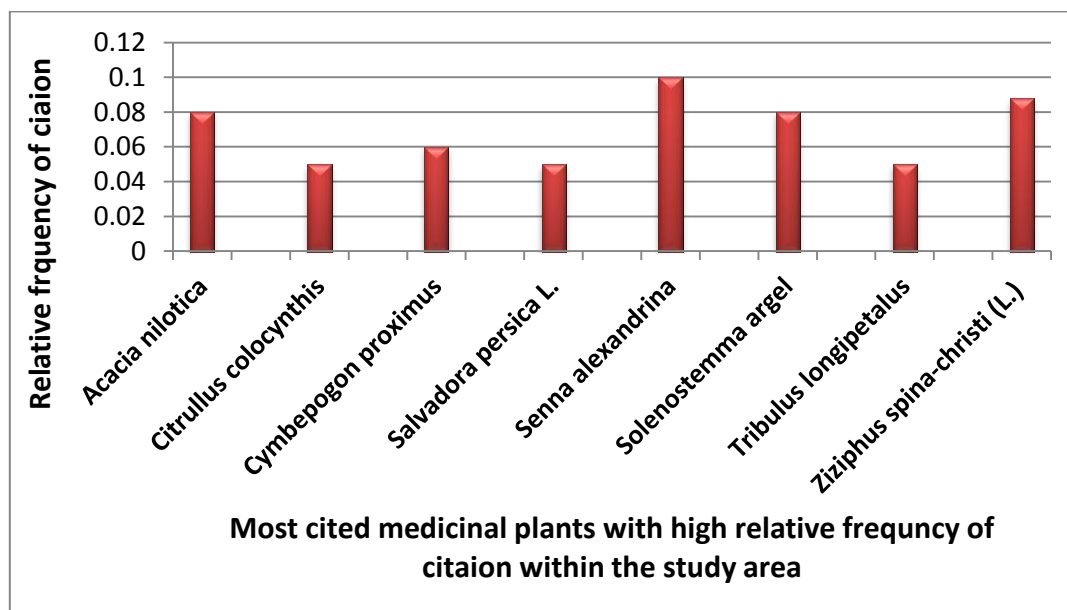


Fig. (8) Sources of medicinal plants (Exotic plants)



Fig(9) Medicinal plants with high relative frequency of citation at the study area

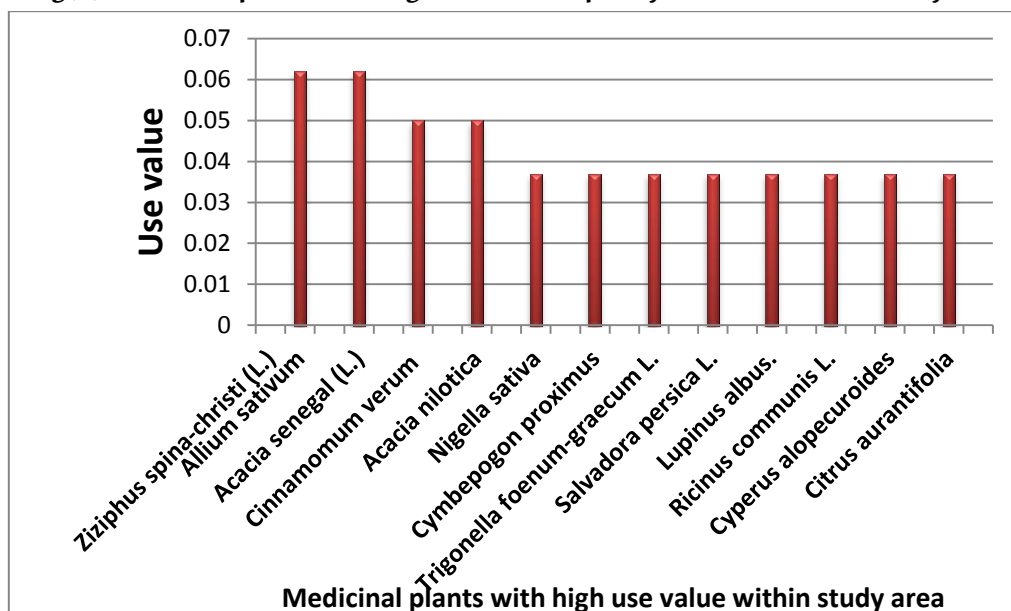


Fig. (10) Medicinal plants with high use value within study area

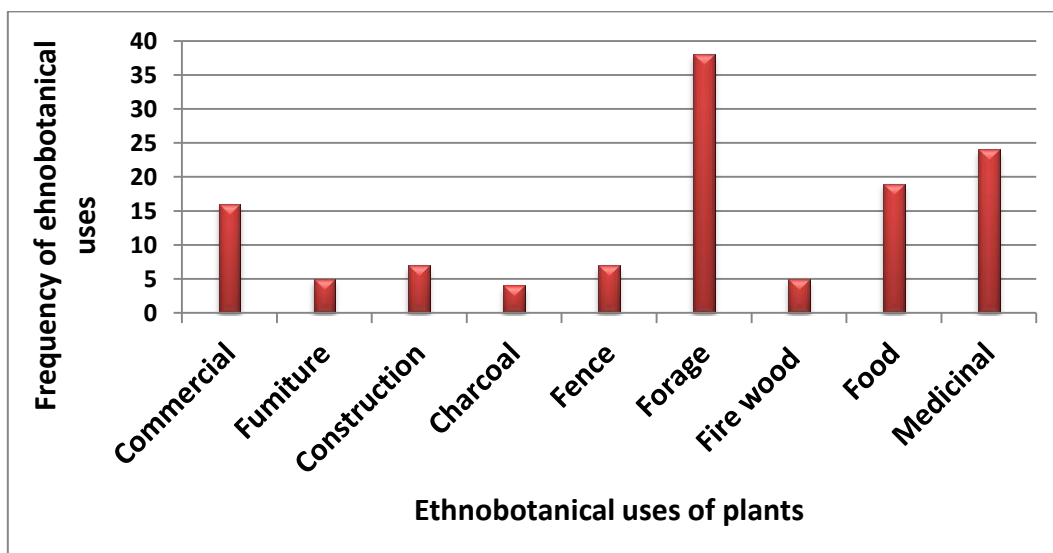


Fig. (11) Ethnobotanical uses of plants in the study area

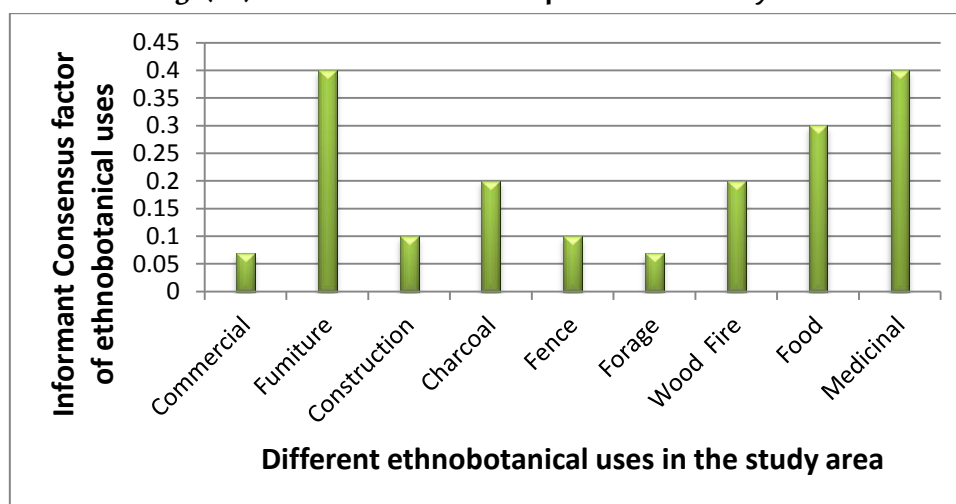


Fig. (12) Different ethnobotanical uses in the study area

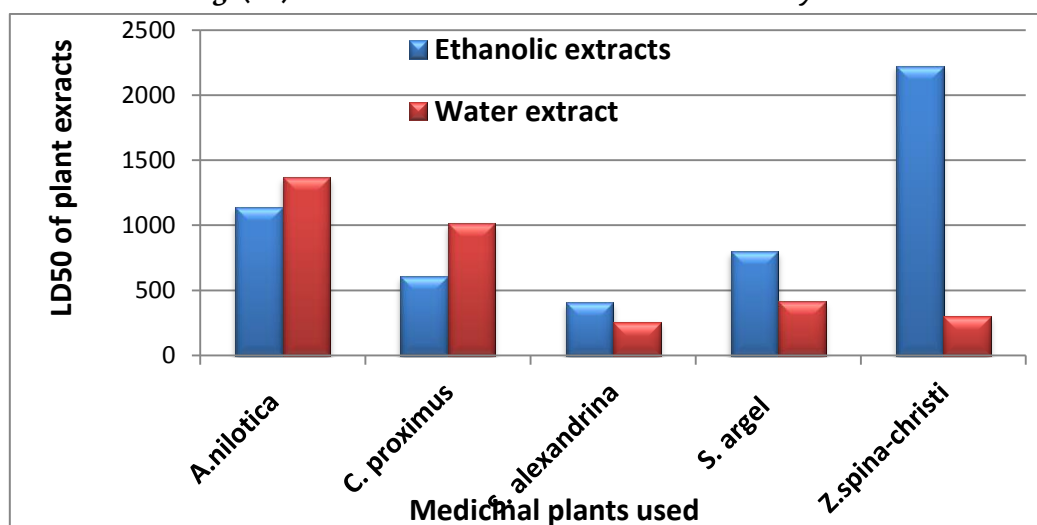


Fig. (13) Cytotoxic effects of the ethanoic and water extracts of medicinal plants of high frequency of citation indicating the level of toxicity



## Results and Discussion

### Ethnobotanical data analysis:

Local community of Jebel Aulia locality have excellent knowledge and medicinal utilities of local flora. People in such area or district have been traditionally using indigenous folk remedies to cure various ailments. The recorded medicinal plants are used in the form of raw or processed through certain herbal preparation for treatment of common health problems. Eighty informants from various community types were interviewed and information was recorded.

### Ethnomedicine:

The medicinal plants of the study area were. Several findings were reported. *Tribulus longipetalus* and *Cyperus alopecuroides* along with their Ethnomedicinal uses were documented for the first time as Sudanese medicinal *Cymbopogon proximus* (Mahareib) was reported for the first time to be used as remedy against worms, but this application was mentioned by (Katiki et al. , 2012). Therefore, this new information probably mentioned by an informant/s from different cultural background particularly from west Africa. *Allium sativum* (Thoom) was found to treat highest number of ailments as anthelmintic (worm), Antihypertensive, and for treatment of tonsils and for lowering cholesterol. Fruits were the most commonly used plant part to prepare medicine followed with leaves and seeds. While, other parts as bark, bulb, corm, roots, aerial parts and whole plant were not frequently used in study area. On the other hand, oils, latex and gum are plant exudates that contributed in the traditional medicine in the study area results were shown in Fig (4). In this study, the main preparation methods of herbal remedies were infusion (25%) followed by decoction (14. 3%), edible (10. 7%) and pills (10. 7%). Whereas, paste, juice, chewing, poultice and fumigation were not commonly used results were shown in Fig (5). Oral administration was the most common route of traditional medicine. Urinary tracts and kidney and abdominal complaints were most frequent ailments traditionally healed in the study area results were shown in Fig (6). In various parts of the world, medicinal plants collected from wild sources either for local use or trade purposes. In the present finding (41. 66%) were wild, (33. 34%) were cultivated and (25%) were commercially bought from the market, herbal shop or imported from abroad results were shown in Fig (7 ). As a consequence, there has been a concourse of knowledge about medicinal plants, wild plants were obviously utilized by the local community which demonstrating the close relationship among the locals and their natural environment. Relative frequency of citation (RFC) was used for calculating the local importance of each species. *Senna alexandrina* was the most cited and important plant in the study area followed with *Ziziphus spina-Christi*, *Acacia nilotica*, *Solenostemma argel* and *Cymbopogon proximus* results were shown in Table (4)and fig (8 ). *Ziziphus spina Christi*, *Acacia senegal*, *Allium sativum* and *Cinnamomum verum* have highest use-value ranging from (0. 062 to 0. 05), results were shown in Table (5 ) and Fig (9 ). In the

current study, various ethnobotanical uses of plants in the study area were studied and documented. These plants were commonly used as forage, medicinal, food and commercial, results were shown in Table (6) and Fig (9). In the present study, Informant Consensus Factor (ICF) of medicinal plants in the study area was ranged from (0.94 to 1) which is high value according to the equation. This results either all informant's consensus on almost all plants that traditionally used as herbal remedies or may be due to limitation reported of medicinal plants, results were shown in Table (7). ICF analysis for ethnobotanical uses of plants in the study area was studied. High informants consensus factor was indicated for Medicinal, furniture and food uses. These categories are significant and popular accordingly care must be taken to ensure an appropriate applications, results were shown in Table (8) and Fig (10).

### Evaluation of Cytotoxicity:

Cytotoxicity was evaluated using (BSLT) assay, the plants of high frequency of citation were subjected to this assay. Extracts exhibited varied cytotoxic activities. The study demonstrated that both water and ethanolic extracts of *Acacia nilotica* were not toxic compared to LC50 of 1369.634 and 1138.238 µg/ml. Whereas water extract of *Cymbopogon proximus* LC50 of 1016.617 µg/ml was not toxic and ethanolic of *Cymbopogon proximus* LC 50 of 606.9773 µg/ml revealed weak toxicity according to (Padmaja *et al.*, 2002). While, water and ethanolic extracts of *Senna alexandrina* LC50 of 256.206 and 409.6079 µg/ml, respectively, were moderately toxic. Also water and ethanolic extracts of *S. argel*, LC50 of 415.8575 and 799.6304 µg/ml demonstrated moderate to weak toxicity. Whereas, water extract of *Z. spina-Christi* of LC50 2225.63 µg/ml was considered not toxic, while, ethanolic extracts of LC50 of 303.4425 µg/ml was moderately toxic. Results were shown in Tables (9&10) and fig (21) Water extracts were subjected to the study of toxicity due to same mode of use in local traditional medicine. Interestingly, the use of *Acacia nilotica* both water and ethanolic extracts were found to be safe. and the results indicated that *Senna alexandrina* both extracts were toxic to some extents, consequently, should be taken carefully. Therefore, these extracts devoided of any toxicity, thus could be subjected to further confirmatory tests

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