Evaluation of Antimicrobial Activity of Rhus coriaria L. Extracts

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Abstract

Investigation of antibacterial activity of water, ethanolic and methanolic extracts of sumac (*Rhus coriaria L*) as compared with Vancomycin, Erythromycin, cloxacillin, Ciprofloxacin, Streptomycin and Kanamycin antibiotics was carried out on Gram positive and Gram negative pathogenic bacteria. The results exhibited variable susceptibilities of microorganisms for different extracts. The zone of inhibition varies depending on bacterial species and type of extract. The average diameter of inhibition zones ranges from 12 to 14, 20 to 25 and 16 to 28 for water, ethanolic and methanolic extracts, respectively. Ethanol extract had the highest bacterial activity with an MICs of 0.17±0.10 mg/Ml against *Bacillus subtilis* and against *Staphylococcus aureus* was 0.21±0.10 mg/M. When comparing the extracts MIC_S with those of antibiotics. All extracts showed pronounced antibacterial effects against both gram positive and gram negative bacteria with a significant difference between the effect of extracts and antibiotic p.0.05 .

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Keyword: *Rhus coriaria* L, Sumac, Antibacterial activity

Introduction

A new wave of research interested in traditional practices which might be used as antimicrobial agents has been stimulated by renewed attention to natural therapies. Microbiologists have two reasons to be interested in topic of antimicrobial plant extracts. First,it is very likely that these phytochemical will find their way into arsenal of antimicrobial drugs prescribed by physicians. New sources, especially plant sources, are also being investigated. Second, the public is becoming increasingly aware of problem with the over prescription and misuse of traditional antibiotics[1]. Sumac or sumach (***Rhus coriaria* L**) a plant belongs to the family **Anacardiaceae**, grows as shrub in Mediterranean and temperate regions throughout the world including Turkey, Syria, Iran, Iraq and Palestine[2].

It has been used as a condiment and sprinkled over kebobs, grilled meats, Soups , and some salads. In folk medicine, it is used for treatment of indigestion, anorexia, diarrhea, hemorrhage, and hyperglycemia [3]. In recent years, the biological activities of sumac have received the increased attention of researchers and industry, as well as consumers [4]. There have been a number of indications that the phytotherapeutic use of this plant might be a viable option in controlling different microbial species [5]. The purpose of this study was to evaluate the antibacterial activity of sumac extract on bacterial growth.

Materials and Methods

Plant material and Extraction

R.coriaria seeds were purchased from the local market of Basrah and grounded to a powder then kept in dry container. Three types of extract were prepared in the present study: ethanolic, methanolic and water based extracts. The ethanolic extract was prepared by mixing 75 gm of sumac powder with 200 ml of 70% ethanol for 24 hours. This mixture was cooled and filtered by filter paper (

wattman NO. 1). The filtrate was dried and concentrated using rotary evaporator at 55°C. The methanolic extract was prepared by the same way except that methanol was used instead of ethanol. Water based sumac extract was prepared in the same way except that distilled water was used instead of alcohol [6]

Preliminary qualitative Chemical tests

Some chemical tests were done on ethanolic, methanolic and water based extracts of R. coriaria to determine its active components, as follows:

Phenolic compounds:

About three ml of each extract was treated with 1% ferric chloride. The development of blue colour was an in indication of the presence of phenolic compound [7].

Flavonides :

Five ml of each extract was treated with 1ml of potassium hydroxide alcohol, the development of white or brown precipitate is an indication of the presence of flavondies[8].

Tanine:

Five ml of each extract was treated with few drops of 1% lead acetate; the development of white, gelatinous precipitate is an indication of the presence of tannis[9]. ..

Alkalodis:

About 1ml of each extract treated with 1ml of dragnadr off reagents, the development of orange precipitation is indicating the present of alkaloids [10].

Saponine:

Five ml of each extract was shaken vigorously in test tube, if foam froth appeared and stayed for long time indicates the presence of saponine.

Five ml of ammonical silver nitrate was added to 5ml of each extract in test tube. Left in boiling water bath for 10 minutes, then cooled. The appearance of silver mirror on wall of test tube indicates the presence of saponine [11].

Antimicrobial activity:

Six types of pathogenic bacteria were previously isolated and identified by other workers were used. To study the antimicrobial activity of extract of sumac, Muller-Hinton agar medium was used for bacterial growth,plates were incubated at 37C° for 24-48hrs. The method of well contain extract were used and the inhibition zones were measured by scale and compared with the control [12]. Vancomycin, Erythromycin, cloxacillin, Ciprofloxacin and Streptomycin antibiotics were used in this study to evaluate the antibacterial efficacy of *Rhus coriaria* (sumac)extracts. Muller Hinton Agar was used with different antibiotic disc to measure MIC_S. The Minimum inhibitory concentration (MIC) was determined by the micro dilution method [13].

Results

The chemical tests were done on *R. coriaria* seeds to determine its active groups are shown in **Table 1**. The antibacterial activity of ***R. coriaria* seeds** are summarized in **Table 2** .The table shows the means of diameter of inhibition zone induced by *R.coriaria* seed extracts on bacterial growth. The inhibition zones induced by activityof extract also illustrated by photographs which are listed in **Figure1. Table2** reveals different influence of extraction on microorganisms due to method of extraction. The average diameter of inhibition zones ranges from 12 to 14mm,20 to 25mm and 16 to 28mm for *R. coriaria* seeds water, ethanolic and methanolic extract, respectively. The largest diameter of inhibition zone was observed for ethanolic and methanolic extracts on the growth of *Bacillus subtilis*. Ethanol extract had the highest bacterial activity with an MICs of 0.17±0.10 mg/Ml against *Bacillus subtilis* and against *Staphylococcus aureus* was 0.21±0.10 mg/Ml(table 3).When comparing the extracts MIC_S with those of antibiotics, all extracts showed pronounced antibacterial effects against both gram positive and gram negative bacteria with a significant difference between the effect of extracts and antibiotic $p<0.05$ (Table 4).

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Table 1 : Preliminary qualitative Chemical tests for *R. coriaria* seeds

Type of extract	Phenolic	Flavonides	Tanine	Alkaloids	Saponine	Glycosides
Ethanol	+	+	+	+	-	+
Methanol	+	+	+	+	-	+
Water	+	+	+	+	-	+

Table 2: Mean of Diameter of the Inhibition zones Induced by Sumac Extract against Microorganisms Used in This Study.

Microorganism	Diameters of Inhibition in mm (mean of three tests)		
Gram Positive	Water	Ethanol	Methanol
Bacillus subtilis	14a	25b	28c
Staphylococcus aureus	13a	22b	22c
Streptococccus sp.	14a	23b	20c
Gram Negative			
Escherichia coli	**14a**	**20b**	**16c**
Klebsiella pneumoniae	12a	20b	21c
Pseudomonas aeruginosa	12a	20b	16c

DIZ=Diameter of Inhibition Zone Measured in Millimeter
Small latter= Designed to present significant differences (p> 0.5)

Table 3: The minimum inhibitory concentrations(MICs)of Sumac Extracts

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Microorganism	Minimum Inhibitory Concentrations		
Gram Positive	Water	Ethanol	Methanol
Bacillus subtilis	0.67±8.165a	0.17±0.103a	0.27±8.165b
Staphylococcus aureus	0.40±0.109a	0.21±0.10b	0.20±0.109b
Streptococccus sp.	0.23± 0.103a	0.20±0.109a	0.23±0.103a
Gram Negative			
Escherichia coli	0.60±0.109a	0.60±0.109a	0.50±000a
Klebsiella pneumoniae	0.43±0.103a	0.63±0.103b	0.57±1.03b
Pseudomonas aeruginosa	0.57±0.103a	0.60±0.109a	0.63±1.03a

MIC_S= Minimum Inhibitory Concentrations Measured in mg/ml
Small latter= Designed to present significant differences (p> 0.5)

Table 4: The minimum inhibitory concentrations(MICs)of the antibiotics on the bacteria used in the study

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croorganism	Antibiotic (30 mcg)					
ram Positive	Vancomycin	Erythromycin	Cloxacillin	Ciprofloxacin	Streptomycin	Kanamycin
cillus subtilis	7.75±0.50	8.25±1.25	11.75±0.50	27±2.44	-	-
aphylococcus aureus	12.25±0.50	23±2.45	23±2.45	12.25±0.50	4.25±1.50	29±1.15
reptococccus sp.	9.5±1.91	21.5±1.91	18.75±0.95	12.75±0.50	4.5±1.91	33.75±1.50
ram Negative						
Escherichia coli	5.5±2.08	16.75±1.50	20.5±1.91	23.5±3.31	-	-
Klebsiella pneumoniae	3.5±1	23±1.41	19.5±1	24.25±7.22	-	-
Pseudomonas aeruginosa	-	-	4.25±1.50	29±1.54	-	-

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