Anti-inflammatory activity of the aqueous extract of *Psychotria sarmentosa*

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Abstract—The hot water extracts of leaves and stems of *Psychotria sarmentosa* at doses of 1015, 2039, 3885 and 5050 mg/kg were subjected to anti-inflammatory activity in a carrageenan induced paw edema model using Wistar male rats, in the presence of the positive control drug and a negative control. The inflammation was induced by injecting carrageenan to the sub plantar surface of the left hind paws of the experimental animals. The results obtained with the Dose 02 (2039 mg/kg) had the greatest significant (p < 0.05 to 0.001) difference than the other doses when compared with the controls. The reductions of paw edema were 71 – 98 % compared to control, indomethacin (p < 0.05 to 0.039 and 40 – 80 %) after 03rdH. Other doses at the different dose range used 1015, 3885 and 5050 mg/kg, there were significant differences in their anti-inflammatory activity, 94.08 %, 85.92 % and 91.54 % respectively at 6th H. The results of this study exhibited that scientific basis exists for the use of this plant in the treatment of inflammatory disease conditions.

Keywords—Anti-inflammatory activity, Carrageenan, *Psychotria sarmentosa*.

I. INTRODUCTION

*Psychotria sarmentosa* Blume (family: Rubiaceae, Gonika in Sinhala) is a twinning shrub with ob lanceolate or elliptic leaves growing in low elevation forests in Western, Southern and Southwest of Sri Lanka, Indonesia and Java. Known as ‘gonika’ in Sinhala, this plant is believed to possess several medicinal properties. As described in folklore, physically assaulted people in Sri Lanka have been drinking the leaf and stem extract of this plant as a porridge to get well quickly. Oral hypoglycaemic effect of the boiled leaf extract had been studied earlier by Malalavidhane et al.,(1999). There is traditional belief that the unboiled extract is effective in healing bone fractures indicating that it may have potent osteoelastic, analgesic and anti-inflammatory activity. The unboiled extract has been studied by Ratnasooriya and Dharmasiri in (1999) for anti inflammatory and analgesic activity. However, these activities are not described in either Sri Lankan Ayurveda pharmacopoeia or in the traditional systems of medicine.

The present study was carried out to determine the anti-inflammatory effect of the hot water extract of leaves and stems (HWELS) of *Psychotria sarmentosa* in healthy Wistar rats.

II. MATERIALS AND METHODS

A. Plant Materials

Fresh leaves and stems of *P. sarmentosa* were collected from wet zone forests in Handapangoda, Udugalakanda and Kotigala in the Kaluthara district, Western Province, Sri Lanka and specimen authentication was carried out and a voucher specimen was deposited at the National Herbarium, Department of National Botanic Garden, Peradeniya (Specimen number RAS 807).

B. Preparation of Extracts

Fresh leaves and stems were washed under running fresh water to remove dust and other particles on surface of leaves and stems. Then they were air dried after blotted dry using cotton cloths. Four different extracts were prepared following the same extraction method with different weights of leaves and stems and same amounts of water in Table1. They were weighed using an electronic digital balance and then crushed leaves on stone mortar and pestle. Added 200.00 ml of fresh well water to the crude extract and soak using the pestle. The extracts were filtered through a 02 layers of cotton cloths in to 500 ml Beaker. The total volumes of extracts were measured using a 100 ml of measuring cylinder and the extracts were heated up to 80 °C to prepare the hot water extract (HWE)

C. Experimental Animals

Healthy male Wistar rats ranging between 250g-350g obtained from the Medical research Institute were used in the present study. They were maintained under standard animal house conditions and were fed on WHO standard rodent pelleted diet and given tap water ad libitum. Animals were kept in well-ventilated house conditions (room temperature range: 27°C – 30°C, photoperiod: 12 H natural light and 12 H dark).

D. Anti-inflammatory Activity

Anti-inflammatory activity was measured using carrageenan induced rat paw edema assay (Winter et al., 1962; Adeyemi et al., 2002). Thirty six rats were divided into six groups based on their body weights. The rats in groups 1 and 2, which served as Negative and Positive controls were treated with 1.5 ml of DW and 1.5 ml of 10 mg/kg indomethacin respectively. The groups 3, 4, 5 and 6
were orally treated with 1015, 2039, 3885 and 5050 mg/kg of HWELS, respectively. At 01 H 0.1 ml, 1% carrageenan suspension in 0.9% saline solution was injected into the sub-plantar surface of the left hind paw. The linear paw circumference was measured at hourly interval for 6 hours (Bamgbose and Noamensi, 1981). Measurement of paw volume was done by means of volume displacement technique using a digital plethysmometer (LE 7500, Panlab, Harvard Apparatus) (Ugo and Basile, 1981) at 1 H prior to the injection of carrageenan and 1, 2, 3, 4, 5 and 6 H after the injection. Anti-inflammatory activity was measured as the percentage reduction in edema level when drug was present, relative to control (Duffy et al., 2001).

**E. Statistical Analysis**

The results and data obtained in this study were evaluated using the one-way analysis of variance (ANOVA) to determine the significant of the difference between the control groups and the rat treated test groups. Significant levels were at p < 0.05 (95% confident limits).

**III. RESULTS**

The anti-inflammatory effects of the four different hot water extracts of leaves and stems of *Psychotria sarmontosa* on carrageenan-induced edema in rat’s right hind paws are presented in Table 2. The % inhibition of edema was calculated at each hour. Dose 02 (2039 mg/kg) had the greatest significant (p < 0.05 to 0.001) difference than the other doses with the control and the reduction of paw edema were 71 – 98 % compared to control after 3rd H. This anti-inflammatory effect of HWE of *Psychotria sarmontosa* was much stronger (71 – 98 %) than the standard drug, indomethacin (p < 0.05 to 0.039 and 40 – 80 % after 03rd H). Every doses of HWE produced significant over 85% of inhibition at 6th H compared to the reference drug.

**IV. DISCUSSION**

This study exhibited the anti-inflammatory activity of HWE of *P. sarmontosa* in rats using the carrageenan-induced paw oedema assay as an acute inflammatory model. The results of anti-inflammatory activity of HWE have the greatest evidence against to the acute inflammation. After injection of carrageenan, the formation of edema in the paw of the rat was raised due to release of mediators of inflammation such as histamine, serotonin and prostaglandin (vinegar et al., 1969). In fact significantly high anti-inflammatory activities of HWE (2039 mg/kg BW) after 3rd H and other hot water extracts, 1015, 3885 and 5050 mg/kg BW at 6H of *P sarmontosa* may be due to inhibition of the inflammation mediators. This significant result indicates the efficacy of hot water extracts of *P sarmontosa* as an effective anti-inflammatory agent.

<table>
<thead>
<tr>
<th>Dose Numbers</th>
<th>Weight of Leaves/g</th>
<th>Weight of Stems/g</th>
<th>Total weight of Plant materials/g</th>
<th>Added volume of Water/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose -01</td>
<td>25.00</td>
<td>25.00</td>
<td>50.00</td>
<td>200.00</td>
</tr>
<tr>
<td>Dose -02</td>
<td>50.00</td>
<td>50.00</td>
<td>100.00</td>
<td>200.00</td>
</tr>
<tr>
<td>Dose -03</td>
<td>100.00</td>
<td>100.00</td>
<td>200.00</td>
<td>200.00</td>
</tr>
<tr>
<td>Dose -04</td>
<td>200.00</td>
<td>200.00</td>
<td>400.00</td>
<td>200.00</td>
</tr>
</tbody>
</table>

Table 1. Prepared dose ranges of extracts of leaves and stems.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Dose (mg/kg)</th>
<th>Paw oedema mean ± SEM (mm)</th>
<th>% Inhibition in parentheses</th>
<th>Time (H)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative Control</td>
<td>0</td>
<td>0.16 ± 0.03</td>
<td>0.14 ± 0.03</td>
<td>0.11 ± 0.02</td>
</tr>
<tr>
<td>Positive Control</td>
<td>10</td>
<td>0.11 ± 0.01 (30.11)</td>
<td>0.09 ± 0.02 (35.36)</td>
<td>0.08 ± 0.01 (47.13)</td>
</tr>
<tr>
<td>Dose 01</td>
<td>1015</td>
<td>0.14 ± 0.02 (8.60)</td>
<td>0.11 ± 0.02 (17.07)</td>
<td>0.08 ± 0.02 (43.68)</td>
</tr>
<tr>
<td>Dose 02</td>
<td>2039</td>
<td>0.10 ± 0.02 (35.48)</td>
<td>0.09 ± 0.01 (31.7)</td>
<td>0.04 ± 0.02 (71.26)</td>
</tr>
<tr>
<td>Dose 03</td>
<td>3885</td>
<td>0.08 ± 0.02 (48.38)</td>
<td>0.10 ± 0.02 (26.82)</td>
<td>0.08 ± 0.02 (44.82)</td>
</tr>
<tr>
<td>Dose 04</td>
<td>5050</td>
<td>0.15 ± 0.01 (16.36)</td>
<td>0.11 ± 0.01 (14.10)</td>
<td>0.07 ± 0.01 (19.99)</td>
</tr>
</tbody>
</table>

Table 2. Anti-inflammatory activities of hot water extracts of leaves and stems of *P. sarmontosa* in carrageenan-induced paw edema of Wistar rats. Values are expressed as (mean ± SEM) and *significant at p < 0.05 and **p < 0.01
As the conclusion, traditional medicines have been popularly used in the treatment of various diseases in Sri Lanka since ancient century. Many medicinal plants show anti-inflammatory activity to treat acute inflammation. Based on its therapeutic claims in traditional medicine, we investigated an important scientific study of the hot water extracts of leaves and stems of *Psarmentosa* as the first time based on the high significant anti-inflammatory activity compared to the other relevant drugs in the market.

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REFERENCES


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