Research Article

EVALUATION OF ANTIMICROBIAL ACTIVITY OF GYMNEMA SYLVESTRE
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ABSTRACT
In this paper the antimicrobial activity of the Water extract of Gymnema sylvestre fruit and root were studied. Antimicrobial studies showed that the extract has considerable activities against Bacillus subtilis, Staphylococcus aureus, Escherichia coli, Klebsiella aerogenes and Aspergillus niger.

Keywords: Gymnema sylvestre, Root and Fruit, antimicrobial activity.

INTRODUCTION
According to World Health Organization (WHO) medicinal plants would be the best source to obtain a variety of drugs1. The information on medicinal plants from Ayurveda, Unani, Homeopathy and Siddha gives idea that the medicinal plants contain a wide range of ingredients. The medicinal value of plants is due to ingredient like alkaloids, flavonoids, tannins and phenolics2. They can be used to treat chronic as well as infectious diseases. Medicinal plants are the main source of pharmaceuticals and healthcare products3. Medicinal plants products are used as home remedies to treat specific conditions as well as complex preparations to treat life threatening diseases4. The antimicrobial properties of medicinal plants have been investigated by a number of researchers’ worldwide. Recent research review shows that, medicinal plants are screened for biological activities for finding potential new compounds for therapeutic use5,6,7. The use of plant extracts and phytochemicals, both with known antimicrobial properties, can be of great significance in therapeutic treatments8. Hence, more studies pertaining to the use of plants as therapeutic agents should be emphasized.

G. sylvestre (Asclepiadaceae), a vulnerable species is a slow growing, perennial, medicinal woody climber found in central and peninsular India. The plant is considered to be a good source of a large number of bioactive substances. G. sylvestre leaves contains large number of phytochemicals like trimerpenoids, saponins, gymnemic acids, gymnasaponins. The antidiabetic activity of G. Sylvestre is due group of closely related gymnemic acids9, 10. The essential oil obtained from G. sylvestre leaves shows Antioxidant & Antimicrobial activity11. The aqueous, methanolic and ethanolic extract of G. sylvestre leaves possess antimicrobial activity12. The present study reports antimicrobial activity of root and fruit water extract of G. Sylvestre.

MATERIALS AND METHODS
Plant Material
The plants of G. sylvestre were collected from ‘Pune’ Maharashtra, India. The plant was authenticated by Botanical Survey of India, Pune (BSI). The material has been deposited at AHMA herbarium at BSI (Voucher No.SVS-1/783).

Preparation of extract
Dried and powdered root and fruit (100 g) of G. sylvestre were subjected to cold extraction with n-hexane (1.5 lit) at room temperature. The dried powder was then extracted with distilled water (1.5 lit) at room temperature (3 x 6 h). The combined water extract was concentrated under reduced pressure at 60°C.

Procurement of cultures
For Antimicrobial activity studies following microbial cultures were used. Bacillus subtilis (Gram +ve, ATCC 2239), Escherichia coli (Gram –ve, ATCC 25744), Staphylococcus aureus (Gram +ve, ATCC 2178), Klebsiella aerogenes (Gram –ve, ATCC 2239), Aspergillus niger (ATCC 504) and Penicillium chrysogenum (ATCC 709). The microbial cultures were procured from National Collection of Industrial Microorganisms (NCIM), National Chemical Laboratory (NCL), Pune.
Antimicrobial Activity

Antimicrobial activity was carried out by agar well-diffusion method using microorganism: Pure cultures of Bacillus subtilis (Gram +ve, ATCC 22393), Staphylococcus aureus (Gram +ve, ATCC 2178), Escherichia coli (Gram –ve, ATCC 25744), Klebsiella aerogenes (Gram –ve, ATCC 2239). The cultures of fungi Aspergillus niger (ATCC 504) and Penicillium chrysogenum (ATCC 709) were obtained National Collection of Industrial Microorganisms (NCIM), National Chemical Laboratory (NCL), Pune. The mother cultures of each micro-organism were allowed to stand for 24 h in order to reach the stationary phase of growth before the assays. Petri dishes containing the mother cultures with proper sterile Muller- Hinton agar medium was used for bacteria. The media were inoculated to obtain the micro-organism concentration of 130 x 10⁷ colony forming units per ml (cfu / ml). A sterile filter paper disc was loaded with 40 µl sample (50 mg / ml). The disc was placed near the edge of the agar surface of the inoculated plate. All the plates were kept at 5°C for half an hour for diffusion. The plates were then incubated for 24 h at 37°C and the diameters of growth inhibition zones were measured using Distilled water as a blank. Each assay was performed in triplicates on three independent experimental runs. The minimum inhibitory concentration (MIC) of extracts indicating clear inhibition was determined by agar diffusion method. Chloramphenicol (10 µg/ml) was used as standard for the antimicrobial activity.

Statistical Analysis

Statistical analysis was done by using Student’s t test on the values of diameters of zones of inhibitions.

Table 1: Antimicrobial activity of fruit and root extract of G. sylvestre against various microbial strains

<table>
<thead>
<tr>
<th>Plant extract</th>
<th>Gram Positive bacteria</th>
<th>Gram Negative bacteria</th>
<th>Fungal Species</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B.subtilis</td>
<td>K.aerogenus</td>
<td>S.aureus</td>
</tr>
<tr>
<td>Gymnema Sylvestre</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruit Extract</td>
<td>11.66</td>
<td>12</td>
<td>8.7</td>
</tr>
<tr>
<td>Gymnema Sylvestre</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Root Extract</td>
<td>10.66</td>
<td>11.33</td>
<td>11.5</td>
</tr>
<tr>
<td>Standard</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

- indicates no zone of inhibition, Zone of Inhibition are in mm

Table 2: Minimum inhibitory concentration (mic) of G. sylvestre plant extract against various microbial strains

<table>
<thead>
<tr>
<th>Sample</th>
<th>S.aureus</th>
<th>E.coli</th>
<th>K.aerogenus</th>
<th>A.niger</th>
<th>B.subtilis</th>
<th>P.chrysogenum</th>
</tr>
</thead>
<tbody>
<tr>
<td>G. Sylvestre Fruit Extract</td>
<td>12.5</td>
<td>12.5</td>
<td>12.5</td>
<td>10.5</td>
<td>12.5</td>
<td>-</td>
</tr>
<tr>
<td>G. Sylvestre root Extract</td>
<td>11.5</td>
<td>12.5</td>
<td>10.0</td>
<td>12.5</td>
<td>12.5</td>
<td>-</td>
</tr>
</tbody>
</table>

RESULT AND DISCUSSION

As compared with synthetic drugs, naturally derived drugs are therapeutically active and commercially available. The antimicrobial activity exhibited by plant extracts are shown in Table 1. The minimum inhibitory concentrations of the extracts, which range between 10.00 mg/ml to 100 mg/ml, is shown in Table 2. In the antimicrobial studies (Table 1 and 2) Fruit and Root extracts of G. Sylvestre exhibited zones of inhibition at 100 mg/ml concentration. G. sylvestre fruit extract shows inhibition zone for bacterial species like Bacillus subtilis (11.66mm), Staphylococcus aureus (8.7mm), Escherichia coli (13mm), Klebsiella aerogenes (12mm) as well as fungal species like Aspergillus niger(10.75mm). The root extract of G.sylvestre shows inhibition zone for Bacillus subtilis (10.66mm), Staphylococcus aureus(11.5mm), Escherichia coli (15.5mm), Klebsiella aerogenes (mm) as well as fungal species like Aspergillus niger(11.33mm). The plant extracts do show any inhibition zone against Penicillium chrysogenum. These extracts were active against tested organisms. The present results therefore offer a scientific basis for traditional use of water extracts of plant G. sylvestre. The antioxidant and antimicrobial activity of G. sylvestre leaf and stem were reported earlier. The antimicrobial activity of G. sylvestre might be due to presence of bioactive phytochemicals. The anti-microbial activities could be enhanced if active compounds from extracts are purified.

REFERENCES


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