

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

Karannagoda HKRD¹, Abeythunga T², and Suresh TS³

^{1&3} University of Sri Jayewardenepura, Sri Lanka, ² University of Colombo, Sri Lanka

¹hkrdkarannagoda@gmail.com, ²thusitha@chem.cmb.ac.lk, ³malalavidhane@yahoo.com (³Correspondence Author)

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 oblanceolate 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 osteoblastic, 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, Udugalananda 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

Dose Numbers	Weight of Leaves/g	Weight of Stems/g	Total weight of Plant materials/g	Added volume of Water/ml
Dose -01	25.00	25.00	50.00	200.00
Dose -02	50.00	50.00	100.00	200.00
Dose -03	100.00	100.00	200.00	200.00
Dose -04	200.00	200.00	400.00	200.00

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

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 Noamesi, 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 sarmentosa* 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 sarmentosa* 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. sarmentosa* 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 3rdH and other hot water extracts, 1015, 3885 and 5050 mg/kg BW at 6thH of *P.sarmentosa* may be due to inhibition of the inflammation mediators. This significant result indicates the efficacy of hot water extracts of *P.sarmentosa* as an effective anti-inflammatory agent.

Treatment	Dose (mg/kg)	Paw oedema mean \pm SEM (ml) and % inhibition in parentheses Time (H)						
		0	1	2	3	4	5	6
Negative Control (water)	0	—	0.16 \pm 0.03	0.14 \pm 0.03	0.15 \pm 0.04	0.11 \pm 0.02	0.12 \pm 0.04	0.12 \pm 0.03
Positive Control Indomethacin	10	—	0.11 \pm 0.01 (30.11)	0.09 \pm 0.02 (35.36)	0.08 \pm 0.01 (47.13)	0.04 \pm 0.02 * (63.49)	0.05 \pm 0.02 (60.00)	0.02 \pm 0.02* (80.28)
Dose 01	1015	—	0.14 \pm 0.02 (8.60)	0.11 \pm 0.02 (17.07)	0.08 \pm 0.02 (43.68)	0.06 \pm 0.02 (44.44)	0.04 \pm 0.02 (64.29)	0.01 \pm 0.00 ** (94.08)
Dose 02	2039	—	0.10 \pm 0.02 (35.48)	0.09 \pm 0.01 (31.7)	0.04 \pm 0.02 (71.26)	0.03 \pm 0.01** (71.43)	0.02 \pm 0.01 * (77.14)	0.00 \pm 0.00 ** (98.59)
Dose 03	3885	—	0.08 \pm 0.02 (48.38)	0.10 \pm 0.02 (26.82)	0.08 \pm 0.02 (44.82)	0.09 \pm 0.02 (19.04)	0.07 \pm 0.02 (39.99)	0.02 \pm 0.01 * (85.92)
Dose 04	5050	—	0.15 \pm 0.01 (16.36)	0.11 \pm 0.01 (14.10)	0.07 \pm 0.01 (19.99)	0.06 \pm 0.01 * (44.27)	0.03 \pm 0.00 * (67.92)	0.01 \pm 0.00 * (91.54)

Table 2. Anti-inflammatory activities of hot water extracts of leaves and stems of *P. sarmentosa* in carrageenan-induced paw edema of Wistar rats. Values are expressed as (mean \pm 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 *P.sarmentosa* 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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BIOGRAPHY OF AUTHORS

¹HKRD Karannagoda is a graduate in Chemistry from the Institute of Chemistry, Ceylon. He is currently reading for his M.Sc. at the Faculty of Science, University of Colombo.

²Prof DTU Abeytunga is a Professor in Chemistry at the Dept. of Chemistry, University of Colombo, Sri Lanka. She is an author of nearly 20 publications in indexed and peer reviewed journals and several books and chapters by recognized publishers. Her main research focus is on isolation of biologically active compounds from mushrooms and microwave enhanced organic synthesis. Prof Abeytunga has organized many workshops and conferences and has served the SLAAS and IChemC in various capacities. He has won several awards for her research and has supervised several MPhil and MSc students.

³Author is a Grade I Senior Lecturer at the Department of Biochemistry, Faculty of Medical Sciences, University of Sri Jaywardenepura, Sri Lanka. Her research interests include bioactivities of indigenous medicines and herbs, cancer and human nutrition. Dr Suresh has authored more than 10 publications in indexed and referred journals and more than 60 scientific communications in national and international conferences. She is an Associate Editor and also a member of Panel of Reviewers for indexed and refereed journals. She has received several awards for her research.