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Antimicrobial activity of nine medicinal plants growing in the south of Algeria

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ABSTRACT

Methanolic and aqueous extracts of nine Algerian plant species used in folk medicine were investigated for their antimicrobial activities against five bacteria strains: Staphylococcus aureus, Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa and Enterobacter aerogenes and one fungus: Candida albicans . The plants exhibited important antimicrobial activity with a significant difference between the different plants. The most active plants were Tamarix gallica, Rhetinolepis sp and Muscari Comosun. Most of the tested plant extracts were active against Candida albicans. Of all extracts, the Methanolic extract of Rhetinolepis sp was the most active (diameter ranges between 15mm and 22mm) whereas, the aqueous extract of Tamarix Gallica was the most active of all tested aqueous extracts (Diameter ranges between 10 mm and 17 mm).

Keywords: Antibacterial activity; methanolic extract; aqueous extract

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INTRODUCTION

The development of microbial resistance towards antibiotics makes it necessary to search for new potential effective compounds against pathogenic bacteria. There have been numerous broad based screening programmers initiated over the past years, in which large numbers of plant species have been evaluated for their antimicrobial activities [**1-3].**

In the constant effort to improve the efficacy and ethics of modern medical practice, researchers are increasingly turning their attention to folk medicine as a source of new drugs **[4].** Nowadays, the development of resistance by a pathogen to many of the commonly used antibiotics provides an impetus for further attempts to search for new antimicrobial agents to combat infections and overcome the problems of resistance and side effects of the currently available antimicrobial agents. Hence, this in vitro study was aimed at screening selected Algerian medicinal plants for

their antimicrobial activity, evaluating their potential use in treating infections caused by bacteria and determining whether their use in folkloric medicine is justified.

MATERIALS AND METHODS

2.1. Plant collection

In the current work, nine plant species commonly used in folk medicine in the south of Algerian were selected (Table1). Mature plants were collected from site in al-golea southeast of Algeria during the spring and summer seasons before being dried in the shade and ground into a powdered material using an appropriate seed mill.

2.2. Extracts Preparation

2.2.1. Aqueous extracts

Each dry powdered plant (20 g) was infused in double distilled water until complete exhaustion .The extract was then filtered using Whatman filter paper, and the filtrate was evaporated in vacuo and dried at 60^{o}C using a rotary evaporator. The final dried material were dissolved in a small amount of DMSO, stored in labeled sterile bottles and kept in the freezer□.

2.2.2. Methanolic extracts

20 g of each dry powdered plant were soaked in Methanol until complete exhaustion of the herb. The extracts were filtered using Whatman filter paper, and the filtrates were then evaporated and dried at 40°C using a rotary evaporator. Dried extracts were dissolved in a small amount of DMSO and stored in the freezer

2.3. Antimicrobial activity

The Anti-microbial activity tests were carried out on crude extracts using disk diffusion method [**5-7**] against five pathogenic bacteria, including Gram positive, Gram-negative bacteria: *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella Pneumoniae*, *Pseudomonas aeruginosa* and *Enterobacter aerogenes* and one fungus *Candida albicans*

The bacterial strains were first grown on Muller Hinton medium (MHI) at 37 ◦C for 24 h prior to seeding on to the nutrient agar but the fungus at 30^{0} C for 48 h. A sterile 6-mm-diameter filter disk (Whatman paper n^{o} 3) was placed on the infusion agar seeded with bacteria. Each extract was suspended in water and dropped onto each paper disk (40 µl per disk) for the prepared concentrations (8mg/ml). The treated Petri disks were kept at 4 ◦C for 1 h, and incubated at 37 ◦C for 24 h. The antibacterial activity was assessed by measuring the zone of growth inhibition surrounding the disks. Each experiment was carried out in triplicate.

Table 1: Ethnobotanical data of studied plants

Spices	Family	Common name	Popular uses
1-Tamarix Gallica	Tamaricaceae	Tararisk Tarfa	antirheumatic
2-Muscari Comosun	Liliaceae	Basal adib	anti-anemic
3- Rhetinolepis sp	Asteraceae	Techerte	antidiabetic
4-Taraxacum officinnale	Asteraceae	El handba ou mekre	Indigestion, diarrhoea
5-Zygohyllum album	Zygophyllaceae	Elagga	diabetes
6 -Urica dioica	Urticaceae	Horika ou karasse	-
7-Silybum marianum	Asteraceae	Gargar	Diabetes
8-Traganum nudatun	Chenopodiaceae	Demrane	anti-anemic
9-Rhamnus sp	Rhamnaceae	Assuid	-

Table 2: Antimicrobial activity of plant extracts against the bacteria strains and the fungus

Inhibition zone Micro-organisms diameter (mm)												
Micro-organisms	***E. coli***		***P. aeruginosa***		***K. Pneumoniae***		***E. aerogenes***		***S. aureus***		***C. Albicans***	
Extract / Plant Species	**W**	**M**	**W**	**M**	**W**	**M**	**W**	**M**	**W**	**M**	**W**	**M**
Tamarix Gallica	15	16	14	12	16	12	14	12	15	10	17	11
Muscari Comosun	13	14	13	12	14	13	11	13	14	13	12	10
Rhetinolepis sp	15	18	12	22	14.5	15	14	17	13.5	15	16	18
Taraxacum officinnalis	12	14	12	14	08	12	13	15	12	12	13	12
Zygohyllum album	13	16	10	12. 5	07	08	14	12	07	06	09	10
Urica dioica	12	10	08	14	06	09	12	14	10.5	09	09	11
Silybum marianum	12	08	12	11	12	10	08	07	11	10	09	11
Traganum nudtun	07	09	11	07	09	09	11	10	12	08	08	08
Rhamnus sp	13	15	10	12	11	13	11	12	08	09	08	07

W: water extract, M: Methanol extract

RESULTS AND DISCUSSION

Antimicrobial activity of the extracts of nine plants belonging to deferent families has been evaluated in vitro against five bacterial species and one yeast (*C. albicans*) known to cause dermal and mucosal infections, in addition to other infections (Table 2). All the studied plants showed antimicrobial activity. For *C. albicans*, the most active plant extracts against this yeast were *Tamarix Gallica and Rhetinolepis sp* while the least active ones were *Traganum nudatun* and *Rhamnus sp.*

The most active plants studied in this work seem to possess similar antimicrobial active compounds including essential oils (especially thymol), flavanoids and triterpenes and other compounds of phenolic nature or with free hydroxyl group, which are classified as active antimicrobial compounds (Rojas *et al*., 1992). However, some of the moderately active and least active plants were also reported to have similar and/or other active compounds but probably in smaller amounts.

The present work has shown that most of the studied plants are potentially a good source of antimicrobial agent and demonstrates the importance of such plants in medicine and in assisting primary health care in this part of the world.

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