Biological studies of *Cuminum cyminum* plant on antibiotic resistant bacteria

AHMED YOUNIS TAYEB
Department of Botany,
Faculty of Science
University Benghazi
AL Marj, Libya

ANAS YOUNIS TAYEB
Department of Botany,
Faculty of Science
University Benghazi
AL Marj, Libya

AMANY YOUNIS TAYEB
Department of Laboratory
Higher Health Institute
AL Marj, Libya

e-mail: Ahmedyounis199@ yahoo.com

***Abstract*— The study was carried out to assess the quantity of plants, *Cuminum cyminum* for their microbial effects. The extracts were screened for their biological activities against bacterial pathogens including *Staphylococcus aureus* and *Streptococcus pneumoniae*. Results showed that inhibition zone and MIC for *Cuminum cyminum* seed and leaves the inhibition zone and MIC in all extract It was resistant to bacteria. However the antimicrobial activity of leaves and seeds *Cuminum cyminum* and extracts was higher than that of antibiotic used against the tested microorganisms**.

Keywords— *Cuminum cyminum*, Antibacterial activity and Antibiotic

1. INTRODUCTION

Medicinal plants have been used in folk medicine in Libyan rural areas at relatively cheaper expenses than modern medicine. They have been widely used as produce several secondary metabolites like phenols, flavonoids, quinones, tannins, alkaloids, saponins، and sterols which are important sources of biocides and many other pharmaceutical drugs (Naili *et al.*, 2010). Medicinal plants are important in pharmacological research and drug de- velopment (Li and Vederas, 2009). Plants have been a rich source of medicines because they produce wide array of bioactive molecules, Most of which probably evolved as chemical defense against predation or infection and antioxidant compounds (Cosimir and Min, 2008).

Many plants possess antimicrobial activities and are used for the treatment of different activities and are used for the treatment of different diseases (Arora and Kaur, 1999).

Cuminum cyminum is a native of arid soils. It is commonly found in Saudi Arabia, Syria, Jordan, Egypt, Iran, India and Pakistan. It is commonly known as Hanzal, Indrian, Tumma or Bitter apple. It is a large creeping herb, with deeply dissected lobulate leaves Flowers, solitary, monoecious of yellow colour. Fruits rounded 7-9cm in diameter, green and white, striped become yellow when ripe (Jafri, 1966).

The *Cuminum cyminum* is useful against fever, intestinal parasities, hepatic and abdominal diseases, visceral and cerebral congestions. Fruit juice with sugar is a house hold remedy in dropsy (Anonymous, 1970). Seeds are diuretic (Vohora and Khan, 1981). Fruits are used against tumors of gastrointestinal tract. It is more pronouncedly used in anticancerous drug. It is effective in leukemia and joint pains. *Cuminum cyminum* is widely used by rural inhabitants as a purgative, anti-diabetic, anti-neoplastic, anti-rheumatic, and anti-allergic agent (Tannin-Spitz *et al*., 2007). They are found mainly in plants belonging to the Cucurbitaceae family, but have also been found in several other families of the plant kingdom (Tannin-Spitz *et al*., 2007).

DOI: 10.5281/zenodo.17220431

Although, the whole fruit is often used for the treatment of the aforementioned diseases, but some particular parts of the fruit are also used for specific purposes.One of such example is the traditional application of the dried pulp and seed extract of Cuminum *cyminum* for the treatment of constipation and diabetes (Kumar *et al.*, 2008; *Nmila et al*., 2000). The use of colocynth as a drug has been documented in ancient times and religious books (Khafagi *et al.*, , 2006). *Cuminum cyminum* is traditionally used as an antidiabetic medication in tropical and subtropical countries (Diwan *et al*., 2000).

Nowday, bacterial infection especially those caused multi drug resistant (MDR) Bacteria have become one of the great challenge for modern healthcare. Therefore, discovering New antibacterial compounds with improve activity is necessary. Majority of scientists define multi drug resistant to at least 3 classes of antimicrobial agents *(*Falagas *et al ;* 2006*).* .

2- MATERIALS AND METHODS

leaves and Seeds of selected plant were separated and washed with distilled water several times, then dried in open air (Figures 1) . Its height is 60 cm, with lobed leaves, a distinctive aroma, and its large white flowers. It gives white top fruits, with small black seeds. The plant grows wild in most areas of Libya. Fresh of *Cuminum cyminum* washed two times tap water and subjected to shade drying at room temperature the dried plant material was powdered using a mechanical grinder (Akinpelu *et al*., 2008;Alshammary and Ibrahim, 2014). The powdered materials . of *Cuminum cyminum* were extracted with methanol 10 grams of each plant powders were added to 100ml of methanol (80% w/v). Crude extract were evaporated at 45ºC with the rotary evaporator the extracts were collected and stored at 4ºC until further use (Akinpelu *et al*., 2008; Alshammary and Ibrahim, 2014). The antimicrobial activity of the plants extracts was determined using the agar well diffusion method (Sathishkumar *et al*., 2008), where Mueller-Hinton (MH) agar plates were seeded with bacterial strain on each plate wells were made by sterile standard cork borer. Each well was filled with 30µl of the different concentrations (0.8, 0.4, 0.2, 0.1, 0.01, 0.001, 0.0001 and 0.00001 g/ml) of studied plants extracts and the plates were then incubated for 24 - 48 h at 37°C for bacteria .

The of inhibition zones were measured, the results are presented as mean of triplicate. The minimal inhibition concentration (MIC) values were evaluated according to published procedures (Koneman *et al.*, 1997; Iscan *et al.*, 2002 and Guven *et al.*, 2005).

The minimal inhibitory concentration (MIC) was determined only with micro-organisms that displayed inhibitory zones. MIC was determined by dilution of the plants extracts and pipetting 30µl of each dilution into wells dilutions of the extracts within a concentrations range of (0.8 - 0.00001 g/ml) . MIC was defined as the lowest concentration that inhibited the visible microbial growth (NCCLS, 2005).

Figure. 1. *Cuminum cyminum*

2.1- Antibiotic Sensitivity Tests

In vitro antimicrobia l susceptilit to four antibiotics in Table. The inoculums was prepared by adding isolated colonies of the microorganism from an overnight nutrient agar plate into 2ml try tone soya broth (TSB). A sterile cotton swab was dipped into the adjusted suspension. The swab was rotated several times and pressed firmly on the inside wall of the tube above the fluid level to remove excess inoculums from the swab. The swab was streaked over the entire surface of the sterile Mueller Hinton Agar plate. This procedure was repeated by streaking two more times, rotating the plate approximately each time to ensure an even distribution of inoculums. plates were allowed to dry for 5 minutes and then the antimicrobial disks were dispensed onto the surface of inoculated agar plates using an Oxide antibiotic. Plates were then incubated at 37°C for 18-22 hours. The diameters of the zones of inhibition are measured to the nearest mm using a venier calipers (junior) , zones diameters were interpreted as being susceptible Sensitive (S) or Resistant (R) according to (NCCLS, 2001).

Table. 1. Antibiotic Sensitivity testing

Kanamycin	K	30mg/ml
Gentamicin	CN	10mg/ml
Tetracycline	TE	30mg/ml
Cefotaxime	CTX	30mg/ml

3- RESULTS

3.1 Antibacterial activity:

3.1.1 Staphylococcus aureus

Showed of the studied plants extract against *Streptococcus pneumoniae* . Results showed that inhibition zone and MIC for *Cuminum cyminum* seed and fruits the inhibition zone and MIC in all extract It was resistant to bacteria.

Table. 2. The effect of *Cuminum cyminum* plant extract (distilled water, methanol) against the *S. aureus*.

Used Bacteria	Solvent	Plant Part	Diameter of Inhibition Zone (mm)
C. cyminum	Distilled Water	Leaves	9
C. cyminum	Methanol	Leaves	7
C. cyminum	Distilled Water	Seeds	10
C. cyminum	Methanol	Seeds	16

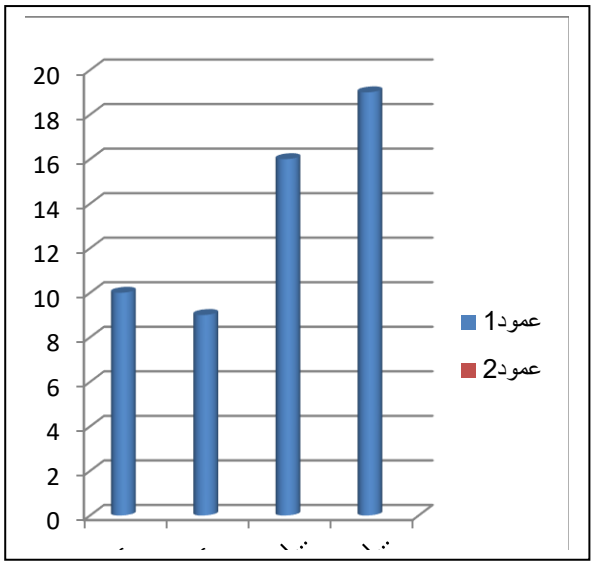

Figure. 2. Antimicrobial activities of studied plant *Cuminum cyminum* extract against Bacteria.

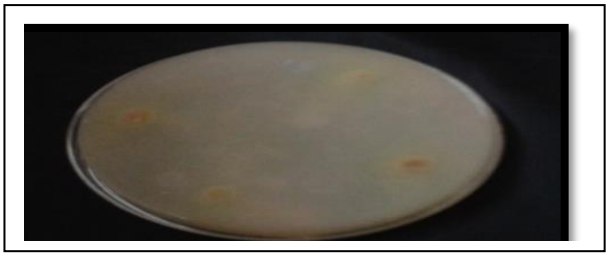

Figure. 3. *Cuminum cyminum* seeds extract against *Staphylococcus aureus*.

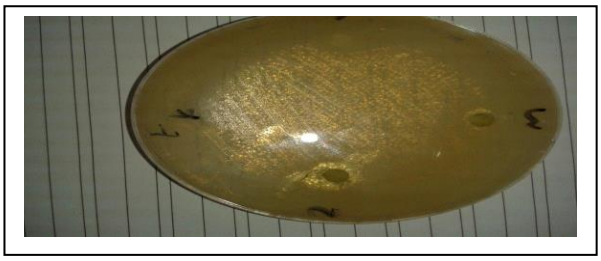

Figure. 4. *Cuminum cyminum* leaves extract against *Staphylococcus aureus*.

3.1.2 Streptococcus pneumonia

Table (10) showed of the studied plants extract against Streptococcus pneumoniae . Results showed that inhibition zone and MIC for *Cuminum cyminum* seed, while for fruits of *Cuminum cyminum*, where the inhibition zone zones of inhibition did not show any effect on the bacterial growth

Table. 3. The effect of *Cuminum cyminum* plant extract (distilled water, methanol) against the *S. pneumonia*

Used Bacteria	Solvent	Plant Part	Diameter of Inhibition Zone (mm)
C. cyminum	Distilled Water	Leaves	N.A
C. cyminum	Methanol	Leaves	20
C. cyminum	Distilled Water	Seeds	22
C. cyminum	Methanol	Seeds	N.A

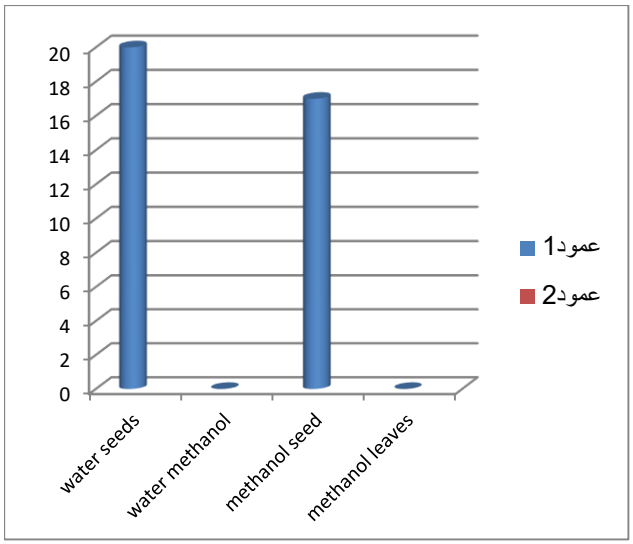

Figure. 5. Antimicrobial activities of studied plant *Cuminum cyminum* extract against Bacteria.

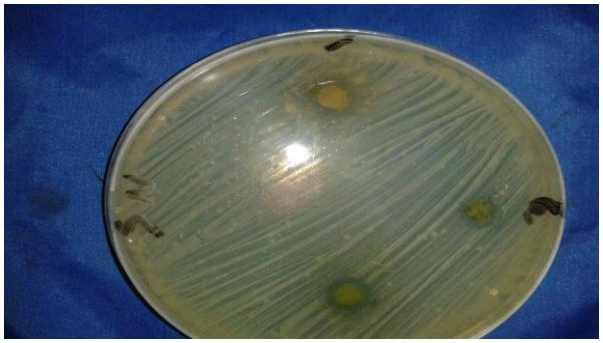

Figure. 6. *Cuminum cyminum* seeds extract against *Streptococcus pneumonia*

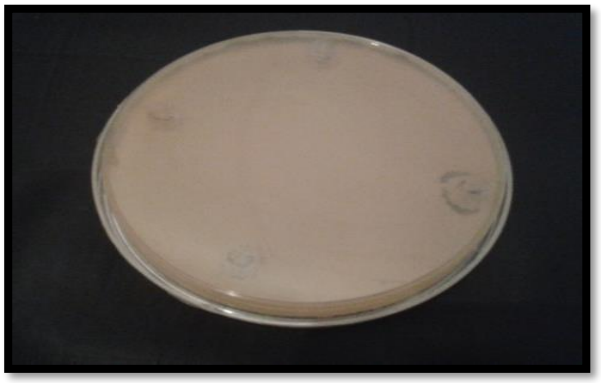

Figure. 7. *Cuminum cyminum* leaves extract against *Streptococcus pneumonia*

Antibiotic Sensitivity

Table show the rates of sensitivity of Gram negative and Gram positive bacteria results showed that the sensitivity pattern of *S. pneumoniae* was sensitive to K, CN, TE and CTX Figures (8). However, *S. dysenteriae* was resistant to K , CN, TE and CTX Figures (9). . Antimicrobial resistance developed by microbes against antibiotics open serious debates in this issue and recognized as a serious problem by global medicinal and research community (Finch,2004).

Antibiotic	**Symbol**	**Concentration**	**Organism**	
			S. pneumoniae	***S.*** *dysenteriae*
Kanamycin	K	30mg/ml	S	R
Gentamicin	CN	10mg/ml	S	R
Tetracycline	TE	30mg/ml	S	R
Cefotaxime	CTX	30mg/ml	S	R

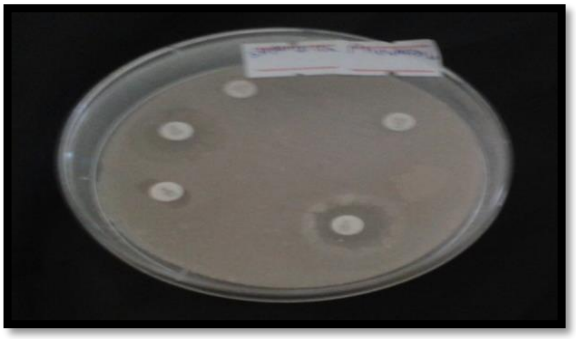

Figure. 8. Antibiotic sensitivity testing of *S. pneumonia*

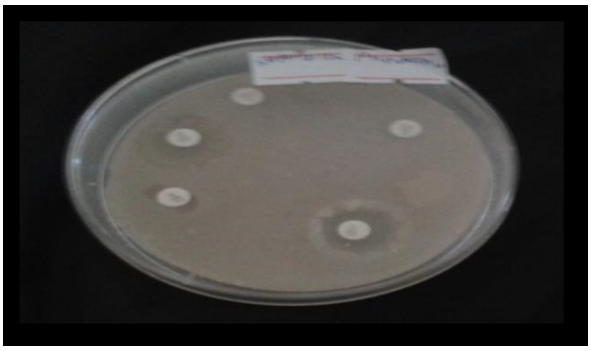

Figure. 9. Antibiotic sensitivity testing of *S. dysenteriae*

4. DISCUSSION

If we notice that the *Cuminum cyminum* plant was a good resistance to different types of bacteria Similar results observed by (Memon et al., 2003)

5- Conclusions

The present investigation proves that antimicrobial activity of seed and leaves ***Cuminum cyminum*** extracts was higher than that of antibiotic used against the nsidered adequate to demonstrate that ***Cuminum cyminum*** extracts can be considered a good antibacterial agent, it can be used to an antibacteral overcoat against the strain that a major problem of resistance in hospitals.

Acknowledgements

Firstly, thanks and merciful to Allah. There are many people that I would like to thank.

Great thanks are also Department of Botany, Faculty of Science, Benghazi University.

6- REFRENCES

[1] Anonymous. (1970): "Hamdard pharmacopoeia of Eastern Medicine", Hamdard National foundation Pakistan 2nd Impression 373.

[2] Akinpelu, D; Adegboye,M.F; Adeloye.O.A and Okoh,A.L (2008): "Biocidal activity of partially purified fractions from methanolic extract of *Cuminum cyminum* seeds on bacterial isolates,"Biological Research,44:277-

[3] Alshammary,A.S .and Ibrahim.N.(2014): "Antimicrobial activity of *Cuminum cyminum* extracts against Bctteria ,"Global Journal of Biolocgy Agricultupre and Health Sciences.3(4):71-73.

[4] Arora, D and Kaur, J. (1999): "Antimicrobial activity of spices," International Journal Antimic. agents, 12: 257-262.

[5] Burt, S. (2004): "Essential oils: Their antibacterial proper- ties and potential applications in foods", International Journal of Food Microbiology, 94, 223-253.

[6] Cosimir, AC .and Min, BD. (2008): "Antioxidants in food lipid chemistry, nutrition, and biotechnology", CRC PRESS. Boca Raton,FL, 236- 409 p.

[7] Diwan, FH ; Abdel-Hassan, IA ; Mohammed, ST.(2000): "Effect of saponin on mortality and histopathological changes in mice", Journal Eastern Mediterranean Health, 6(2-3):345-351.

[8] Falagas, S. M ;Nazif, N. M ;Hassan, R .H, Hassanein, H.D;Elkholy,Y.M ;Gomaa, N. S;Shahat, A. A. (2006): "Chemical and biological constituents from the ieaf extracts of the wild artichoke (*Cuminum cyminum*)", International Journal of Pharmacy and Pharmaceutical Sciences,4:396-400.

[9] Finch,R.G.(2004): "Antibiotic resistance a view from the prescriber", Nature Reviews Microbiolgy,2(12):989-994.

[10] Guven, K.; Celik, S. and Uysal, L. (2005): "Antimicrobial activity of *Entaurea* species", Pharmaceutical Biology, 43: 67–71.

[11] Jafri, SMH. (1966) : "The flora of Karachi (Coastal West Pakistan) ", The book Corporation Karachi Pakistan, p.23.

[12] Kumar, S; Kumar, D; Saroha, K; Singh, N. and Vashishta, B. (2008): "Antioxidant and free radical scavenging potential of *Cuminum cyminum* Schrad. Methanolic fruit extract," Acta Pharm. 58(2):215-220.

[13] Khafagi, I; Zakaria, A; Dewedar, A; El-Zahdany,K.(2006): A voyage in the world of plants as mentioned in the Holy Quran, International Journal of Botany,2(3):242-251.

[14] Iscan, G.; Demirci, F.; Kirimer, N.; Ku¨rkcu¨oglu, M. and Baser, K.H. (2002): "Antimicrobial screening: Mentha piperita essential oil", Journal of Agricultural Food and Chemistry, 50: 3943–3946.

[15] Kumar, S; Kumar, D; Saroha, K; Singh, N. and Vashishta, B. (2008): "Antioxidant and free radical scavenging potential of *Cuminum cyminum* . Schrad. Methanolic fruit extract," Acta Pharm. 58(2):215-220.

[16] Koneman, E; Allen, S.D; Janda, W.M; Schreckenberger, P.C. and Inn, W.C. (1997):"Colour atlas and textbook of diagnostic microbiology hiladelphia", Lippincott-Raven Publ, 13: 785–856.

[17] Li, J.W. and Vederas, J.C. (2009): "Drug discovery and natural products: End of an era or an endless frontier? ," Science, 325, 161-165.

[18] Lopez-Molina, D; Heering, HA; Smulevich, G; Tudela, J; Thorneley, RNF; Garcia-Canovas, F.and Rodriguez-Lopez, JN. (2003):"Purification and characterization of a new cationic peroxidase from fresh flowers of *Cuminum cyminum*," Journak of Inorganic Biochemistry, 94: 243–254

[19] Memon ,U ; Brohi, H . A; Syed,W,A ; Iqbal, A. and Husan, B. (2003): "Antibacterial screening of *Cuminum cyminum* Pakistan Journal of Pharmaceutical Sciences, 16(1) 1-6.

[20] Nccls - (2005): "Performance Standards for Antimicrobial Susceptibility Testing", MIC Testing Document, 100-S12, 22: 82–112.

[21] Nccls - (2001): "National Committee for Clinical Laboratory Standards Performance Standards for antimicrobial Susceptibility testing Eleventh information Supplement", Nccl Document,M100-S11. ccls,Wayne,Pennsylvania 2001.

[22] Naili, M; Alghazeer, R; Saleh., N. and Al-Najjar, A.(2010):Evaluation of antibacterial and antioxidant active-ties of Artemisia Campestris (Astraceae)and Ziziphus lo-tus (Rhamnacea).Arabian Journal of Chemistry,3,73-134.

[23] Omar . (2012) : "Medicinal Plants and Traditional medicine in Africa Published by John Wiley and Sons Ltd", 1st edition, 131: 168-171.

[24] Padhi,S;Dash,S;Raj,M.(2015) : "Asian Resonance Phytochemical Analysis of Seeds and Leaves of *Cuminum cyminum* Schard", 0976 –

[25] Sofowora, A. (1982): ''Medicinal Plants and Traditional medicine in Africa Published by John Wiley and Sons Ltd'', 1st edition, 131: 168-171.

[26] Sathishkumar, J.; Muthu, S.M. and Seethalakshmi, I. (2008): "*In-vitro* Antimicrobial and Antitumor Activities of *Stevia Rebaudiana*(Asteraceae) Leaf Extracts",Tropical Journal of Pharmaceutical Research, 7(4), 1143-1149.

[27] Sofowora A. (1982): "Medicinal Plants and Traditional medicine in Africa Published by John Wiley and Sons Ltd", 1st edition, 131: 168-171.

[28] Tannin-Spitz, T. S; Grossman, S; Dovrat, H. E; Gottlieb, M. and Bergman, M. (2007): "Growth inhibitory activity of Cucurbitacin glucosides isolated from *Cuminum cyminum* on human breast cancer cells," Biochemistry Pharmacology, 73:56-67.

[29] Vohora S.B and Khan M.S.Y (1981): Diuretic studies on plant principles. Indian drugs Pharmaceutical Industry, 161 39-40.