The Antibacterial activity of Aqueous Extraction of Petroselinum crispum (Parsley) and Rhus glabra (Smooth sumac)

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Abstract

Throughout history, Parsley has been used mainly as kidney stone, bladder infection, and jaundice medications, as well as digestive aids. Smooth sumac was used to treat a large number of ailments, particularly mouth and throat sores, burns, to control diarrhea, and to promote urination.

The Antibacterial activity of parsley (Petroselinum crispum) and Smooth Sumac ( Rhus glabra) leaves aqueous extract was examined using agar disc diffusion methods against six bacteria ( Bacillus subtilis, Staphylococcus aureus, Escherichia coli, Proteus mirabilis, Klebsiella pneumonia, Pseudomonas aeruginosa ). The extract of both plants had inhibitory effect at various concentrations (5%, 7%, 15% for sumac and 1.5%, 2% for Parsley against both gram positive and Gram-negative). Based on these results of this study both plants could be considered as potential antibacterial agents which confirms their use in folk Medicine.

Introduction

Plants remain the most common source of antimicrobial agents. Their usage as traditional health remedies is the most popular for 80% of world population in Asia, Latin America and Africa and is reported to have minimal side effects (Douglasii, 2006). Infectious diseases count for about half of the death in tropical countries (Khosravi and Fatheddin, 2006). Besides, incidents of epidemics due to drug resistant microorganisms pose enormous public health concerns (Burt and Reinders, 2003). Many studies indicates that in some plants there are many substances such as peptides, unsaturated long chain aldehydes, alkaloidal constituents, some essential oils, phenols and water, ethanol, chloroform, methanol butanol soluble compounds (Klausmeyer et al., 2004). These plants then emerged as compounds with potentially significant therapeutic application against human pathogens, including bacteria, fungi or viruses ( Perez, 2003).

Material and Methods

Extract preparation

-Parsley was obtained from the local market. Rhus glabra (smooth sumac) leaves were collected from plants grown in mountains in North of Palestine.

-The Leaves of parsley were dried, ground and soaked in distilled water at concentration of 5% for 24 h then filtered and sterilized by filtration and stored in freezer

-Dry Leaves of Rhus glabra (smooth sumac) were grinded and soaked in distilled water for 72 h, filtered, sterilized by filtration and stored in freezer at final concentration of 7 %.

Test Bacteria

A total of six bacteria species were tested. The gram positive bacteria were Bacillus subtilis, Staphylococcus aureus and The Gram negative species were, Escherichia coli, Proteus mirabilis, Klebsiella pneumonia, Pseudomonas aeruginosa. These species were originally isolated from clinical materials collected from patients. They were identified using standard biochemical tests.

Determination of antimicrobial activity:

-Antibacterial activity of the extracts of both plant sample was evaluated by the paper disc diffusion method (Sagdic and Ozcan, 2003).

-Stock culture of test bacteria were grown in TSB medium at 37°C for 22 h. Final cell concentrations were 10⁶ cfu ml⁻¹ with reference to the Mc Farland turbidity (Burt and Reinders, 2003).

-One milliliter of this inoculum was added to each plate containing Mueller-Hinton agar (MHA, Oxoid) spread by sterile cotton swab and allowed to remain in contact for 1 min.

-Four concentrations of Smooth Sumac (2.5, 4, 5, 7 %) and (0.5, 1, 1.5, 2 %) of parsley were prepared.

-Sterile 6 mm filter paper discs (Hueh et al., 2001) were placed on these cultures and immediately 50 µL volumes of the each concentrations from the two mentioned extracts were added.

-The plates allowed to remain 1 h at room temperature in order to diffusing the extract across the surface and then were incubated at 37°C for 24 h.

-The inhibition zone around each disc was measured in millimeter.

-Discs containing different concentrations of two antibiotics (Tetracycline 30 mcg, Gentamycin 10 mcg) served as positive controls.

Results

Effects of Parsley extract

The antibacterial activity of the parsley extracts was quantitatively assessed by the presence or absence of inhibition zone and measuring the diameter of the inhibition zone around the discs. Results showed the antibacterial activity of the tested extracts against bacteria (Table 1).

The results show in Table 1 indicate that parsley aqueous extract had inhibitory effect at various concentrations against Gram-positive and Gram-negative bacteria. Also it was effective in lower concentrations on E. coli. The extract of parsley inhibit the growth of Proteus mirabilis only at higher concentration.

Name of bacteria  | 5%  | 1%  | 1.5%  | 2%  | Antibiotic  | Gentamycin (30 mcg)  
--- | --- | --- | --- | --- | --- | ---
Pseudomonas aeruginosa  | R  | R  | 12  | 15  | R  |
Staphylococcus aureus  | R  | R  | 14  | 16  | 24  |
Bacillus  | R  | 10  | 12  | 17  | 19  |
Escherichia coli  | R  | 10  | 16  | 18  | 20  |
Proteus mirabilis  | R  | R  | 12  | 15  | 25  |
Klebsiella  | R  | 6  | 8  | 10  | 12  |

Table: Minimum zone (mm) of Parsley aqueous extracts on some bacterial species.

These results suggesting that antibacterial activity of parsley aqueous extract against bacterial species used in the experiment. This activity was decreased when used in lower concentrations. However, E. coli was the most susceptible organism to the different concentrations of the aqueous parsley extract.

Effect of Smooth Sumac

The antibacterial activity of the Smooth sumac extracts was quantitatively assessed by the presence or absence of inhibition zone and measuring the diameter of the inhibition zone around the discs. Results showed the antibacterial activity of the tested extracts against bacteria (Table 2).

Table: Minimum zone (mm) of Smooth sumac aqueous extracts on some bacterial species.

Discussion

Parallel to increasing the resistance of microorganisms to the currently used antibiotics and the high cost of production of synthetic compounds, pharmaceutical companies are now looking for alternatives. Medicinal plants could be one approach because most of them are safe with little side effects if any, cost less and affect a wide range of antibiotic resistant microorganisms. The results of this study showed that aqueous extracts from the parsley and Smooth sumac inhibited the growth of various species of Gram-positive and Gram-negative bacteria. Smooth sumac and Parsley extract at (7%) for sumac and (2%) for parsley showed significant effect on E. coli and Proteus. In hospitals, E coli and Proteus mirabilis are the most frequently isolated bacteria from Enterobacteriaceae (Champs et al., 2000).

Based on the results of this study we will further investigate the plants that showed broad antibacterial activities in vivo to uncover their potential as a source of antibiotics against selected human pathogens.

The active plant extracts could also be considered as disinfectants or anti-bacterial.

References