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Antimicrobial Effects of Medicinal Plants Collected in Zabol, Iran, on Pathogenic Food Pathogenic Bacteria

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ABSTRACT

***Background*:** A large number of plants are used for treatment of diseases because of their antimicrobial activities. This study aims to investigate the antimicrobial effects of some plants on the food pathogenic bacteria.

***Methods*:** Plant extracts were obtained using the rotary system, the minimum inhibitory concentration (MIC) by diluting method against bacteria was determined.

***Results*:** Results showed that the lowest MIC of the *Peganum harmala* was 3.1 ppm and the highest inhibitory concentration was 6.25 ppm for inhibiting the *Vibrio cholerae*.

***Conclusion*:** The present study confirms the use of this extract as an antibacterial agent. Further research is required to evaluate the practical value of its therapeutic application.

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Introduction

Using chemical preservatives is one of the prevailing methods for controlling the food microbial activities (1). *Rumex alpinus* L is from Polygonaceae family. In the past, its leaves and flowers were used for treatment of sting, fatigue and as an antitoxin (2). Bucks beard with the scientific name of *Tragopogon graminifolius* from the Asteraceae family grows at 1400 m altitudes of the Zagros region. *Prangos feralacea* has carminative, laxative, stomach tonic, anti-inflammatory, nerve analgesic, anti-virus, ant parasitic, antibacterial, and antifungal characteristics (4). *Peganum Harmalal* (Zygophyllaceae) that is also called Harmal Suryin Rue is a perennial and bushy (5). *Teucrium polium* herbal plant of pathogenic mint family (Labiatae) with its anti-diabetic, antispasmodic, analgesic, anti-inflammatory and anti-oxidant nature has been reported during recent years. This study aims to investigate the antimicrobial effects of few plants on the food pathogenic bacteria. Bacterial strains were obtained from standard laboratory. The antibacterial activity of the extracts was investigated using the strain of bacteria *Staphylococcus aureus* ATCC1189, *Shigella dysenteriae* ATCC1188, *Listeria monocytogenes* ATCC1298, *Vibrio cholerae* ATCC1611, *Bacillus cereus* ATCC1015. The plants were collected from Zabol, southeastern of Iran and dried at room temperature. Briefly, serial doubling dilutions of the extract were prepared in a 96-well microliter plate ranged from 500 ppm, 250 ppm, 126 ppm, 63 ppm, to 31 ppm. *E. coli* ATTCC 25922 and ethanol were used as positive and negative controls. The results were expressed as mean and or ranked in order of importance as percent. The data were subjected to one-way analysis of variance (ANOVA), using the SPSS-17 software. The p-value of > 0.05 was regarded as significant. Results showed that the plant extracts are the proper bacteria inhibitors so that the lowest MIC of the *Peganum Harmala* was 3.1 ppm and the highest inhibitory concentration was 6.25 ppm for inhibiting the *V. cholerae*. The lowest MIC of the *Teucrium polium* was 6.25 ppm for inhibiting the *Vibrio cholerae* and *shigella*. The highest inhibitory concentration was 50 ppm for inhibiting all the other bacteria.

The high rate of the diseases and foodborne intoxications with their economic and social consequences has motivated studies on healthy food production and using the new antimicrobial combinations. A study conducted by (6) showed that the lowest inhibitory concentration of the *Tragopogon graminifolius* was >1900 ppm for inhibiting the *S. aureus*, *S. epidermidis* and *Enterococcus faecalis*. Another study by (7) showed that the lowest MIC of the MRSA, *B. anthracis* and *S. typhi* were 6.25, 2.5, 0.625 and 0.625 ppm, respectively. A study by Hayet revealed that the chloroformic, ethyl acetate, butanolic and methanolic extracts of *P. harmala* leaves all displayed good antifungal activity with MIC values of 2.5 mg/ml^{-1}.Chloroformic and methanolic extracts showed the important antibacterial activity against Gram-positive bacteria compared to the Gram-negative bacteria with MIC values ranging between 0.251 and 2.5 mg/ml^{-1} (8). Another study by Durmaz et al. (9) showed the antimicrobial effects of four plant extracts of *Prangos feralaceae* (ethanolic, methanolic, aqueous and concentration-hexane) against the several Gram-positive bacteria such as *Bacillus cereus*, *Bacillus subtilis*, *Micrococcus luteus*, and *S. aureus* and Gram-negatives such as *E. coli*, *Klebsiella pneumoniae*, *Proteus mirabilis* and *Salmonella enteritidis*. The highest rate of the antimicrobial features is related to the ethanolic and methanolic extracts with their meaningful antimicrobial properties. The study of Zerroug, extracts of *Teucrium poliumgave* zones of inhibition against *B. subtilis*, *M. luteus* and *Paracoccus paratrophus* were 3.7, 2.0 and 2.0 mm (10).

Table 1. The result of antibacterial extract against human pathogens.

	P. harmala MIC/MBC	*T. polium* MIC/MBC	*P. feralaceae* MIC/MBC	*T. graminifolius* MIC/MBC	*Eremurus* MIC/MBC	*R. alpinus* MIC/MBC
Shigella sp.	3.1 /6.25	6.25 / 12.5	12.5 / 25	12.5 / 25	50 /100	50 / 100
Listeria sp.	3.1 / 6.25	12.5 / 25	12.5 / 25	6.25 / 12.5	50 / 100	50 / 100
B. cereus	3.1 / 6.25	25 / 50	12.5 / 25	12.5 / 25	50 / 50	50 / 50
S. aureus	3.1 / 6.25	25 / 50	25 / 50	6.25 / 12.5	50 / 100	Growth
Vibrio sp.	6.25 / 12.5	6.25 / 12.5	No Growth	6.25 / 12.5	50 / 100	25 / 50

Conclusion

Results show the proper antimicrobial effects of the plant extracts, however its mechanism of action has not been realized yet. The essences and extracts of the plain plants can be used as the synergist with the antibiotics because most of these plant medicines have positive increasing or synergic effects on one or more medicines.

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Conflict of interest

No conflict of interests is declared.

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