Effects of Methanol Extract of *Piper chaba* Stem Bark on Acute Inflammation in Rats

F Begum¹, ZA Begum², MR Uddin³, AHMZ Haider⁴, RC Barman⁵,

Abstract

The plant *Piper chaba* Hunter (Piperaceae), a climbing glabrous shrub grows in plenty in southern Bangladesh. Popularly known as 'Choi' it is used as spices and believed to have medicinal value in a wide variety of disease conditions including arthritis, asthma, bronchitis and piles. In the present study, effect of methanol extract of *Piper chaba* stem bark on acute inflammation has been reported. The anti-inflammatory effect was studied in rats by injecting 0.1ml of 1% carrageenan suspension into the planter surface, where oedema of the rat's hind paw was used as an index of acute inflammation. Methanol extract of *Piper chaba* stem bark given orally 1 hour before injection at doses of 125 and 250 mg/kg body weight, produced significant (p< 0.05) anti inflammatory effect compared to control and the percentage of inhibition of oedema formation was 33% and 35% respectively, which however was less compared to aspirin (46%) and hydrocortisone (56%). The result suggest that in case of acute inflammation, *Piper chaba* stem bark possess mild to moderate anti inflammatory effect compared to that of aspirin and hydrocortisone.

Key words: Rats, acute inflammation, *Piper chaba*, aspirin, hydrocortisone, choi.

Introduction:

Piper species are widely distributed in the tropical and subtropical regions of the world¹. The plant *Piper chaba* Hunter (Piperaceae) is a climbing, glabrous shrub available in various parts of India and Malay Islands². In Bangladesh it is grown in plenty in the southern part particularly in Jessore, Khulna, Satkhira and Bagerhat areas². Popularly known as choi, it is used as spices in meat curry and other dishes and believed to have medicinal value in a wide variety of disease conditions including arthritis, asthma, bronchitis and piles. The crude extract was found to possess antibacterial, carminative, expectorant, analgesic, hypotensive and smooth muscle relaxant properties²-⁴. Recently, 80% aqueous acetone extract from the fruit of *Piper chaba* as well as some isolated alkamides were found to be protective against ethanol and indomethacin induced gastric lesions in rats⁵. Stem bark of *Piper chaba* produced a significant anti-inflammatory effect in rat model⁶.

Considering its reported anti-inflammatory properties and availability in our country, the present study was undertaken to evaluate the anti-inflammatory effect of methanol extract of *Piper chaba* stem bark, compared to steroidal and non-steroidal anti-inflammatory agents in case of acute inflammation in rats.

Materials and Methods:

The stem bark of *Piper chaba* Hunter was cut into pieces, shade-dried and grounded to coarse powder, which was then extracted with methanol at room temperature for 3 days. The filtrate concentrated in vacuum (50°C) yielding the crude methanol extract was stored at 4°C, weighed to appropriate dosages form and diluted with normal saline prior to use. Thirty Long
Evan Norwegian rats of either sex, weighing between 150-200g were kept under standard conditions of light and temperature, fed with animal pellets and allowed to drink water ad libitum. Animal were divided into five groups each consisting of 6 rats. Acute inflammation was produced by injecting 0.1 ml of 1% Carrageenan suspension in normal saline in all rats. One hour before carrageenan injection, group I served as control that received normal saline, group II and group III were given methanol extract of *Piper chaba* Hunter at a dose of 125 mg and 250 mg/kg body weight orally respectively. Group IV were given aspirin at a dose of 100mg/kg body weight orally and group V were given hydrocortisone at a dose of 2mg/kg body weight subcutaneously. Progress of the local inflammatory exudative lesion was assessed by measuring the maximum linear cross-section of the joint 1 hour before and 3 hours after the carrageenan injection, the measurements were taken as accurately as possible by slide calipers. Percentage of inhibition of oedema formation was calculated by using the formula: \( \frac{(C-T)}{C} \times 100 \), where T and C stand for test and control.

**Results:**

The mean initial antero-posterior diameter of rat's paw of control group (group-I) was 7.93±0.04 mm and after 3 hours of carrageenan injection it was 13.22±0.15 mm. The mean initial antero-posterior diameter of rats paw of group-II (choi 125mg/Kg body weight) was 8.14 ±0.18 mm, whereas after 3 hours of carrageenan injection it was 11.45±0.20 mm. The mean initial antero-posterior diameter of rat's paw of group III (choi 250 mg/kg body weight) was 8.16±0.18 mm and after 3 hours of carrageenan injection it was 11.33±0.28 mm. The mean initial antero-posterior diameter of rat's paw of group IV (Aspirin 100 mg/Kg body weight) was 8.17 ±0.17 mm and after 3 hours of carrageenan injection it was 10.85±0.16 mm. The mean initial antero-posterior diameter of rat's paw of group V (Hydrocortisone 2mg/kg body weight) was 8.12±0.19 mm and after 3 hours of carrageenan injection it was 10.46±0.17 mm. Finally increase in antero-posterior diameter (MEAN ±SEM) of rat's paw in group-I, II, III, IV and V were 4.94±0.43, 3.30±0.36, 3.18±0.24, 2.67±0.17, 2.17±0.24 mm respectively. (Table I) The percentage of inhibition of oedema formation in group II, III, IV, and V were 33%, 35%, 46% and 56% respectively. (Figure I)

### Table I: Anti-inflammatory effects of *Piper chaba* extracts, aspirin and hydrocortisone on carrageenan induced oedema in rat's paw.

<table>
<thead>
<tr>
<th>Group</th>
<th>Initial antero-posterior diameter (mm) (MEAN ± SEM)</th>
<th>Antero-posterior diameter after 3 hours of carrageenan injection (mm) (MEAN± SEM)</th>
<th>Increase in antero-posterior diameter (mm) (MEAN± SEM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group-I (Control)</td>
<td>7.93±0.04</td>
<td>13.22±0.15</td>
<td>4.94±0.43</td>
</tr>
<tr>
<td>Group-II</td>
<td>8.14 ±0.18</td>
<td>11.45±0.20</td>
<td>3.30±0.36*</td>
</tr>
<tr>
<td>Group-II (Piper chaba extract 125 mg/kg b.w.)</td>
<td>8.16 ±0.18</td>
<td>11.33±0.28</td>
<td>3.18±0.24*</td>
</tr>
<tr>
<td>Group-III</td>
<td>8.17 ±0.17</td>
<td>10.85±0.16</td>
<td>2.67±0.17***</td>
</tr>
<tr>
<td>Group-IV</td>
<td>8.12±0.19</td>
<td>10.46±0.17</td>
<td>2.17±0.24***</td>
</tr>
</tbody>
</table>

*P < 0.05 in a test of significance difference from control.

*** P< 0.001 in a test of significance difference from control.

![Graph](image-url)

**Figure I:** Percentage of inhibition of carrageenan induced inflammation by different doses of methanol extract of *Piper chaba*, Aspirin and Hydrocortisone in comparison to control.

**Discussion:**

Administration of methanol extract of stem bark of *Piper chaba* at a dose of 125 mg/kg body weight and 250mg/kg body weight orally produced a significant (p<0.05) anti-inflammatory effect, where the percentage of inhibition of oedema formation was 33% and 35% respectively. Following administration of aspirin and hydrocortisone the anti-inflammatory effects were highly significant (p<0.001) and the percentage of inhibition of oedema formation were 46% in aspirin and 56% in hydrocortisone.
In earlier studies, mean paw volume after carrageenan administration in animals treated with test samples increased up to the third hour of study and then got a declining trend. Carrageenan induced paw oedema has been reported to have more than one phase and the initial phase has been attributed to the release of histamine and serotonin (5-HT), the maintenance of oedema during the plateau phase is caused by kinin-like substances and the second accelerating phase of swelling are due to prostaglandin like substances.

As the crude methanol extract exhibited significant inhibition of paw oedema, the possible mechanism of the observed anti-inflammatory activity might be its ability to inhibit the release of histamine, serotonin or kinin like substances or biosynthesis of prostaglandins.

**Conclusion:**

The results suggest that *Piper chaba* stem bark possess mild to moderate anti-inflammatory effect compared to aspirin and hydrocortisone in case of acute inflammation. Before establishing extract of stem bark of *Piper chaba* as a therapeutically effective anti-inflammatory agent, further studies should be carried out to determine the active principles responsible for anti-inflammatory effect and its cellular mechanism of action. Toxicological studies should also be undertaken as well before any clinical trial for suitability of using in man.

**References :**


