A COMPARATIVE ANALYSIS OF ANTIBACTERIAL PROPERTIES OF DIFFERENT VARIETIES OF ROSA INDICA LEAVES AND PETALS AGAINST VARIOUS PATHOGENS

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ABSTRACT
The present study was designated to evaluate the antibacterial properties of ethanolic extract of leaves and petals of Rosa indica. Two different varieties of rose were used for this work (red and orange). The antibacterial activities of ethanolic extract against bacteria were tested by using agar well diffusion assay and the MIC values were determined by broth dilution assay. The ethanolic extract of Rosa indica of red and orange color showed positive result against 3 bacterial pathoges- E. coli, S. aureus and P. aeruginosa. The least concentrations were obtained 2.314 mg/ml for ethanolic extract of orange rose leaves against E. coli and 0.01 mg/ml for ethanolic extract of red rose leaves, ethanolic extract of red rose petals and ethanolic extract of orange rose petals against P. aeruginosa.

Key words: Antibacterial activities, ethanolic plant extract, MIC, zone of inhibition.

INTRODUCTION
For a long period of times plant have been valuable sources of natural products for maintaining human health, especially in the last decade with more intensive studies for natural therapies. According to World Health Organization (WHO) medicinal plants would be the best source to obtain a variety of drugs [1]. Developments of microbial resistance to the available antibiotics have led scientists to introduce the antibacterial activity of medicinal plants. The medicinal properties of plants have been investigated in the light of recent scientific developments throughout the world, due to their potent pharmacological activities and low toxicity [2,3]. Antimicrobial activity of herbs has been known and described for several centuries [4]. Many naturally occurring compounds found in edible and medicinal plants, herbs, and spices have been shown to possess antimicrobial functions and could serve as a source of antimicrobial agents against bacteria and fungi [5,6,7]. Several studies have pointed out the possibility to use essential oils and/or their components in medical and plant pathology as well as in the food industry for the
control of microorganisms pathogenic to consumers and/or responsible for food spoilage [8]. The acceptances of traditional medicine as an alternative form of health care and the development of microbial resistance to the available antibiotics have led researchers to investigate the antimicrobial activity of medicinal plants [9,10]. Rose is a perennial plant of genus Rosa, within the family Rosaceae. There are over hundred species of roses, they form a group of erect shrubs and climbing plants with stems armed with sharp pickles. Flowers are large and showy and come out in many colors. Most species are native to Asia, Europe, North America and North West Africa. They are cultivated for their beauty and fragrance.

The present study is carried out by evaluation of antibacterial properties of different varieties of *Rosa indica* against various pathogens.

**MATERIALS AND METHOD**

**Collection of plant sample:**
The red and orange *Rosa indica* leaves and petals were collected from the local area in Gomti Nagar, Lucknow.

**Preparation of plant extract:**
An extract is a mixture of phytochemical from any plant which is obtained by extraction of specific parts of the plant. *Rosa indica* leaves and petals were washed with distilled water and kept in incubator at 37°C for 3-4 days and grinded into fine powder. Now plant material was dissolved in 70% ethanol (1:10); 1 g sample should be dissolved in 10 ml of solvent. Mixture was kept in the dark for 3 days at room temperature in sterilized beakers wrapped with aluminum foil to avoid evaporation and exposure to sunlight was avoided. After 3 days, mixtures were filtered through Whatman no.1 filter paper and kept it in incubator at 37°C till all solvents had completely evaporated from mixtures. Now all mixtures were dissolved in Tris HCl (pH-8).

**Tested microorganisms:**
Bacterial cultures were obtained from IMTECH, Chandigarh. Subcultures were maintained by MRD LifeSciences, Lucknow. One gram positive culture-*Staphylococcus aureus* (MTCC 2940) and two gram negative cultures-*Pseudomonas aeruginosa* (MTCC 2453) and *E. coli* (MTCC 739) were used.

**Antibiogram analysis:**
The antimicrobial activity of *Rosa indica* was evaluated against bacterial strains in ethanolic extract by using agar well diffusion method [11]. Nutrient agar plates were prepared for all extracts, 50µl inoculum of each selected bacterium was uniformly spreaded on agar plates with the help of glass spreader, after five minutes three wells approximately 5mm diameter was bored with the help of borer. The equal volume (50µl) of antibiotic (tetracycline), distilled water and plant extract were poured into the wells. The plates were incubated at 37°C for 24 hrs.

**Determination of minimum inhibitory concentration (MIC) of ethanolic, methanolic, ethyl acetate and hot water extract:**
The minimum inhibitory concentration (MIC) is defined as the lowest concentration of the antimicrobial agent that inhibits the visible growth of a microorganism after overnight incubation at 37°C in shaker incubator [12,13].MIC of all samples were determined by broth dilution method. A two-fold serial dilution of the ethanolic extract was prepared and optical density was measured at 600 nm [14].
Graph 1: Comparative analysis of all bacterial cultures for rose leaves and petals:

Graph 1 showed that compared to all bacterial cultures the antibacterial activity was found to be maximum against *P. aeruginosa* followed by *E. coli* and *S. aureus*.

**Table 1:** Antibiogram analysis of ethanolic extract of red rose leaves

<table>
<thead>
<tr>
<th>Pathogens</th>
<th>ZOI of Sample (mm)</th>
<th>ZOI of Tetracycline (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>E. coli</em></td>
<td>26</td>
<td>20</td>
</tr>
<tr>
<td><em>P. aeruginosa</em></td>
<td>24</td>
<td>27</td>
</tr>
<tr>
<td><em>S. aureus</em></td>
<td>19</td>
<td>29</td>
</tr>
</tbody>
</table>

**Figure 1:** Antibiogram analysis of ethanolic extract of red rose leaves
**Graph 2:** Antibiogram analysis of ethanolic extract of red rose leaves

![Graph](image)

Series 1 = Sample, Series 2 = Tetracycline

Table 1, figure 1 and graph 2 showed that the maximum antibacterial properties were found to be highest against *E. coli*.

**Table 2:** Antibiogram analysis of ethanolic extract of red rose petals

<table>
<thead>
<tr>
<th>Pathogens</th>
<th>ZOI of Sample (mm)</th>
<th>ZOI of Tetracycline (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>E. coli</em></td>
<td>23</td>
<td>19</td>
</tr>
<tr>
<td><em>P. aeruginosa</em></td>
<td>27</td>
<td>28</td>
</tr>
<tr>
<td><em>S. aureus</em></td>
<td>22</td>
<td>24</td>
</tr>
</tbody>
</table>

![Images](image)

**Figure 2:** Antibiogram analysis of ethanolic extract of red rose petals
Graph 3: Anti-biogram analysis of ethanolic extract of red rose petals

Table 2, figure 2 and graph 3 showed that the antibacterial properties were found to be maximum against *P. aeruginosa*.

**Table 3: Anti-biogram analysis of ethanolic extract of orange rose leaves**

<table>
<thead>
<tr>
<th>Pathogens</th>
<th>ZOI of Sample (mm)</th>
<th>ZOI of Tetracycline (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>E. coli</em></td>
<td>21</td>
<td>20</td>
</tr>
<tr>
<td><em>P. aeruginosa</em></td>
<td>27</td>
<td>23</td>
</tr>
<tr>
<td><em>S. aureus</em></td>
<td>22</td>
<td>22</td>
</tr>
</tbody>
</table>

Figure 3: Anti-biogram analysis of ethanolic extract of orange rose leaves

Graph 4: Anti-biogram analysis of ethanolic extract of orange rose leaves
Table 3, figure 3 and graph 4 showed that the antibacterial properties were found to be maximum against *P. aeruginosa*.

**Table 4: Antibiogram analysis of orange rose petals**

<table>
<thead>
<tr>
<th>Pathogens</th>
<th>ZOI of Sample (mm)</th>
<th>ZOI of Tetracycline (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>E. coli</em></td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td><em>P. aeruginosa</em></td>
<td>22</td>
<td>25</td>
</tr>
<tr>
<td><em>S. aureus</em></td>
<td>19</td>
<td>21</td>
</tr>
</tbody>
</table>

**Figure 4:** Antibiogram analysis of orange rose petals
Graph 5: Antibiogram analysis of orange rose petals

Table 4, figure 4 and graph 5 showed that the antibacterial properties were found to be maximum against *P. aeruginosa*.

<table>
<thead>
<tr>
<th>Test tube</th>
<th>Concentration of plant extract (mg/ml)</th>
<th>Ethanol extract of red rose leaves (OD at 600 nm against <em>E. coli</em>)</th>
<th>Ethanol extract of red rose petals (OD at 600 nm against <em>P. aeruginosa</em>)</th>
<th>Ethanol extract of orange rose leaves (OD at 600 nm against <em>P. aeruginosa</em>)</th>
<th>Ethanol extract of orange rose petals (OD at 600 nm against <em>P. aeruginosa</em>)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>83.33</td>
<td>0.03</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>13.89</td>
<td>0.75</td>
<td>0.38</td>
<td>0.53</td>
<td>0.38</td>
</tr>
<tr>
<td>3</td>
<td>2.314</td>
<td>0.45</td>
<td>0.54</td>
<td><strong>0.26</strong></td>
<td>0.54</td>
</tr>
<tr>
<td>4</td>
<td>0.3858</td>
<td>0.41</td>
<td>0.46</td>
<td>0.38</td>
<td>0.46</td>
</tr>
<tr>
<td>5</td>
<td>0.064300</td>
<td>0.32</td>
<td>0.36</td>
<td>0.34</td>
<td>0.36</td>
</tr>
<tr>
<td>6</td>
<td><strong>0.01071</strong></td>
<td><strong>0.31</strong></td>
<td><strong>0.21</strong></td>
<td>0.45</td>
<td><strong>0.32</strong></td>
</tr>
</tbody>
</table>

Table 5 showed that the least concentrations were obtained 2.314 mg/ml for ethanolic extract of orange rose leaves against *E.coli* and 0.01 mg/ml for ethanolic extract of red rose leaves, ethanolic extract of red rose petals and ethanolic extract of orange rose petals against *P. aeruginosa*.

**DISCUSSION**

The extraction of biologically active compounds from the plant material depends on the type of solvent used in the extraction procedure. The most commonly used solvents for investigations of antimicrobial activity in plants are methanol and ethanol [15,16]. Most of the antimicrobial active compounds that have been identified were soluble in polar solvents such as methanol and ethanol instead of water [17,18]. In this present study the antibacterial activity of ethanolic extract of *Rosa indica* was evaluated against 3 bacterial pathogens (*E. coli, S. aureus* and *P. aeruginosa*). Two varieties of rose sample were...
used; red and orange and also leaves and petals were taken as a used part of plant sample. The maximum antibacterial properties were found for all the samples against *E. coli* and *P. aeruginosa* in the form of zone of inhibition. The maximum inhibition obtained 27 mm against *P. aeruginosa* for ethanolic extract of red rose petals and orange rose leaves. The least concentrations were obtained 2.314 mg/ml for ethanolic extract of orange rose leaves against *E. coli* and 0.01 mg/ml for ethanolic extract of red rose leaves, ethanolic extract of red rose petals and ethanolic extract of orange rose petals against *P. aeruginosa*.

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REFERENCES


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