In vitro antibacterial activity of hexane and ethanolic leaf extracts of *Ricinus communis* L.

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**Abstract**

In the present investigation the antibacterial activity of hexane and ethanolic leaves extract of *Ricinus communis* was determined. Among these the extracts the ethanolic leaf extract was showed a broad spectrum of antibacterial activity. The activity against *B. subtilis* and *E. coli* was more pronounced. The effective antibacterial activity observed against *E. coli* and *B. subtilis*. The Minimum Inhibitory Concentration of all the test Bacteria was determined. The preliminary phytochemical tests for the detection of secondary metabolites was performed.

**Key words:** In vitro- antibacterial activity, *Ricinus communis*, hexane, ethanolic extract.

**Introduction**

Natural history has been a source of remedial agents ever since times immemorial. Though, the harmonizing components give the plant as entire a safety as well as efficiency much finer to that of its isolated in addition to pure active components. Medicinal plants, since dawn of civilization, have been used in virtually all cultures as a source of medicine. There is growing interest in medicinal plants as a re-emerging health aid has due to the rising costs of prescription drugs in the maintenance of personal health and well-being, and the bioprospecting of new plant-derived drugs [1, 2]. Furthermore, an increasing reliance on the use of medicinal plants in the industrialized societies has been traced to the extraction and development of several drugs and chemotherapeutics from these plants as well as from traditionally used rural herbal remedies [3]. The increasing prevalence of multidrug resistant strains of bacteria and the recent appearance of strains with reduced susceptibility to antibiotics raises the specter of untreatable bacterial infections and adds urgency to the search for new infection-fighting strategies [4].

*Ricinus communis* is belongs to Euphorbiaceae. This family provides food [5] as well as diverse medicinal properties used in ethnobotany [6-9]. *Ricinus communis* contains ricin is a well known toxic compound that elicits aggressive purgative accomplishment in man [10-12]. Thus current study was worn to calculate the comparative antibacterial activity of hexane and ethanolic leaf extracts of *Ricinus communis*. They have been screened against *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas* spp. and *Bacillus subtilis*. The crude drug was the *Ricinus communis* used as antimicrobial drug. The antibacterial activity of leaf extracts were compared with standard antibiotic drug streptomycin sulphate.

**Materials and Methods:**

**Collection of plant material:** Plant material was collected from around the Govt. Degree and P.G college of Gulbarga. The collected material was authenticated by using Flora of Gulbarga, Department of Botany, Govt. degree college Gulbarga University, Gulbarga. Collected materials were brought to the laboratory, washed with tap water followed by distilled water and surface sterilized with 1% HgCl2 shade dried and used for extraction. The dried stems were homogenized to a fine powder and stored in a air tight bottles.

**Extraction of plant material by soxhlet apparatus:** The leaf materials after drying were ground in a grinding machine in the laboratory. 25g of shade dried powder was weighed and extracted successively with hexane and ethanol in soxhlet extractor for 48h. The extracts were concentrated under reduced pressure and preserved in refrigerator in airtight bottles for further use.

**Test microorganisms:** Bacterial strains, *Bacillus subtilis*, *Escherichia coli*, *Pseudomonas aeruginosa* obtained from Dept of Microbiology, Gulbarga, Karnataka, India were used in the present study. Bacterial cultures were grown in nutrient broth (Himedia, M002) at 37°C and maintained on nutrient agar slants at 4°C.

**Agar-well diffusion method:** The assay was conducted by agar well diffusion method. About 15 to 20 ml of potato dextrose agar medium was poured in the sterilized petri dishes and allowed to solidify. Fungal lawn was prepared.
The antibacterial results due to ed for zone of inhibition. Diameter zone of inhibition was showed 26 to 31 mm in diameter of inhibition sulphate standard used as a positive control at conc. 2 mg/ml was showed 26 to 31 mm in diameter of inhibition against test bacteria. The Minimum Inhibition concentration value 1.25 mg-1 recorded against E. coli and S. aureus followed by 0.62 B. subtilis, Psudomonas spp. (Figure.1). In the present study the flavonoid groups shown positive results. Flavonoids have been shown to have antibacterial and antifungal activities by several investigators [15-16] [40-42]. Similar types of results were reported previously by various workers [18, 20]. The antibacterial activity of the leaf extract of Ricinus communis was related to their chemical composition. The diameters of the inhibition zones were measured in millimetres shown by [21]. The results indicated that the leaf extracts of Ricinus communis showed antibacterial activity, according to [22], mainly against the gram negative bacteria (E. coli). The antibacterial results due to present of the phytochemical components of the Ricinus communis have been established in previous studies and these include tannins, saponins, alkaloids, carbohydrates, phenols, flavonoids, sterols and resins [23-24] but in the present study alkaloids were absent.

**Table-1:** Preliminary tests for the occurrence of secondary metabolites of ethanolic leaf extract of *Ricinus communis*

<table>
<thead>
<tr>
<th>Secondary metabolites</th>
<th>Name of the test</th>
<th>Ethanolic extract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkaloids</td>
<td>Dragendorff’s test</td>
<td>-</td>
</tr>
<tr>
<td>Phenol</td>
<td>Hot water test</td>
<td>-</td>
</tr>
<tr>
<td>Flavonoids</td>
<td>Shinoda test</td>
<td>+</td>
</tr>
<tr>
<td>Tannins</td>
<td>Salkowski’s test</td>
<td>+</td>
</tr>
<tr>
<td>Steroids</td>
<td>Salkowski’s test</td>
<td>+</td>
</tr>
<tr>
<td>Saponins</td>
<td>Foam test</td>
<td>+</td>
</tr>
</tbody>
</table>

**Table-2:** Antibacterial activity of hexane and ethanolic leaf extract of *Ricinus communis*.

<table>
<thead>
<tr>
<th>Bacterial strains</th>
<th>Bacterial strains</th>
<th>Inhibition zone in mm in different concentrations of crude extract</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>40mg/ml</td>
</tr>
<tr>
<td>Hexane extract</td>
<td>E. coli</td>
<td>08.00</td>
</tr>
<tr>
<td></td>
<td>B. subtilis</td>
<td>05.00</td>
</tr>
<tr>
<td></td>
<td>P. sps</td>
<td>10.00</td>
</tr>
<tr>
<td></td>
<td>S. aureus</td>
<td>05.00</td>
</tr>
<tr>
<td>Ethanolic extract</td>
<td>E. coli</td>
<td>16.00</td>
</tr>
<tr>
<td></td>
<td>B. subtilis</td>
<td>22.00</td>
</tr>
<tr>
<td></td>
<td>P. sps</td>
<td>19.00</td>
</tr>
<tr>
<td></td>
<td>S. aureus</td>
<td>20.00</td>
</tr>
</tbody>
</table>

using 5 days old culture strains. The fungal strains were suspended in a saline solution (0.85% NaCl) and adjusted to a turbidity of 0.5 Mac Farland standards (108 CFU/ml). 1 ml of fungal strain was spread over the medium using a sterilized glass spreader. Using flame sterilized borer, wells of 4 mm diameter were punctured in the culture medium and required concentrations of serially diluted extract (0.62, 1.25, 2.5, 5, 10, 20 and 40mg/ml) was added to the 20μl to each wells. The plates thus prepared were left for diffusion of extracts into media for one hour in the refrigerator and then incubated at 37°C. After incubation for 48h, the plates were observed for zone of inhibition. Diameter zone of inhibition was measured and expressed in millimetres. Dimethyl formamide (DMF) was used as a negative control. The experiments were conducted in triplicates. The same method was followed for testing antibacterial activity using nutrient agar medium incubated at 37oC for 18h. [13]

**Results and discussion**

The preliminary phytochemical analysis of ethanolic leaves extract was adopting by standard methods [14]. The results were represented in table-2 which reveals the presence of various phytochemicals such as alkaloids, flavonoids, phenols, steroids and saponins. In the results of antibacterial activity of four human pathogenic bacterial strains were tested to determine the comparative effect hexane and ethanolic extracts. The effective antibacterial activity was recorded against B. subtilis 22mm followed by 20 mm S. aureus, P. aeruginosa (19mm) and least E. coli showed 16 mm at high concentration at 40 mg/ml. in ethanolic extract. The zone of inhibition was found to be concentration dependent. While the hexane extract was shown negligible results (Table 1). The negative control (DMF) was not shown inhibition against all the tested bacterial strains. Streptomycin sulphate standard used as a positive control at conc. 2 mg/ml was showed 26 to 31 mm in diameter of inhibition against test bacteria. The Minimum Inhibition

![Figure 1](https://example.com/figure1.png)

**Figure 1:** Minimum inhibitory concentration of ethanolic leaves extract of *Ricinus communis*
CONCLUSION
Result of the present study indicates the ethanolic extract is very effective when compared with hexane, this is to be further searches and deep phytochemical studies like isolation of pure compounds for antibiotics are needed. This study demonstrated that leaves of Ricinus communis crude inhibited pathogenic microorganisms. Thus, this record ascertains the value of the present plant used in Ayurveda, which could be of considerable interest to the development of new drugs.

References

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