In-vitro Antibacterial Study of Stem Extract of *Rumex dentatus* Against Different Bacterial Pathogenic Strains

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Abstract: The aim of present study was to investigate the antibacterial activity of the stem extract of *Rumex dentatus* against some bacterial pathogenic strains. All the work was done in the laboratory of Microbiology, Faculty of Health Sciences, COMSATS Institute of Information Technology, Abbottabad, Khyber Pakhtunkhwa, Pakistan during the month of June 2012. The agar well diffusion method was used. The methanol, cold water and hot water extracts were used. The result of the extracts in methanol and cold water was found to be effective against all the tested bacterial strains i.e. *Bacillus subtilis*, *Escherichia coli*, *S. aureus* and *Micrococcus luteus* *P. aeruginosa*, while the extracts in hot water show no activity against the bacterial pathogenic strains. Minimum inhibitory concentration (MIC) of the extracts against these bacterial strains were in the range of 0.10 mg/ml. Different phytochemical analysis result indicate the presence of secondary metabolites viz., alkaloids, flavonoids which may be responsible for antibacterial activity. From our result it can be concluded that extract of *Rumex dentatus* have potential against bacterial pathogenic strains.

Key words: Antibacterial activity • Well diffusion method • *Rumex dentatus*

INTRODUCTION

Plants have the ability to synthesize a wide variety of chemical compounds that are used to perform important biological functions and to defend against attack from predators such as insects, fungi and herbivorous mammals. Many of these phytochemicals have beneficial effects on long-term health when consumed by humans and can be used to effectively treat human diseases. At least 12,000 such compounds have been isolated so far; a number estimated to be less than 10% of the total [1].

Chemical compounds in plants mediate their effects on the human body through processes identical to those already well understood for the chemical compounds in conventional drugs; thus herbal medicines do not differ greatly from conventional drugs in terms of how they work. This enables herbal medicines to be as effective as conventional medicines, but also gives them the same potential to cause harmful side effects [2].

*Rumex dentatus* belongs to family polygonaceae is commonly known as toothed dock. *Rumex dentatus* has allelopathic activity and inhibit the growth of other plants by producing some growth inhibitory substances. The genus Rumex comprises about 150 species widely distributed around the world. The main chemical constituents of Rumex are anthraquinones and flavonoids [3]. This genus includes many edible plant species that have medicinal importance for the treatment of some most dangerous diseases and *Rumex* plants are used as bactericidal agents [4]. Yildirim et al. [5] stated that *Rumex alpinus* and *Rumex caucasicus* have antibacterial potency on a range of food borne bacteria and these plants used to treat constipation, diarrhea and eczema.

Ethyl acetate extract of aerial part of *Rumex japonicus* extract has strong antioxidant and antibacterial activities which are correlated with its high level of phenolic compounds, particularly pyrogallol and pyrocatechin. The extract of *R. japonicus* aerial parts can be utilized as an effective and safe source of antioxidants [5].
The aim of present study was to investigate the antibacterial activity of the stem extracts of *Rumex dentatus* in methanol, cold water and hot water against different bacterial pathogenic strains. The plant is edible and can be utilized for further bacterial pathogens, to produce new antibacterial drugs. The antifungal activity of the *Rumex dentatus* should be investigated for antifungal drugs discovery.

**MATERIAL AND METHODS**

**Collection of Plants:** The plant is collected from different part of District Mansehra including Bafa, Dhodial and Shinkyari. *Rumex dentatus* plant stem is collected in sterile polythene bag and was transferred to the laboratory of Microbiology for the antibacterial assay.

**Washing of the Stem:** Stem of the collected plants was washed with distilled water to remove the soil particle from the surface. The washed stem was then treated with disinfectants (Ethanol) to remove any contaminants.

**Extraction from Stem:** Healthy fresh plant leaf was harvested and air dried under shade at room temperature for the period of fifteen days. The dried plant was homogenized into powder form by using grinder. About 12 gram powder of stem was soaked in 100ml of cold water, hot water and methanol covered them with aluminium foil. The solution containing powder was shaken for 24 hours on the shaker at 150 rpm. After shaking the solution were filtered through artsman filter paper. The filtrate was then dried and weighed and stored in sterile condition in refrigerator at 4 °C [6].

**Test Bacterial Pathogen:** Five bacterial pathogenic strains were used in this study i.e. *Bacillus subtilis, Escherichia coli, S. aureus, Micrococcus luteus and P. aeruginosa*. The bacterial strains were obtained from the microbiology lab of COMSATS Abbottabad Khyber Pakhtunkhwa, Pakistan. The bacterial strain were then cultured in the Nutrient agar overnight at 37 °C.

**Agar-well Diffusion Method:** Agar well diffusion method as stated by [7]. With the help of sterilize cork borer 8mm diameter well was punched aseptically in the agar plates.

**Evaluation of Antibacterial Activity:** The antimicrobial activity was carried out using agar well diffusion method. The crude extract of *Rumex dentatus* was tested against bacterial pathogen. 120 il of suspensions were aseptically introduced and spread using pre-sterilized cotton swabs on surface of MHA plates. All the plates were kept in the incubator by adjusting temperature 37°C for 24 hour. The zone of inhibition was measured with the help of Vernier caliper.

**Statistical Analysis:** All the experiments were performed in triplicates. The statistical analysis was conducted by using Graph pad prism software. The data was arranged as mean and S.D (Standard deviation).

**RESULTS AND DISCUSSION**

In the present study the *Rumex dentatus* stem extracts were investigated for antibacterial activity by using Agar well diffusion method. MIC values of all the extracts tested against pathogens were ranged between 0.10mg/ml. The extracts of *Rumex dentatus* stem part in methanol and Cold water were found effective against all test bacterial strains i.e. *Bacillus subtilis, Escherichia coli, S. aureus* and *Micrococcus luteus P. aeruginosa*, but no activity was observed in the extracts in hot water. The maximum inhibition was noted against *E. coli* which was 18.0 mm in methanol, while lowest inhibition was observed against *p. aeruginosa* which was 2.00mm in cold water extracts. The overall result of this study was good, the MIC value of all the extracts tested against bacterial pathogen (Table 1 and Fig. 1).

Adeniyi et al. [8] reported that methanol and hexane extracts of *Rumex dentatus* have antibacterial and antifungal potential and methanol extract also showed presence of alkaloids, saponins, anthraquinones and tannins while flavonoids were also found in both methanol as well as hexane extract. *Rumex dentatus*
Table 1: Antibacterial activity of *Rumex dentatus* stem extracts against bacterial strains.

<table>
<thead>
<tr>
<th>Part of the plant (extracted)</th>
<th>Solvent</th>
<th>Concentration used (µl)</th>
<th>Bacillus Subtilis</th>
<th>S. aureus</th>
<th>E. coli</th>
<th>P. aeruginosa</th>
<th>Micrococcus luteus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stem</td>
<td>Methanol</td>
<td>120µl</td>
<td>13.0±0.4</td>
<td>10.0±0.5</td>
<td>18.0±1.2</td>
<td>8.0±0.7</td>
<td>5.0±0.4</td>
</tr>
<tr>
<td>Cold Water</td>
<td>120µl</td>
<td></td>
<td>9.0±0.5</td>
<td>7.0±0.6</td>
<td>5±0.6</td>
<td>2.0±0.9</td>
<td>12.0±0.5</td>
</tr>
<tr>
<td>Hot water</td>
<td>120µl</td>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

extract has potential to be used for isolation of antimicrobial, allelochemicals and other chemotherapeutic agents. Some scientists have opined that the observed effect of plants extracts is due to the presence of secondary metabolites [9, 10, 11]. The studied antibacterial effects on the bacterial are believed to be due the presence of alkaloids, tannins and flavonoids which have shown to have possessed antibacterial properties [12, 13].

Hawas et al. [14] the antimicrobial activity was moderate and the antioxidant enzymes activity was generally low. We concluded that *Rumex dentatus* plants grown at different environments have differential chemical composition and hence varied biological activities. From our research work it is revealed that *Rumex dentatus* have good antibacterial activity against the tested bacterial species.

CONCLUSIONS

From the results of our research work, we have concluded that the *Rumex dentatus* stem have bioactive compounds having good antibacterial activity against different bacterial pathogenic strain. Further study should be made for the discovery of new antibacterial drugs.

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REFERENCES


