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Antimicrobial Activity of *Psidium guajava, Schoenanthus cymbopogon, Solenostemma argel, Hyphaene thebaica and Petroselinum crispum*

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Abstract
Psidium guajava, Schoenanthus cymbopogone, Solenostemma argel, Hyphaene thebaica and Petroselinum crispum plants are traditionally used for medicinal purposes in Sudan. The present study was designed to check in vitro efficacy of these plants against selected bacterial and fungal strains. PetroLeum ether, ethyl acetate, acetone and ethanol extract of these plants were used for antimicrobial screening. Antibacterial activity was tested against four standard bacteria i.e.: two Gram positive (*Bacillus subtilis* and *Staphylococcus aureus*), two Gram negative (*Escherichia coli* and *Pseudomonas aeruginosa*). Antifungal activity was tested against two standard fungi species i.e. *Aspergillus niger* and *Candida albicans* using the Agar plate diffusion method was used for both. The ethanolic extract showed greater bacterial activity as compared with other extract may due to the polarity. exhibited inhibitory effects against most of the tested organisms with the zone of inhibition ranging from (11-23.5 mm) in length. All extract of S. argel showed excellent inhibitory activities (12 -23.5mm) and obtained remarkable inhibitory (23.5, 22mm) against *Pseudomonas aeruginosa* and *Escherichia coli* respectively. *Petroselinum crispum* showed good inhibitory activities (23mm) against *E. coli*. The other extract of plants showed modrate inhibitory ranging between (12 -17 mm) against all bacteria. In case of fungi highest inhibition was observed against *Aspergillus niger* (23 mm) from *S.cymbopogone* and S. argel followed by P. guajava (22mm), while *S. argel* showed highest inhibition (21mm) against *Candida albicans*. However *S. cymbopogone* showed no zone of inhibition was observed in *Aspergillus niger* and *Candida albicans* except with petroieum ether extract.
In conclusion: These finding provide scientific evidence of traditional use of medicinal plants and also indicate the potential of these plants for the development of antimicrobial agents.

Keywords: medicinal plants, screening, chemotherapeutic, phytomedicin, disc diffusion.

1. Introduction
Medicinal plants provide a subsidy from nature that can be of great value to rural people and may be of value to global society as a source of new drugs. More than 50% of all the drugs in clinical use currently, are of natural product origin [1]. A number of significant global diseases including cancer, malaria, tuberculosis and certain viral, fungal and bacterial infections are showing patterns of resistance to known therapeutic agents. The plant kingdom represents an extra ordinary reservoir of novel molecules. Of the estimated 250,000 – 500,000 plant species around the globe, only small percentage has been investigated phytochemical and the fractions subjected to biological or pharmacological screening [2]. The World Health Organization estimates that approximately 80 percent of the world's population relies primarily on traditional medicines as sources for their primary health care. [3]. Over 100 chemical substances that are considered to be important drugs are either currently in use or have been widely used in one or more countries in the world have been derived from less than 100 different plants. Approximately 75 % of these substances were discovered as a direct result of chemical studies focused on the isolation of active substances from plants used in traditional medicine[4].39% of the 520 new drugs approved during the period 1983 through 1994 were either natural products or derivatives of natural products [5]. Over 60 percent of antibacterial and antineoplastics were again either natural products themselves or based on structures of natural products [6]. The development of drug resistance in human pathogen against commonly used antibiotics necessitated a search for new antimicrobial substances from other sources including plants. Screening of medicinal plants for antimicrobial activities is important for potential new compounds for therapeutic use [7]. Phytochemicals such as vitamins (A, C, E and K), carotenoids, terpenoids, flavonoids, polyphenols, alkaloids, tannins, saponins, pigments, enzymes and minerals proved to have antimicrobial and antioxidant activity [8].
People in Sudan and in other developing countries have relied on traditional herbal preparations to treat themselves. Therefore, it is useful to investigate the potential of local plants against these disabling diseases [9-10].
Plant-derived substances have traditionally played important roles in the treatment of human diseases. Today, about 80 % of the world population residing in third world countries still rely almost entirely on plant products for their primary health care. The remaining 20% of individuals living in the world use, in more than 25% of cases, pharmaceuticals which have been directly derived from plant products [11-12]. These range from common remedies such as aspirin (originally isolated from the Rosacea; *Filipendula ulmaria*), to prescription drugs such as the analgesic morphine and the

cardiacglycoside digitoxin and digoxin (isolated from the Papaveracea; *Papaver somniferum*, and the Apocynacea, *Digitalis purpula*, respectively).

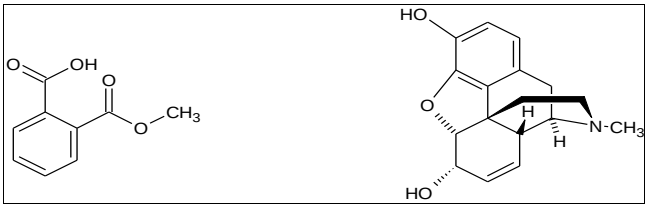

Fig 1: Aspirin Morphine

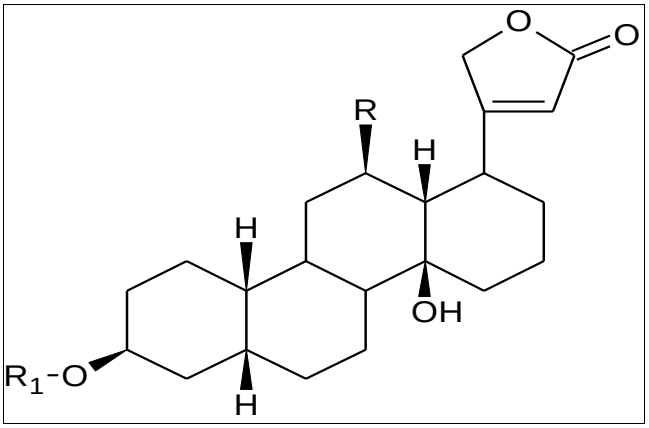

Fig 2: The chemical structure of aspirin, morphine, digitoxin and digoxin [12] Digitoxin (R = H, R1 = sugar residue) Digoxin (R = OH, R = sugar)

The potential for developing antimicrobials into medicines appears rewarding, from both the perspective of drug development and the perspective of phytomedicine. The immediate source of financial benefit from plant based antimicrobial is from herbal products market. This market offers many opportunities for those cultivating new crops, as many of the plant that are wild grafted today must be cultivated to march the demands of this market [1]. According to International Union of Conservation of Nature (IUCN) and world health organization (WHO) the cultivation of plants as sources of drugs is the best and the most promising way to satisfy market's expanding demand for these raw materials, for wild plant species that are endangered through over exploitation, this is certainly the only applicable way in which we can stop their decline and secure their long-term survival. In addition, there will be an accelerated poverty reduction through creation of rural income [13].

The plants samples under study are common plants widely used in many parts of Sudan for medicinal purposes or herbal medicine to treat various diseases. The leaves part of *P. guajava* is one of the oldest known medicinal plants, used in a long time to treat ailments including cough and pulmonary diseases [14]. The aqueous extract decreased the frequency of cough induced by capsaicin aerosol within 10 minutes after in traperitoneal injection of the extract**.** *Cymbopogon schoenanthus* was an a romatic herb consumed in salads and used to prepare traditional meat recipes [15]. The plant was used in traditional medicine as antihelminthes, antidiarrhea, antirheumatic, carminative, diaphoretic, stomachic, diuretic, emenagogue, antipyretic, for treatment of jaundice and as tonic. It was also used for anorexia; astringent. *S. argel* is a traditional herbal medicine used widely as analgesic, sedative, antimalarial, stomach disorders, dysmenorrheal and menstrual and to relieve diarrhea [16]**.** Leaf of hargel is characterized by high carbohydrates and low crude fiber, contained protein, crude oil, ash and moisture content. Hargel has antimicrobial effect to some bacteria and fungi and has antiviral activity to new castle disease virus. Hargel leaves are used in indigenous medicine for the treatment of some diseases such as the disease of liver and kidney. It is an effective remedy for bronchitis and is used to treat neuralgia [17]. Doum palm fruit (Hyphaene thebaica) is a desert palm tree with edible oval fruit, originally native to the Nile valley. It also grows very well in the northern part of Nigeria. It is a member of the palm family, Arecaceae [18]. Roots of doum palm are used for treatment of bilharzias while the fruit is often chewed to control hypertension [19]. The drink has been prepared from the fruits by infusing the dried ground fruit pulp in hot water. This drink is widely consumed as a health tonic as a remedy for hypertension [20]. It is regarded as a natural anti colon cancer [21]. Doum fruits are relatively rich in protein and in essential minerals. It contains high amounts of essential minerals [22]. Infusion of this herb has been used in pain, fever, diarrhoea, dysentery, an emmenagogue and other intestinal problems [23]. Parsley (Petroselinum crispum), medicinal plants and herbs play an important role in the prevention and treatment of kidney diseases. Parsley (Petroselinum crispum, Family: Umbelliferae is used as a culinary, garnishing and medicinal herb in the Mediterranean region of Southern Europe. Parsley extract was reported to produce a diuretic effect and good antioxidant activity [24]. Parsley leaves are rich in apigenin and its glucosidal flavonoids that were found to possess anti-inflammatory especially for renal inflammation; antioxidant and anticancer activities [25].In addition, the aqueous extract of parsley reduced the number of calcium oxalate deposits and therefore parsley can be used for kidney and bladder stones [26]. They are multipurpose plants, widely used in traditional medicine around the world to treat stomach ailments, wounds, boils and blisters [27]. A number of pharmacological and biological activities including anti-*Candida*, anti-inflammatory, antidiabetic, antidiarrheal, cytoprotective, antimicrobial, antibacterial, antioxidant, cytotoxic and apoptotic, anti-pyretic and analgesic activities have been reported for this plant [28]. *S. argel* has a broad spectrum of applications as herbal remedies in Africa, India, Saudi Arabia and Sudan. Moreover, it showed significant antidiarrheal activity. The aqueous extract of the dried leaves are used to treat dysmenorrhea and other menstrual irregularities [29]. Has an inhibitory effect on the uterus, (uterine relaxation) in both pregnant and non-pregnant women, and relieving pain [30].

2.Materials and methods

2.1Plant materials

The samples of the plants *Psidium guajava, Schoenanthus cymbopogone, Solenostemma argel, Hyphaene thebaica and Petroselinum crispum* were collected randomly from different location of Sudan. The plant materials were dried under shade for 7 days except the fruits of *doom palm* which was found dried. They were ground into fine powder in preparation for extraction. The finely powdered materials were weighed separately and stored in bottles at room temperature.

2.2Chemicals

chemicals Organic solvents used in this study petroleium ether, ethyl acetate, acetone and ethanol were from Sisco Research Lab (SRL), India. culture media were from Merck, Germany, dimethyl sulfuric, peptone water, Mueller hinton agar, saboraud dextrose agar, normal saline, dimethyl sulfoxide, Bacillus subtitls, Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa, sodium chloride, distilled water.

2.3Instruments and apparatus

Petri- dishes, cotton swab, incubate

2.4Methods of extraction

A100 g of the finely ground material was soaked successive in four solvents of varied polarty. Firstly soaked in petroleum ether (a least polar solvent) for 48 hours with occasional swirling to ensure maximum extraction. The soaked material was filtered and the crude extract were collected in clean containers. The crude extract was dried at room temperature and weighed. The residue after extraction with petroleum ether was air dried under room temperature and soaked in ethyl acetate for 48 hours with occasional swirling to ensure maximum extraction. The soaked material was filtered and the crude extract collected in clean containers. The crude extract was dried at room temperature and weighed. The residue after extraction with ethyl acetate was air dried and soaked in acetone for 48 hours with occasional swirling. This was followed by filtering, drying and weighing. The residue was air dried and soaked in ethanol (high polar solvent) and the above procedure was repeated. Finally, residue obtained from each extract was air dried under room temperature and its yield percentage was determined, colour and texture were reported.

3. Determination of antimicrobial activity

3.1Culture media

3.1.1Nutrient broth

This medium contains peptone, yeast extract and sodium chloride. It was prepared according to Barrow and Feltham [31] by dissolving 13 grams of the medium in one liter of distilled water. The pH of the medium was adjusted to 7.4 and the medium was then distributed into screw capped bottles, 5ml of each was taken and sterilized by autoclaving at 121˚C for 15 minutes.

3.1.2Nutrient agar

The medium contained lab-lemco powder (1.0 g), yeast extract (2.0 g), peptone (5.0 g) and agar No.3 (15.0 g). 28 grams of dehydrated medium were dissolved in one liter of distilled water and the pH was adjusted to 7.4. The dissolved medium was sterilized by autoclaving at 121˚C for 15 minutes.

3.1.3Mueller Hinton agar

Mueller Hinton dehydrated media (38 g) was dissolved in liter of purified water and heated with frequent agitation. Media was sterilized at 121˚C for 15 minutes and cooled to 45 - 50˚C and dispensed into sterile Petri dishes.

3.1.4Saboraud dextrose agar

The medium contained mycological peptone (10.0 g), dextrose (D-glucose) (40.0 g) and agar (15.0 g). 65 grams of dehydrated medium were suspended in a liter of distilled water, dissolved by heating and the pH was adjusted to 5.6. The medium was sterilized by autoclaving at 121˚C for 15 minutes.

3.2 Preparation of reference strains of bacteria

One ml aliquots of 24 hour's broth culture of tested organisms were aseptically added to nutrient agar slopes and incubated (Griffin and George Ltd, England) at 37˚ C for 24 hours. The bacterial growth was harvested and washed off by addition of sterile normal saline. The harvested bacteria were suspended in a suitable volume of normal saline to produce a suspension containing about 10^8- 10^9 colony forming units per ml (cfu/ml). The suspension was stored in the refrigerator at 4˚C till used. The average number of viable organisms per ml of the stock suspension was determined by means of the surface viable counting technique [32].

3.3 Preparation of reference strains of fungi

The fungal culture was grown on saboraud dextrose agar, incubated at 25˚C for 4 days. The suspended fungal growth was harvested in 100 ml of sterile normal saline and the suspension was stored in refrigerator till used.

3.4Testing for antibacterial activity

The antibacterial activity test was performed using the disc diffusion assay [33]. Sterile filter paper discs (Whatman No. 1, 6 mm in diameter) were impregnated with one of each extract (20mg/ml) and left to dry to remove residual solvent, which might interfere with the determination. Twenty ml aliquots of the molten Mueller Hinton agar were distributed into sterile Petri-dishes.

About 0.1 ml of the standardized bacterial stock suspension 10^8 –10^9 C.F.U/ ml were streaked on Mueller Hinton agar medium plates using sterile cotton swab. The sterilized filter paper disc were soaked in the prepared extracts, and then were placed on surface of the test bacteria plates. 10% Dimethyl sulfoxide (DMSO) was used as the positive controls. The plates were incubated at room temperature for 24 hours [34]. After the incubation period, the inhibition zone around the discs were measured. Mean and standard error values were tabulated, each test was carried out in triplicates.

3.5Testing for antifungal activity

The same method as for bacteria was adopted. Instead of nutrient agar, Saporaud dextrose agar was used. The molten medium was incubated with the specific organism and the medium was incubated at 25˚C for one day.

4. Results and discussion

4.1Antibacterial and antifungal activities

All the crude extracts, (petroleum ether, ethyl acetate, aceton and ethanol) obtained from plant sample of P. gujava, S. cymbopogone, S. argel, H. thebaicaand P. crispum were screened for their antimicrobial activity against four standard bacteria strains and two fungi to determine their activity. The pathogens used were *Bacillus subtilis*, *Echerichia coli*, *Pseudmonas aeroginosa*, *Staphylococus aureus*, *Aspergillus Niger and Candida albicans*. The antibacterial and antifungal assay for crudes was conducted by using the disc diffusion method. The tests were carried out at a concentration of 20 mg/ml. The zones of inhibition of bacterial and fungal growth were measured

after 24 hours and the measurements were done (in mm) from the end of the growth of one side of the disc to the beginning of growth of the other side including the diameter of the disc. On the basis of the results obtained with standard chemotherapeutic agents against the same standard tested organisms, plant extracts resulting in more than 18 mm growth inhibition zones are considered to possess relatively high antibacterial activity, and those resulting in 14-18 mm inhibition are of intermediate, and those resulting in zones below 14 mm are inactive [35]. Susceptibility of standard bacteria to different plants extracts were arranged according to their activity. The results clearly indicated variation in the activity against different bacterial and fungal strains ranging between relatively high to resistant. The result of petroleum ether extract obtained in Table (1);

Table 1: Anti-microbial activity of petroleum ether extracts from P. gujava, S. cymbopogone, S. argel, H. thebaicaand P. crispumfour bacterial and two fungal strains

Sample	*M.D.I.Z Inhibition zone (mm)					
	Bacterial strains				Fungal strains	
	B. s.	*E. c.*	P. a	S. a	A. n.	C.a.
P. guajava	18.5±0.7	20.5±0.7	18.5± 0.7	21±1.4	22±	16.5±
S. cymbopogone	13±0	18.5± 0.7	13.5±0.7	16.5±0.7	17±0	0
S. argel	20±0	22± 0	18.5±0.7	20± 0	23±0	21±1.4
H. thebaica	17±0	11± 0	20± 0	17± 0	20±0	15±0
P. crispum	15.5±0.7	13.5± 0.7	13.5±0.7	16± 1.4	17.5±0.7	0

*M.D.I.Z Mean diameter of growth inhibition zone in mm

Key*:* B. s.: *Bacillus subtilis*, E. c.: *Echerichia coli*, P.a.: *Pseudmonas aeroginosa*, S. a.: *Staphylococus aureu*s, A. n.: *Aspergillus Niger*, C. a: *Candida albicans*.. Interpretation of results: MDIZ (mm): < 9 mm Inactive; 9-15 mm partially active; 15-25mm Active; >25 mm: Very active [36].

The activity ranged between high and intermediate activity to resistant against all strains, P. guajava and S. argel are showed high activity or resistant in all strains(18.5 -23mm), but *H.thebaica* and *P. crispum* are showed relatively low activity (11-13mm) against *E. coli* While *S. cymbopogon* and *P. crispum* are showed no activity or resistant to *C.albicans*. Ethyl acetate extracts showed moderate activity or resistant for almost bacterial and fungal strains with some exceptions, that is showed at Table 2

Table 2: Anti-microbial activity of ethyl acetate extracts from P. gujava, S. cymbopogone, S. argel, H. thebaicaand P. crispum four bacterial and two fungal strains.

Sample	*M.D.I. Z Inhibition zone (mm)					
	Bacterial strains				Fungal strains	
	B. s.	*E. c.*	P. a	S. a	A. n.	C.a.
P. gujava	17±1.4	16±0	13±0	18.5±0.7	16±0	12±0
S. cymbopogone	14±0	13±0	15±0	15±	0	0
S. argel	12.5±0.7	13±0	15±1.4	14.5±0.7	22±0	10±0.7
H. thebaica	20±0	21±0	18±0	13±0	0	0
P. crispum	13.5±0.7	12.5±0.7	14±1.4	14.5±0.7	17±0	13.5±0.7

*M.D.I.Z Mean diameter of growth inhibition zone in mm

Key*:* B. s.: Bacillus subtilis, E. c.: Eche±richia coli, P.a.: Pseudmonas aeroginosa, S. a.: Staphylococus aureus, A. n.: Aspergillus niger, C. a: Candida albicans. Interpretation of results: MDIZ (mm): < 9 mm Inactive; 9-15 mm partially active; 15-25mm Active; >25 mm: Very active [36].

S. argel showed relatively high activity(22mm) to the A. niger fungal strains while *S. cymbopogon* and *H. thebaica* showed no activity towards the two fungal *H. thebaica* showed high activity or resistant to the three bacterial strains except on the test against Staphylococus aureus which give inhibition zone of (13 mm). *P. gujava* showed high activity to the all bacterial strains except on the test against *Pseudmonas aeroginosa* (13mm) and *S. argel* showed low activity against *candida albicans* (10mm).

Acetone extract results shown in Table (3)

Table 3: Anti-microbial activity of acetone extracts *fromP. gujava, S.cymbopogone, S. argel, H. thebaica and P. crispum* four bacterial and two fungal strains.

Sample	*M.D.I.Z Inhibition zone (mm)					
	Bacterial strains				Fungal strains	
	B. s.	*E. c.*	P. a	S. a	A. n.	C.a.
P. gujava	15.5±0.7	20±0	16±0	19±1.4	15±0	14±0
S. cymbopogone	15±0	19±1.4	14.5±0.7	17±1.4	12±0	9±0
S. argel	17.5±0.7	14±0	16±1.4	13.5±0.7	17±0	18.5±0.7
H. thebaica	17.5±0.7	20±0	14.5±0.7	18.5±0.7	12±0	14±1.4
P. crispum	12.5±0.7	14.5±0.7	16±0	14±1.4	14±1.4	12.5±0.7

*M.D.I.Z Mean diameter of growth inhibition zone in mm

Key*:* B. s.: Bacillus subtilis, E.c.: Eche±richia coli, P.a.: Pseudmonas aeroginosa, S. a.: Staphylococus aureus, A. n.: Aspergillus niger, C. a: Candida albicans. Interpretation of results: MDIZ (mm): < 9 mm Inactive; 9-15 mm partially active; 15-25mm Active; >25 mm: Very active [36].

The result of acetone extract indicated that all samples

tested showed high activity or resistant (14.5 -20mm) for *Escherichia coli* bacterial strains while for the others bacterial and fungal strains showed moderate activity or resistant except *P. crispum* which showed low inhibition (12.5mm) against *Bacillus subtilis*, all samples showed low activity against *candida albicans* fungal while *S. argel* showed high activity or resistant (18.5mm).

Table (4) explain the result of ethanol extract for anti-microbial activity:

Table 4: Anti-microbial activity of ethanol extracts fromP. gujava, S.cymbopogone, S. argel, H. thebaicaand P. crispum four bacterial and two Fungal strains

Sample	*M.D.I.Z Inhibition zone (mm)					
	Bacterial strains				Fungal strains	
	B. S.	***E. c.***	**P. a**	**S. a**	**A.n**	**C.a.**
P. gujava	15.5±0.7	17±0	16.5±0.7	17±0	13±0	13.5±0.7
S.cymbopogone	18.5±0.7	20.5±0.7	19±1.4	18±0	23±0	12±0
S.argel	20±0.7	18.5±0.7	23.5±0.7	18±0	18±0	13.5±0.7
H.thebaica	16±1.4	12.5±0.7	11±0	14±1.4	17±0	13±0
P.crispum	15±0	23±0	12.5±0.7	15±0	15±0	7±0

*M.D.I.Z Mean diameter of growth inhibition zone in mm

Key*:* B. s.: Bacillus subtilis, E. c.: Echerichia coli, P.a.: Pseudmonas aeroginosa, S. a.: Staphylococus aureus, A. n.: Aspergillus niger, C. a: Candida albicans. Interpretation of results: MDIZ (mm): < 9 mm Inactive; 9-15 mm partially active; 15-25mm Active; >25 mm: Very active [36].

In ethanol extracts the mean zones of inhibition were found to be in the range of (18- 23.5 mm) for *S. argel* followed by *S. cymbopogone*. except the *P. crispum* showed low activity or resistant (7mm) for *C. albicans* only while *S. argel* gave the highest inhibition zone against the all bacterial (18 - 23mm) and(18mm) for *Aspergillus niger* fungal strain. Generally ethanolic extract showed greater antimicrobial activity as compared with other extract may due to the polarity. Therefore the observed antibacterial potency of ethanol extract can be attributed to two reasons: firstly, to the nature of biologically active components (alkaloids, flavonoids, sterols, tannins, phenols etc.) which might be enhanced in the presence of ethanol. It has been documented that alkaloids, flavonoids, tannins and phenols are plants metabolites, well known for their antimicrobial activity [37]. Secondly, the stronger extraction capacity of ethanol could have produced a large number of active constituents responsible for antibacterial activity, which have been found to be present in large quantity in the ethanol extract. This finding was in agreement with the finding of Agunu (2011) who reported that the ethanol extract of *S. cymbopogone* gave higher antibacterial activity and contain high level of flavonoids. Flavonoids have been found in vitro to be effective antimicrobial substances against a wide array of microorganisms. Their activity is probably due to their ability to complex with extracellular and soluble proteins, and to complex with bacterial cell walls [38].

4.2Conclutions

Phytochemicals that are present in plants have been shown to possess a range of bioactivity, including antimicrobial properties. Five medicinal plants used in sudan traditional medicine were assessed for their antimicrobial activities. The extracts of *P. guajava, S. cymbopogone, S. argel, H. thebiaca and P. crispum* revealed antimicrobial activities against bacteria, and fungal.The results indicated that extracts of plants samples have potential antibacterial effects on bacterial tested and fungal strains, especially *E. coli, P. aeruginosa* and *A. niger*. This was confirmed by determination of diameters of inhibition zones inhibitory concentrations. S. argel showed a remarkable inhibition zone against all bacterial strains and *A. Niger* strains special by p. ether and ethanol extracts. The study obtained petroleum ether and ethanol extracts showed significant broad spectrum antibacterial activity in disc diffusion method. However; there was no effect of some plants extracts on the some fungai. This indicated that these plants have potentially antibacterial properties and could be used in the development of novel antibacterial agents. The antimicrobial activity might be due to the presence of alkaloids, flavonoids, tannins, phenolic compounds, steroids, saponins and triterpenoids, whose presence may be attributed to the medicinal properties of plants. Other investigations are necessary to be done on a wide range of bacteria and fungi to assess the spectrum of such plants parts extracts. It is concluded that this study would lead to the establishment of some valuable compound that has to be used to formulate new, different and more potent antimicrobial drugs of natural origin. Further studies are needed to identify the biologically active compounds and to evaluate the efficiency of the compound against pathogenic microorganisms associated with various human diseases. The present study was conducted to investigate the antimicrobial activity of plants in Sudan.

Fig 3: Anti-bacterial activity of ethanol extract of S. cymbopogone Against Pseudomonas aeruginosa

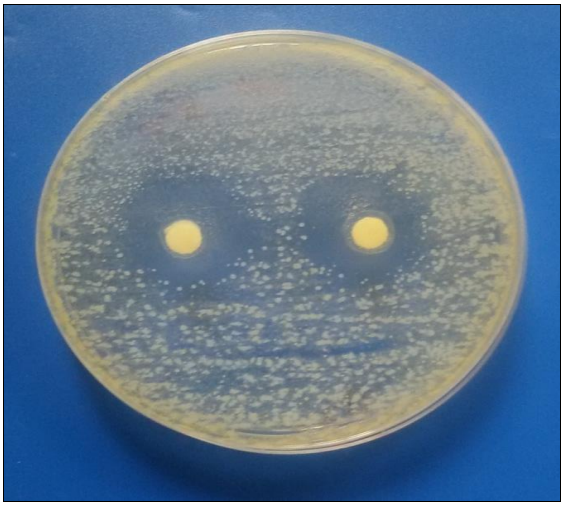

Fig 4: Anti-bacterial activity of ethyl acetate extract of H. thebaicaagainst *Escherichia col*

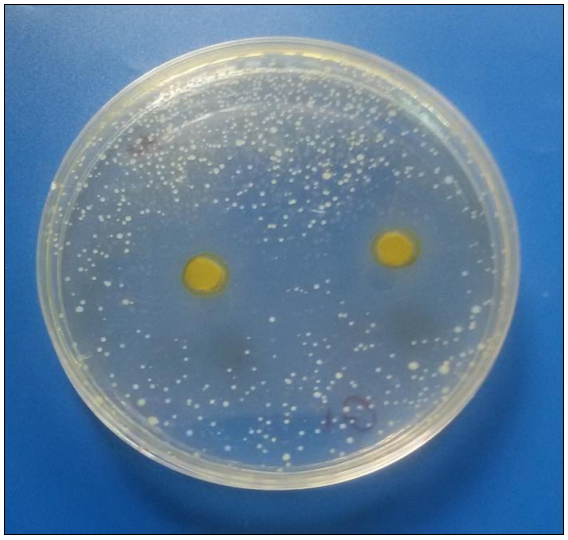

Fig 3: Anti-fungal activity ofpetroleum ether extractof P. gujavaagainst *Aspergillus niger*

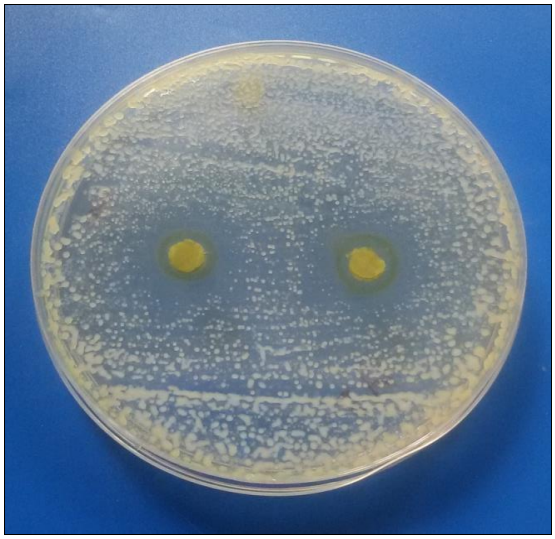

Fig 4: Anti-fungal activity of acetone extract of S. argel against *Candida albicans*

5. References

1. Amit R, Shailendra S. Ethnomedicinal Approach in Biological and Chemical Investigation of Phytochemicals as Antimicrobials. *Pharmainfomation.* 2005; 4:2.
2. Hostettman K, Morston A, Wolfender JL. Strategy in the Research for New Biological Active Plants Constituents. Phytochemistry of Plants used in Traditional Medicine. (Ed. K. Hostettman A. Morston, M. Millard and M. Hanburger). Claredon Press, Oxford. 1995, 24.
3. Farnsworth NR. The role of medicinal plants in drug development. In: P Krogsgaard-I. arsen, SB Christensen, 11 Kofod, (eds.) Natural Product and Drug Development. Balliere, Tindall and Cox. London, 1984.
4. Cragg GM, Newman DJ. Natural product drug discovery in the next millennium. Pharmaceutical Biology. 9 (Supplement), 2001, 8-17.
5. Harvey A. The continuing value of natural products to drug discovery. Georgia Institute of Technology Journal. 2001; 5(6):284-285.
6. Grabley S, Sattler I. Natural products for lead information: Nature is a valuable resource for providing tools. In A Hillisch and R Hingenfeld (eds.), Modern Methods of Drug Discovery. Birkhauser Verlag, Switzerland, 2003; 87-107.
7. Madhuri S, Pandey G. Some Anticancer Medicinal Plants of Foreign Origin. *Current Science.* 2009; 96:6-25.
8. Nascimento G, Locatelli P, Freitas C, Silva G. Antibacterial Activity of Plant Extracts and Phytochemicals on Antibiotic Resistant Bacteria. Brazilian Journal of Microbiology. 2000; 31:247-256.
9. Amaral FMM, Ribeiro MNS, Barbosa-Filho JM, Reis AS, Nascimento FRF. *et al.* Plants and chemical constituents with giardicidal activity. Braz. J. Pharmacogn. 2006; 16:696-720.
10. Koko WS, Mesaik MA, Yousaf S, Galal M, Choudhary MI. *In vitro* immunomodulating properties of selected Sudanese medicinal plants. J. Ethnopharmacol. 2008; 118:26-34.
11. Cox PA. The ethnobotanical approach to drug discovery, strength and limitations. In: DJ Chadwick, J. Marsh, (eds.) CIBA Foundation Symposium 185-Ethnobotany and the Search for New Drugs. Chichester, John Wiley and Sons, 1994, 25-41.
12. O′Keefe BR. Biologically active proteins from natural products extracts. Journal of Natural products. 2001; 64:1373-1381.
13. Mukonyi KW, Situma CA, Kyalo S, Erik K. Commercial Wild Aloe Resource Base in Kenya and Uganda Dry Lands as an Alternative Livelihoods Source to Rural Communities. *Discovery and Innovation Journal*. 2001; 19:117-275.
14. Prance GT, Kallunki JA, editors. Advances in Economic Botany: Ethnobotany in the neotropics. New York: New York Botanical Gardens, 1984, 9-23.
15. Khadri A, Serralheiro MLM, Nogueira JMF, Smiti A and Araujo MEM. Antioxidant and antiacetyl cholinesterase activities of essential oils from Cymbopogon schoenanthus L Spreng. Determination of chemical composition by GC–mass spectrometry and 13C NMR. Food Chemistry. 2008; 109(3):630-637.
16. Weenen H, Nkunya MH, Bray DH, Mwasumbi LB, Kinabo LS, Kilimali VA. *et al.* Antimalarial activity of Tanzanian medicinal plants. *Planta. Medica* 1999; 56:368-370.

17. Elhardallou SB. Cytotoxicity and biological activity of selectedSudanese medicinal plants. Res. J. Med. Plant. 2011; 5:201-229.
18. Fletcher R. Listing of useful plants of the world. Australian New Crops, 1997.
19. Orwa C, Mutua A, Kindt R, Jamnadass R, Anthony S. Agroforestree Database:a tree reference and selection guide version 4.0 Owolarae, 2009.
20. Hashem AN, Physicochemical Investigation of the Fruit of Hyphaene thebaica (L). Mart. Growing in Egypt Family Palma. M.Sc. Thesis, Cairo University. (1994), 2009.
21. Coimbra MC, Jorge N. Proximate Composition Guariroba (Syagrusoleracea), Jeriva (Syagrus roman-zoffiana) and Macauba (Acrocomiaaculeate) Palm Fruits. Food Research International. 2011; 44:2139-2142.
22. Cook JA, Vander Jagt DJ, Pastuszyn AG, Glew RS, Millison M, Glew HR. *et al.* Nutritional and Chemical Composition of 13 Wild Plant Foods of Niger. Journal of Food Composition and Analysis. 2000; 13:83-92.
23. Dubois C. The Practical Application of Fiber Materials in Bread Production. Baker‘s Digest. 1978; 52:30-33.
24. Kreydiyyeh SI, Usta J. Journal of Ethnopharmacology. 2002; 79(3):353-357.
25. Papay ZF, Kosa A, Boldizsar I, Ruszkai A, Balogh E, Antal. Acta Pharmaceutica Hungarica. 2012; 82(1):3-4.
26. Saeidi J, Bozorgi m H, Zendehdel A, Mehrzad J. Urology Journal. 2012; 9(1):361-366.
27. Puratuchikody A, Nithya DC, Nagalakshmi G. Wound Healing Activity of *Cyperus rotundus* Linn. Indian J. Pharm. Sci. 2006; 68:97-101.
28. Sundaram MS, Sivakumar T, Balamurugan G. Anti-inflammatory effect of *Cyperus rotundus* Linn. Leaves on acute and subacute inflammation in experimental rat models. *Biomedicine*. 2008; 28:302-304.
29. El-Ghazali GEB, El-Tohami MS, El-Egami AAB, Medicinal plants of the White Nile provinces. Medicinal plants of the Sudan, 1994.
30. Saadabi AMA, Moglad EH. Experimental Evaluation of Certain Sudanese Plants Used in Folkloric Medicine for Their Antibacterial Activity (*In- Vitro* Tests). Journal of Applied Sciences Research. 2011; 7(3):253-256.
31. Barrow GI, Feltham RKA. Cowan and Steels Manual for the Identification of Medical Bacteria. 3rd edition. Cambridge University press, Cambridge, UK, 1993.
32. Miles AA, Misra SS. Estimation of bacterial power of blood. Journal of Hygiene. 1938; 38:732-735.
33. Shankar RS, Rangarajan R, Sarada DV, Kumar SC. Evaluation of antibacterial activity and phytochemical screening of *Wrightia tinctoria* L. Pharmacognosy Journal. 2010; 2:19-22.
34. Onkar D, Dhigra J, James B. Basic plant pathology method. 1995; 287-305.
35. Cruickshank R, Duguid JP, Marion BP, Sawain RH. Medical microbiology. 12th Edn, Churchill Livingstone (Pub.). Edinburg London and New York. 1975; 11.
36. Parveen M, Ghalib RM, Khanam, Z, Mehdi SH, Ali M. Anoval antimicrobial agent from the leaves of *Peltophorum vogelianum*. Nat. prod. Res. 2010; 24(13):1268 -1273.
37. Tschesche, RAdvances in the chemistry of antibiotics substances from higher plants: Pharmacognosy and phytochemistry. In: Wagner H, Horharmmer L, editors. Proceeding of the 1st International Congress, Murich. Berlin, 1971, 274-89.
38. Stern JL, Iiagerman AE, Steinberg PD, Masion PK. Phorotannin-protein interactions. Journal of Chemical Ecology. 1996; 22:1877-99.