Antimicrobial Activity of *Girardinia heterophylla*

P. S. Bedi, Neayti Thakur, Balvinder Singh

**Abstract**—In the present study an attempt has been made to prepare the crude extracts of leaves and stem of *Girardinia heterophylla* by using various solvents like petroleum ether, ethanol and double distilled water. The samples were given the code NGLS 1, NGLS 2, NGLS 3 and NGSS 1, NGSS 2 and NGSS 3 respectively. All the extracts were used to study their antimicrobial activity against gram positive bacteria e.g. *Bacillus subtilis*, gram negative bacteria e.g. *E. coli* and *K. pneumonia* and antifungal activity against *Aspergillus niger*. The results of the antimicrobial activity showed that all the crude extracts of the plant possesses antibacterial activity. Maximum antibacterial activity was shown by NGLS 2, NGLS 3 and NGSS 3 against *K. pneumonia*. The growth of fungus *A. niger* was also inhibited by all the crude extracts. Maximum inhibition was shown by NGSS 2 followed by NGSS 1.

**Keywords**—*Girardinia heterophylla*, leaves and stem extracts, antibacterial activity, antifungal activity.

I. INTRODUCTION

HERBS had been prized for their medicinal, flavoring and aromatic qualities for centuries, the synthetic products of the modern age surpassed importance, for a while. There is evidence of herbs having been used in the treatment of diseases and for revitalising body system in almost all ancient civilizations, the Egyptian, the Chinese and even Greek and Roman civilizations [1], [2]. Nature has been a source of medicinal agents for thousands of years. Medicinal plants have been used to promote good health and treat diseases effecting people. Medicinal plants constitute an effective source of traditional and modern medicines [3]. According to the estimates of WHO, over 80% of people in developing countries depend upon traditional medicine for their primary health care. One possible reason for this is the perception of them having lesser side effects [4], [5]. Traditional treatments may provide valuable clues for the development of new oral hypoglycemic agents and simple dietary adjuncts, as one of the most important plant *Girardinia heterophylla*, Dence. = G. *dversifolia* [6]. Hindi names: Awa, alla, bichua (means scorpion); English name ‘Himalayan Nettle’ or ‘Stinging Nettle’ belongs to family ‘Urticaceae’ [7]. The plant has many hollow stinging hairs called trichomes on its leaves and stems, which act like hypodermic needles that inject histamine and other chemicals that produce a stinging sensation when contacted by humans or animals [8]. The literature is silent or very limited information is available about *Girardinia heterophylla*. Keeping this in view the present study has been under taken.

II. MATERIAL AND METHODS

The sample of leaves and stem of *Girardinia heterophylla* were collected from Solan, Himachal Pradesh, India and given the codes NGL and NGS respectively (Table I).

### TABLE I

<table>
<thead>
<tr>
<th>PLANT PART</th>
<th>CODES</th>
<th>SOLVENT USED</th>
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</thead>
<tbody>
<tr>
<td>Leaves</td>
<td>NGLS1</td>
<td>Petroleum ether</td>
</tr>
<tr>
<td></td>
<td>NGLS2</td>
<td>Ethanol</td>
</tr>
<tr>
<td></td>
<td>NGLS3</td>
<td>Double distilled water</td>
</tr>
<tr>
<td>Girardinia heterophylla</td>
<td>NGSS1</td>
<td>Petroleum ether</td>
</tr>
<tr>
<td>Stem</td>
<td>NGSS2</td>
<td>Ethanol</td>
</tr>
<tr>
<td></td>
<td>NGSS3</td>
<td>Double distilled water</td>
</tr>
</tbody>
</table>

**A. Determination of Anti Microbial Activity**

Many herbs are known to posses antimicrobial properties. The plant “*Girardinia*” is used to treat many diseases. Many patients have been benefited by this herb. Hence the antimicrobial property of the medicine was investigated.

III. ASSAY TECHNIQUES

Various microbiological techniques are available to assay the antimicrobial activity of any compound e.g. Disc diffusion method, Cup plate method, Overlay assay technique etc. Agar diffusion method (well diffusion method) or cylinder plate method was used for antibacterial activity as reported by Kavanagh [9] and Leven [10]. Wells were made in seeded agar and the test sample was then introduced directly into these wells. After incubation, the diameter of the clear zones around each well was measured and compared against zone of inhibition of the known concentrations of the standard antibiotics. The fresh plant materials collected were rinsed with water and kept under shade at room temperature for drying. After complete dryness, these plant parts were ground into powder and were kept in sealed plastic bags duly labeled. Extraction of these plant parts were carried out one by one by simple maceration process.

IV. SAMPLE PREPARATION

Petroleum ether, Ethanol and double distilled water were used to extract bioactive products from leaf and stem of *Girardinia heterophylla*. The test bacterial isolated studied were *Bacillus subtilis* (MTCC-121), *Escherichia coli* (MTCC-1052) and *Klebsiella pneumonia* (MTCC-109), the fungus...
Aspergillus niger. These cultures were maintained at culture collection centre of SBSPGI Dheradun.

A. Test Culture Preparation

Test culture were inoculated in nutrient broth (0.5gm NaCl; 0.5gm peptone; 0.3gm beef extract; 1000ml water pH 7) and kept in incubator at 37°C for 24 hours. The fungal strains were inoculated in fungal medium (0.4g Yeast extract; 1.5g glucose; 0.05g MgSO₄; 0.05g MgSO₄; 0.05g KCl; distilled water 100ml 2.5; pH 5.0-5.5) kept in another incubator at 23°C for 48 hours.

V. CUP PLATE METHOD

Sample extracts were poured into the wells dug in the Petri plates of solid agar medium and before fitting the wells with sample supernants the plates were swabbed with test organism cultures on the respective plates i.e. nutrient agar (Nutrient broth with 1.5% agar) for bacterial test cultures and fungal agar medium (fungal medium with 1.5% agar) for fungal culture (Aspergillus niger).

VI. RESULTS AND DISCUSSION

A. Antimicrobial Activity

In-vitro antimicrobial activity of solvent extracts against microbial cultures of gram positive and gram negative bacteria and fungi studied were Bacillus subtilis (MTCC-121), Escherchia coli (MTCC-1652) and Klebsiella pneumoniae (MTCC-109) and Aspergillus niger. The results depict in-vitro preliminary activity in terms of the zone of inhibition in millimeter around the agar wells. The antibiotic Erythromycin (10mg/ml) was used as positive control while respective solvent were used to negative control in comparison to the plant extracts. The sample NGLS1 showed the 1mm inhibition zone against all the three bacterial strains whereas it was higher in case of sample NGLS2 i.e. 2mm in both Bacillus subtilis and E. coli. The inhibition zone was higher for K. pneumoniae and Bacillus subtilis and the bacterial cultures were found to be sensitive against all the studied extracts. The results of the present study showed maximum growth inhibition of E. coli followed by NGSS2, NGSS1, NGSS3 and NGLS1 (Figs. 3 and 4).

VII. CONCLUSION

The observations of the present study indicate that either leaf or stem parts of the plant may be used against bacterial infection caused by K. pneumonia or E. coli as well. The extracts of the plant may also be used against fungal diseases caused by Aspergillus niger.
Fig. 1 (A) Antimicrobial activity of *Girardina diversifolia* Stem (A: Petroleum, B: Ethanol & C: DDW) against *Bacillus subtilis* (B) Antimicrobial activity of *Girardina diversifolia* Stem (A: Petroleum, B: Ethanol & C: DDW) against *Escherichia coli*. (C) Antimicrobial activity of *Girardina diversifolia* Stem (A: Petroleum, B: Ethanol & C: DDW) against *Klebsiella pneumoniae*
**Fig. 2** (A) Antimicrobial activity of *Girardina diversifolia* leaf (Petroleum, Ethanol & DDW) against (A) *Bacillus subtilis* (B) *Escherichia coli* (C) *Klebsiella pneumoniae* & (D) *Aspergelus niger*.

<table>
<thead>
<tr>
<th></th>
<th>Bacillus subtilis</th>
<th>Escherichia coli</th>
<th>Klebsiella pneumoniae</th>
<th>Aspergelus niger</th>
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**Fig. 3** Comparison between anti microbial activity of different solvent extracts of leaves.
Fig. 4 Comparison between anti microbial activity of different solvent extracts of stem

ACKNOWLEDGMENT

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REFERENCES