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Antibacterial Activity of Leaves and Fruit of *Pistacia lentiscus*

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***Abstract*—** The study was carried out on the ethanolic and aqueous extracts of the Pistacia lentiscus leaves and fruits. The extracts were tested for its antibacterial activity against the following organisms; Staphylococcus aureus, Esherichia coli and Klebsilla pneumonia at different concentrations of 40, 80, 100, 120 µl. The ethanol extract of Pistacia was more effective than water extract. ethanol extract showed variation in the anti-bacterial activity toward S. aureus that isolated from clinical source, the zone of their inhibition ranged between (10-25mm).

Keywords— *Pistacia lentiscus*, anti-bacterial activity, natural products, aromatic trees

I. INTRODUCTION

Pistacia lentiscus L. is an aromatic member of the Anacardiaceae family. In Libya, (*Pistacia lentiscus*) is an evergreen shrub or tree and producing bright red globose berries [1], *P.lentiscus* occurs in various regions, the aerial parts of *P. lentiscus* has traditionally been used against several diseases [2]. Mastic gum from Pistacia has been used by folkloric medicine for the relief of upper abdominal discomfort, stomach aches, dyspepsia and pepticulcer [3]. The fixed oil extracted from mature fruits is commonly used in Tunisian traditional medicine as an anti-ulcer, wound healing and antiseptic [4]. Several biological activities have been attributed to the essential oil from aerial parts of *P. lentiscus*. such as their antifungal, antibacterial an antimicrobial effect [5] [6] [7]. Some works reported the chemical composition of the essential oil from aerial parts of *P. lentiscus* of diverse countries of the Mediterranean region [8]- [9]. Previous phytochemical studies of *P. lentiscus* presented that the major components were glycosides, flavonoids, alkaloids, saponins, tannins, terpenoids and steroids. Aim of the present work was to investigate the antibacterial activity of *Pistacia lentiscus* leaves and fruit extracts against some pathogenic bacteria.

II. METHODOLOGY

Collection the Samples

The plant material was collected from the Taknes area, east of the city of EL Marj, Libya. This plant was identified by Department of Biology, Faculty of science, Benghazi University, Elmarj, Libya.

Preparation of the extracts

The leaves and fruits were air-dried at room temperature, and ground into fine powder using an electric blender. The powder using was transferred into closed containers. Each of powdered air-dried planet material was extracted with water and ethanol. Five grams (5g) of each powdered sample was mixed in a conical flask with 100mL of deionized water or organic solvent, plugged, then shaken at 100rpm for 24 hours, each of the extracts was filtered rapidly through gauge and then by No. 1 Whatman filter paper. The filtrates were then concentrated in rotary evaporator [10].

Test organisms

Escherichia coli, Staphylococcus aereus and *Klebsilla pneumoniae*. The bacterial strains which obtained from El-Marj hospital.

Antibacterial Screening Method

To objectively evaluate the antimicrobial activity of the Pistacia lentiscus extracts, the following microorganisms were tested: Gram negative - *Escherichia coli* and *Klebsilla pneumoniae*; Gram positive - *Staphylococcus aureus*, were cultivated and stored in Nutrient Agar (NA) bacterial cultures incubated for 24 hours at 37°C. The Muller-Hinton agar medium was used for antibacterial assay. The agar diffusion method was used to accurately assess the antimicrobial activity of the extracts Equip the bacterial suspension by taking from 3-5 colonies of bacteria and put in 3-4 ml Normal saline. Then, we took from suspension 100µl and put in all agar plates by sterile cotton swab containing bacterial cultures incubated for 24 hours at 37°C [11]; [12]. Then, the extracts were applied directly on agar plates using the drop method (100 µL), [13]. Next, the prepared extracts were poured in to the well in the standard concentration (100 µL). All the plates were incubated for 24 hours at 37°C. Subsequently, the presence of the zone of inhibition could be measured on the plates. All tests which performed in triplicate and clear zones

greater than 7 mm were considered as positive results because Cork borer was 7 mm in diameter [14].

III. Results and Discussion

The best result was the extracts of the Pistacia fruits dissolved in ethanol more than the extracts of Pistacia leaves dissolved in ethanol. Perhaps the reason is that the active substances are found at higher rates in the fruits of the plant than the leaves. Ethanol extracts gave better results than distilled water extracts. *Staphylococcus aereus* bacteria were the most affected than other bacteria (24.22 mm) at 100 µl then *Klebsiella pneumonia* bacteria then *Escherichia coli* bacteria. This may be due to the difference in the structure of the cell wall between Gram-positive and Gram-negative bacteria, Where the effect of the extract on the cell membrane. Observed from the results that the greater the concentration the greater the diameter of the inhibition zone, where concentration were used: 40µl & 80µl & 100 µl & 120 µl. Table (1,2).

These results confirm previous reports of antibacterial activity of *P. lentiscus* which have been shown to be more effective against the Gram-positive than the Gram-negative bacteria [15], [16], [17]. The structure of the Gram-positive bacteria cell wall allows hydrophobic molecules to easily penetrate the cells and act on both the cell wall and within the cytoplasm. Phenolic compounds, which are present in the *P. lentiscus*, generally show antimicrobial activity against Gram-positive bacteria [18], [19]. The cell wall of Gram-negative bacteria is more complex. It has a thin peptidoglycan layer more than in the cell wall of Gram-positive bacteria. This observation is consistent with previous work carried out with several plants.

Table 1: Effect of Different Concentrations of ethanol Extract of Pistacia fruits and leaveson Growth of Bacteria.

Bacteria	40µl		80µl		100µl		120µl	
	fruits	leaves	fruits	leaves	fruits	leaves	fruits	leaves
Escherichia coli	13.58	11.41	15.58	13.65	21.29	17.21	22.27	19.34
Staphylococcus aureus	15.69	13.41	18.56	15.63	23.35	21.67	24.22	22.34
Klebsiella pneumonia	14.79	12.63	18.25	14.52	22.31	18.06	23.53	20.51

Diameter of the well 7 mm - average diameter of the inhibition zones in mm - at least 6 replicates

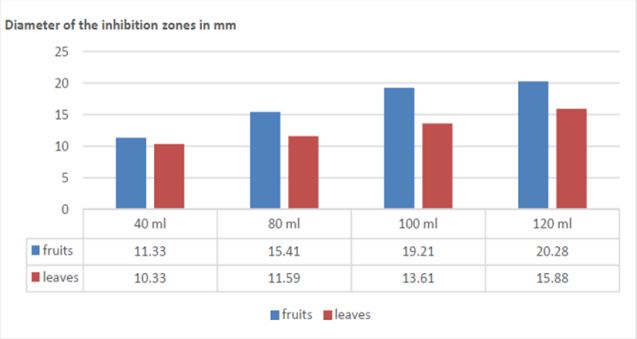

Figure 1:Effect of Different Concentrations of Eethanol Extract of Pistacia fruits and leaves on Growth of Escherichia coli

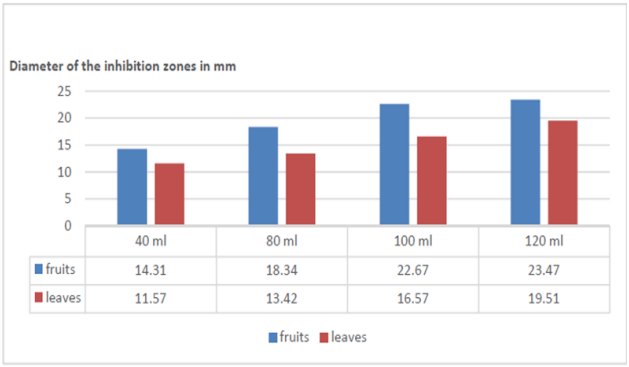

Figure 2: Effect of Different Concentrations of Eethanol Extract of Pistacia fruits and leaves on Growth of Staphylococcus aureus

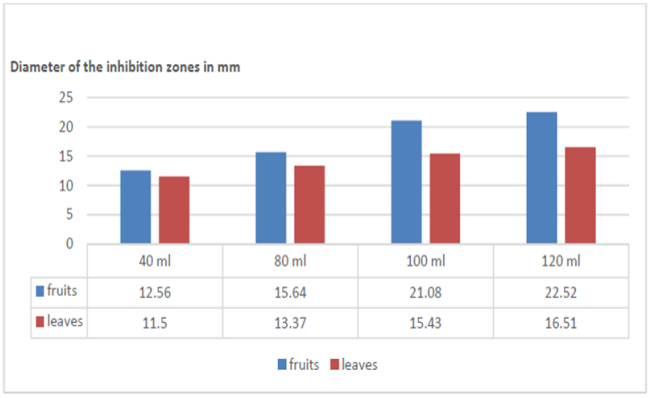

Figure 3: Effect of Different Concentrations of Eethanol Extract of Pistacia fruits and leaves on Growth of *Klebsiella pneumonia*

Table 2: Effect of Different Concentrations of Distilled Water Extract of Pistacia fruits and leaves on Growth of Bacteria.

Bacteria	40µl		80µl		100µl		120µl	
	fruits	leaves	fruits	leaves	fruits	leaves	fruits	leaves
Escherichia coli	11.33	10.33	15.41	11.59	19.21	13.61	20.28	15.88
Staphylococcus aureus	14.31	11.57	18.34	13.42	22.67	16.57	23.47	19.51
Klebsiella pneumonia	12.56	11.50	15.64	13.37	21.08	15.43	22.52	16.51

Diameter of the well 7 mm - average diameter of the inhibition zones in mm - at least 6 replicates

IV. Conclusion

From the study, it can be concluded that the antibacterial activity of Pistacia ethanol extracts was found to be high for gram positive and gram negative strains. so we can conclude that the activity varies according to the plants species and the type of solvents used for extraction. Different solvents with different polarity may result in extraction of different types of biologically active compound from plants. These bioactive compounds may go and bind to the cell wall of the microbes leading to inhibition of its growth.

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