

Anti-inflammatory and Analgesic Activity of *Scindapsus officinalis* (Roxb.) Schott. Fruit in Experimental Animal Models

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Abstract: The aim of the present study was to evaluate the anti-inflammatory and analgesic activity of ethanolic extract of *Scindapsus officinalis* (EESO) fruit as assessed in the carrageenan-induced rat paw oedema at the doses of 50, 100 and 200 mg/kg, using different animal models. Phytochemical analysis of ethanolic extract of *Scindapsus officinalis* has indicated the presence of steroid, flavonoid and terpenoid compounds. Since these compounds are of pharmacological interest, coupled with the use of this plant in traditional medicine, prompted us for its possible analgesic and anti-inflammatory activities. The ethanolic extract of *Scindapsus officinalis* showed statistically significant ($P < 0.001$) analgesic activity in albino rat in a dose-dependent manner. The extract at 50, 100 and 200 mg/kg body weight reduced significantly, the formation of oedema induced by carrageenan. The analgesic activity of extract was evaluated for their central and peripheral pharmacological actions using tail flick method. It was concluded that apart from the folklore uses of *Scindapsus officinalis* as antioxidant agents, the ethanolic extract of fruit of the plant *Scindapsus officinalis* also possess anti-inflammatory and analgesic activities.

Key words: *Scindapsus officinalis* • Anti-inflammatory • Analgesic • EESO

INTRODUCTION

Plant extracts have been used for centuries, as popular remedies against several health disorders. The study of plants that have been traditionally used as pain killers should still be seen as a fruitful and logical research strategy in the search for new analgesic drugs and pain mechanisms [1]. Inflammation is usually associated with pain as a secondary process resulting from the release of algogenic mediators [2]. Most clinically important medicines are steroidal or non-steroidal anti-inflammatory chemical therapeutics, for treatment of inflammation related diseases including arthritis, asthma and cardiovascular diseases. Though these have potent activity, long-term administration is required for the treatment of chronic disease. Furthermore, these drugs

have various and severe adverse effects. Therefore, naturally occurring agents with reduced side effects are required to substitute the chemical therapeutics [3]. As a result of adverse side effects, like gastric lesions, caused by NSAIDs and tolerance and dependence induced by opiates, the use of these drugs as anti-inflammatory and analgesic agents have not been successful in all the cases. Therefore, new anti-inflammatory and analgesic drugs lacking those effects are being searched all over the world as alternatives to NSAIDs and opiates. During this process, the investigation of the efficacy of plant-based drugs used in the traditional medicine have been paid great attention because they are cheap, have little side effects and according to WHO still about 80% of the world population rely mainly on plant-based drugs [4].

Scindapsus officinalis (Roxb.) Schott. known as 'Gajapeepal' in Hindi, is a member of the family; Araceae. Gajapeepal consists of dried, transversely cut pieces of mature female spadix of *Scindapsus officinalis* Schott. a large epiphytic climber, found all along the sub-Himalayan tract between an altitude of 330-1000 m in West Bengal, Orissa andhra Pradesh and the Andaman Islands. Fruit occurs in transversely cut circular pieces of about 2.0-3.0 cm in diameter and 2.0-3.5 cm thick, brownish-grey, rough and scaly, cut surface has a central core, surrounded by fruits enclosing the seed covered partly by aril; odour and taste not distinct. Fruit shows more or less loosely arranged, thin-walled, parenchymatous cells having more or less isodiametric cells filled with brown content and numerous acicular crystals of calcium oxalate [5]. Ethanolic extract (50%) and ethyl acetate extracts of *Scindapsus officinalis* fruit were found to be significant antioxidant property. This antioxidant property may be due to the presence of flavonoids and phenolics compounds [6].

The present study was undertaken to find out the possible actions on *Scindapsus officinalis* fruit for its anti-inflammatory and analgesic activity.

MATERIALS AND METHODS

Chemicals: Indomethacin, Micro Labs, Bangalore; Carrageenan, Sigma Chemicals, USA and Tween-80, Sisco Chem, Mumbai; were used in the experiment. All other chemicals used were of analytical grade.

Plant Material: The fruits of the plant *Scindapsus officinalis* for the proposed study were collected from the Kuwari River, Gormi, Bhand, MP, India, during July 2009. It was identified the help of available literature and authenticated at the Department of Pharmaceutical Sciences, Dr. H.S. Gaur University, Sagar (MP). The voucher specimen of the plant and fruit has deposited in departmental herbarium (voucher specimen no. J-88).

Preparation of Extracts: The fruit of the plant *Scindapsus officinalis* was shade dried and coarsely powdered with mechanical grinder. Powdered drug was extracted successively with ethanol by cold maceration method. After complete extraction, the extracts were concentrated by distilling off the solvent and then evaporated to dryness on water bath. The ethanolic extract of *Scindapsus officinalis* (EESO) was subjected to investigate its anti-inflammatory and analgesic activity.

Animals: Healthy wistar albino rats of either sex (150-180 g) were selected for the present study. The animals were grouped and housed in polyacrylic cages, with not more than six animals per cage. The animals housed under standard laboratory conditions maintained at 25±1°C and under 12 / 12 h light / dark cycle and fed with standard pellet diet (Gold Mohur Brand, Lipton India Ltd.) and water *ad libitum*. All experimental procedures were followed in strict accordance with the guideline prescribed by the Committee for the Purpose of Control and Supervision on Experimental on Animals (CPCSEA) and the protocol was approved by the Institutional Animal Ethical Committee (Registration no. 1030/a/07/CPCSEA).

Determination of Anti-inflammatory Activity

Carrageenan Induced Paw Oedema: The activity was evaluated by using carrageenan induced hind paw oedema method [7]. The Wistar albino rats of either sex were divided into five groups comprising six animals in each group (n=6). Male or female albino rats with body weight of 150-180 g were selected for the study. The animals were starved overnight and deprived of water only during the experiment. Inflammation of the hind paw was induced by injecting 0.1 ml of the 1% w/v carrageenan (Sigma Chemicals Co. USA) in normal saline into the sub-planter surface of the right hind paw. Group I, the negative control group, was treated with tween-80 (2% w/v) solution at a dose of 10 ml/kg body weight. Group II, the positive control group, was treated with Indomethacin (10 mg/kg body weight). Group III received 50 mg/kg body weight of ethanolic extract of *Scindapsus officinalis* (EESO-I) orally, Group IV received 100 mg/kg body weight of ethanolic extract of *Scindapsus officinalis* (EESO-II) orally and Group V received 200 mg/kg body weight of ethanolic ether extract of *Scindapsus officinalis* (EESO-III) orally. All of the treatments were given one hour before the carrageenan injection. The measurement of paw volume was accomplished immediately by displacement technique using the Plethysmometer before the carrageenan injection and at 1, 2, 3 hrs after the carrageenan injection. Oedema was expressed as the increment in paw volume due to carrageenan administration. Mean increase in the paw volume was measured and percentage inhibition was calculated by using following formula:

$$\% \text{ Inhibition} = (1 - dt/dc) 100$$

Where,

dt = Difference in paw volume in drug treated group.

dc = Difference in paw volume in control animals.

Determination of Analgesic Activity

Analgesic Activity by Tail Flick Method: The activity was evaluated by using tail flick method [8]. The Wistar albino rats of either sex were divided into five group comprising six animals in each group (n=6). Wistar albino rats of either sex with body weight of 150-180 g were selected for the study. The animals were starved overnight and deprived of water only during the experiment. Group I, the negative control group, was treated with tween-80 (2% w/v) solution at a dose of 10 ml/kg body weight. Group II, the positive control group, was treated with Indomethacin (10 mg/kg body weight). Group III received 50 mg/kg body weight of ethanolic extract of *Scindapsus officinalis* (EESO-I) orally, Group IV received 100 mg/kg body weight of ethanolic extract of *Scindapsus officinalis* (EESO-II) orally and Group V received 200 mg/kg body weight of ethanolic ether extract of *Scindapsus officinalis* (EESO-III) orally. The tail flick latency was assayed by the analgesiometer. The strength of the current passing through the naked nichrome wire was kept constant at 6 ampere. The distance between the heat source and the tail skin was 1.5 cm. The site of application of the radiant heat in the tail skin was maintained at 2.5 cm measured from the root of the tail. The cut-off reaction time was fixed at 10 second to avoid tissue damage. The reaction time was recorded using tail flick analgesiometer at basal reaction time, 30, 60, 120 minute time interval after the drug administration. The observation were recorded and tabulated in table 2.

Statistical Analysis: Results were expressed as Mean \pm SEM, statistical significance was calculated by applying *t-test*. $P < 0.05$ was considered as significant.

RESULTS AND DISCUSSION

In the present study, carrageenan-induced paw oedema method shows the result given in Table 1. Ethanolic extract of *Scindapsus officinalis* at 50 mg/kg body weight per day (EESO-I) when given orally as a suspension the paw volume were reduced by 37.00 %, ethanolic extract of *Scindapsus officinalis* at 100 mg/kg body weight per day (EESO-II) shows 39.00 % inhibition, ethanolic extract of *Scindapsus officinalis* at 200 mg/kg body weight per day (EESO-III) shows 53.00 % inhibition after 3 hr which indicate that effect of ethanolic extract of *Scindapsus officinalis* is reflect in dose dependent manner. All the extracts showed inhibitory effect on carrageenan-induced paw oedema, thus exhibiting anti-inflammatory effect against acute inflammation. For the determination of analgesic activity, we used tail-flick method. Ethanolic extracts of *Balanites roxburghii* showed significant analgesic activity when compared to Indomethacin (standard drug). In the tail flick model, 30 minutes after drug administration, reaction time was increased significantly for the ethanolic extracts and standard drug when compared to the basal reaction time. The ethanolic extracts produced a dose dependent increase in the reaction time. Inflammation has different

Table 1: Evaluation of anti-inflammatory activity of ethanolic extracts of *Scindapsus officinalis* by carrageenan induced paw oedema in wistar albino rats

Groups	Dose (mg/kg body weight)	Mean Increase in Paw Volume (ml)			Percent Inhibition of Paw Oedema		
		1 hr.	2 hr.	3 hr.	1 hr.	2 hr.	3 hr.
Control	---	0.38 \pm 0.060	0.70 \pm 0.120	1.00 \pm 0.025	---	---	---
Indomethacin	10	0.18 \pm 0.024**	0.22 \pm 0.024**	0.31 \pm 0.023**	52.63	68.57	69
EESO-I	50	0.30 \pm 0.041	0.42 \pm 0.039**	0.63 \pm 0.022**	21.05	40	37
EESO-II	100	0.29 \pm 0.014	0.41 \pm 0.017**	0.61 \pm 0.024**	23.68	41.43	39
EESO-III	200	0.17 \pm 0.007**	0.28 \pm 0.013**	0.47 \pm 0.016**	55.26	60	53

* $P < 0.05$, ** $P < 0.01$ as compared to control, as per one way analysis of variance (ANOVA) followed by Dunnett's multiple comparison test. Value are presented as mean \pm SEM, n= 6 animal in each group.

Table 2: Evaluation of analgesic activity of ethanolic extracts of *Scindapsus officinalis* by tail flick method in wistar albino rats

Groups	Dose (mg/kg body weight)	Reaction time in sec. (mean \pm SEM)			
		Basal reaction time	30 min	1 hr.	2 hr.
Control	---	3.18 \pm 0.40	3.30 \pm 0.26	3.66 \pm 0.33	3.75 \pm 0.32
Indomethacin	10	3.33 \pm 0.41	7.90 \pm 0.28	8.29 \pm 0.30	8.38 \pm 0.18
EESO-I	50	3.31 \pm 0.11	7.86 \pm 0.31	8.20 \pm 0.19	8.30 \pm 0.58
EESO-II	100	3.31 \pm 0.27	4.42 \pm 0.90	5.18 \pm 0.60	5.23 \pm 0.34
EESO-III	200	3.25 \pm 0.38	6.22 \pm 0.25	7.25 \pm 0.13	7.50 \pm 0.70

$P < 0.05$ as compared to control, as per one way analysis of variance (ANOVA) followed by Dunnett's multiple comparison test. Value are presented as mean \pm SEM, n= 6 animal in each group.

phases the first phase is caused by an increase in vascular permeability, the second one by infiltrate of leucocytes and the third one by granuloma formation. We determined anti-inflammatory activity by using inhibition of carrageenan-induced inflammation which is one of the most feasible methods to screen anti-inflammatory agents. The development of carrageenan-induced oedema is biphasic; the first phase is attributed to the release of histamine, serotonin and kinins and the second phase is related to the release of prostaglandins and bradykinins [9-11]. We observed that EESO-I, EESO-II and EESO-III showed significant inhibition against carrageenan-induced paw oedema in the dose dependent manner. This response tendency of the extract in carrageenan-induced paw oedema revealed good peripheral anti-inflammatory properties of the ethanolic extract. This anti-inflammatory effect of EESO-I, EESO-II and EESO-III may be due to the presence of flavonoids. It has been reported that a number of flavonoids possess anti-inflammatory and analgesic activities [13, 12]. Flavonoids are known to inhibit the enzyme prostaglandin synthetase, more specifically the endoperoxidase and reported to produce anti-inflammatory effects [14]. Since, prostaglandins are also involved in the pain perception; inhibition of their synthesis might be the possible reason for the analgesic activity of the ethanolic extract. The presence of flavonoid identified might be responsible for the analgesic and anti-inflammatory activities in the ethanolic extract.

In conclusion, the results of the experiments suggested that *Scindapsus officinalis* may be used as an alternative or supplementary herbal remedy for the treatment of analgesic and inflammatory diseases. Because of its analgesic and anti-inflammatory effects, ethanol extract of *Scindapsus officinalis* fruit may have beneficial effects together with drugs known for a strong analgesic as well as anti-inflammatory effects. Thus the present study warrants further investigation involving components of ethanol extracts of *Scindapsus officinalis* for possible development of new class of analgesic and anti-inflammatory drugs. Thus, it is concluded that the ethanolic extract of fruit of *Scindapsus officinalis* produces significant anti-inflammatory and analgesic activities in dose dependent manner.

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