Antibacterial Effect of *Lantana Camara* L. Fruit Extraction with Ethanol

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ABSTRACT

Background: *Lantana camara* L. is a tropical plant that is used for a variety of purposes, including herbal medicine and, in some areas, as firewood and mulch. It is also used to treat asthma, measles, and various types of cancer.

Method and results: The ethanoic extract of Lantana camara fruits were incubated for 24 hours with strains of *Staphylococcus aureus*, *Bacillus subtilis*, *Pseudomonas aeruginosa*, *E. coli*, *Proteus mirabilis* and *Shegilla* sp.) The extract showed the highest inhibition zone (39 mm) against *Bacillus subtilis*, it also showed activity against *Staphylococcus aureus* isolate resistant to the antibiotics (AK, AX, A/S and CIP), the activity represented by inhibition zone equal to 17 mm. The second isolate of *Staphylococcus aureus* showed sensitivity to the extract represented by inhibition zone (11mm). One isolate of *E. coli* showed sensitivity to the extract while was resistant to AK, AX and A/S.

Conclusion: Because the ethanolic extract of Lantana camara fruits shown antibacterial action, it could be developed into a more effective traditional medicine to offer an alternative to the problem of antibiotic resistance.

Key words*: Lantana camara*, antibacterial activity, Ethanol extract

INTRODUCTION

In 2019, bacterial infections, both resistant and sensitive to antimicrobials, caused 7.7 million of the predicted 13.7 million infection-related deaths (1).

The rise of microbes resistant to practically all types of antimicrobial drugs has become a major public health problem in recent years. The discovery of antimicrobial agents from plants through the examination of conventional plant extracts is a very relevant research area (2).

The discovery of antibiotics greatly reduced the spread of many disease. The amazing efficiency of these antibiotics was coupled by their widespread and abusive usage, resulting in the emergence of bacterial resistance (3). This resistance resulted to microbe-related disorders becoming the biggest cause of death in the globe in 2019, killing over 1.2 million people and emphasizing the need for novel compounds. Medicinal plants remain a potential source of novel active compounds. One of the numerous exploited species was Lantana camara L.

Lantana camara L, an ornamental grass from the Verbenaceae family, has aromatic leaves, orange to bright red flowers, and blue or black fruits. It is native to tropical and warm climates globally (4). Lantana camara contains a variety of chemical compounds, including essential oils, phenols, flavonoids, carbohydrates, proteins, alkaloids, glycosides, iridoid glycosides, phenylethanoids, oligosaccharides, quinines, saponins, steroids, triterpenoids, sesquiterpenoids, and tannins (5).

It usually has active compounds such as alkaloids and flavonoids. It has numerous applications, including antibacterial, fungistatic, hematicidal, immunosuppressive, and anticancer effects. Lantana oil is used to relieve skin itching and as an antibacterial for injuries (6).

The plant's roots are used to treat malaria and rash, while the leaves are disinfectant, anticancer, and antimicrobial agents (7).

Many studies have explored the effect of extracting leaves, stems, and roots against microorganisms, but there is no study on the effect of fruit extraction against pathogenic bacteria.

METHODS

The experimental work of the present study was carried out in the laboratory of microbiology/College of Nursing, University of Basrah in Iraq.

1-Pathogenic Bacterial Strains

Gram- positive bacteria contain (*Bacillus subtilis* and two isolates of *Staphylococcus aureus*) and Gram- negative bacteria contain (Two isolates of *Escherichia coli*, *Pseudomonas aeruginosa*, *Proteus mirabilis* and *Shegilla* sp.) were identified in biology department in Education college of pure sciences at Basrah University.

2- Sample preparation

Fresh fruit mature of the plants were air dried at room temperature before grinding them to powder form with the help of mechanical grinder. 100 g of the air dried powder of fruit powder were filled in the thimble and extracted successively with 400 ml of ethanol solvent using a shaker extractor for 72 hours.

The extract was first filtered using Whatman No.1 filter paper. Filtration shows during the removal of organic solvent (Ethanol) from the extraction by rotary evaporator. The filtrate was evaporated under reduced pressure in vacuum evaporator. The dried crude extracts were sterilized overnight by UV radiation and stored at room temperature in amber color glass vials until used for antibacterial testing.

3- Assessment of Antibacterial Activity

Antibacterial activity was evaluated according to the agar diffusion method. Using 100 µl of suspension containing 10^8 CFU/ml of bacteria, spread evenly on the surface of the nutrient agar the extract was added in a hole in each dish using a pure cork punch in diameter 4mm. The reference antibiotics : Amikacin (AK 20 µg), Ampicillin/ sulbactam (A/S 10/10 µg), Amoxicillin (AX 10 µg) and Ciprofloxacin (CIP 5 µg) [TM MEDIA, were used as positive controls or reference standard drugs for comparing the sensitivity of tested bacteria, with the test extract. The inoculated plates were incubated for 24 h at 37°C.

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RESULTS and DISCUSSION

Many studies have focused on the biological effectiveness of *Lantana camara* extracts such as leaves, stems, roots, and flowers. However, we didn't find a study that focused the effectiveness of Lantana camara fruit extracts, therefore our study is considered maybe the first in our knowledge.

Lantana camara contains a variety of chemical compounds, including essential oils, phenols, flavonoids, carbohydrates, proteins, alkaloids, glycosides, iridoid glycosides, phenylethanoids, oligosaccharides, quinines, saponins, steroids, triterpenoids, sesquiterpenoids, and tannins (8).

These active compounds have an inhibitory ability against bacteria, destroying them by attacking them with multiple targets (9).

The disc diffusion method was initially used to evaluate the antibacterial activity of the extract of *Lantana camara* fruit versus some group of bacteria. The outcome is displayed in Table (1), Figure(1). The extract showed the highest inhibition zone (39 mm) against Bacillus subtilis . This is in agreement with the results of Ganjewala et al (2009) (10), who reported that the *Lantana camara* flower and leaf extracts exhibited the highest level of inhibition against Bacillus subtilis.

The ethanoic Lantana camara fruit extract exhibited the same effect as Ciprofloxacin (CIP 5 µg) and higher than the other antibiotics tested in the study (11).

Ciprofloxacin is one of a new generation of fluorinated quinolones structurally related to nalidixic acid. The primary mechanism of action of ciprofloxacin is inhibition of bacterial DNA gyrase. It is a broad spectrum antibacterial drug to which most Gram-negative bacteria are highly susceptible in vitro and many Gram-positive bacteria are susceptible or moderately susceptible (12).

This strongly suggests that the Lantana camara fruit contains effective compounds that should be studied and identify and apply these compounds as therapeutic alternatives.

The extract showed activity against *Staphylococcus aureus* isolate resistant to the antibiotics (AK, AX, A/S and CIP), the activity represented by inhibition zone equal to 17 mm. The second isolate of *Staphylococcus aureus* showed sensitivity to the extract represented by inhibition zone (11mm). One isolate of *E. coli* showed sensitivity to the extract while was resistant to AK, AX and A/S (Fig. 2) .

Our results agree with previous studies using *Lantana camara* extracts that showed they were able to inhibit the growth of Gram-positive and Gram-negative bacteria (13;14).

Table 1. Antimicrobial activity of the fruit extract of *Lantana camara* compared with antibiotics

Inhibition zone (mm)					Microorganism
CIP (5 µg)	A/S (10/10 µg)	AX (10 µg)	AK (20 µg)	extract	
15	-	-	-	-	*Pseudomonas aeroginosa*
-	-	-	-	17	*Staphylococcus aureus* 1
39	20	27	30	39	*Bacillus subtilis*
37	9	-	12	-	*Proteus mirabilis*
30	-	-	15	-	*Shegilla* sp.
15	-	-	-	12	*E. coli* 1
11	-	-	12	-	*E. coli* 2
30	-	11	11	11	*Staphylococcus aureus* 2

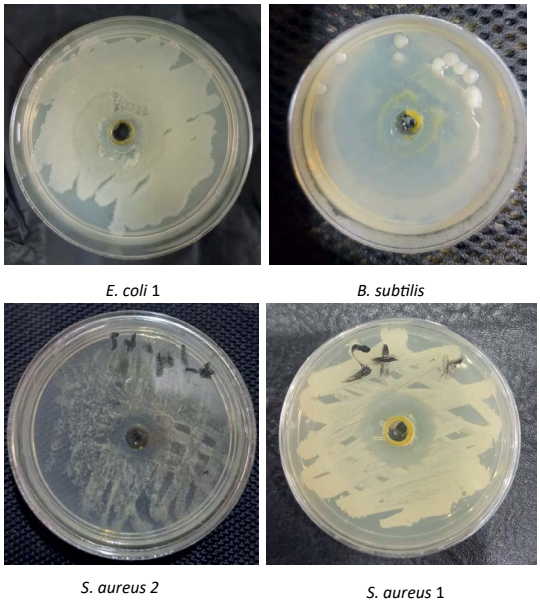

Figure 1. Antibacterial activity of *Lantana camara* extract against bacterial species

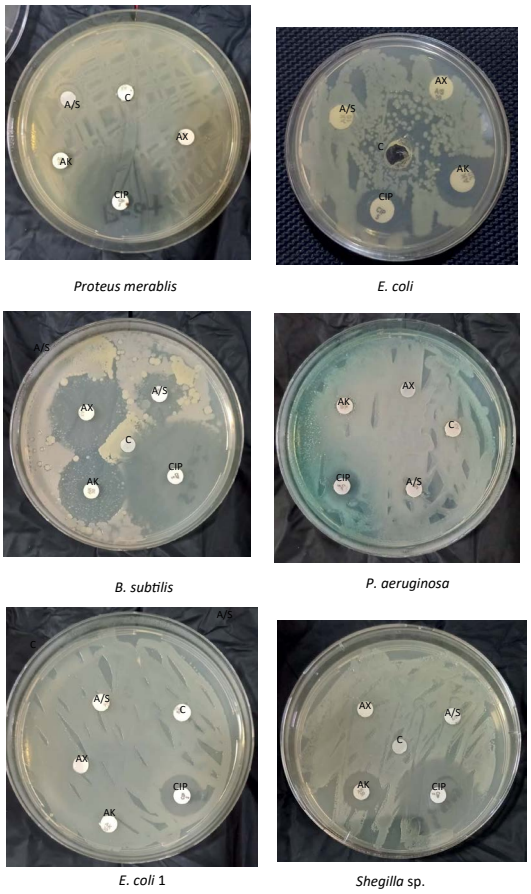

Figure 2. Susceptibility of antibiotics against bacterial species

Authorship Contribution: All authors share equal effort contribution towards (1) substantial contributions to conception and design, acquisition, analysis and interpretation of data; (2) drafting the article and revising it critically for important intellectual content; and (3) final approval of the manuscript version to be published. Yes.

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