Antibacterial Activity of *Hibiscus* Flower Extracts

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**ABSTRACT**

In Ayurveda and the traditional Chinese medicine system, it is well documented that the use of herbal extracts and nutritional supplements for the treatment of various diseases. The *Hibiscus* plant has been used as a diuretic, mild laxative, and treatment for cardiac and nerve diseases. This plant is used for mild laxative effect, the ability to increase urination, relief during hot weather, and treatment of cracks in the feet, bilious, sores, and wounds. The purpose of this study was to examine the evolution of antimicrobial activity of flower extract of *Hibiscus* against human pathogens. Fresh flowers and dried flower powder were used for extract production. Two types of extracts were prepared, viz. aqueous and solvent extracts. Their antibacterial activity was studied against different human pathogens. Well agar diffusion assay was used for antibacterial investigation.

**Key words:** *Hibiscus*, Extract, Antibacterial activity, Well agar diffusion assay.

**Introduction**

Medicinal plants are used traditionally to prevent and cure diseases all over the world. Herbal medicines play an important role in rural areas and various locally produced drugs are still used as household remedies for different ailments. Plant derived medicines are widely used because they are relatively safer than the synthetic alternatives, as they are easily available and cheaper (Singh *et al.*, 2019). Folk medicinal plants, particularly their extracts and Phytochemicals, have been perceived as relatively safe with little or no side effects and often act at multiple and novel target sites, thereby reducing the risk of resistance development. A number of medicinal plant preparations traditionally used for treatment of topical wounds and gastrointestinal disorders have been reported to have anti- *H. pylori* activity (Ngan *et al.*, 2021). Specifically, *Hibiscus rosa-sinensis* L. (Malvaceae family), a tropical evergreen shrub with red flowers, is traditionally used for the treatment of flu and cough, bronchitis, stomach pain, dysentery and diarrhea, and also for regulation of menstruation and stimulation of blood circulation. Aerial part extracts of the plant have been known to possess antiulcerogenic activity on gastric ulcers. Extracts from leaves and flowers of the plant have been proven to possess antibacterial activity. Due to the effectiveness and safety, all parts of the plant could be used for pharmacological purposes (Al-Snafi, 2018). The phytochemical constituents, pharmacological effects, and medicinal uses of the plant have been well described (Missoum, 2018). *Hibiscus* flowers (*Hibiscus rosa-sinensis* L.) contain antibacterial compounds such as saponins, flavonoids, and tannins. Flavonoids inhibit bacteria by forming complex compounds against extracellular proteins of bacterial cells that disrupt the integrity of the bacterial cell membrane. Saponins will damage bacterial cell membranes, resulting in protein and nucleic acid denaturation. Tannins work by inhibiting the production of bacterial enzymes, and bind to...
cell walls and can destroy bacterial cell membranes (Farasayu et al., 2021).

Materials and Methods

Preparation of Hibiscus flower extract

Two types of flower extracts were prepared, viz. aqueous and solvent extracts with fresh flower and dried powdered flower. 10 g of air-dried powder of flower was extracted in distilled water for 6 h at low heat (60°C). After every 2 h during heating, it was filtered through 8 layers of muslin cloth and centrifuged at 5000 rpm for 15 min. The supernatant was collected and again heated further at 60°C. After 6 h of heating likewise, the supernatant was concentrated to make the final volume one fourth of the original volume and stored at 4°C.

For solvent extraction, 10 g of air-dried powder of flower was extracted in 100 ml ethanol, kept on a rotary shaker at 190 – 220 rpm for 24 h. After 24 h, it was filtered through 8 layers of muslin cloth and centrifuged at 5000 rpm for 15 min. The supernatant was collected and the solvent was evaporated to make the final volume one fourth of the original volume. It was stored at 4°C for further use.

Antibacterial assay

Antibacterial assay was performed using agar well diffusion method in nutrient agar. The test compounds i.e. aqueous and solvent extracts of Hibiscus flowers were introduced into the wells and the plates were incubated overnight at 37°C for 24 h. The antibacterial activity was evaluated by measuring the diameters zone of inhibition for each strain. The experiment was performed thrice and the mean values were presented. The test organisms used were S. aureus, E. coli, P. aeruginosa, P. aeruginosa and M. leutius.

Results and Discussion

The results for antibacterial activity of Hibiscus flower extracts are shown in Photoplate 1 and briefed in Table 1. From the Table, it can be concluded that the fresh flower solvent extract shows considerably more antibacterial activity for E. coli.

Table 1. Antibacterial activity of Hibiscus flower extracts in terms of diameter of zone of inhibition.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Organism</th>
<th>Fresh flower solvent extract (mm)</th>
<th>Fresh flower aqueous extract (mm)</th>
<th>Dry flower powder aqueous extract (mm)</th>
<th>Dry flower powder solvent extract (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>S. aureus</td>
<td>2</td>
<td>3</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>B. cereus</td>
<td>4</td>
<td>4</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>M. leutius</td>
<td>-</td>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>P. aeruginosa</td>
<td>-</td>
<td>11</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>E. coli</td>
<td>16</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Photoplate 1: Photographs of zones of inhibition for Hibiscus flower extracts: a) dry powder aqueous extract against S. aureus, b) fresh flower solvent extract against M. leutius, c) dry powder aqueous extract against B. cereus, d) fresh flower solvent extract against E. coli, e) dry powder aqueous extract against P. aeruginosa, f) fresh flower aqueous extract against P. aeruginosa, g) fresh flower solvent extract against B. cereus, h) fresh flower aqueous extract against B. cereus.
The dry powder solvent extract shows considerably more antibacterial activity for *S. aureus* while fresh flower aqueous extract shows considerably more antibacterial activity for *P. aeruginosa*. The dry powder aqueous extract shows considerably more antibacterial activity for *P. aeruginosa*.

### Conclusion

Fresh flower as well as dry powder extractions of Hibiscus flowers were studied for antibacterial activity against some pathogens. The activity was studied using agar well diffusion method. The fresh flower extract shows highest activity against *P. aeruginosa* and *E. coli*. While dry powder extract shows highest activity against *B. cereus* and *S. aureus*. From the study, it can be concluded that the flower of Hibiscus have a great potential as antibacterial agents.

### Conflict of interest

There is no any conflict of interest.

### References


