Research Article

Antiinflammatory Activity of Whole Plant of *Petiveria alliacea* L. (Phytolaccaceae)

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ABSTRACT

In the present study, antiinflammatory activity of ethanol extract of *Petiveria alliacea* whole plant was investigated. The antiinflammatory activities of ethanol extract of whole plant of *P. alliacea* were evaluated by carageenan induced rat paw edema to determine its effect on acute phase of inflammation models in rats. Preliminary phytochemical analysis of ethanol extract of whole plant showed the presence of alkaloid, catechin, coumarin, flavonoid, tannin, saponin, steroid, phenol, glycoside and terpenoid. Maximum inhibition (76.35%) was obtained at the dose of 400 mg/kg of *P. alliacea* whole plant after 3h of treatment in carrageenen induced paw edema, whereas indomethacin produced 77.34% of inhibition. The present study suggested that *P. alliacea* whole plant extract possess strong antiinflammatory property.

Keywords: Antiinflammatory, paw edema, *P. alliacea*, indomethacin.

INTRODUCTION

Inflammation is the complex biological response of vascular tissues to harmful stimuli including pathogens, irritants or damage cells. It is a protective attempt by the organism to remove the injurious stimuli as well as initiate the healing process for the tissue[1]. Inflammation is either acute or chronic. Acute inflammation is characterized by classical signs- edema, erythrema, pain, heat and above all, loss of function. The classical signs are triggered by the infiltration of the tissues by serum and white blood corpuscles (leucocytes). Chronic inflammation results in a progressive shift in type of cells, present at site of inflammation. It is characterized by simultaneous destruction and healing of the injured tissue from incidence of inflammation[2].

Cyclooxygenase (COX) is the key enzymes in the synthesis of prostaglandins, prostacyclins and thromboxanes which are involved in inflammation, pain and platelet aggregation[3]. Steroidal and non-steroidal antiinflammatory drugs (SAIDs and NASIDs respectively) are currently and most widely used drugs in the treatment of acute inflammatory disorders, despite their renal and gastric negative secondary effects[4]. SAIDs and NASIDs are being used till now. As a result long term uses of these drugs cause adverse side effects and damage human biological system such as liver, gastrointestinal tract etc[5, 6]. The use of herbal medicines is fast becoming more popular due to toxicity and side effects of allopathic medicines. In the recent years, the use of traditional medicine information on plant has again received considerable interest. The renewed interest in medicinal plant research has focused on herbal cures among indigenous populations around the world. Nevertheless, the standardization of botanicals has remained a key issue to be addressed to the consumers and for the popularization of herbal drugs all over the world. Hence, ethno pharmacology and drug discovery using natural products has remained an important issue in the current target-rich, lead-poor section of pharmaceutical research[7].

Petiveria alliacea L. (Phytolaccaceae) is claimed to have several medicinal properties. It is used in folk medicine to enhance memory and in the treatment of the common cold, flu, other viral or bacterial infections, inflammation, diabetes and cancer[8,9]. Previous work on *P.alliacea* revealed the presence of triterpenoids, saponins, polyphenols, coumarins, benzaldehyde, benzoic acid, flavonoids, fredelinol, pinitol and allantonin, varying their concentrations in the root, stems and leaves[10,11]. Hence, the present study was undertaken to evaluate the antiinflammatory activity of *Petiveria alliacea* L. in wistar Albino rats using ethanol extracts.

MATERIALS AND METHODS

Plant material

The whole plant of *Petiveria alliacea* L. was freshly collected from Agasthiarmalai Biosphere Reserve, Southern Western Ghats of Tamil Nadu. The plant specimen was identified and authenticated in Botanical Survey of India, Southern Circle, Coimbatore, Tamil Nadu. A voucher specimen was deposited in Ethno pharmacology Unit, Research Department of Botany, V.O. Chidambaram College, Tuticorin, Tamil Nadu.

Preparation of plant extract for antiinflammatory activity

The whole plant of *P.alliacea* was powdered in a Wiley mill. Hundred grams of whole plant powder was packed in

a Soxhlet apparatus and extracted with ethanol. The ethanol extract was concentrated in a rotary evaporator. The concentrated ethanol extract was used for preliminary phytochemical screening[12] and antiinflammatory activity.

Animals

Adult Wistar Albino rats of either sex (150-200g) were used for the present investigation. Animals were housed under standard environmental conditions at temperature (25±20C) and light and dark (12:12 h). Rats were fed with standard pellet diet (Goldmohur brand, MS Hindustan lever Ltd., Mumbai, India) and water *ad libitum*.

Acute toxicity study

Acute oral toxicity was performed by following OECD-423 guidelines (acute toxic class method), albino rats (n=6) of either sex selected by random sampling were used for acute toxicity study[13]. The animals were kept fasting for overnight and provided only with water, after which the extracts were administrated orally at 5mg/kg body weight by gastric intubations and observed for 14 days. If mortality was observed in two out of three animals, then the dose administrated was assigned as toxic dose. If mortality was observed in one animal, then the same dose repeated again to confirm the toxic dose. If mortality was not observed, the procedure was repeated for higher doses such as 50,100 upto 2000 mg/kg body weight.

Antiinflammatory activity of Carrageenan induced hind paw edema

Albino rats of either sex weighing 150-200 grams were divided into four groups of five animals each. The dosage of the drugs administered to the different groups was as follows. Group I - Control (normal saline), Group II - Ethanol extract of *P.alliacea* whole plant (200 mg/kg, p.o.); Group III - ethanol extract of *P.alliacea* whole plant (400 mg/kg, p.o.); and Group IV- Indomethacin (10 mg/kg, p.o). All the drugs were administered orally. Indomethacin served as the reference standard antiinflammatory drug.

After one hour of the administration of the drugs, 0.1 ml of 1% W/V carrageenan solution in normal saline was injected into the sub plantar tissue of the left hind paw of the rat and the right hind paw was served as the control. The paw volume of the rats were measured in the digital plethysmograph (Ugo basile, Italy), at the end of 0 min, 60min, 120min and 180min. The percentage increase in paw edema of the treated groups was compared with that of the control and the inhibitory effect of the drugs was studied. The relative potency of the drugs under investigation was calculated based upon the percentage inhibition of the inflammation. Percentage inhibition was calculated using the formula;

$$\text{Percentage inhibition} = [(Vc-Vt)/Vc] \times 100$$

Where, Vt the percentage represents the percentage difference in increased paw volume after the administration of test drugs to the rats and Vc represents difference of increased volume in the control groups.

Statistical analysis

The data were analyzed using student's t-test statistical methods. For the statistical tests a *p* values of less than 0.001, 0.01 and 0.05 was taken as significant.

RESULTS

The phytochemical screening of ethanol extract of whole plant of *P. alliacea* revealed the presence of alkaloid, catechin, coumarin, flavonoid, tannin, saponin, steroid, phenol, glycoside, terpenoid and xanthoprotein. Acute toxicity study revealed the non toxic nature of the ethanol extract of *P.alliacea* whole plant.

In the present study, the antiinflammatory activity of ethanol extract of whole plant of *P. alliacea* was assayed in albino rats using carrageenan induced rat paw edema method. Table 1 shows the antiinflammatory activity of ethanol extract of whole plant of *P. alliacea* significantly inhibited the rat paw edema at 3 rd hour post carrageenan were 72.30%and 76.35% for 200 mg/kg and 400 mg/kg of whole plant extract respectively. The results were compared with indomethacin at 10 mg/kg, which shows paw reduction of 77.34%.

Table 1: Effect of *P. alliacea* extract on the percentage of inhibition on the carrageenan induced paw edema

Treatment	Edema volume (ml)				% inhibition after 180min
	0 min	60 min	120 min	180 min	
Group I (Control)	38.16 ± 1.36	84. 31 ± 2.93	106.31 ± 2.65	124. 16 ± 2.92	-
Group II	36.81 ± 1.08	62.16 ± 1.85*	48.54 ± 1.65**	34.39 ± 1.86***	72.30
Group III	37.92 ± 0.94	53.81 ± 1.35*	40.16 ± 1.29***	29.36 ± 1.55***	76.35
Group IV (Indomethacin)	36.54 ± 1.36	63.16 ± 1.09*	39.84 ± 1.16***	28.13 ± 1.58***	77.34

Each value is SEM ± 5 individual observations * P<0.05; **P<0.01; ***P<0.001, compared paw edema induced control vs drug treated rats

DISCUSSION

This study revealed an antiinflammatory effect of the ethanol extract of *P.alliacea* whole plant. The different doses of ethanol extracts were effective antiinflammatory in nature, however, ethanol extract at a dose of 400 mg/kg was found to be most potent. It was found to be comparable with that of indomethacin (10 mg/kg) for prevention of edema at the later phase in the third hour after carrageenan injection with major reduction in paw volume. It has been reported that various mediators are revealed by carrageenan in the rat paw. The initial phase is attributed to the release of histamine and 5-hydroxytryptamine (5-HT). A second phase is mediated by kinins and finally in a third phase, the mediator is suspected to be prostaglandin[14,15]. Prostaglandin-E_2, a powerful vasodilator, synergizes with other inflammatory vasodilators such as histamine and bradykinin and contributes to redness and increased bloodflow in areas of acute inflammation. The significant ($P<0.001$) suppressive activity of the ethanol extract of whole plant of *P.alliacea* in late phase shows its potent antiinflammatory effect. Therefore, it is suggested that the mechanism of action of the extract may be related to histamine and prostaglandin synthesis inhibition. Variety of phytochemicals like flavonoids, terpenoids, alkaloids and saponin has been described to possess significant of prostaglandins (the end products of the COX and lipoxygenase pathways), which acts as a secondary messengers and are involved in various immunologic responses[16]. Inhibition of these enzymes provides the mechanism by which flavonoids inhibit inflammatory disorders[17]. Further studies will be carried out to isolate and characterize antiinflammatory chemicals constituents present in the ethanol extract of this plant.

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