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Phytochemical and pharmacological investigations of *Pseudarthria viscida* (L.)Wight & Arnott

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ABSTRACT

Pseudarthria viscida L. Wight & Arnott belongs to family Leguminosae commonly called as Salaparni is an essential component of potent Ayurvedic formulations. It has been screened for antioxidant, cytotoxic, antidiabetic & antidiarrhoeal activity. Currently, there is no enough scientific evidence or literary resources on the anti-inflammatory & antipyretic activity of this plant. Therefore, this study was aimed at exploring P.viscida for its therapeutic potentials as anti-inflammatory & antipyretic agent. A research was conducted to evaluate the anti-inflammatory property (inflammation-induced to rat paw oedema by carrageenan & cotton pellet granuloma) & antipyretic (Pyrexia induced by brewer's yeast) activities of petroleum ether extract of Pseudarthria viscida (PEPV) stems & roots in albino rats. Pre-treatment of the animals with the plant extract (100 & 200 mg/kg, p.o.) has prevented the inflammation produced evident by the change in volume of paw oedema which is proportional to the dose. A maximum effect was seen at 200 mg/kg, which was competent to Indomethacin (10 mg/kg, i.p). The antipyretic effect of PEPV (100 & 200 mg/kg, p.o.), measured as percentage lowering in body heat was compared with st&ard, Paracetamol (150 mg/kg, p.o.). The anti-inflammatory & antipyretic activities showed dose-related response at 100 mg/kg & 200 mg/kg, when compared to the st&ard. This current research investigated & advocates the anti pyretic property & anti-inflammatory potency of Pseudarthria viscida, and it supports the application of the plant in medicine as per ethnopharmacology.

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INTRODUCTION

The plant named *Pseudarthria viscida* (L.) Wight & Arnott (Leguminosae) is a distributed al over southern India & found in Timor & Srilanka too [1]. It is located in the places to the south of Godavari river & it is often seen in Kerala because the plant grows in regions to 3000 feet in the high areas. The plant is called as Salaparni in Sanskrit & is an essential component in the ayurvedic medicine & formulations like Dashamoolaristha, Mahanarayanatailam & Dhantaratailam [2]. Ethnopharmacological sources reveal the astringent, bitter & emollient property of the plant. It also has anti-inflammatory, diuretic, anthelmintic aphrodisiac & cardiotonic properties.

It has a curative effect on vitiated conditions of vata & pitta, cough, bronchitis, asthma, tuberculosis, dyspepsia, diarrhoea, other fever, food poisoning, vomiting & general debility. A decoction of the roots is given for treating rheumatic pains, asthmas, heart disorders & piles. The root juice is provided as a nasal drop in case of headache & hemicranias [3, 4]. The root of this species had been proved for containing leucopelargonidin, flavonoids, phytosterols & proteins [5, 6].

Inflammatory response or process is a primary defence response of the body which helps to safeguard itself from any external agents like chemicals, allergens, burns & infections or other fatal stimuli. This long term & continuous inflammation is a factor of those long term illnesses. Even though it is the body defence response, it involves a very complex series of events & inflammatory pain mediators that included in the inflammation process, which will give rise to many diseases & pain. Presently in the market, synthetic drugs are showing many adverse & side effects. So, the investigations to find the anti-inflammatory medications with fewer side effects are the urgency of the hour.

Controlling the body heat needs a significant equilibrium among the intensity of heat & loss of body heat. The gland called hypothalamus will regulate the average & required body temperature. In fever & hyperthermia, average body temperature elevates & anti-inflammatory & antipyretics will control it back healthy. These drugs do not have any effect on temperature is raised because of physical workout or with a response to external climate. But usually elevated body temperature means that there may be an infection, damage to the tissue, tissue rejection of the grafts or any other malignancy. The above conditions elevate the production of interleukins, cytokinins, TNF alpha & IL-6 [7–9].

The plant has been screened for antioxidant, cytotoxic, antidiabetic & antidiarrhoeal activities. At present, there was no single study scientifically evaluated the literary sources have been performed out so far on anti-inflammatory & antipyretic activities of this plant. Therefore, this study was aimed at investigating the plant, P.viscida for its therapeutic potentials as anti-inflammatory & antipyretic agent [10].

MATERIALS & METHODS

Collection

The stems & roots of the plant, *Pseudarthria viscida* (L.) Wight & Arnott were easily collected on Tirumala hills, Tirupati, India & it was identified & authenticated**.** The herbarium specimen was stored at the library for future reference. These stems & roots were dried and powder & pass from 40-mesh sieve [11].

Extract preparation

This plant powder material extracted by petroleum ether, as phytosterols get extracted with this solvent, which is expected to be responsible for the pharmacological activity. Pet ether was removed by using a vacuum pump which yields a dark green residue (the yield 5.4% w/w, of the dry powder material used for extraction). This petroleum ether extract using Pseudarthria viscida (PEPV) was investigated for the phytochemistry & found to possess steroids, terpenoids & carbohydrates.

Phytochemical screening

The dried extract was investigated for the presence of different kinds of plant constituents [12].

Acute toxicity study

The toxicity studies were conducted according to OECD423 guidelines at doses of 30, 100, 300, 1000 & 2000mg/kg bodyweight. The investigations lasted up to 1week period.

Animals

Healthy adult albino Wistar rats of both sexes, which are between 150g & 200gm were kept in polypropylene cages & at 25 $\pm$ 2°C in 10-14hrs of light & dark cycle provided on normal food & water. Based on this acute toxicity values, doses 100 mg/kg & 200mg/kg orally were used for treatment in further experimentation [13].

Anti-inflammatory activity of the extract

Paw Edema Assay by carrageenan induction

The anti-inflammatory potency of the plant extract was evaluated by inducing the inflammation to rat paw, which causes oedema [14]. Thirty minutes after treatment of extract, 0.1ml of 1%carrageenan solubilized in saline which was injected directly in the plantar region on the hind paw on the left side of a rat to induce inflammation which finally expresses as oedema. The volume of rat paw was measured in the starting of the experiment & at regular intervals after inducer injection like 15min, 30min, 60min, 120min & 180min. The injection was done using a plethysmometer after immersing the rat paw in a mercury cell. The %inhibition of oedema volume in the treated group was compared within the control group. The standard drug, Indomethacin, was administered at 10mg/kg. The %inhibition of oedema was measured by using the below formula;

$$\%\text{of inhibition} = (1\text{-}Vt/Vc) \times 100$$

Where

Vc-Volume of the control group

Vt-volume of in test group

Cotton Pellet Granuloma

The cotton pellet granuloma method is adopted for investigating the proliferation of inflammation [14]. The animal grouping is similar to that of the previous study. Cotton pellets which are weighing approximately 30mg were synthesized & are sterilized in an oven at 125°C for 3hr. Each animal was anaesthetized using ether & 4 cotton pellets were implanted subcutaneously, two pellets under axillae right & left side & left & right groin area accommodated two pellets. Chemicals & extracts were given orally for 7days from pellets implantation. On 8^{th} day, all the animals are sacrificed & the cotton pellet was taken out. They are cleaned & blotted using a filter paper. These clean cotton were dried using an oven at 70C & the weights are noted. % inhibition of granulomas in rats was measured using the below formula:

percentage Inhibition=(Control Group-Test group)/Control group$\times$100

Antipyretic activity

Pyrexia Induced by Yeast

The division of animals was similar to the previous experiment. The natural body temperature in every rat was noted through the rectal route at fixed intervals. A thermistor probe is inserted 3-4 cm into the rectum of rats & attached to its tail with the help of tape. The average rectal temperature is measured. 15%w/v yeast was mixed in a 0.5%w/v methylcellulose solution & this suspension at 10ml/kg was subcutaneously injected into rats. 19hr after the yeast injection, the temperature measurement was taken as usual in prescribed timings & intervals. Now, the PEPV was administered through oral route at doses of 100 & 200mg/kg for two groups of rats, respectively. 5 ml/kg per weight of rats of 2% of Tween-80 solution is given orally to control group. 4^{th} group of animals were assigned the standard drug that is Paracetamol at a dose of 150mg/kg orally. The temperature was noted immediately after administration & observed again at 1hr interval up to the 4 hrs after the yeast injection.

Statistics

All the values are expressed in terms as mean$\pm$S.E.M. The significance of the data were tested using an unpaired two-tailed Student's t-test.

RESULTS AND DISCUSSION

The phytochemical analysis showed that the extract contained phytoconstituents such as phytosterols, terpenoids, fixed oils & fats in the pet ether extract (Table 1). It is evident from the Acute toxicity studies that the extract is safe at dose 2000mg/kg. An Anti-inflammatory effect of PEPV observed through Rat Paw Edema Assay induced by carrageenan was found higher at p<0.001 which is compared to 2% CMC that is control & Indomethacin that is Standard (Table 2). The %inhibition after 3hr were 70.73 % of indomethacin, 57.32 % & 66.46 % in case of 100 mg/kg & 200 mg/kg of PEPV respectively. In the cotton pellet method, the extract had significantly lowered the weight of cotton pellet of granuloma, which is a direct proportion to the dose. This lowering of the weight of a cotton pellet at two doses is 85.65 mg & 59.31mg respectively. However, reduction in inflammation by P.viscida 200 mg/kg was compatible with Indomethacin (53.84 mg).

Table 1: Phytochemical analysis of PEPV

Phytoconstituents	Petroleum ether extract
Alkaloids	-
Steroids	+
Glycosides	-
Terpenoids	+
Saponins	-
Flavonoids	-
Tannins	-
Polyphenols	-
Fixed oils & Fats	+
Carbohydrates	-
Proteins & amino acids	-

(+) Presence, (-) Absence

DISCUSSION

The Inflammatory process is body response of tissues towards injury or stimulus due for any external agents. Varied & continuous inflammation will act as a reason for chronic illness [13].

The results of this study indicate the petroleum ether extract of *Pseudarthria viscida* lowered the paw oedema significantly in a carrageenan-induced method in rats. So, the mechanism of action is by the histamine inhibition & prostaglandin or serotonin synthesis. This feedback of the extract of the drug in the carrageenan method showed an excellent peripheral anti-inflammatory potential of the plant (Tables 3 and 4). Generally, most of the anti-inflammatory & NSAID drugs possess antipyretic activities. Usually, NSAIDs exhibit

Table 2: Anti-inflammatory effect of the PEPV paw edemainduced by carrageenan

Dose	oedema volume (ml)						%inhibition
	0min	15min	30min	60min	120min	180min	
Contrl (5ml/kg)	0.79± 0.14	1.07± 0.12	1.39± 0.15	1.76± 0.13	1.84± 0.12	1.64 ±0.06	_
Standard (Indomethacin 10mg/kg)	0.82± 0.08	1.11± 0.10	1.15± 0.10	1.11± 0.10	0.65± 0.17**	0.48 ±0.04**	70.73
PEPV, 100mg/kg	0.76± 0.11	1.20± 0.18	1.25± 0.10	1.40± 0.14	0.85± 0.10*	0.70 ±0.20*	57.32
PEPV, 200mg/kg	0.81± 0.08	1.15± 0.15	1.15± 0.15	1.20± 0.18	0.75± 0.20**	0.55 ±0.04**	66.46

*p< 0.001, **p< 0.01, comparison to control values. PEPV - Petroleum ether extract of *Pseudarthria viscida* Linn.

Table 3: Effect of the PEPV on granuloma induced in Cotton pellet

S.No	Groups	Dose (mg/kg)	Dry weight (mg)
1	Control	-	107.35±0.91
2	Standard (Indomethacin)	10	53.84±0.52*
3	PEPV	100	85.65±0.48
4	PEPV	200	59.31±0.47*

*p< 0.001, **p< 0.01, comparison to control values. PEPV - Petroleum ether extract of *Pseudarthria viscida* Linn.

Table 4: Antipyretic effect of PEPV

Dose	Initial rectalthe temper-ature in °Cbefore injection	Temperature °C in 18 hrs of injection				
		0 hr	1 hr	2 hr	3 hr	4 hr
Control (5ml/kg)	37.02±0.02	39.96±0.02	39.40±0.03	39.12±0.07	38.69±0.03	38.05±0.03
Standard (Parac-etamol, 150mg/kg)	37.10±0.01	40.09±0.03	38.94±0.01^a	38.06±0.01^a	37.78±0.05^a	37.31±0.03^a
PEPV, 100mg/kg	37.08±0.03	39.98±0.01	39.60±0.01^b	39.24±0.02^b	38.03±0.05^b	37.81±0.08^a
PEPV,200 mg/kg	37.23±0.07	40.12±0.07^a	39.05±0.01^a	38.00±0.03^a	37.75±0.01^a	37.28±0.05^a

*p< 0.001, **p< 0.01, comparison to control values. PEPV - Petroleum ether extract of *Pseudarthria viscida* Linn.

their action by inhibiting PG's synthase in the hypothalamus [14]. So, the antipyretic activity of petroleum ether extract of Pseudarthria viscida is due to the inhibition of PG synthesis in hypothalamus. The anti-inflammatory & antipyretic activities of petroleum ether extract of *Pseudarthria viscida* may be due to the presence of sterols. Phytosterols are well-considered to fight the prostaglandins that play a significant role in the inflammation & pyrexia. Hence, the presence of phytosterols in the petroleum ether extract Pseudarthria viscida stems & roots may be responsible for its anti-inflammatory & antipyretic activities. In support of folklore claims for cure of inflammatory & pyrexia conditions where salaparni is used, could be justifiable.

CONFLICT OF INTEREST

Authors declared no conflict of interest.

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