Biological Forum – An International Journal **8**(1): 299-323(2016)

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Promising Sudanese Medicinal Plants with Antibacterial Activity - a Review Article

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(Received 05 March, 2016, Accepted 06 April, 2016)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: This study is considered as the most comprehensive review of Sudanese medicinal plants with promising antibacterial activities, since it covered more than 60 published studies on that topic. A total of 142 plant species belonging to 64 families, which showed antibacterial activities when extracted using different solvents (polar and non-polar) and tested against some gram negative or gram positive bacteria *in vitro* (cup-plate method and disc diffusion method) have been presented. In conclusion, the list of medicinal plants presented in this review clearly indicates that most of them could be promising sources of new antibacterial drugs and encourages researchers for further microbiological and pharmacological studies.

Keywords: *medicinal plants, Sudan, antibacterial, traditional medicine.*

INTRODUCTION

Plants are the largest drug stores ever known on Earth, by producing endless bioactive chemical compounds which have direct effects on animal and human health (Abdallah, 2011). Today, most of the modern drugs (synthetic or semi-synthetic) are initially produced from natural products such as medicinal plants prescribed in the ancient traditional medicine (Sukanya *et al.*, 2009). Atropine, Ephedrine, Digoxin, Morphine, Quinine, Reserpine and Tubocurarine are few examples of medicines invented from the knowledges of the traditional medicine (Gilani and Atta-ur-Rahman, 2005).

Traditional medicine is still used as the primary health care system for up to 80 % of the world population, most of them are in the developing countries. This popularity of traditional medicine is due to the better cultural acceptability, compatibility and lesser side effects (Kamboj, 2000). Recently, the interest in medicinal plants is growing, since many plant species have been recognized to have medicinal benefits and positive impact on human health, such as anti-inflammatory, antibacterial, hypolidemic, anti-carcinogenic, anti-oxidant and many other (Cai *et al.*, 2004).

Infectious diseases remain among the leading causes of death, more than 25% of annual deaths worldwide are related to infectious diseases (Morens *et al.*, 2004). Due to the failure of modern antibiotics to overcome these infectious diseases, attention has been drawn to medicinal plants. Numerous plants worldwide reported having antimicrobial activities, most of these activities could be attributed to the bioactive phytochemical ingredients of these plants (Abdallah *et al.*, 2012). Accordingly, screening for antimicrobial properties in order to extract the curative compounds from these plants is of crucial importance.

Currently, the health situation in Sudan is critical, the separation of south Sudan, the conflict in Darfur, South Kordofan and Blue Nile States, has led to deterioration of the health care services. Accordingly, the health care sector is currently fragile and underfunded. In a survey held in 2010, 78 out of every 1000 children born, die before reaching age five. 18.7% of children between 5 to 59 months were suffering from pneumonia, 26.8% of them had diarrhea, 119 per 100,000 were suffering from tuberculosis (WHO, 2014). Though, most of the Sudanese people rely on medicinal plants as a primary health care system instead of the expensive modern medicine.

Regretfully, in Sudan, detailed documentation of the pharmacological properties of Sudanese medicinal plants is scanty (Eldeen and Van Staden, 2007). WHO in (2001) reported that there are more than 2000 medicinal plants in use, which are recorded in "The Sudan Atlas of Medicinal Plants", but it is believed that the number of medicinal plants that in current use may be much more than that reported.

Although, there is wide experience among the people of Sudan in the employment of medicinal plants as an integral part of the health care system, this experience passed from one generation to another without documentation (El Ghazali *et al.*, 1997).

The aim of this review is to highlight about some Sudanese medicinal plants which revealed potent antibacterial activity against different human pathogens.

MATERIALS AND METHODS

Data collection of medicinal plants native to Sudan, which reported to have potent antibacterial activity was carried out during the period October 2015 – February 2016, by reviewing various research papers, review papers, short communications, MSc and PhD theses and published books. The sources of data were initially gathered from the major scientific databases such as science web of Knowledge, Science Direct, Pubmed and Google.

The non-documented, non-authenticated and non-published data were omitted. During gathering and tabulating the data, many criteria were put in consideration, such as:

(i) Plant species which are collected only from Sudan,

(ii) With reported antibacterial activity,

(iii) Which are tested *in vitro* with either the cup-plate method or disc diffusion method, in order to record the zone of inhibition in millimeters (mm),

(iv) The bacterial strains included six gram negative (*Pseudomonas aeruginosa*, *Escherichia coli*, *Salmonella typhi*, *S. enterica*, *Proteus vulgaris*, *Klebsiella pneumonia*) and five gram positive (*Staphylococcus aureus*, *S. epidermis*, *Bacillus subtilis*, *B. cereus*, *Enterococcus faecalis*).

RESULTS

Detailed information regarding the plant families, the scientific and vernacular names of plant species, the plant parts used, the solvents used for extraction, the activities against some gram negative and gram positive bacteria, and the reference for each plant species reported, have been tabulated in Table (1). Families were arranged alphabetically.

Table 1: Promising Sudanese medicinal plants with antibacterial activity.

Plant Family	Plant Scientific Name	Plant Vernacular Name	Plant Part	Solvent used	Activity against gram negative bacteria (Diameter zone of inhibition in mm)						Activity against gram positive bacteria (Diameter zone of inhibition in mm)					References
					P. ae.	*E. co.*	*S. ty.*	*S. enc.*	*P. vu.*	*K. pn.*	*St. au.*	*St. ep.*	*B. su.*	*B. ce.*	*En. fa.*	
Anacardiaceae	*Ozoroa insiginis* Del.	Tugul	Ba.	EtOH	15	-ve	-ve	–	–	–	-ve	–	-ve	–	–	Abdalla *et al.* 2013
Apiaceae/ Umbelliferae	*Trachyspermum ammi* Sprague		Fr.	MeOH	-ve	30	–	–	–	–	18	–	20	–	–	Al-Saiym *et al.* 2015
	Coriandrum sativum L.	Kasbarah	Fr.	MeOH	–	10	–	–	–	13	12	–	–	–	–	Mohamed *et al.* 2010
Apocynaceae	*Caralluma retrospiciens* (Ehrenb.) N.E.Br.	Tenegera	W.P.	MeOH	–	19	–	–	–	14	13	–	–	–	–	Elegami *et al.* 2001
Arecaceae/ Palmae	*Hyphaene thebaica* Mart.	Dome	Fr.	$CHCl_3$	-ve	-ve	–	–	–	12	–	-ve	–	–	–	Elegami *et al.* 2001
				MeOH	18	19	–	–	–	25	–	24	–	–	–	
				H_2O	17	14	–	–	–	16	–	16	–	–	–	
Aristolochiaceae	*Aristolochia bracteolata* Lam.	Umm Glagel	Le.	MeOH	–	10	–	–	–	10	10	–	–	–	–	Mohamed *et al.* 2010
			Fr.	MeOH	–	12	–	–	–	10	12	–	–	–	–	

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Plant Family	Plant Scientific Name	Plant Vernacular Name	Plant Part	Solvent used	Activity against gram negative bacteria (Diameter zone of inhibition in mm)						Activity against gram positive bacteria (Diameter zone of inhibition in mm)					References
					P. ae.	*E. co.*	*S. ty.*	*S. enc.*	*P. vu.*	*K. pn.*	*St. au.*	*St. ep.*	*B. su.*	*B. ce.*	*En. fa.*	
Asclepiadaceae	*Solenostemma argel* (Del.) Hayne	Hargel	Le.	$CHCl_3$	11	-ve	_	_	-ve	_	-ve	_	-ve	_	_	Abdalla 2004
				H_2O	-ve	-ve	_	_	-ve	_	15	_	-ve	_	_	
				MeOH	12	-ve	_	_	23	_	28	_	15	_	_	
					_	_	16	_	_	_	_	_	_	_	_	Hassouna *et al.* 2013
				Pet. ether	_	_	4	_	_	_	_	_	_	_	_	
Asteraceae/ Compositae	*Ceruana pratensis* Forssk.	Elasab'a	W.P.	$CHCl_3$	-ve	-ve	_	_	_	13	_	16	_	_	_	Elegami *et al.* 2001
				MeOH	17	15	_	_	_	24	_	22	_	_	_	
				H_2O	-ve	-ve	_	_	_	-ve	_	-ve	_	_	_	
	Cotula anthemoides L.	Afresh	W.P.	$CHCl_3$	–ve	–ve	_	_	_	15	_	15	_	_	_	
				MeOH	13	11	_	_	_	18	_	17	_	_	_	
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
	Echinops longifolius A. Rich.	Erg El Agrab	Ro.	$CHCl_3$	12	–ve	_	_	_	11	_	14	_	_	_	
				MeOH	16	–ve	_	_	_	16	_	17	_	_	_	
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
	Eclipta prostrata (L.) L.	Tamr El Ghanam	W.P.	$CHCl_3$	-ve	-ve	_	_	_	_	15	_	13	_	_	Elegami *et al.* 2006
				MeOH	18	17	_	_	_	_	25	_	21	_	_	
				H_2O	-ve	-ve	_	_	_	_	19	_	-ve	_	_	
	Rhanterium epapposum Oliv.	Al-Arfaj	A.P.	Pet. ether	10	10	_	_	-ve	10	10	_	26	_	_	Adam *et al.* 2011
				MeOH	16	15	_	_	10	15	21	_	20	_	_	
				H_2O	-ve	-ve	_	_	-ve	-ve	-ve	_	-ve	_	_	
	Francoeuria crispa (Forssk.) Cass.	Rabul	A.P.	EtOH	22	21	_	_	20	22	23	_	20	_	_	El-Kamali and Mahjoub 2009
				Pet. ether	-ve	-ve	_	_	-ve	-ve	-ve	_	15	_	_	
				EtOAc	21	20	_	_	20	19	20	_	17	_	_	
				MeOH	20	22	_	_	20	19	25	_	17	_	_	
				H_2O	-ve	-ve	_	_	-ve	-ve	-ve	_	-ve	_	_	
	Pulicaria undulata (L.) Kostel	Rabul	A.P.	EtOH	23	25	_	_	25	25	26	_	23	_	_	
				Pet. ether	-ve	-ve	_	_	-ve	-ve	-ve	_	30	_	_	
				EtOAc	20	20	_	_	20	-ve	19	_	17	_	_	
				MeOH	18	20	_	_	20	15	18	_	15	_	_	
				H_2O	-ve	-ve	_	_	-ve	-ve	-ve	_	-ve	_	_	
	Ambrosia maritima L.	Damsisa	Le.	EtOH	15	15	_	_	_	_	12	_	15	_	_	EL-Kamali and EL-amir 2010
	Geigeria alata Benth. & Hook.	Gudgat	A.P.	EtOH	13	13	_	_	_	_	16	_	22	_	_	

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					P. ae.	*E. co.*	*S. ty.*	*S. enc.*	*P. vu.*	*K. pn.*	*St. au.*	*St. ep.*	*B. su.*	*B. ce.*	*En. fa.*	
Asteraceae/ Compositae	*Sphaeranthus suaveolens* (Forssk.) DC.	Forgeyh	W.P.	EtOH	19	20	_	_	_	21	18	_	_	_	_	El Kamali and Mohammed 2006
				EtOAc	-ve	-ve	_	_	_	-ve	-ve	_	_	_	_	
				MeOH	12	20	_	_	_	23	-ve	_	_	_	_	
				H_2O	20	15	_	_	_	21	24	_	_	_	_	
	Carthamus tinctorius L.	Gortom	Se.	$CHCl_3$	-ve	_	_	_	_	-ve	-ve	_	_	_	_	Hamadt-Allah *et al.* 2011
				MeOH	17	_	_	_	_	15	16	_	_	_	_	
				H_2O	-ve	_	_	_	_	-ve	-ve	_	_	_	_	
Avicenniaceae	*Avicennia marina* (Forssk.) Vierh.	Mangrove	Le.	MeOH	_	14	_	_	_	13	11	_	_	_	_	Mohamed *et al.* 2010
			St.	MeOH	_	13	_	_	_	14	14	_	_	_	_	
Balanitaceae	*Balanites aegyptiaca* (L.) Del.	Hegleig	Fr.Me	MeOH	18	20	_	_	_	15	17	_	22	22	20	Abdalla *et al.* 2012
Bignoniaceae	*Kigelia africana* (Lam.) Benth.	Umm mashtour	Fr.	$CHCl_3$	13	12	_	_	15	_	15	_	25	_	_	Abdalla 2004
				MeOH	15	22	_	_	13	_	30	_	15	_	_	
				H_2O	-ve	-ve	_	_	-ve	_	20	_	23	_	_	
Bombacaceae	*Adansonia digitata* L.	Tabeldi	Le.	EtOH	18	17	_	_	_	_	15	_	15	_	_	Kabbashi *et al.* 2015c
			Fr.	EtOH	34	33	_	_	_	36	35	_	_	_	_	Sirag *et al.* 2013b
Boraginaceae	*Heliotropium aegyptiacum* Lehm.	Arri	W.P.	CH Cl_3	-ve	-ve	_	_	_	–ve	_	13	_	_	_	Elegami *et al.* 2001
				MeOH	-ve	-ve	_	_	_	16	_	14	_	_	_	
				H_2O	-ve	-ve	_	_	_	–ve	_	–ve	_	_	_	
	Heliotropium sudanicum F.W. Andr.	Gereira	W.P.	CH Cl_3	-ve	11	_	_	_	11	_	13	_	_	–	
				MeOH	17	16	_	_	_	20	_	21	_	_	_	
				H_2O	-ve	-ve	_	_	_	17	_	-ve	_	_	_	
	Cordia sinensis Lam.	Andorab	St. Ba.	EtOH	15	15	_	_	15	20	-ve	_	-ve	_	_	El-Kamali and Awad EL-Karim 2009
				Pet. ether	-ve	-ve	_	_	-ve	-ve	-ve	_	-ve	_	_	
				EtOAc	-ve	-ve	_	_	-ve	-ve	-ve	_	-ve	_	_	
				MeOH	15	-ve	_	_	-ve	-ve	19	_	-ve	_	_	
				H_2O	-ve	-ve	_	_	-ve	-ve	-ve	_	-ve	_	_	
	Cordia africana Lam.	Andrab	Le.	MeOH	17	19	_	_	_	_	17	17	_	_	_	Alhadi *et al.* 2015
				Pet. ether	-ve	-ve	_	_	_	_	-ve	-ve	_	_	_	
				$CHCl_3$	-ve	-ve	_	_	_	_	-ve	-ve	_	_	_	
				EtOAc	17	15	_	_	_	_	21	17	_	_	_	
				H_2O	-ve	-ve	_	_	_	_	-ve	-ve	_	_	_	

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					P. ae.	*E. co.*	*S. ty.*	*S. enc.*	*P. vu.*	*K. pn.*	*St. au.*	*St. ep.*	*B. su.*	*B. ce.*	*En. fa.*	
Boraginaceae	*Cordia africana* Lam.	Andrab	Fr.	MeOH	17	17	_	_	_	_	16	15	_	_	_	Alhadi *et al.* 2015
				Pet. ether	-ve	-ve	_	_	_	_	-ve	-ve	_	_	_	
			St.	MeOH	16	17	_	_	_	_	18	15	_	_	_	
				Pet. ether	-ve	-ve	_	_	_	_	-ve	-ve	_	_	_	
				$CHCl_3$	-ve	-ve	_	_	_	_	-ve	-ve	_	_	_	
				EtOAc	15	15	_	_	_	_	18	19	_	_	_	
				H_2O	-ve	-ve	_	_	_	_	-ve	-ve	_	_	_	
			Ba.	MeOH	17	16	_	_	_	_	18	18	_	_	_	
				Pet. ether	-ve	-ve	_	_	_	_	-ve	-ve	_	_	_	
Brassicaceae/ Cruciferae	*Lepidium virginicum* L.	Hab El-rashad	Se.	EtOH	16	6	_	_	_	15	28	_	_	_	_	Sirag *et al.* 2009
	Rorippa indica (L.) Hiern.	Fikki	W.P.	$CHCl_3$	-ve	-ve	_	_	_	-ve	_	13	_	_	_	Elegami *et al.* 2001
				MeOH	16	15	_	_	_	18	_	19	_	_	_	
				H_2O	-ve	-ve	_	_	_	-ve	_	-ve	_	_	_	
	Raphanus sativus L.	Figl	Se.	$CHCl_3$	-ve	12	_	_	-ve	_	12	_	-ve	_	_	Abdalla 2004
				MeOH	13	12	_	_	13	_	30	_	12	_	_	
				H_2O	20	20	_	_	20	_	25	_	27	_	_	
	Trichodesma africanum (L.) R.Br.	Harrish	A.P.	Pet. ether	18	15	_	_	18	15	16	_	16	_	_	Adam *et al.* 2011
				MeOH	15	14	_	_	15	13	12	_	15	_	_	
				H_2O	14	-ve	_	_	-ve	-ve	-ve	_	-ve	_	_	
Burseraceae	*Boswellia papyrifera* (Caill. ex Del.) Hochst.	Tarag Tarag	O.G.R.	Pet. ether	_	_	_	_	_	_	7	_	_	_	_	Abdallah *et al.* 2009
				EtOAc	_	_	_	_	_	_	8	_	_	_	_	
				MeOH	_	_	_	_	_	_	8	_	_	_	_	
				H_2O	_	_	_	_	_	_	6	_	_	_	_	
Cannabaceae	*Cannabis sativa* L.	Hasheesh	Se.	MeOH	15	16	_	_	_	28	_	21‘	_	_	_	Ali *et al.* 2012
			W.P.	Pet. ether	–ve	14	_	_	_	23	_	28	_	_	_	
				MeOH	18	16	_	_	_	12	_	29	_	_	_	
Capparaceae/ Capparidaceae	*Boscia angustifolia* A. Rich.	El serhaya	W.P.	$CHCl_3$	–ve	–ve	_	_	_	14	_	13	_	_	_	Elegami *et al.* 2001
				MeOH	14	14	_	_	_	18	_	17	_	_	_	
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
	Boscia salicifoila Oliv.	Tella	Ba.	EtOH	-ve	-ve	-ve	_	_	_	-ve	_	-ve	_	_	Abdalla *et al.* 2013
	Capparis cartilaginea DC.	Lasaf	Le.	$CHCl_3$	–ve	12	_	_	_	13	_	13	_	_	_	Elegami *et al.* 2001

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					P. ae.	*E. co.*	*S. ty.*	*S. enc.*	*P. vu.*	*K. pn.*	*St. au.*	*St. ep.*	*B. su.*	*B. ce.*	*En. fa.*	
Capparaceae/ Capparidaceae	*Capparis cartilaginea* DC.	Lasaf	Le.	MeOH	11	12	_	_	_	16	_	20	_	_	_	Elegami *et al.* 2001
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
			St.	$CHCl_3$	–ve	–ve	_	_	_	14	_	15	_	_	_	
				MeOH	11	11	_	_	_	14	_	15	_	_	_	
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
	Cadaba farinosa Forssk.	Sareh, Surreh	Le.	$CHCl_3$	_	20	15	_	_	_	14	_	13	_	_	Moglad *et al.* 2012
				MeOH	_	13	15	_	_	_	14	_	13	_	_	
			St.	$CHCl_3$	14	13	_	_	_	_	15	_	13	_	_	Saadabi and Moglad 2011
				MeOH	15	16	_	_	_	_	11	_	11	_	_	
				H_2O	13	14	_	_	_	_	14	_	12	_	_	
	Courbonia virgata Brongn**.**	Kordala	Ro.	$CHCl_3$	-ve	-ve	_	_	-ve	_	17	_	15	_	_	Abdalla 2004
				MeOH	12	34	_	_	-ve	_	32	_	25	_	_	
				H_2O	15	-ve	_	_	13	_	25	_	-ve	_	_	
	Maerua oblongifolia (Forssk.) A. Rich.	Abu Tamra, Surreih	Le.	MeOH	_	10	_	_	_	10	15	_	_	_	_	Mohamed *et al.* 2010
					_	-ve	-ve	_	_	_	-ve	_	15	_	_	Moglad *et al.* 2014
					_	15	-ve	_	_	_	-ve	_	15	_	_	Moglad *et al.* 2012
				$CHCl_3$	_	15	14	_	_	_	13	_	13	_	_	
					_	14	14	_	_	_	13	_	13	_	_	Moglad *et al.* 2014
			St.	$CHCl_3$	_	15	15	_	_	_	13	_	14	_	_	
				MeOH	_	-ve	-ve	_	_	_	-ve	_	15	_	_	
Caryophyllaceae	*Peganum harmala* L.	Harmel	Le.	$CHCl_3$	13	11	_	_	_	_	13	_	12	_	_	Saadabi and Moglad 2011
				MeOH	12	12	_	_	_	_	15	_	13	_	_	
				H_2O	12	11	_	_	_	_	12	_	11	_	_	
	Polycarpaea corymbosa (L.) Lam.	Girair	W.P.	$CHCl_3$	11	12	_	_	_	_	16	_	15	_	_	
				MeOH	12	13	_	_	_	_	17	_	16	_	_	
				H_2O	14	14	_	_	_	_	14	_	16	_	_	
Celastraceae	*Maytenus senegalensis* (Lam.) Exell.	Shagarat El Marfain	Le.	MeOH	_	11	_	_	_	10	10	_	_	_	_	Mohamed *et al.* 2010
			Ba.	MeOH	_	20	_	_	_	11	13	_	_	_	_	
Chenopodiaceae	*Salsola baryosma* (Schult.) Dandy.	Debra	W.P.	$CHCl_3$	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	Elegami *et al.* 2001
				MeOH	12	14	_	_	_	18	_	17	_	_	_	
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
Combretaceae	*Combretum hartmannianum* Schweinf.	Habeil	Wo.P.	H_2O	_	–ve	_	–ve	_	_	13	_	_	_	_	Mariod *et al.* 2014

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					P. ae.	*E. co.*	*S. ty.*	*S. enc.*	*P. vu.*	*K. pn.*	*St. au.*	*St. ep.*	*B. su.*	*B. ce.*	*En. fa.*	
Combretaceae	*Combretum hartmannianum* Schweinf.	Habeil	Wo.P.	EtOAc	_	18	_	15	_	_	–ve	_	_	_	_	Mariod *et al.* 2014
				$CHCl_3$	_	–ve	_	–ve	_	_	–ve	_	_	_	_	
				Pet. Ether	_	–ve	_	–ve	_	_	–ve	_	_	_	_	
			Le.	$CHCl_3$	-ve	-ve	_	_	_	_	-ve	_	25	_	_	Elegami *et al.* 2002
				MeOH	22	23	_	_	_	_	26	_	27	_	_	
				H_2O	19	21	_	_	_	_	21	_	20	_	_	
				EtOH	19	18	_	_	_	_	17	_	18	_	_	Mosa *et al.* 2014
			Ba.	$CHCl_3$	-ve	11	_	_	_	_	-ve	_	15	_	_	Elegami *et al.* 2002
				MeOH	21	20	_	_	_	_	23	_	23	_	_	
				H_2O	21	22	_	_	_	_	23	_	24	_	_	
			Fr.	$CHCl_3$	-ve	-ve	_	_	_	_	-ve	_	17	_	_	
				MeOH	23	22	_	_	_	_	25	_	27	_	_	
				H_2O	17	22	_	_	_	_	22	_	23	_	_	
			St.	$CHCl_3$	-ve	-ve	_	_	_	_	17	_	16	_	_	
				MeOH	13	14	_	_	_	_	16	_	16	_	_	
				H_2O	11	13	_	_	_	_	12	_	13	_	_	
	Combretum glutinosum Perr. ex Dc.	Habeil	Ba.	MeOH	_	11	_	_	_	10	10	_	_	_	_	Mohamed *et al.* 2010
	Terminalia brownii Fresen.	Subagh, Arza	Wo.P.	H_2O	_	–ve	_	13	_	_	–ve	_	_	_	_	Mariod *et al.* 2014
				EtOAc	_	18	_	17	_	_	15	_	_	_	_	
				$CHCl_3$	_	–ve	_	13	_	_	–ve	_	_	_	_	
				Pet. Ether	_	–ve	_	12	_	_	–ve	_	_	_	_	
			Ba.	EtOH	17	-ve	-ve	_	_	_	18	_	-ve	_	_	Abdalla *et al.* 2013
	Guiera senegalensis J.F.Gmel	Ghubeish	Le.	$CHCl_3$	12	12	_	_	12	_	13	_	-ve	_	_	Abdalla 2004
				MeOH	25	25	_	_	20	_	20	_	25	_	_	
				H_2O	22	20	_	_	20	_	15	_	21	_	_	
	Anogeissus schimperi Guill. & Perr.	Sahab	Le.	$CHCl_3$	11	14	_	_	_	_	15	_	12	_	_	Elegami *et al.* 2002
				MeOH	28	27	_	_	_	_	29	_	30	_	_	
				H_2O	20	22	_	_	_	_	25	_	25	_	_	

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Plant Family	Plant Scientific Name	Plant Vernacular Name	Plant Part	Solvent used	Activity against gram negative bacteria (Diameter zone of inhibition in mm)						Activity against gram positive bacteria (Diameter zone of inhibition in mm)					References
					P. ae.	*E. co.*	*S. ty.*	*S. enc.*	*P. vu.*	*K. pn.*	*St. au.*	*St. ep.*	*B. su.*	*B. ce.*	*En. fa.*	
Combretaceae	*Combretum pentagenum* Vent.	Habeil	Le.	$CHCl_3$	11	-ve	_	_	_	_	11	_	18	_	_	Elegami *et al.* 2002
				MeOH	21	20	_	_	_	_	23	_	22	_	_	
				H_2O	18	20	_	_	_	_	18	_	20	_	_	
			Ba.	$CHCl_3$	11	-ve	_	_	_	_	-ve	_	13	_	_	
				MeOH	20	21	_	_	_	_	22	_	23	_	_	
				H_2O	15	18	_	_	_	_	19	_	18	_	_	
			Fr.	$CHCl_3$	-ve	-ve	_	_	_	_	12	_	12	_	_	
				MeOH	19	21	_	_	_	_	23	_	21	_	_	
				H_2O	14	19	_	_	_	_	15	_	18	_	_	
			St.	$CHCl_3$	-ve	-ve	_	_	_	_	-ve	_	11	_	_	
				MeOH	19	19	_	_	_	_	20	_	22	_	_	
				H_2O	16	16	_	_	_	_	15	_	18	_	_	
	Terminalia arjune (Roxb.) Wight. & Arn.	Daroot	Le.	$CHCl_3$	-ve	-ve	_	_	_	_	-ve	_	11	_	_	
				MeOH	22	21	_	_	_	_	24	_	25	_	_	
				H_2O	16	15	_	_	_	_	20	_	19	_	_	
			Ba.	$CHCl_3$	-ve	-ve	_	_	_	_	-ve	_	11	_	_	
				MeOH	19	19	_	_	_	_	20	_	20	_	_	
				H_2O	18	19	_	_	_	_	20	_	19	_	_	
			Fr.	$CHCl_3$	11	11	_	_	_	_	-ve	_	13	_	_	
				MeOH	16	17	_	_	_	_	24	_	26	_	_	
				H_2O	15	16	_	_	_	_	17	_	18	_	_	
			St.	$CHCl_3$	-ve	-ve	_	_	_	_	-ve	_	11	_	_	
				MeOH	18	19	_	_	_	_	24	_	23	_	_	
				H_2O	15	15	_	_	_	_	16	_	16	_	_	
Convolvulaceae	*Ipomoea carnea* Jacq.	Aweer	Le.	MeOH	_	13	_	_	_	15	17	_	_	_	_	Mohamed *et al.* 2010
	Ipomoea blepharosepala Hochst ex A.Rich	Hantut	W.P.	$CHCl_3$	12	12	_	_	_	_	13	_	15	_	_	Saadabi and Moglad 2011
				MeOH	14	15	_	_	_	_	-ve	_	16	_	_	
				H_2O	13	11	_	_	_	_	14	_	13	_	_	
Cucurbitaceae	*Cucurbita pepo* L.	Gara'a Kosa	Fr.	EtOH	13	-ve	_	_	-ve	-ve	-ve	_	-ve	_	_	El-Kamali and Mahjoub 2009
				Pet. ether	-ve	-ve	_	_	-ve	-ve	-ve	_	-ve	_	_	
				EtOAc	-ve	-ve	_	_	-ve	16	-ve	_	12	_	_	
				MeOH	-ve	-ve	_	_	-ve	-ve	-ve	_	-ve	_	_	
				H_2O	13	23	_	_	-ve	-ve	-ve	_	-ve	_	_	
	Cucurbita maxima Duchesne	Gara' asali	Se.	EtOH	23	23	_	_	_	_	22	_	21	_	_	Kabbashi *et al.* 2015c

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					P. ae.	*E. co.*	*S. ty.*	*S. enc.*	*P. vu.*	*K. pn.*	*St. au.*	*St. ep.*	*B. su.*	*B. ce.*	*En. fa.*	
Cucurbitaceae	*Citrullus colocynthis* (L.) Schrad.	Handel	Fr.	MeOH	–	6	2	–	–	2	6	–	6	–	–	Elkamali and Mahjoob 2015
				H_2O	–	-ve	-ve	–	–	-ve	-ve	–	-ve	–	–	
	Citrullus lanatus var. *citroides* (L. H. Bailey) Mansf.	Betteikh El Khala	Le.	Hexane	-ve	11	–	–	12	–	12	–	13	–	–	Hassan *et al.* 2011
				$CHCl_3$	16	15	–	–	16	–	18	–	14	–	–	
				EtOH	-ve	-ve	–	–	-ve	–	17	–	13	–	–	
			St.	Hexane	-ve	-ve	–	–	-ve	–	25	–	19	–	–	
				$CHCl_3$	17	31	–	–	22	–	33	–	37	–	–	
				EtOH	20	36	–	–	26	–	29	–	36	–	–	
			Fr.	Hexane	19	37	–	–	23	–	36	–	38	–	–	
				$CHCl_3$	15	28	–	–	19	–	26	–	27	–	–	
				EtOH	18	19	–	–	18	–	17	–	20	–	–	
			Se.	Hexane	16	22	–	–	23	–	27	–	20	–	–	
				$CHCl_3$	18	26	–	–	29	–	33	–	24	–	–	
				EtOH	18	19	–	–	18	–	21	–	17	–	–	
	Momordica balsamina L.	Abu el Efein	W.P.	$CHCl_3$	13	15	–	–	–	–	13	–	13	–	–	Saadabi and Moglad 2011
				MeOH	14	16	–	–	–	–	16	–	15	–	–	
				H_2O	12	13	–	–	–	–	13	–	14	–	–	
Cyperaceae	*Cyperus rotundus* L.	Sei'da	W.P.	$CHCl_3$	14	14	–	–	–	–	18	–	16	–	–	
				MeOH	15	16	–	–	–	–	16	–	17	–	–	
				H_2O	15	12	–	–	–	–	14	–	13	–	–	
				EtOH	20	19	–	–	–	31	–	30	–	–	–	Kabbashi *et al.* 2015d
Ebenaceae	*Diospyros mespiliformis* Hochst. ex A.DC.	Joghan	Ba.	MeOH	–	17	–	–	–	10	10	–	–	–	–	Mohamed *et al.* 2010
			Le.	MeOH	–	10	–	–	–	15	12	–	–	–	–	
	Euclea schimperi (A.DC.) Dandy	Uqum	Le.	$CHCl_3$	11	11	–	–	–	–	12	–	11	–	–	Elegami *et al.* 2006
				MeOH	16	16	–	–	–	–	25	–	23	–	–	
				H_2O	14	14	–	–	–	–	19	–	18	–	–	
			St.	$CHCl_3$	-ve	-ve	–	–	–	–	12	–	14	–	–	
				MeOH	15	17	–	–	–	–	24	–	18	–	–	
				H_2O	15	16	–	–	–	–	18	–	23	–	–	
Euphorbiaceae	*Croton zambesicus* Mull. Arg.	Um glegla	Fr.	MeOH	–	10	–	–	–	10	10	–	–	–	–	Mohamed *et al.* 2010
	Jatropha aceroides (Pax et Hoffm.) Hutch.	Abu Quaeihat	Ro. + St.	$CHCl_3$	–ve	–ve	–	–	–	12	–	13	–	–	–	Elegami *et al.* 2001

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					P. ae.	*E. co.*	*S. ty.*	*S. enc.*	*P. vu.*	*K. pn.*	*St. au.*	*St. ep.*	*B. su.*	*B. ce.*	*En. fa.*	
Euphorbiaceae	*Jatropha aceroides* (Pax et Hoffm.) Hutch.	Abu Quaeihat	Ro. + St.	MeOH	–ve	–ve	_	_	_	16	_	15	_	_	_	Elegami *et al.* 2001
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
	Jatropha curcas L.	Habb El Meluk	Se.	Pet. ether	-ve	-ve	_	_	_	_	-ve	_	-ve	_	_	Magda *et al.* 2015
				MeOH	10	9	_	_	_	_	9	_	8	_	_	
			Le.	Pet. ether	-ve	-ve	_	_	_	_	-ve	_	-ve	_	_	
				MeOH	13	13	_	_	_	_	12	_	13	_	_	
			Hy.Ca	Pet. ether	-ve	-ve	_	_	_	_	-ve	_	18	_	_	
				MeOH	13	11	_	_	_	_	10	_	12	_	_	
			Co.Ca	Pet. ether	-ve	-ve	_	_	_	_	-ve	_	13	_	_	
				MeOH	17	11	_	_	_	_	10	_	12	_	_	
	Ricinus communis L.	Khirwi'	Le.	MeOH	15	15	_	_	13	16	20	_	15	_	_	Abd-Ulgadir *et al.* 2015
			Se.	MeOH	-ve	-ve	_	_	-ve	-ve	-ve	_	-ve	_	_	
Fabaceae, (subfam. Caesalpinioideae)	*Tamarindus indica* L.	Aradaib	Fr.Pu.	MeOH	12	12	_	10	11	10	11	17	_	11	_	Abdallah 2014
			Fr.	MeOH	_	20	_	_	_	12	11	_	_	_	_	Mohamed *et al.* 2010
					_	_	18	_	_	_	_	_	_	_	_	Hassouna *et al.* 2013
				Pet. ether	_	_	6	_	_	_	_	_	_	_	_	
	Senna alexandrina Mill.	Sana Mekka	Le.	MeOH	-ve	-ve	_	_	_	_	23	_	25	_	_	Al-Saiym *et al.* 2015
					_	_	12	_	_	_	_	_	_	_	_	Hassouna *et al.* 2013
				Pet. ether	_	_	2	_	_	_	_	_	_	_	_	
			Po.	EtOH	-ve	15	_	_	_	_	12	_	13	_	_	EL-Kamali and EL-amir 2010
			W.P.	$CHCl_3$	14	14	_	_	_	_	12	_	13	_	_	Saadabi and Moglad 2011
				MeOH	13	14	_	_	_	_	14	_	12	_	_	
				H_2O	14	15	_	_	_	_	15	_	14	_	_	
	Senna obtusifolia (L.) Irwin & Barneby (*Cassia tora* L.)	Kawal	Fe.Le.	EtOH	13	14	_	_	_	_	12	_	17	_	_	EL-Kamali and EL-amir 2010

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					P. ae.	*E. co.*	*S. ty.*	*S. enc.*	*P. vu.*	*K. pn.*	*St. au.*	*St. ep.*	*B. su.*	*B. ce.*	*En. fa.*	
Fabaceae, (subfam. Caesalpinioideae)	*Senna obtusifolia* (L.) Irwin & Barneby (*Cassia tora* L.)	Kawal	Le.	MeOH	_	12	_	_	_	13	12	_	_	_	_	Mohamed *et al.* 2010
	Senna occidentalis (L.) Link (*Cassia occidentalis* L.)	Soreib	Se.	EtOH	16	15	_	_	_	_	14	_	17	_	_	EL-Kamali and EL-amir 2010
			Le.	$CHCl_3$	_	-ve	12	_	_	_	11	_	14	_	_	Moglad *et al.* 2012
				MeOH	–	16	15	_	_	_	15	_	15	_	_	
Fabaceae (subfam. Faboideae)	*Aeschynomene indica* L.	Ambaj	Le.+ Fr.	$CHCl_3$	–ve	–ve	_	_	_	–ve	_	13	_	_	_	Elegami *et al.* 2001
				MeOH	14	–ve	_	_	_	15	_	16	_	_	_	
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
	Glycyrrhiza glabra L.	Irgsoos	Ro.	EtOH	26	4	_	_	_	15	16	_	_	_	_	Sirag *et al.* 2009
	Indigofera spinosa Forssk.	Singeed	W.P.	$CHCl_3$	–ve	–ve	_	_	_	14	_	16	_	_	_	Elegami *et al.* 2001
				MeOH	14	13	_	_	_	17	_	16	_	_	_	
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
	Melicago sp.	Barseem	W.P.	$CHCl_3$	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
				MeOH	13	12	_	_	_	16	_	16	_	_	_	
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
	Rhynchosia minima (L.) DC. var. *memnonia* (Del.) Cooke	Irg El Dem	Ro.	EtOH	14	13	_	_	_	_	16	_	15	_	_	EL-Kamali and EL-amir 2010
	Trigonella foenum-graecum L.	Helba	Se.	Seed oil	20	_	_	_	_	10	_	_	_	_	_	Sulieman *et al.* 2008
				EtOH	27	32	_	_	_	31	31	_	_	_	_	Sirag *et al.* 2013b
					15	-ve	_	_	13	-ve	-ve	_	-ve	_	_	El-Kamali and Awad EL-Karim 2009
				EtOAc	-ve	-ve	_	_	-ve	-ve	-ve	_	-ve	_	_	
				H_2O	-ve	-ve	_	_	-ve	-ve	-ve	_	-ve	_	_	
				Pet. ether	-ve	17	_	_	_	_	15	_	-ve	_	_	ElNour *et al.* 2015
					-ve	-ve	_	_	-ve	-ve	-ve	_	-ve	_	_	El-Kamali and Awad EL-Karim 2009

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					P. ae.	*E. co.*	*S. ty.*	*S. enc.*	*P. vu.*	*K. pn.*	*St. au.*	*St. ep.*	*B. su.*	*B. ce.*	*En. fa.*	
Fabaceae (subfam. Faboideae)	*Trigonella foenum-graecum* L.	Helba	Se.	Pet. ether	–	–	12	–	–	–	–	–	–	–	–	Hassouna *et al.* 2013
				MeOH	-ve	-ve	–	–	–	–	-ve	–	-ve	–	–	ElNour *et al.* 2015
					-ve	-ve	–	–	-ve	-ve	-ve	–	-ve	–	–	El-Kamali and Awad EL-Karim 2009
					–	–	15	–	–	–	–	–	–	–	–	Hassouna *et al.* 2013
					–	10	–	–	–	13	11	–	–	–	–	Mohamed *et al.* 2010
			Hy.Ca	Pet. ether	-ve	-ve	–	–	–	–	-ve	–	-ve	–	–	ElNour *et al.* 2015
				MeOH	-ve	10	–	–	–	–	11	–	-ve	–	–	
			Co.Ca	Pet. ether	-ve	-ve	–	–	–	–	-ve	–	-ve	–	–	
				MeOH	-ve	10	–	–	–	–	12	–	-ve	–	–	
	Sesbania leptocarpa DC.	Surib	Se.	EtOH	15	13	–	–	–	–	-ve	–	13	–	–	Mosa *et al.* 2014
	Sesbania sesban (L.) Merr.	Sesaban	Le.+ Fr.	$CHCl_3$	–ve	–ve	–	–	–	11	–	–ve	–	–	–	Elegami *et al.* 2001
				MeOH	14	13	–	–	–	18	–	16	–	–	–	
				H_2O	–ve	–ve	–	–	–	–ve	–	–ve	–	–	–	
	Vigna frutescens A.Rich. (*V. fragrans* Bak.f.)	Al Dombosa	Ro.	$CHCl_3$	15	17	–	–	–	–	15	–	14	–	–	Saadabi and Moglad 2011
				MeOH	17	15	–	–	–	–	17	–	17	–	–	
				H_2O	10	13	–	–	–	–	12	–	13	–	–	
Fabaceae (subfam. Mimosoideae)	*Acacia nilotica* (L.) Del. (*A. nilotica* ssp. *nilotica*)	Sunt	Po.	EtOH	23	26	–	–	25	24	27	–	27	–	–	El-Kamali and Awad EL-Karim 2009
				Pet. ether	21	23	–	–	21	24	20	–	22	–	–	
				EtOAc	40	40	–	–	30	32	37	–	27	–	–	
				H_2O	27	39	–	–	26	21	43	–	22	–	–	
					20	18	–	–	–	28	28	–	25	–	12	Abd El Nabi *et al.* 1992
				MeOH	35	37	–	–	32	32	36	–	29	–	–	El-Kamali and Awad EL-Karim 2009

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					P. ae.	*E. co.*	*S. ty.*	*S. enc.*	*P. vu.*	*K. pn.*	*St. au.*	*St. ep.*	*B. su.*	*B. ce.*	*En. fa.*	
Fabaceae (subfam. Mimosoideae)	*Acacia nilotica* (L.) Del. (*A. nilotica* ssp. *nilotica*)	Sunt	Po.	MeOH	_	10	_	_	_	10	10	_	_	_	_	Mohamed *et al.* 2010
			Le.	EtOH	28	25	_	_	_	_	27	_	25	_	_	Kabbashi *et al.* 2015a
	Acacia seyal Del.	Talh	Wo.P.	H_2O	_	–ve	_	11	_	_	14	_	_	_	_	Mariod *et al.* 2014
				EtOAc	_	18	_	17	_	_	15	_	_	_	–	
				$CHCl_3$	_	12	_	14	_	_	–ve	_	_	_	_	
				Pet. ether	_	–ve	_	–ve	_	_	–ve	_	_	_	_	
			St.Ba.	EtOH	28	16	_	_	_	19	16	_	_	_	_	El Kamali and Mohammed 2006
				EtOAc	-ve	-ve	_	_	_	-ve	-ve	_	_	_	_	
				MeOH	29	12	_	_	_	17	25	_	_	_	_	
				H_2O	16	21	_	_	_	22	21	_	_	_	_	
	Albizia lebbek (L.) Benth.	Dign Al Basha	Le.	MeOH	_	4	2	_	_	-ve	8	_	6	_	_	Elkamali and Mahjoob 2015
				H_2O	_	-ve	-ve	_	_	-ve	-ve	_	-ve	_	_	
	Dichrostachys cinerea (L.) Wright et. Arn.	Kadad	Fr.	$CHCl_3$	16	12	_	_	_	_	16	_	15	_	_	Eisa *et al.* 2000
				MeOH	22	16	_	_	_	_	30	_	28	_	_	
				H_2O	13	-ve	_	_	_	_	17	_	17	_	_	
			Le.	$CHCl_3$	13	-ve	_	_	_	_	16	_	16	_	_	
				MeOH	20	20	_	_	_	_	27	_	25	_	_	
				H_2O	12	20	_	_	_	_	20	_	18	_	_	
	Mimosa pigra L.	Shagarat Alfas	Le.	$CHCl_3$	12	-ve	_	_	-ve	_	-ve	_	20	_	_	Abdalla 2004
				MeOH	22	20	_	_	20	_	18	_	30	_	_	
				H_2O	-ve	-ve	_	_	-ve	_	-ve	_	-ve	_	_	
	Neptunia oleracea Lour.		W.P.	$CHCl_3$	11	12	_	_	_	17	_	16	_	_	_	Elegami *et al.* 2001
				MeOH	12	16	_	_	_	16	_	15	_	_	_	
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
	Prosopis chilensis (Molina) Stuntz	Mesquite	Le.	MeOH	_	12	_	_	_	12	10	_	_	_	_	Mohamed *et al.* 2010
	Vachellia nilotica (L.) P.J.H.Hurter & Mabb.		Fr.	MeOH	35	35	_	_	_	_	39	_	36	_	_	Al-Saiym *et al.* 2015
Fagaceae	*Quercus infectoria* G. Oliv.	Afas	Fr.	EtOH	–ve	37	_	_	_	15	35	_	_	_	–	Sirag *et al.* 2009
Hydnoraceae	*Hydnora abyssinica* A. Braun.	Tartoos	Rh.	$CHCl_3$	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	Elegami *et al.* 2001

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Plant Family	Plant Scientific Name	Plant Vernacular Name	Plant Part	Solvent used	Activity against gram negative bacteria (Diameter zone of inhibition in mm)						Activity against gram positive bacteria (Diameter zone of inhibition in mm)					References
					P. ae.	*E. co.*	*S. ty.*	*S. enc.*	*P. vu.*	*K. pn.*	*St. au.*	*St. ep.*	*B. su.*	*B. ce.*	*En. fa.*	
Hydnoraceae	*Hydnora abyssinica* A. Braun.	Tartoos	Rh.	$CHCl_3$	7	6	_	_	_	_	5	_	6	_	_	Saadabi and Ayoub 2009
				MeOH	8	9	_	_	_	_	8	_	6	_	_	
					18	17	_	_	_	23	_	24	_	_	_	Elegami *et al.* 2001
				H_2O	13	19	_	_	_	18	_	17	_	_	_	
					10	8	_	_	_	_	6	_	8	_	_	Saadabi and Ayoub 2009
				EtOH	21	20	_	_	_	_	25	_	22	_	_	Mosa *et al.* 2014
Hydrocharitaceae/ Najadaceae	*Najas pectinata* (Parl.) Magnus.		W.P.	$CHCl_3$	–ve	–ve	_	_	_	12	_	–ve	_	_	_	Elegami *et al.* 2001
				MeOH	–ve	–ve	_	_	_	–ve	_	11	_	_	_	
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
Lamiaceae/ Labiatae	*Lavandula coronopifolia* Pior	Balolib, Sedam	W.P.	$CHCl_3$	–ve	–ve	_	_	_	11	_	13	_	_	_	
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
				MeOH	13	13	_	_	_	21	_	17	_	_	_	
					_	16	_	_	_	10	12	_	_	_	_	Mohamed *et al.* 2010
	Salvia aegyptiaca L.	Ra'al	W.P.	$CHCl_3$	–ve	–ve	_	_	_	14	_	18	_	_	_	Elegami *et al.* 2001
				MeOH	15	15	_	_	_	20	_	22	_	_	_	
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
Loranthaceae	*Plicosepalus acaciae* (Zucc.) Weins. et Polhill.	Anab El Talh	Le.	$CHCl_3$	13	12	_	_	_	_	14	_	14	_	_	Elegami *et al.* 2001
				MeOH	29	28	_	_	_	_	32	_	34	_	_	
				H_2O	21	18	_	_	_	_	24	_	24	_	_	
			St.	$CHCl_3$	-ve	-ve	_	_	_	_	-ve	_	-ve	_	_	
				MeOH	22	20	_	_	_	_	24	_	22	_	_	
				H_2O	12	13	_	_	_	_	18	_	16	_	_	
			W.P.	$CHCl_3$	15	14	_	_	_	_	12	_	15	_	_	Saadabi and Moglad 2011
				MeOH	22	22	_	_	_	_	12	_	14	_	_	
				H_2O	15	15	_	_	_	_	16	_	17	_	_	
Lythraceae	*Lawsonia inermis* L.	Henna'	Le.	EtOH	-ve	24	_	_	22	17	29	_	20	_	_	El-Kamali and Awad EL-Karim 2009
				Pet. ether	-ve	-ve	_	_	-ve	-ve	-ve	_	-ve	_	_	
				EtOAc	-ve	20	_	_	21	19	24	_	21	_	_	
				$CHCl_3$	15	14	_	_	_	_	13	_	14	_	_	Saadabi 2007

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					P. ae.	*E. co.*	*S. ty.*	*S. enc.*	*P. vu.*	*K. pn.*	*St. au.*	*St. ep.*	*B. su.*	*B. ce.*	*En. fa.*	
Lythraceae	*Lawsonia inermis* L.	Henna'	Le.	MeOH	-ve	26	_	_	22	19	28	_	20	_	_	El-Kamali and Awad EL-Karim 2009
					16	17	_	_	_	_	16	_	14	_	_	Saadabi 2007
				H_2O	18	16	_	_	_	_	19	_	16	_	_	
					16	15	_	_	-ve	12	20	_	22	_	_	El-Kamali and Awad EL-Karim 2009
	Punica granatum L.	Rumman	Fr.Pe.	MeOH	_	6	6	_	_	-ve	20	_	24	_	_	Elkamali and Mahjoob 2015
				H_2O	_	-ve	10	_	_	10	8	_	10	_	_	
Malvaceae	*Abutilon figarianum* Webb.	Gargadan, Mukshash el Rujal	Le.	MeOH	_	10	_	_	_	21	20	_	_	_	_	Mohamed *et al.* 2010
			W.P.	$CHCl_3$	17	15	_	_	_	_	16	_	14	_	_	Saadabi and Moglad 2011
				MeOH	16	16	_	_	_	_	15	_	14	_	_	
				H_2O	12	12	_	_	_	_	12	_	14	_	_	
	Hibiscus sabdariffa L.	Karkadeh	Cy.	EtOH	29	23	_	_	_	33	22	_	_	_	_	Sirag *et al.* 2013a
					15	-ve	_	_	_	27	20	_	_	_	_	El Kamali and Mohammed 2006
				EtOAc	-ve	11	_	_	_	-ve	-ve	_	_	_	_	
				MeOH	29	16	_	_	_	28	25	_	_	_	_	
				H_2O	31	30	_	_	_	22	23	_	_	_	_	
			Le.	MeOH	22	20	_	_	19	22	26	_	21	_	_	Abd-Ulgadir *et al.* 2015
			Se.	MeOH	-ve	-ve	_	_	-ve	-ve	-ve	_	-ve	_	_	
Meliaceae	*Azadirachta indica* A. Juss.	Neem	Le.	EtOH	-ve	-ve	_	_	-ve	-ve	-ve	_	18	_	_	El-Kamali and Awad EL-Karim 2009

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					P. ae.	*E. co.*	*S. ty.*	*S. enc.*	*P. vu.*	*K. pn.*	*St. au.*	*St. ep.*	*B. su.*	*B. ce.*	*En. fa.*	
Meliaceae	*Azadirachta indica* A. Juss.	Neem	Le.	Pet. ether	-ve	15	_	_	-ve	-ve	-ve	_	-ve	_	_	El-Kamali and Awad EL-Karim 2009
				EtOAc	-ve	-ve	_	_	-ve	-ve	18	_	14	_	_	
				MeOH	15	-ve	_	_	-ve	19	-ve	_	17	_	_	
				H_2O	22	19	_	_	-ve	-ve	22	_	17	_	_	
			G.	MeOH	_	4	4	_	_	-ve	8	_	-ve	_	_	Elkamali and Mahjoob 2015
				H_2O	_	-ve	4	_	_	-ve	7	_	-ve	_	_	
	Khaya senegalensis (Desr.) A. Juss.	Mahogany	Ba.	$CHCl_3$	–ve	–ve	_	_	_	12	_	12	_	_	_	Elegami *et al.* 2001
				H_2O	14	15	_	_	_	18	_	18	_	_	_	
				MeOH	19	18	_	_	_	21	_	20	_	_	_	
					_	_	15	_	_	_	_	_	_	_	_	Hassouna *et al.* 2013
				Pet. ether	–	–	4	_	_	_	_	_	_	_	_	
			Le.	MeOH	_	_	13	_	_	_	_	_	_	_	_	
				Pet. ether	–	–	3	_	_	_	_	_	_	_	_	
Menispermaceae	*Tinospora bakis* (A.Rich.) Miers	Irg Alhagar	Ro.	$CHCl_3$	-ve	-ve	_	_	-ve	_	-ve	_	12	_	_	Abdalla 2004
				MeOH	11	-ve	_	_	15	_	25	_	19	_	_	
				H_2O	-ve	-ve	_	_	-ve	_	-ve	_	-ve	_	_	
Molluginaceae (Aizoaceae)	*Glinus lotoides* L.	Tarba	W.P.	$CHCl_3$	–ve	–ve	_	_	_	12	_	13	_	_	_	Elegami *et al.* 2001
				MeOH	–ve	–ve	_	_	_	13	_	13	_	_	_	
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
Moraceae	*Ficus sycomorus* L.	Gom'aiz	Ba.	EtOH	15	–ve	_	_	_	–ve	44	_	_	_	_	Sirag *et al.* 2013b
	Ficus vasta Forssk.	Gom'aiz	Le.	EtOH	20	18	_	_	_	_	18	_	20	_	–	Mosa *et al.* 2014
Moringaceae	*Moringa oleifera* Lam.	Al ruwag	Se.	H_2O	25	22	_	_	_	_	48	_	40	_	_	Saadabi and Abu Zaid 2011
				MeOH	13	12	_	_	_	_	18	_	18	_	_	
			Le.	H_2O	10	-ve	_	-ve	-ve	-ve	7	12	_	8	_	Abdallah 2016
				BuOH	12	-ve	_	-ve	-ve	6	10	14	_	9	_	
				EtOAc	13	7	_	7	6	7	14	16	_	10	_	
				$CHCl_3$	-ve	-ve	_	-ve	-ve	-ve	11	9	_	7	_	
Myrtaceae	*Eucalyptus globulus* Labill.	Ban	Le.	EtOH	31	30	_	_	_	30	23	_	_	_	_	Sirag *et al.* 2013b
	Psidium guajava L.	Guwava	Ba.	$CHCl_3$	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	Abdelrahim *et al.* 2002

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					P. ae.	*E. co.*	*S. ty.*	*S. enc.*	*P. vu.*	*K. pn.*	*St. au.*	*St. ep.*	*B. su.*	*B. ce.*	*En. fa.*	
Myrtaceae	*Psidium guajava* L.	Guwava	Ba.	MeOH	20	22	_	_	_	20	_	18	_	_	_	Abdelrahim *et al.* 2002
				H_2O	16	20	_	_	_	16	_	16	_	_	_	
			Le.	$CHCl_3$	23	_	_	_	_	23	22	_	_	_	_	Hamadt-Allah *et al.* 2011
				MeOH	23	_	_	_	_	19	26	_	_	_	_	
				H_2O	20	_	_	_	_	19	13	_	_	_	_	
Nymphaeaceae	*Nymphaea lotus* L.	Suteib	W.P.	$CHCl_3$	-ve	-ve	_	_	_	_	-ve	_	-ve	_	_	El-Egami *et al.* 2005
					13	16	_	_	_	_	15	_	14	_	_	Saadabi and Moglad 2011
				MeOH	22	20	_	_	_	_	22	_	21	_	_	
					22	20	_	_	_	_	24	_	23	_	_	El-Egami *et al.* 2005
				H_2O	-ve	-ve	_	_	_	_	14	_	13	_	_	
					15	14	_	_	_	_	14	_	14	_	_	Saadabi and Moglad 2011
Olacaceae	*Ximenia americana* L.	Um medeika, Beu'ok	Ba.	EtOH	14	-ve	-ve	_	_	_	20	_	-ve	_	_	Abdalla *et al.* 2013
				$CHCl_3$	15	11	_	_	_	_	12	_	13	_	_	Omer and Elnima 1992
				MeOH	22	19	_	_	_	_	30	_	23	_	_	
				H_2O	14	16	_	_	_	_	18	_	18	_	_	
			Le.	$CHCl_3$	12	-ve	_	_	_	_	14	_	13	_	_	
				MeOH	25	-ve	_	_	_	_	22	_	23	_	_	
				H_2O	22	16	_	_	_	_	19	_	17	_	_	
			Ro.	$CHCl_3$	13	12	_	_	_	_	13	_	15	_	_	
				MeOH	15	19	_	_	_	_	21	_	15	_	_	
				H_2O	-ve	-ve	_	_	_	_	13	_	13	_	_	
			St.	$CHCl_3$	-ve	11	_	_	_	_	11	_	-ve	_	_	
				MeOH	24	-ve	_	_	_	_	25	_	20	_	_	
				H_2O	13	13	_	_	_	_	17	_	17	_	_	
Onagraceae	*Ludwigia erecta* (L.) H.Hara (*Jussiaea erecta* L.)	Arkala	W.P.	$CHCl_3$	13	16	_	_	_	_	16	_	14	_	_	El-Egami *et al.* 2005
				MeOH	20	23	_	_	_	_	29	_	24	_	_	
				H_2O	18	20	_	_	_	_	20	_	18	_	_	
Papaveraceae	*Argemone mexicana* L.	Khashkhash Mexicki	Le.	$CHCl_3$	15	16	_	_	_	_	16	_	17	_	_	Saadabi and Moglad 2011

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					P. ae.	*E. co.*	*S. ty.*	*S. enc.*	*P. vu.*	*K. pn.*	*St. au.*	*St. ep.*	*B. su.*	*B. ce.*	*En. fa.*	
Papaveraceae	*Argemone mexicana* L.	Khashkhash Mexicki	Le.	MeOH	-ve	-ve	_	_	_	_	-ve	_	-ve	_	_	Saadabi and Moglad 2011
				H_2O	13	12	_	_	_	_	14	_	12	_	_	
Poaceae/ Graminae	*Cymbopogon nervatus* Chiov.	Nal	Inf.	EtOH	16	14	_	_	_	_	15	_	20	_	_	EL-Kamali and EL-amir 2010
	Cymbopogon schoenanthus (L.) Spreng. ssp. *proximus* (Hochst. Ex. A. Rich) Maire & Weiller	Mahareib	A.P.	EtOH	15	14	_	_	_	_	20	_	24	_	_	
	Zea mays L.	Eish Reif	Co.Si.	EtOH	_	20	17	_	_	20	-ve	_	23	_	_	Azhari and Mohammed 2013
Polygalaceae	*Polygala irregularis* Boiss.	Ha_ut	W.P.	$CHCl_3$	–ve	–ve	_	_	_	–ve	_	12	_	_	_	Elegami *et al.* 2001
				MeOH	14	12	_	_	_	14	_	16	_	_	_	
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
	Securidaca longepedunculata Fres.	Irg Alali	Ro.	$CHCl_3$	11	-ve	_	_	-ve	_	12	_	15	_	_	Abdalla 2004
				MeOH	11	20	_	_	-ve	_	25	_	-ve	_	_	
				H_2O	-ve	-ve	_	_	-ve	_	-ve	_	-ve	_	_	
Polygonaceae	*Polygonum barbatum* L.	Timsahiya	W.P.	$CHCl_3$	–ve	–ve	_	_	_	13	_	14	_	_	_	Elegami *et al.* 2001
				MeOH	15	15	_	_	_	16	_	18	_	_	_	
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
	Rumex nervosus Vahl.	Hara	W.P.	$CHCl_3$	–ve	–ve	_	_	_	–ve	_	14	_	_	_	
				MeOH	14	13	_	_	_	15	_	15	_	_	_	
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
	Rumex vesicarius L.	Hara	W.P.	$CHCl_3$	–ve	–ve	_	_	_	–ve	_	18	_	_	_	
				MeOH	–ve	–ve	_	_	_	15	_	14	_	_	_	
				H_2O	–ve	–ve	_	_	_	12	_	–ve	_	_	_	
Pontederiaceae	*Eichhornia diversifolia* (Vahl) Urb.	A'shab El nil	W.P.	$CHCl_3$	–ve	–ve	_	_	_	13	_	14	_	_	_	
				MeOH	–ve	–ve	_	_	_	–ve	_	12	_	_	_	
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
Ranunculaceae	*Nigella sativa* L.	Habat El Baraka	Se.	MeOH	_	11	_	_	_	10	14	_	_	_	_	Mohamed *et al.* 2010
				EtOH	20	32	_	_	_	_	_	_	_	18	_	Kabbashi *et al.* 2015b
Rhamnaceae	*Ziziphus spina-christi* (L.) Desf.	Sidir	St.Ba.	EtOH	21	-ve	_	_	24	20	21	_	22	_	_	El-Kamali and Mahjoub 2009

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					P. ae.	*E. co.*	*S. ty.*	*S. enc.*	*P. vu.*	*K. pn.*	*St. au.*	*St. ep.*	*B. su.*	*B. ce.*	*En. fa.*	
Rhamnaceae	*Ziziphus spina-christi* (L.) Desf.	Sidir	St.Ba.	Pet. ether	-ve	20	_	_	20	-ve	14	_	15	_	_	El-Kamali and Mahjoub 2009
				EtOAc	11	12	_	_	12	12	-ve	_	14	_	_	
				H_2O	15	17	_	_	15	13	15	_	16	_	_	
				MeOH	12	13	_	_	13	15	16	_	14	_	_	
					–	19	_	_	_	27	34	_	–	_	_	Mohamed *et al.* 2010
			Le.	EtOH	21	-ve	_	_	-ve	12	-ve	_	12	_	_	El-Kamali and Mahjoub 2009
				Pet. ether	-ve	-ve	_	_	-ve	-ve	-ve	_	-ve	_	_	
				EtOAc	-ve	-ve	_	_	-ve	-ve	-ve	_	-ve	_	_	
				H_2O	-ve	-ve	_	_	-ve	-ve	-ve	_	-ve	_	_	
				MeOH	-ve	-ve	_	_	-ve	-ve	13	_	-ve	_	_	
					_	17	_	_	_	10	10	_	–	_	_	Mohamed *et al.* 2010
Rubiaceae	*Xeromphis nilotica* (Stapf.) Keay	Shagarat Elmarfien	Br.	$CHCl_3$	11	12	_	_	-ve	_	12.5	_	20	_	_	Abdalla 2004
				MeOH	11	17	_	_	15	_	20	_	-ve	_	_	
				H_2O	-ve	-ve	_	_	-ve	_	-ve	_	-ve	_	_	
Rutaceae	*Murraya paniculata* (L.) Jack (*M. exotica* Koem.ex L.)		W.P.	$CHCl_3$	12	13	_	_	_	_	12	_	12	_	_	Saadabi and Moglad 2011
				MeOH	16	15	_	_	_	_	14	_	15	_	_	
				H_2O	10	12	_	_	_	_	10	_	11	_	_	
Salvadoraceae	*Salvadora persica* L.	Arak	St.	$CHCl_3$	12	13	_	_	_	_	14	_	13	_	_	
				MeOH	16	14	_	_	_	_	16	_	12	_	_	
				H_2O	14	12	_	_	_	_	13	_	11	_	_	
Simaroubaceae	*Harrisonia abyssinica* Oliv.	Karb-El wadi	Le.	MeOH	_	10	_	_	_	17	23	_	_	_	_	Mohamed *et al.* 2010
			Fr.	MeOH	–	18	_	_	_	10	10	_	–	_	–	
Solanaceae	*Datura stramonium* L.	Saikaran	Le.	MeOH	12	12	_	_	_	_	12	_	30	_	_	ElNour *et al.* 2014
				Pet. ether	-ve	-ve	_	_	_	_	-ve	_	-ve	_	–	
			Le.Ca.	MeOH	-ve	-ve	_	_	_	_	-ve	_	11	_	_	
				Pet. ether	-ve	-ve	_	_	_	_	-ve	_	-ve	_	_	
			W.P.	$CHCl_3$	14	14	_	_	_	_	18	_	16	_	_	Saadabi and Moglad 2011

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					P. ae.	*E. co.*	*S. ty.*	*S. enc.*	*P. vu.*	*K. pn.*	*St. au.*	*St. ep.*	*B. su.*	*B. ce.*	*En. fa.*	
Solanaceae	*Datura stramonium* L.	Saikaran	W.P.	MeOH	15	16	_	_	_	_	16	_	17	_	_	Saadabi and Moglad 2011
				H_2O	12	12	_	_	_	_	14	_	14	_	_	
	Hyoscyamus muticus L.	Saikaran	Le.	$CHCl_3$	11	14	_	_	_	_	13	_	14	_	_	
				MeOH	12	13	_	_	_	_	14	_	13	_	_	
				H_2O	15	14	_	_	_	_	13	_	12	_	_	
	Physalis angulata L.	Hembook	W.P.	$CHCl_3$	–ve	–ve	_	_	_	13	_	12	_	_	_	Elegami *et al.* 2001
				MeOH	–ve	11	_	_	_	16	_	16	_	_	_	
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
	Solanum nigrum L.	Tamr el Abeid, El Mugt	Le.	$CHCl_3$	–ve	–ve	_	_	_	13	_	14	_	_	_	
					_	20	14	_	_	_	-ve	_	15	_	_	Moglad *et al.* 2012
				MeOH	_	15	25	_	_	_	15	_	15	_	_	
					14	12	_	_	_	15	_	14	_	_	_	Elegami *et al.* 2001
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
			St.	$CHCl_3$	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
				MeOH	–ve	–ve	_	_	_	–ve	_	14	_	_	_	
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
	Withania somnifera (L.) Dun.	Shar el Fagri	Le.	$CHCl_3$	20	15	_	_	_	_	16	_	20	_	_	Saadabi and Moglad 2011
				MeOH	19	15	_	_	_	_	17	_	15	_	_	
				H_2O	14	12	_	_	_	_	14	_	14	_	_	
Sterculiaceae	*Sterculia setigera* Del.	Shager el Luban	Fr.	$CHCl_3$	12	12	_	_	_	_	11	_	11	_	_	
				MeOH	15	13	_	_	_	_	14	_	14	_	_	
				H_2O	15	16	_	_	_	_	15	_	14	_	_	
Tamaricaeae	*Tamarix aphylla* (L.) Karsten	Tarfa	Le.+ Br.	$CHCl_3$	12	-ve	_	_	-ve	_	-ve	_	20	_	_	Abdalla 2004
				MeOH	20	15	_	_	20	_	25	_	27	_	_	
				H_2O	20	-ve	_	_	-ve	_	20	_	20	_	_	
Thymelaceae	*Gnidia kraussiana* Meisn.	Abu Gutnah	W.P.	$CHCl_3$	13	14	_	_	_	_	11	_	15	_	_	Saadabi and Moglad 2011
				MeOH	13	16	_	_	_	_	15	_	17	_	_	
				H_2O	14	11	_	_	_	_	12	_	16	_	_	
Tiliaceae	*Grewia damaine* Gaertn. (*G. bicolor* Juss.)	Basham al-bayad	Ro.	MeOH	13	15	_	_	_	_	14	_	12	_	_	Jaspers *et al.* 1986
				$CHCl_3$	–ve	–ve	_	_	_	_	–ve	_	–ve	_	_	
	Grewia tenax (Forsk.) Fiori	Guddeim	Le.	$CHCl_3$	-ve	-ve	_	_	_	_	-ve	_	-ve	_	_	Saadabi and Moglad 2011

Continuied….

Plant Family	Plant Scientific Name	Plant Vernacular Name	Plant Part	Solvent used	Activity against gram negative bacteria (Diameter zone of inhibition in mm)						Activity against gram positive bacteria (Diameter zone of inhibition in mm)					References
					P. ae.	*E. co.*	*S. ty.*	*S. enc.*	*P. vu.*	*K. pn.*	*St. au.*	*St. ep.*	*B. su.*	*B. ce.*	*En. fa.*	
Tiliaceae	*Grewia tenax* (Forsk.) Fiori	Guddeim	Le.	MeOH	17	15	_	_	_	_	18	_	17	_	_	Saadabi and Moglad 2011
				H_2O	14	16	_	_	_	_	17	_	15	_	_	
	Grewia villosa Wildd.	Hellaiwe	Le.	$CHCl_3$	21	15	_	_	_	_	16	_	20	_	_	
				MeOH	19	15	_	_	_	_	17	_	15	_	_	
				H_2O	14	12	_	_	_	_	14	_	14	_	_	
Vahliaceae/ Saxifragraceae	*Vahlia dichotoma* (Murr.) Kurtze	Sifeirt el Bahr	W.P.	$CHCl_3$	17	20	_	_	_	_	21	_	14	_	_	
				MeOH	16	15	_	_	_	_	15	_	14	_	_	
				H_2O	11	13	_	_	_	_	10	_	10	_	_	
Verbenaceae	*Premna resinosa* (Hochst) Schan.	Singeil	Le.	$CHCl_3$	15	14	_	_	_	_	13	_	15	_	_	
				MeOH	12	13	_	_	_	_	13	_	10	_	_	
				H_2O	11	13	_	_	_	_	-ve	_	10	_	_	
Vitaceae	*Cissus quadrangularis* L.	Sala'la'	W.P.	MeOH	_	10	_	_	_	20	22	_	_	_	_	Mohamed *et al.* 2010
Xanthorrhoeaceae (Liliaceae)	*Aloe sinkatana* Rey.	Sabbar	Le.	MeOH	_	10	_	_	_	11	10	_	_	_	_	Mohamed *et al.* 2010
	Asphodelus tenuifolius Cav.	Bassal El Unsul	W.P.	$CHCl_3$	13	14	_	_	_	15	_	13	_	_	_	Elegami *et al.* 2001
				MeOH	18	17	_	_	_	23	_	19	_	_	_	
				H_2O	–ve	–ve	_	_	_	–ve	_	–ve	_	_	_	
Zingiberaceae	*Curcuma longa* L.	Kurkum	Rh.	MeOH	_	6	2	_	_	4	6	_	6	_	_	Elkamali and Mahjoob 2015
				H_2O	_	-ve	-ve	_	_	-ve	-ve	_	-ve	_	_	
Zygophyllaceae	*Fagonia cretica* L.	Um Shewaikah	Le.	$CHCl_3$	13	14	_	_	_	_	17	_	13	_	_	Saadabi and Moglad 2011
				MeOH	13	14	_	_	_	_	16	_	15	_	_	
				H_2O	16	17	_	_	_	_	14	_	13	_	_	
	Tribulus terrestris L.	Dereisa	Le.	MeOH	_	12	_	_	_	22	21	_	_	_	_	Mohamed *et al.* 2010
	Zygophyllum macrophyllum Regel & Schmalh. (*Z. portulacoides* Forssk.)	Um mamleiha	St.	$CHCl_3$	10	14	_	_	_	_	13	_	14	_	_	Saadabi and Moglad 2011
				MeOH	12	13	_	_	_	_	14	_	13	_	_	
				H_2O	13	11	_	_	_	_	-ve	_	10	_	_	

_= Not Tested, -ve= No inhibition zone observed, Ro.= Roots, Rh.= Rhizome, Le.= Leaves, St.= Stem, W.P.= Whole Plant, A.P.= Aerial Parts, Fr.= Fruits, Po.= Pods, Se.= Seeds, Br.= Branches, Tw.= Twigs, Ba.= Bark, Oleo-gum resin= O.G.R., Wo.P.= Woody Parts, Me.= Mesocarp, Pu.= Pulp, Pe.= Peel, Hy.= Hypocotyls, Ca.= Callus, Co.= Cotyledon, Po.= Pods, Fe.= Fermented, Cy.= Calyces, G.= Gum, Inf.= Inflorescence, Co.Si.= Corn silk.

P. ae.= Pseudomonas aeruginosa, E. co.=Escherichia coli,S. ty.= Salmonella typhi, S. enc.= Salmonella enterica, P. vu.= Proteus vulgaris, K. pn.= Klebsiella pneumonia, St. au.= Staphylococcus aureus, St. ep.= Staphylococcus epidermis, B. su.= Bacillus subtilis, B. ce.= Bacillus cereus, En. fa.= Enterococcus faecalis.

H_2O= Aqueous, MeOH= Methanol, $CHCl_3$= Chloroform, Pet. ether= Petroleum ether, EtOAc= Ethyl acetate, EtOH= Ethanol, BuOH= Butanol

DISCUSSION

In this review, up to 142 species belonging to 64 families were reported to have antibacterial activity against different gram positive and gram negative bacteria *in vitro* with either cup-plate or disc diffusion methods. Table (1) shows some promising Sudanese medicinal plants with antibacterial activities. Plant families most studied were: Fabaceae (21 species: Faboideae (9 species), Mimosoideae (8 species), Ceasalpinioideae (4 species)), Asteraceae (11 species), Combretaceae (7 species), Capparaceae (6 species), Cucurbitaceae (5 species), Solanaceae (5 species), the rest of families with 4 or less than 4 species. These findings might reflect the importance of these families as a potential source of compounds with antibacterial activities, or otherwise, simply the abundance of these plants in the Sudanese habitats. Out of these 142 plant species which showed antibacterial activities against different pathogens, 17 species recorded highest potent antibacterial activities (inhibition zone 30 mm or more), namely: *Acacia nioltica*, *Citrullus lanatus*, *Quercus infectoria*, *Vachellia chilensis*, *Adansonia digitata*, *Courbonia virgata*, *Plicosepalus acaciae*, *Ziziphus spina-christi*, *Cyperus rotundus*, *Trigonella foenum-graecum*, *Eucalyptus globules*, *Trachyspermum ammi*, *Kigelia africana*, *Raphanus sativus*, *Anogeissus schimperi*, *Dichrostachys cinerea* and *Mimosa pigra*, respectively (Fig. 1). These plant species are highly recommended for further studies, in order to discover new antibacterial drugs able to stand in the face of the dramatic spreading multi-drug resistant (MDR) bacteria.

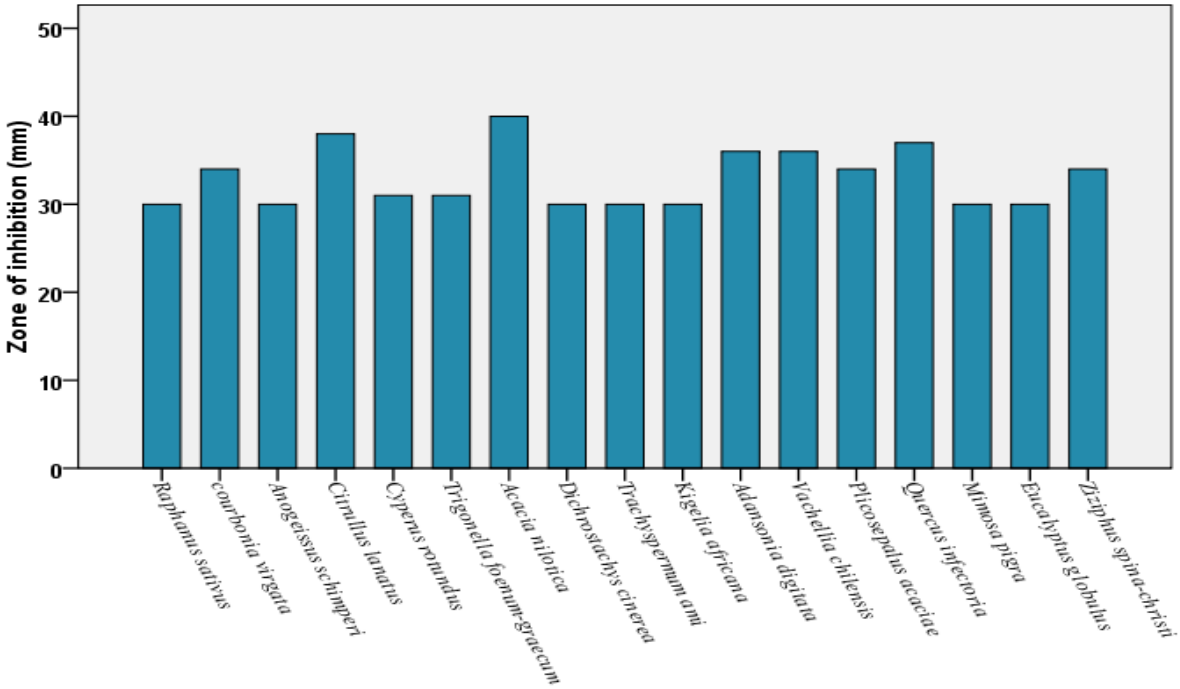

Fig. 1. Some of the most potent antibacterial Sudanese medicinal plants.

The ongoing emergence and spread of multi-drug resistant (MDR) bacteria is an international public health issue and now the effective antimicrobial drugs for bacterial infections are limited few or even sometimes absent (Magiorakos *et al.*, 2012). This fact led to searching for new antimicrobial agents, hastily. The screening for antibacterial activity of medicinal plants have been spread all over the world and many plants showed different degrees of antibacterial activities, most of these plants are prescribed in traditional and folk medicine.

As examples; Samy *et al.* (1998) screened 34 plant species belonging to 18 different families, 16 of them showed significant antibacterial activity. Rabe and Van Staden (1997) screened 21 South African medicinal plants, 12 plant species revealed antibacterial activity. Holetz *et al.* (2002) screened 13 Brazilian medicinal plants, 10 of them recorded potent antibacterial activity. Such studies are important, particularly in the developing countries like Sudan, where the weakness of people's income, and high cost of modern medicines, makes medicinal plants becoming much popular.

Although, it was observed during data collection of this study that the interest in the scientific research on medicinal plants in Sudan is scanty. The majority of the published work on medicinal plants is either self-funded (University staff members or MSc of PhD students) or funded from foreign bodies (Scholarships or fellowships from developed countries or support from interested international institutions). On the other hand, the authors observed that there is no standardized method used in the studies for screening the antibacterial activities of Sudanese plants, there are great variations in methods of extraction (maceration, infusion, percolation, decoction, etc.) to bacteria tested (referenced bacterial strains, environmental or pathogenic strains), till the antibacterial assays (cup-plate diffusion, disk diffusion, minimum inhibitory concentration, etc.), and even the concentration of the extract itself (500 mg/ml, 250 mg/ml, 100 mg/ml, etc.) which make it difficult in demonstration and comparison between different studies. However, most studies are published on the crude, as the fractionation and single compound studies are more sophisticated and very expensive in low income countries like Sudan. Interestingly, the majority of the screened plants has applications in the folkloric or traditional Sudanese medicine, which reflects the richness of Sudanese folklore in herbal remedies. Technically, the majority of the antibacterial studies on the crude extracts in Sudan is depending on either Agar disk diffusion assay or Agar well diffusion assay. Although, there are many other assays used in the *in vitro* antibacterial testing such as: Broth micro-dilution, Broth macro-dilution assay, Bioautography, Contact bio-autography, Agar overlay bio-autography and Direct bio-autography. Hence, it is important to standardize the *in vitro* antimicrobial efficacy testing so that the searching for new antibacterial compounds could be more systematic, facilitated and accurate (Das *et al.*, 2010). It is also observed from (Table 1) that, some plants showed high antibacterial activity against gram negative bacteria and others are more effective against the gram positives, while other plants revealed a broad spectrum activity, indicating that medicinal plants may have different mechanisms or mode of actions on bacteria, differ than that of the synthesized antibiotics. Further studies on these promising antibacterial plants is recommended.

CONFLICT OF INTEREST STATEMENT

We declare that we have no conflict of interest.

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