Phytochemical and Antimicrobial Activity of
Xanthium strumarium

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The antimicrobial activities of the Methanol and its sub fractions of chloroform, Ethyl acetate, and water extracts of the roots, stem and leaves of Xanthium strumarium were conducted. The bacterial strain used were Staphylococcus aureus, Klebsiella pneumoniae, Salmonella typhymurium and Escherichia coli. The fungal species including Aspergillus fumigatus, Fusarium solani, Aspergillus niger and Aspergillus flavus. Phytochemical analysis was also performed using the literature methods. All fractions of root extract showed significant activities against E. coli and Klebsiella pneumoniae. Methanol, chloroform and water fraction of stem extract also found active against Salmonella typhymurium. Some fractions of stem, root and leaves extract were also give positive result against different fungi. In the present study, the selection of medicinal plant parts is based on the fact that most of these plant parts were not previously screened against multidrug resistant pathogenic

Key words: Antimicrobial activity, phytochemicals, Xanthium strumarium L.

Herbs are the source of medicine production and for the treatment of various diseases¹. From natural sources impressive numbers of modern drugs have been isolated. A lot of medicinal plants are utilized in modern medicine where they take up a very significant place as raw materials for important drugs and plants used for traditional medicine contain a wide range of substances that can be used to treat chronic as well as infectious diseases.

X. strumarium is an annual herb with a short, stout, hairy stem. Leaves broadly triangular-ovate or suborbicular; flower heads in terminal and axillary racemes; white or green; numerous; male upper most; female ovoid, covered with hooked bristles; Fruit obovoid, enclosed in the hardened involucre, with 2 hooked beaks and hooked bristles. Flowering time in India is August-September. It can be propagated through seeds. This weed is easily dispersed through animals as the fruits have hooked bristles and 2 strong hooked beaks². The whole plant, specially root and fruit, is used as medicine. According to Ayurveda, X. strumarium is cooling, laxative, fattening, anthelmintic, alexiteric, tonic, digestive, antipyretic, and improves appetite, voice, complexion, and memory.

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It cures leucoderma, biliousness, and poisonous bites of insects, epilepsy, salivation and fever. The plant of *Xanthium* yields xanthinin which acts as a plant growth regulator. Antibacterial activity of xanthinin has also been reported. Seed yields semidrying edible oil (30-35%) which resembles sunflower oil and used in bladder infection, herpes, and erysipelas. Cake can be used as manure whereas shell can be used as activated carbon. The plant has been reported as fatal to cattle and pigs\(^3,4\).

**MATERIALS AND METHODS**

**Plant Material**  
This is a common plant and grows in different parts of Pakistan. It was collected in March-June in flowering season and was identified by the help of plant taxonomist.

**Antimicrobial activity**  
**Preparation of crude extract**  
100 g of each of the coarsely powdered plant material was taken and extracted with methanol. Then this crude of methanol is further fractionating into n-hexane, Chloroform, ethyl acetate and water. The extracts were filtered and sodium chloride solution was then added to the filtered extract to form precipitates. The precipitates were then separated, air dried and transferred to air tight amber glass container. The crude extract was dissolved in chloroform and water to make the final concentration, which was kept in refrigerator till use\(^5\).

**Phytochemical analysis and Antimicrobial bioassay**  
Phytochemical analysis and Antimicrobial activities assay were conducted as described by Hussain *et al.*\(^6\)

**RESULTS AND DISCUSSION**  
The present study was initiated because of the increasing resistance to antibiotics of many skin pathogens including bacteria and fungi. Plant extracts and compounds are of new interest as antiseptics and antimicrobial agents in dermatology\(^7\). As a result, the phytochemical and antimicrobial activity of different parts *Xanthium strumarium* was screened against the most common skin pathogens.
Table 1. Antibacterial activities of *X. strumarium*

<table>
<thead>
<tr>
<th>Name of bacteria</th>
<th>CH_OH⁰</th>
<th>EtOAc⁰</th>
<th>CHCl₃⁰</th>
<th>H₂O⁰</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>E. coli</em></td>
<td>R+N+S+L</td>
<td>R+S+L</td>
<td>R+S+L</td>
<td>R+S+L</td>
</tr>
<tr>
<td><em>Staphylococcus</em></td>
<td>N+N+12</td>
<td>14+13+N</td>
<td>N+12+17</td>
<td>13+13+10</td>
</tr>
<tr>
<td><em>Klebsiella</em></td>
<td>13+N+15</td>
<td>16+N+18</td>
<td>15+13+N</td>
<td>N+N+14</td>
</tr>
<tr>
<td><em>Salmonella</em></td>
<td>15+12+17</td>
<td>N+11+13</td>
<td>11+N+17</td>
<td>14+N+16</td>
</tr>
</tbody>
</table>

⁰ Zone of inhibition in mm, N= Nil, R=Root, S=Stem, L=Leaves

Table 2. Antifungal activity of tested fractions of *X. strumarium*

<table>
<thead>
<tr>
<th>Name of fungi</th>
<th>CH_OH⁰</th>
<th>EtOAc⁰</th>
<th>CHCl₃⁰</th>
<th>H₂O⁰</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>A. fumigatus</em></td>
<td>N+P+N</td>
<td>P+N+P</td>
<td>N+P+P</td>
<td>P+N+P</td>
</tr>
<tr>
<td><em>F. solani</em></td>
<td>N+P+P</td>
<td>N+P+P</td>
<td>P+N+P</td>
<td>P+N+P</td>
</tr>
<tr>
<td><em>A. niger</em></td>
<td>P+P+P</td>
<td>P+N+P</td>
<td>P+N+N</td>
<td>N+P+P</td>
</tr>
<tr>
<td><em>A. flavus</em></td>
<td>P+N+P</td>
<td>N+P+N</td>
<td>N+N+P</td>
<td>P+P+N</td>
</tr>
</tbody>
</table>

⁰ R=Root, S=Stem, L=Leaves, P=Positive, N=Negative

Table 3. Phytochemical screening of powder of *X. strumarium*

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Test</th>
<th><em>X. strumarium</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flavonoids</td>
<td>Positive</td>
</tr>
<tr>
<td>2</td>
<td>Saponins</td>
<td>Positive</td>
</tr>
<tr>
<td>3</td>
<td>Antraquinone</td>
<td>Positive</td>
</tr>
<tr>
<td>4</td>
<td>Terpenoids</td>
<td>Positive</td>
</tr>
<tr>
<td>5</td>
<td>Tannins</td>
<td>Positive</td>
</tr>
<tr>
<td>6</td>
<td>Reducing Sugar</td>
<td>Positive</td>
</tr>
<tr>
<td>7</td>
<td>Cardiac glycosides</td>
<td>Positive</td>
</tr>
</tbody>
</table>

Ethyl acetate friction

Ethyl acetate root extract found active against *A. niger* and *A. fumigatus*.

Chloroform fraction

Chloroform fraction of *X. strumarium* root active against *A. niger* and *F. solani*.

Water extract

Water crude fraction of *X. strumarium* root found active against all tested four fungal strains except *A. niger*.

Stem Extract

Methanol extract

Methanol extract of stem active against *A. fumigatus, F. solani* and *A. niger* while ethyl acetate extract of *X. strumarium* stem active against *F. solani* and *A. flavus*.

Chloroform crude fraction of *X. strumarium* stem only active against *A. fumigatus* in all four tested fungi strain. Water crude fraction of *X. strumarium* stem found active against *A. niger* and *A. flavus*.

Leaves Extract

Methanol fraction of leaves inactive against *A. fumigatus* while active again the rest tested fungi strain.

Ethyl acetate crude fraction of leaves inactive against *A. flavus* while active again the rest tested fungi strain. Chloroform crude fraction...
of *X. strumarium* leaves inactive against *A. niger* while active again the rest tested fungi strain. Water crude fraction of *X. strumarium* leaves found active against all test fungi strain except *A. flavus*.

From Table 3 it is clear that *X. strumarium* give positive result for Flavonoids, Saponins, Anthraquinone, Terpenoids, Tannins, Reducing Sugar and Cardiac glycosides. This plant species can be use as a source for isolation of different classes of natural product including Flavonoids, Saponins, Antraquinone, Terpenoids, Tannins, Reducing Sugar and Cardiac glycosides. Flavonoids are a group of phenolics that are found in varying amounts in foods and medicinal plants which have been shown to exert anti-allergic, anti-inflammatory, antimicrobial and antihypertensive activities. As the study of Srinivas *et al.*, only concern with methanolic fraction therefore our result not totally agree with his reported result. According to Srinivas *et al.*, there is no flavanoid and tannins in methanolic extract, Here we obtained positive result for both flavanoid and tannin in the whole plant.

**CONCLUSION**

The antimicrobial effects of extracts against the studied microbes suggest that, different crude parts of this plant species hold notable therapeutic action that can prop up the traditional practice of this plant in the treatment of disease causes by bacteria and fungi such as gastrointestinal infection, diarrhoea, respiratory and skin diseases. This study gives more specific results. It showed that which fraction of which part of plant again which bacteria and fungus will be screened for specific antibacterial and antifungal agent.

**ACKNOWLEDGMENTS**

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**REFERENCES**