Antimosquito (Insecticidal) activity of extracts of *Hemidesmus indicus* and *Swertia chirata* against *Aedes aegypti* mosquito larvae- A Comparative Study

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**ABSTRACT**

The present study was carried out to investigate antimosquito (insecticidal) activity of methanol, chloroform and petroleum ether extracts of two medicinal plants *Hemidesmus indicus* and *Swertia chirata* against second instar larvae of *Aedes aegypti*. The insecticidal activity of different concentrations of solvent extracts was found to be dose dependent. Among extracts, *H. indicus* showed more larvicidal efficacy when compared to *S. chirata*. Overall, it was found that the chloroform extract was more effective in killing larvae followed by ethanol and petroleum ether extracts. The larvicidal efficacy of solvent extracts may be due to the presence of phytochemicals in the extracts. Further, isolation of active constituents from solvent extracts and determination of insecticidal efficacy of isolated constituents are to be carried.

**Key words:** *Hemidesmus indicus*, *Swertia chirata*, Soxhlet extraction, Insecticidal activity, *Aedes aegypti*

**INTRODUCTION**

Mosquitoes are considered as a major health menace as they serve as disease transmitting vectors to humans and animals. Several mosquito species belonging to the genera Anopheles, Aedes and Culex are vectors of pathogens of various diseases such as malaria, filariasis, Japanese encephalitis, dengue, respiratory disorders, skin diseases, syphilis, fever, bronchitis, asthma, eye diseases, urinary disorders, loss of appetite, burning sensation and rheumatism and especially for epileptic fits in children 6. *Swertia chirata* belongs to family Gentianaceae, which records the occurrence of taxonomically informative molecules, namely iridoids, xanthones, mangiferin and C-glucoflavones. The entire plant is used in traditional medicine; however, the root is mentioned to be the most powerful part. The biological activities attributed to *Swertia chirata* are Alternative, Antihelmintic, Antileishmaniac, Anticholinergic, Anticonvulsant, Antiedemic, Antimicrobial, Antimalarial, Antipyretic, Antitubercular, Astringent, Bitter, Cardio stimulant, Cholagogue, Choleretic, CNS depressant, Emollient, Hepatoprotective, Hypnotic, Hypoglycemic/antidiabetic, Laxative, Secretagogue, Stomachic, Tonic, Undersedative, Vermifuge 7. In the present study, we investigated antimosquito (insecticidal) activity of methanol, chloroform and petroleum ether extracts of two medicinal plants *Hemidesmus indicus* and *Swertia chirata* against second instar larvae of *Aedes aegypti*.
MATERIALS AND METHODS

Collection and identification of plant

The plant materials of *H. indicus* (voucher no. SRNMN/PK/201) and *S. chirata* (voucher no. SRNMN/PK/202) were purchased from local shops of Udupi city, Karnataka, India and authenticated to identity in the department of Botany, S.R.N.M.N College of Applied Sciences, Shivamogga, Karnataka, India. The voucher specimens were deposited in the department for future reference.

Extraction and Phytochemical constituents of solvent extracts

The plant materials were washed thoroughly 2-3 times with running tap water and once with sterile water, shade dried, powdered and used for extraction. The powdered plant material (200g) was extracted with solvents namely ethanol, chloroform and petroleum ether, ethyl acetate and acetone by soxhlet extraction and exhaustively extracted for about 48 hours. The extracts were filtered through Whatman filter paper No. 1 and concentrated in vacuum under reduced pressure using rotary flash evaporator and dried in the desiccator. The screening of the extract was carried out to detect the presence of phytoconstituents.

Screening of solvent extracts for Insecticidal activity

Insecticidal activity of solvent extracts was tested on second instar larvae of *Aedes aegypti* mosquito. Different concentrations of solvent extracts (5, 10, 15 and 20mg/ml) were prepared in 10% DMSO and added to sterile labeled beakers containing about 100ml of water. Twenty larvae were placed in each of the beakers containing extracts. A control was kept containing 10% DMSO. After adding the larvae, the beakers were kept in the growth room maintained at room temperature. The larvicidal effect of extracts was determined by counting the number of dead larvae after 24 hours. Extracts were probed thrice; the percentage of larval mortality was determined.

Table 1: Insecticidal activity of different concentrations of ethanol extract of *H. indicus* and *S. chirata*

<table>
<thead>
<tr>
<th>Plant</th>
<th>Extract</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>H. indicus</em></td>
<td>Ethanol</td>
<td>55.00</td>
<td>70.00</td>
<td>80.00</td>
<td>80.00</td>
</tr>
<tr>
<td></td>
<td>Pet. Ether</td>
<td>35.00</td>
<td>40.00</td>
<td>55.00</td>
<td>60.00</td>
</tr>
<tr>
<td></td>
<td>Chloroform</td>
<td>65.00</td>
<td>80.00</td>
<td>95.00</td>
<td>100.00</td>
</tr>
<tr>
<td><em>S. chirata</em></td>
<td>Ethanol</td>
<td>60.00</td>
<td>90.00</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td></td>
<td>Pet. Ether</td>
<td>55.00</td>
<td>80.00</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td></td>
<td>Chloroform</td>
<td>80.00</td>
<td>90.00</td>
<td>100.00</td>
<td>100.00</td>
</tr>
</tbody>
</table>

RESULTS AND DISCUSSION

The preliminary phytochemical analysis showed the presence of tannin, alkaloid, saponin and steroid in ethanol extract of *H. indicus* and steroid, tannin, alkaloid, flavonoids and saponins in ethanol extract of *S. chirata*. The insecticidal activity of different concentrations of solvent extracts of *H. indicus* and *S. chirata* is presented in Table-1. It is evident from the result that the extracts have caused dose dependent mortality of larvae. Among extracts, *H. indicus* showed more larvicidal efficacy as compared to *S. chirata*. At concentrations 15mg/ml and more of *H. indicus*, 100% mortality of larvae was observed. Chloroform extract of *S. chirata* at 20mg/ml concentration only showed 100% mortality. Overall, it was found that the chloroform extract was more effective in killing larvae followed by ethanol and petroleum ether extracts.

Mosquito borne diseases are one of the public health issues in developing countries. It can be controlled by preventing mosquito bite using repellent, causing larval mortality and killing mosquitoes. Higher plants are a rich source of novel substances that can be used to develop environmental safe methods for insect control. Insecticidal activity of many plants against several insect pests has been demonstrated. The deleterious effects of plant extracts or pure compounds from plants on insects can be manifested in several manners including toxicity, mortality, antifeedant growth inhibitor, suppression of reproductive behavior and reduction of fecundity and fertility. It has been arrived that there is a strong connection between medicinal and pesticidal plants. It is observed that the carbohydrates, saponins, phytosterols, phenols, flavonoids and tannins are having larvicidal activity. Prenylated xanthones, tetracyclic phenols and saponins are reported to be effective in controlling mosquito *A. aegypti*, the vector of yellow fever. From the results, it may be concluded that the presence of phytoconstituents in the solvent extracts of *H. indicus* and *S. chirata* might be the reason for larvicidal activity. The plants could be used for beneficial effect to control vector borne diseases such as dengue, malaria etc. Further, isolation of active constituents and determination of insecticidal efficacy of isolated constituents are to be carried.

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