ANTIBACTERIAL ACTIVITY OF SOME PLANTS EXTRACTS AGAINST PROTEUS MIRABILIS BACTERIA

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ABSTRACT

***Background**: Medicinal plants are being looked at as potential new sources of medicines that could replace antibiotics in the treatment of antibiotic-resistant bacteria. The aim of this study is to measure the effect of plant extracts on Proteus mirabilis growth to determine the antibacterial activity of them .*

Methods: Experimental, in vitro, of Al-Mustaqabal University Collage, The effects of four plant extracts on Proteus mirabilis were assessed. At a concentration of 10%, the activity was assessed using the well diffusion method.

Result: Four aqueous plant extracts were tested for antibacterial activity (Peganum harmala, Piper nigrum, Syzygium aromaticum and Cinnamomum zeylanicum) has been evaluated against Proteus mirabilis (Isolated from urinary tract infection). The concentration was used for each type of extract 10mg\ml. In this concentration, the aqueous extract was effective against Proteus mirabilis with inhibition zones of 18 mm, 15 mm and 14 mm respectively, and extract of Cinnamomum zeylanicum shown no inhibition zone.

Conclusion: The aqueous extract of Peganum harmala against Proteus mirabilis, showed the highest inhibition of 18mm with the concentration 10%. Whereas, aqueous extract of Cinnamomum zeylanicum has no antibacterial activity against Proteus mirabilis.

KEYWORDS

Medicinal plant, Proteus mirabilis, antibacterial activity, aqueous extract

PAPER INDEX

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1. INTRODUCTION

In recent years, the world has turned its attention to the study of medicinal plants, many of which have been found to have inhibitory effect against pathogens. They have been used in the treatment of many diseases, since they contain effective compounds that are inhibitory and free from side effects compared with the drugs used which have side effects on health with increased resistance towards it by time. This has called for urgent and continuous need to search for new antimicrobials as a result of increase in disease cases. The other reason is increasing resistance to antibiotics and on a continuous basis (1).

Medicinal plants contain various types of natural active substances used in traditional medicine (alternative medicine) to treat diseases around the world, the efficiency of these medicinal plants or their extracts varies depending on the method of extraction, the type of extraction solvent employed and the microscopic organism (2).

According to the World Health Organization (WHO), there are over 20,000 species of all recognized medicinal plants utilized worldwide (3).

Some of the chemicals derived from these plants have proven to be an effective preventive medicine and have even been utilized to treat difficult illnesses like cancer (4). The critical necessities to use medicinal plants do not involving severe feature control concerning to safety and efficiency compared to the other drug types (5).

Aim of study: The goal of this study was to see how effective aqueous plant extracts were at killing bacteria (Peganum harmala, Piper nigrum, Proteus mirabilis is fought using Syzygium aromaticum and Cinnamomum zeylanicum.

2. MATERIALS AND METHODS

The following instruments, as indicated in the table, were utilized in this study table 1.

Table 1. Instruments, their manufacturer companies and its origins.

No.	Instruments	Manufacturer company and Origin
1	Centrifuge tube	NURE /turkey
2	Incubator	Biomerieux/USA
3	Autoclave	Hirayama/japan
4	oven	Biomerieux/USA
5	Sensitive balance	Precia/swesra
6	Petri dish	Al-hanoof/jordon
7	Loop	Al-rawan/china

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Chemicals and Biological Materials: The table below lists the chemicals and biological materials utilized in this study table 2.

Table 2. The chemicals and biological materials as well as their suppliers and origin.

No.	Name of material	Supplier / Origin
1	Muller Hinton agar	Oxoid /united kingdom
2	Nutrient agar	Oxoid /united kingdom

Samples: The plant materials were obtained from a local market in Babylon Province, and included:

Table 3. Scientific name of plant

No	Scientific name of plant
1	*Peganum harmala* (Harmal)
2	*Piper nigrum* (Black pepper)
3	*Syzygium aromaticum* (Clove)
4	*Cinnamomum zeylanicum* (Cinnamon)

The plant material was washed in distilled water and dried at room temperature in the shade. The plant material has been processed in a mill to produce fine powders after most of the moisture has been removed (6).

Study design (7)

All plants were convert to fine powder

↓

5 gm of plant powder

↓

50 ml D.W

↓

Concentrated the extract by using an oven at 40 c o

↓

1g\ 10ml of each plant extract against Proteus mirabilis

↓

By the well diffusion method 50µ

2.1. EXTRACT PREPARATION

We prepared the plant extracts of (Peganum harmala, Piper nigrum, Syzygium aromaticum and Cinnamomum zeylanicum) according (8) and (9), that include the following : All plants were convert to fine powder and freshly prepared at the day of

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experiment using distilled water . In this method, the dried powder plants (5g) were soaked 50 milliliters distilled water. The solvent was evaporated by using an oven at 40 c o and then stored the dry powder in the refrigerator for further use to test the effectiveness against the bacteria used in the experiment.

2.2. ANTIBACTERIAL ACTIVITY

The antibacterial activities of the plant extracts (Peganum harmala, Piper nigrum, Syzygium aromaticum and Cinnamomum zeylanicum) The well diffusion method was used to test Muller-Hinton plats. The medium was sterilized in an autoclave at 121oC (1.5 psi/inch 2) for 15 minutes, following the manufacturer's recommendations. 50 uL of the plant extract was poured into wells cut into the agar. The plates were then incubated at 37°C for 24 hours. The diameter of the inhibitory zone was used to assess antibacterial activity(10)and(11).

2.3. ANTIBACTERIAL ACTIVITY MEASUREMENT (AGAR WELL DIFFUSION METHOD)

Muller Hinton agar plates were prepared and infected with test organisms by using a sterile brush to disseminate the bacterial inoculum on the surface of the media. Wells were punched in the agar by using Cork borer . Extracts with concentrations (10 mg/ml) were added. The plates were incubated for 24 hours at 37°C (12). The antibacterial activity was measured in millimeters by measuring the diameter of the inhibitory zone.

3. RESULT AND DISSCUSSION

Results of antibacterial activity of four aqueous plant extracts (Peganum harmala, Piper nigrum, Syzygium aromaticum and Cinnamomum zeylanicum) against Proteus mirabilis (Isolated from urinary tract infection).

Table 4. The activity of aqueous extracts against Proteus mirabilis

Name of plant	Inhibition zone of diameter
Peganum harmala	18 mm
Piper nigrum	15 mm
Syzygium aromaticum	14 mm
Cinnamomum zeylanicum	No inhibition zone

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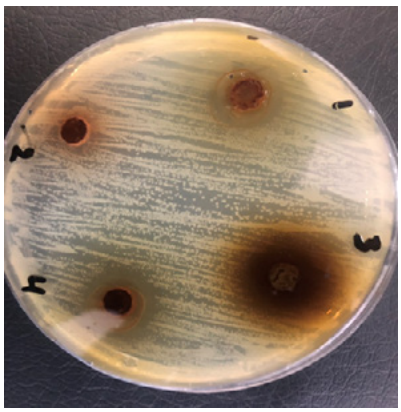

Figure 1. Inhibition zones of Proteus mirabilis growth on Mueller-Hinton agar produced by (1) black pepper (2) Cinnamon (3) clove (4) harmalcontained extract concentrations (10 mg/ml), whereas the central well contained 50 µl.

These results in table(1) revealed that this bacteria was sensitive to the concentrations of 10% in aqueous extract of harmal (Peganum harmala) with inhibition zone 18 mm, that agree with (13) ,which revealed the highest effect on bacterial growth since the hot extract reduced growth of most of bacterial isolates (Proteus mirabilis).(14), which obtained good antibacterial activity in harmal and pomegranate against Proteus mirabilis and Klebsiella using aqueous extract.

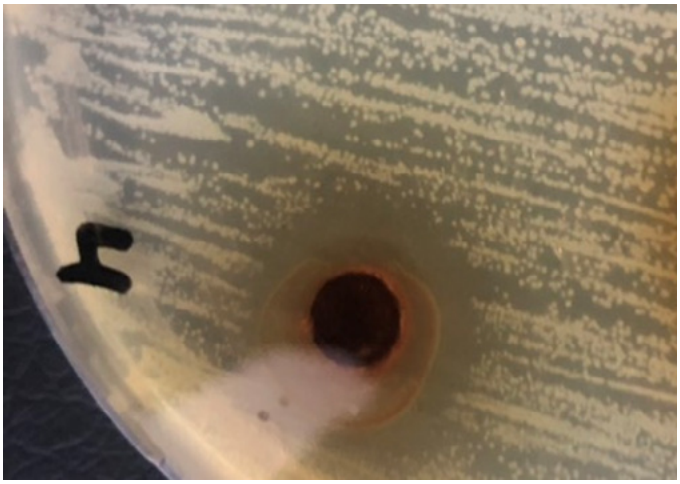

Figure 2. Inhibition zones of Proteus mirabilis growth produced by harmal contained extract concentrations (10 mg/ml), whereas the central well contained 50 µl.

And aqueous extract of black pepper (Piper nigrum) showed in Table1 that antibicrobial activity

against Proteus mirabilis with inhibition zone 15 mm, that agree with (15), reported the antibacterial

effect of piperine against Proteus mirabilis with inhibition zone (8mm). Also with (16), which he mentioned that black pepper (aqueous decoction) showed strongest antibacterial activity and in research against different bacterial isolates from oral cavity of two hundred individual volunteers.

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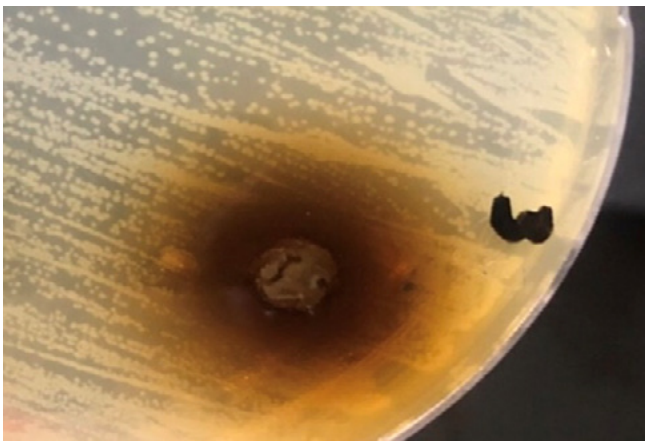

Figure 3. Inhibition zones of Proteus mirabilis growth produced by black pepper contained extract concentrations (10 mg/ml), whereas the central well contained 50 µl.

Our results of clove (Syzygium aromaticum) revealed antibacterial activity against Proteus mirabilis with inhibition zone 14 mm, that agree with, (17) which reported the result of antibacterial susceptibility to S.aromatic The average diameter zone of inhibition for S.aureus, Proteus mirabilis, and P.aeruginosa in aqueous extract was 31mm, 8mm, and 14.33mm, respectively. (18), provided additional support for these findings.

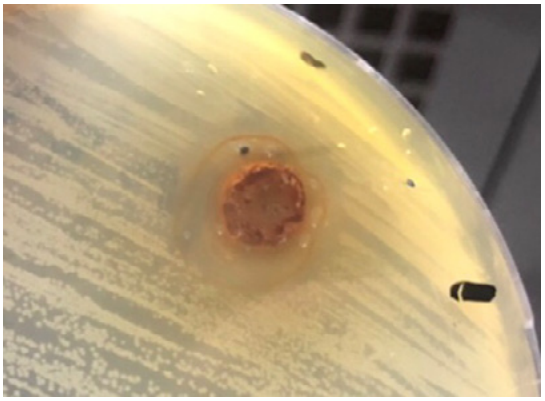

Figure 4. Inhibition zones of Proteus mirabilis growth produced by clove contained extract concentrations (10 mg/ml), whereas the central well contained 50 µl.

While Escherichia coli showed resistance against aqueous concentration extract of Cinnamon (Cinnamomum zeylanicum) as showed in table (1).

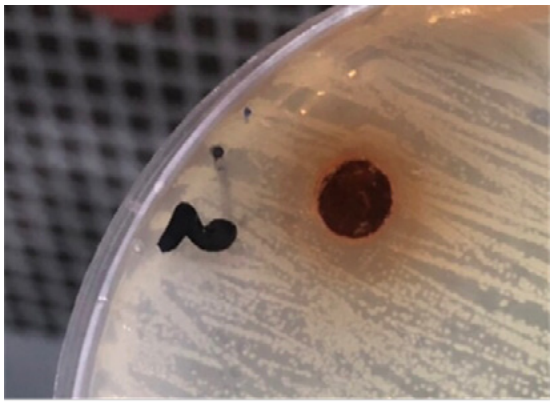

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Figure 5. Inhibition zones of Proteus mirabilis growth produced by Cinnamon contained extract concentrations (10 mg/ml), whereas the central well contained 50 µl.

4. CONCLUSIONS

1. Plant extracts have a complicated structure, with active components in the form of natural organic compounds.

2. The solubility of a component in the solvent determines the extraction method for that substance (water or organic solvent).

3. The extracts of the plants studied showed promising antibacterial properties. The prospect of developing antimicrobial chemicals from higher plants appears promising, as it could lead to the development of a phytomedicine that can combat multidrug-resistant bacteria.

4. The aqueous extract of Peganum harmala displayed the greatest inhibition of 18mm against Proteus mirabilis at a concentration of 10%. Cinnamomum zeylanicum aqueous extract, on the other hand, displays no antibacterial action against Proteus mirabilis.

REFERENCES

(1) Abid, M., Patra, A., Tirath, K., Khan, N. A., & Asad, M. (2008). **Subchronic toxicity study of alcoholic extract of pachyrrhizus erosus (linn.) seeds**. *Pharmacologyonline,* 3, 504-508.

(2) Hussein, N. and Hanon, N.A. (2017). **The Antimicrobial Activity of Some Medical Plants Extracts Used Against Some Types of Bacteria that Causes Urinary Tract Infection**. *Al-Mustansiriyah Journal of Science*, 28(3), 72-84.

(3) Harbone ,J.B.(1984). **Phyto chemical methods**. *2nd Ed. chapman Hull.*

(4) Foxman B. (2014). **Urinary tract infection syndromes occurrence, recurrence, bacteriology, risk factors, and disease burden**. *Infect. Dis. Clin. North Am.,* 28, 1-13. https://doi.org/10.1016/j.idc.2013.09.003.

(5) Dubey,. D., M.C. Sahu, S. Rath, B.P. Paty, N.K. Debata and R.N. Padhy. (2012). **Antimicrobial activity of medicinal plants used by aborigines of Kalahandi, Orissa, India against multidrug resistant bacteria**. *Asian Pac. J. Trop. Biomed.*, 2(2), 846-854.

(6) Dorman HJ, Deans SG. (2000). **Antimicrobial agents from plants: antibacterial activity of plant volatile oils**. *J Appl Microbiol,* 88(2), 308-316.

(7) Dorman HJ, Deans SG. (2000). **Antimicrobial agents from plants: antibacterial activity of plant volatile oils**. *J Appl Microbiol,* 88(2), 308-316.

(8) Diba K, Gerami Shoar M, Sharbatkhori M, Khorshivand Z. (2011). **Anti-fungal activity of alcoholic extract of Peganum harmala seed**. *J Med Plants Res.,* 5, 5550-5554.

(9) Dhuley JN. (1999). **Anti-oxidant effects of cinnamon (Cinnamomum verum) bark and greater cardamom (Amomum subulatum) seeds in rats fed high fat diet**. *Indian J Exp Biol.,* 37, 238-242.

https://doi.org/10.17993/3cemp.2023.120151.301-309

(10) Damanhouri ZA, Ahmad A. (2014). **A Review on Therapeutic Potential of Piper nigrum L. (Black Pepper): The King of Spices**. *Med. Aromat. Plants,* 3, 161.

(11) Chaieb K, Hajlaoui H, Zmantar T, et al. (2007). **The chemical composition and biological activity of clove essential oil, Eugenia caryophyllata (Syzigium aromaticum L. Myrtaceae): a short review**. *Phytother Res.,* 21(6), 501-6.

(12) Burt S. (2004) **Essential oils: their antibacterial properties and potential applications in foods – a review**. *Int J Food Microbiol,* 94, 223-253.

(13) Bhalodia, N. R., & Shukla, V. J. (2011). **Antibacterial and antifungal activities from leaf extracts of Cassia fistula l.: An ethnomedicinal plant**. *Journal of advanced pharmaceutical technology & research*, 2(2), 104-109. https://doi.org/10.4103/2231-4040.82956.

(14) Asgarpanah, J. and Ramezanloo Chemistry, F. (2012). **Chemistry, Pharmacology and Medicinal Properties of Peganum harmala L**. *African Journal of Pharmacy and Pharmacology*, 6, 1573-1580.

(15) Alsamarai AGM, Tawfeq B, Salih Y. (2016). **Teenage pregnancy complications in Samara city, Iraq**. *World J Pharm Pharmaceut Sci.*, 5, 142-163.

(16) Al-Sahlany, S.T.G. (2017). **Production of biodegradable film from soy protein and essential oil of lemon peel and use it as cheese preservative**. *Basrah J. Agric. Sci.*, 30(2), 27-35.

(17) Ahmad, N., Fazal, H., Abbasi, B. H., Farooq, S., Ali, M., & Khan, M. A. (2012). **Biological role of Piper nigrum L. (Black pepper): A review**. A*sian Pacific Journal of Tropical Biomedicine*, 2(3), S1945-S1953.

https://doi.org/10.17993/3cemp.2023.120151.301-309