



Comparative Evaluation of Antibacterial Properties of Some Medicinal Plants in Iran

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ABSTRACT: With increased prevalence of antibiotic-resistant bacterial, finding new sources with antibacterial activity could be an effective help in diseases. The antibacterial activity and Minimal Inhibitory Concentration (MIC) of the extracts of *Calendula Officinalis* L., *Achillea millefolium* L., *Millefolium* L., *Allium haemanthoides* Boiss. & Reut. ex Regel, *Allium ampeloprasum* L. and *Echinophora platyloba* DC. were evaluated against four bacteria (*Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella typhimurium*). These plants are used in Iran folk medicine. The methanol and water extracts were obtained by standard methods. The antibacterial activity was examined using paper disc diffusion method. No plant extracts showed activity against *Escherichia coli* but showed five medicinal plants antibacterial activity against one or more strains. The most active antimicrobial plant was *Allium Haemanthoides*.

KEYWORDS: Antibacterial activity; Minimal Inhibitory Concentration; Medicinal plants

ORIGINAL ARTICLE

INTRODUCTION

Herbal medicine represents one of the most important fields of traditional medicine all over the world. To promote the proper use of herbal medicine and to determine their potential as sources for new drugs, it is essential to study medicinal plants, which have folklore reputation in a more intensified way (Kumaraswamy et al., 2008). The use of plant extracts and phytochemicals, with known antibacterial properties, may be of immense importance in therapeutic treatments. In the past few years, a number of studies have been conducted in different countries to prove such efficiency. According to the WHO, medicinal plants would be the best source for obtaining a variety of drugs. About 80% populations of the developed countries use traditional medicines, derived from medicinal plants. Therefore, such plants should be investigated thoroughly to determine their structural and functional properties, as well as the efficiency of various parts (Bhattacharjee et al., 2006). Infectious diseases are the world's leading cause of premature deaths, killing almost 50,000 people every day. In recent years, drug resistance to human pathogenic bacteria has been commonly reported from all over the world (Guessan et al., 2007). Clinical microbiologists have two reasons to be interested in the topic of antimicrobial plant extracts. First, it is very likely that these phytochemicals will find their way into the arsenal of antimicrobial drugs prescribed by physicians; several are already being tested in humans.

Second, the public is becoming increasingly aware of problems with the over prescription and misuse of traditional antibiotics (Cowan, 1999).

The aim of the present study was to investigate antibacterial effects of the methanol and water extracts of five medicinal plants against one gram positive (*Staphylococcus aureus*) and three gram negative (*Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella typhimurium*).

MATERIALS AND METHODS

Plant Material

Five medicinal plants were collected from Hamadan region in the west of Iran. Plant parts have been chosen in relation to Iranian popular medicine use. Plants materials were dried at room temperature, then were grinded and extracted (20g) with methanol and distilled water (200 ml) for 48 h. The extracts were filtered and obtained filtrates were concentrated under the reduced pressure.

Human Pathogenic Bacterial

Staphylococcus aureus, *Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella typhimurium* were obtained from Farshchian hospital the University medicinal science, Hamadan, Iran.

Antimicrobia assay

Disc diffusion method (Rahman et al., 2008) with some modifications was used to test the antimicrobial activity of the extractives against four bacteria. Dried and sterilized filter paper discs (6 mm diameter) were then impregnated with known amount of the test substances (10µl/disc) using micropipette. Discs containing the test material (10µl/disc) were placed on nutrient agar medium uniformly with the test microorganisms. Disc of blank discs were used as negative control. The plates were then incubated at 37°C for 48 hours to allow maximum growth of the organisms.

Determination of minimum inhibitory concentration (MIC)

The minimal inhibitory concentration (MIC) values were determined. The MIC was defined as the lowest concentration of the compound to inhibit the growth of microorganisms. Antibacterial activity was determined as diameter of the zone of inhibition (DIZ). DIZ measurements were made three times for each disc at different orientation and the average was recorded.

RESULTS

The MIC results of the antibacterial activity of the aqueous and methanol extracts are shown in Table 1. The results showed that almost all of bacterial strains were sensitive to the aqueous extract of *Allium Haemanthoides*. Results of this study showed that no plant extracts showed activity against *Escherichia coli*.

Table-1 The MIC value of five medicinal plant extracts. The results are shown as average Values from three separate experiments

Extracts		<i>S. typhimurium</i>	<i>S. aureus</i>	<i>P. aeruginosa</i>	<i>E coli</i>
<i>C. Officinalis</i>	A	-	+	-	-
	M	-	++	-	-
<i>A. millefolium</i>	A	-	+	-	-
	M	-	+	-	-
<i>A. haemanthoides</i>	A	++	+++	+	-
	M	-	-	-	-
<i>A. ampeloprasum</i>	A	+	++	-	-
	M	-	-	-	-
<i>E. platyloba</i>	A	-	-	-	-
	M	-	+	+	-
Control methanol		-	-	-	-
Control aqueous		-	-	-	-

-: Absent; +: DIZ =1.5-2.5 mm; ++: DIZ =3-5 mm; +++: DIZ > 5 mm; A: Aqueous extract; M: Methanol extract.

DISCUSSION

Field existences of antibiotic resistant phytopathogenic bacteria are increasing in recent years. Many reports of antibacterial activity of plants extracts against human pathogens and their pharmaceutical application are available (Babu et al., 2007). Considering the rich diversity of plants, it is expected that screening and scientific evaluation of plant extracts for their antimicrobial activity may provide new anti-microbial substances; hence the present investigation clearly reveals the antibacterial nature of this plant and suggests that this plant could be exploited in the management of diseases caused by these bacteria in human systems (Kumaraswamy et al., 2008). In this study, using the disk diffusion method it was observed that extracts of *C. Officinalis*, *A. Millefolium*, *A. haemanthoides*, *A. ampeloprasum* and *E. platyloba* antibacterial activity against pathogens. The aqueous extract of the flowers of *Thonningia sanguinea* is bactericidal for these tested strains. The most active antimicrobial plant was *Allium Haemanthoides*. In addition, this result form a good basis

for selection of the plant for further phytochemical and pharmacological investigation and suggests antibacterial properties that can be used as antimicrobial agents in new drugs for the therapy of infectious diseases caused by pathogens. Therefore, it is of great interest to carry out a screening of these plants in order to validate their use in folk medicine and to reveal the active principle by isolation and characterization of their antimicrobials constituents and carry out further pharmacological evaluation. Since compounds of biological origin are known to possess minimal residual effect. The most active extracts can be subjected to isolation of the therapeutic and carry out further pharmacological evaluation.

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