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ANTI-INFLAMMATORY AND ANALGESIC ACTIVITIES OF *PYROSTEGIA VENUSTA* PRES. STEMS

Md. Rageeb Md. Usman * and Neelesh Chaubey

Department of School of Pharmacy, Sri Satya Sai University of Technology and Medical Sciences, Sehore - 466001, Madhya Pradesh, India.

Keywords:

Pyrostegia venusta Pers., Stems, Pharmacognostical, Physiochemical, Anti-Inflammatory, Analgesic

Correspondence to Author:
Mohammed Rageeb Mohammed Usman

Research Scholar,
Department of School of Pharmacy, Sri Satya Sai University of Technology and Medical Sciences, Sehore - 466001, Madhya Pradesh, India.

E-mail: rageebshaikh@gmail.com

ABSTRACT: Objective: *Pyrostegia venusta* (Ker Gawl.) Miers, Bignoniaceae, is native to the Brazilian Cerrado and popularly known as "cipó-de-são-joão". In Brazilian folk medicine, the flowers of *P. venusta* are used as a general tonic and a treatment for diarrhea, vitiligo, cough, and common infections and inflammatory diseases of the respiratory system. Nevertheless, there are still no studies on its possible anti-inflammatory and analgesic effects. **Methods:** The *P. venusta* methanolic and pet. ether extract was used to evaluate the anti-inflammatory and analgesic effects in carrageenan-induced paw edema and anti analgesic activity effect in hot plate method. **Results:** Stem extracts of *Pyrostegia venusta* demonstrated the analgesic activity at dose of 50 mg/kg body weight. At the end of one-hour percent analgesia induced by petroleum ether extract is 26.34% and that by total methanolic extract is 40.69%. The total petroleum ether extract produced 43.10% inhibition of paw edema, methanolic extract showed 54.31% inhibition of paw edema. Both the extracts had comparable activity. **Conclusions:** Hence it revealed that *Pyrostegia venusta* stem extracts had potent anti-inflammatory activity.

INTRODUCTION: Many species belonging to the Bignoniaceae family, such as *Pyrostegia venusta* (Ker Gawl). Miers are known to be of medicinal value [1]. *P. venusta* is popularly known in Brazil as "cipó-de-são-joão", "cipó-caititu", "cipó-tingá" and "dedo-de-moça" [2] and is widely distributed in the cerrado, which is noted as being a typical ecosystem of central and southeastern Brazil [3]. In folk medicine, the aerial parts of *P. venusta* are mainly used as an infusion or decoction.

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They are administered orally as a general tonic for the treatment of diarrhea, vitiligo, cough and common infections and inflammatory diseases of the respiratory system, such as bronchitis, flu and the common cold [4, 5, 6]. Previous studies demonstrated that the hydroethanolic extract of flowers of *P. venusta* attenuated the sickness behavior induced by lipopolysaccharide (LPS) in the forced swim and open field test, suggesting that the extract inhibits immune and inflammatory responses, including cytokine and prostaglandin production, supporting the popular use of *P. venusta* as a general tonic as well as a treatment for the general symptoms of flu and cold [7].

The literature records the phytochemical study of the flowers of *P. venusta*, from which the compounds β-sitosterol, n-hentriacontane, acacetin-7- O-β-glucopyranoside and meso-inositol have

been isolated [7, 8]. Other studies have indicated the presence of carotenoids in the flowers and rutin in the leave [9]. It has been demonstrated that the compounds acacetin-7-O-β-glucopyranoside and β-sitosterol showed anti-inflammatory activity [10, 11]. The objective of this study was to evaluate the anti-inflammatory and analgesic effects of the methanolic and pet. ether extract of *P. venusta* stems in animal models.

MATERIAL AND METHODS:

Plant Material: The plant specimens for the proposed study were collected from Maharashtra in the month of October 2016 were air dried in shade avoiding exposure to direct sunlight, then were pulverized in grinder. The plant was authenticated by Dr. D. A. Dhale, PG and Research Department of Botany, SSVPS's L. K. Dr. P. R. Ghogare Science College Dhule, Maharashtra, India, identified the plant and Voucher R-002. The powdered stem (# 60-80) were utilized for Soxhlet extraction.

Preparation of the Plant Extracts and Reference Drugs: The stems of *P. venusta* were dried in an oven at 40 °C and powdered. The *P. venusta* methanolic and pet. ether extract were obtained by Soxhlet extraction for 48 h. Both extract were concentrated on a rotary evaporator and then dried with a spray dryer (Büchi Mini Spray Dryer B-290).

Pharmacological Procedures:

Animals: Albino rats, Hoechst strain (100 - 120 gms) collected and housed under controlled light (12:12 h light: dark cycle; lights on at 6:00 am) and temperature conditions (23 ± 1 ºC) with access to water and food *ad libitum*. The animals were allowed to habituate to the housing facilities for at least one week before the experiments were started. All experiments were conducted according to India regulations for animal experimentation (CPCSEA), after approval by the Ethical Commission of Animal Experimentation (COPSSS UTMS/ANIL/17-03). The doses used in the present study were selected based on previous studies [12].

Evaluation of Anti-Inflammatory Activity in Rat: Carrageenan-Induced Mice Paw Edema: Paw edema was measured with a plethysmometer (Model 7140, Ugo Basile, Italy). The basal volume of the right hind paw was determined before the administration of any drug. After determination of the basal volume, the animals (n=6 per group) were divided into the experimental groups in such a way that the mean volumes of the different groups were similar. The vehicle, extract or ibuprofen was orally administered 1 h before pl. injection of carrageenan (1 mg/paw, 20 µl). The paw volume was measured at 1, 2, 3 and 4 h after injection of the inflammatory stimulus. The results are presented as the paw volume (ml) variation in relation to the basal.

Evaluation of Anti-Analgesic Activity in Mice:

Hot Plate Method: Test Drugs: Successive petroleum ether extract and successive methanolic extract. Swiss albino mice weighing 20 - 25 gm were divided into groups. The methanol and petroleum ether extract were made as suspension in 0.1% CMC in 0.9% saline. One group served as control that received 0.1 ml normal saline containing 0.1% CMC. The second group served as standard, which received pentazocine (10 mg/kg i.p). The remaining groups served as test groups. The temperature of hot plate was set at 55 ± 0.5 ºC. The cut off time was set at 20 sec. the animals were placed on the hot plate and time to lick paw / jumping / withdrawal of paw was recorded for each animal. The % analgesia was calculated using below mentioned formula.

$$\% \text{ Analgesia} = T_t - T_c / 20 - T_c \times 100$$

T_t = time required to lick paw in test animal.
T_c = time required to lick paw in control animal.

RESULTS AND DISCUSSION:

Evaluation of Anti-inflammatory Activity: In groups III and IV 100 mg/kg oral dose of extract was given to test group and in group II, 40 mg/kg oral dose of ibuprofen was given. After one-hour 0.1ml of 1% w/v carrageenan was given in sub plantar region in right paw in control as well as in all test groups. Then the reading of paw displacement volume of control and test group was noted at 0, 60, 120 and 180 min. Then the % inhibition of extract was calculated values **Table 1** and **2, Fig. 1** and **2**.

% inhibition of paw edema is calculated as:

$$1 - \frac{\text{Volume of test}}{\text{Volume of control}} \times 100$$

TABLE 1: ANTI-INFLAMMATORY ACTIVITY OF DIFFERENT EXTRACTS OF STEMS OF *PYROSTEGIA VENUSTA*

Group no.	Treatment	Dose	Time	Paw volume displaced in animal					Average Paw volume	Vt	% Inhibition Paw edema
				1	2	3	4	5			
I	Carrageenan	0.1	0	0.2	0.2	0.2	0.19	0.19	0.24	1.16/Vc	----
		ml of 1%	60	0.29	0.3	0.4	0.2	0.5	0.338		
			120	0.7	1	0.9	0.8	1.2	0.92		
			180	1.4	1.6	1.3	1.3	1.4	1.4		
II	Ibuprofen	40	0	0.21	0.2	0.3	0.2	0.2	0.222	0.44	
		mg/kg	60	0.7	0.5	0.5	0.3	0.5	0.5		62.06%
			120	0.6	0.7	0.7	0.6	0.5	0.62		
			180	0.8	0.6	0.7	0.5	0.7	0.66		
III	Pet-ether extract + carrageenan	100	0	0.2	0.2	0.19	0.2	0.21	0.204	0.66	
		mg/kg	60	0.5	0.3	0.4	0.4	0.3	0.38		43.10%
			120	0.8	0.6	0.7	0.6	0.5	0.64		
			180	0.8	1	0.8	0.8	0.9	0.86		
IV	Methanolic extract + carrageenan	100	0	0.3	0.19	0.18	0.2	0.2	0.214	0.53	54.31%
		mg/kg	60	0.3	0.4	0.5	0.2	0.3	0.34		
			120	0.4	0.3	0.6	0.8	0.7	0.56		
			180	0.9	0.6	0.7	0.8	0.7	0.74		

TABLE 2: % INHIBITION IN RAT HIND PAW EDEMA AFTER 3 h

Treatment	Dose	0 h	1 h	2 h	3 h	% Inhibition of paw edema at 3 h
Carrageenan	40 mg/kg	0.24%±0.002	0.33±0.05	0.92±0.08	1.4±0.05	------
Ibuprofen	40 mg/kg	0.22%±0.019	0.5±0.06	0.62±0.03	0.66±0.05	62.06%
Petroleum ether extract	100 mg/kg	0.20±0.005	0.38±0.03	0.64±0.05	0.86±0.04	43.10%
Methanolic extract	100 mg/kg	0.21±0.02	0.34±0.05	0.56±0.09	0.74±0.05	54.31

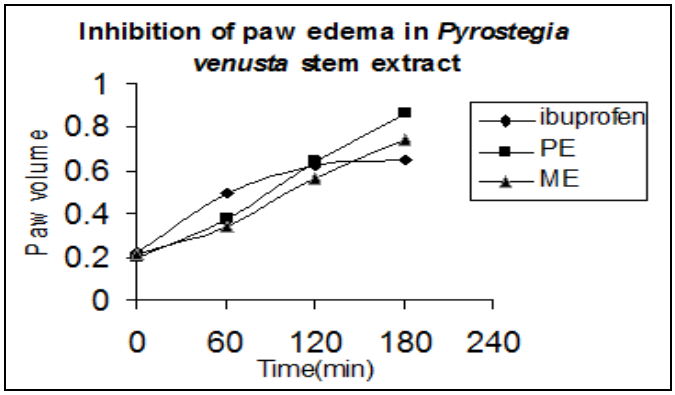

FIG. 1: INHIBITION OF PAW EDEMA IN *PYROSTEGIA VENUSTA* STEM EXTRACT

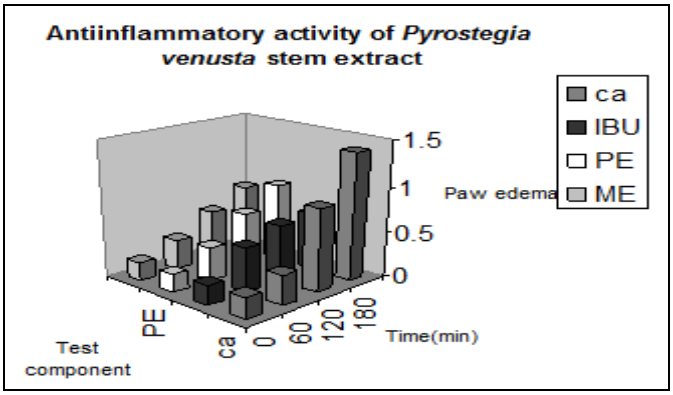

FIG. 2: ANTIINFLAMMATORY ACTIVITY OF *PYROSTEGIA VENUSTA* STEM EXTRACT

TABLE 3: ANALGESIC ACTIVITY OF STEM EXTRACTS OF *PYROSTEGIA VENUSTA* STEM EXTRACTS

S. no.	Treatment	Latency to lick paw (min)				
		0	30	60	90	120
1	Vehicle	3.6 ± 0.47	3. 65 ± 0.63	3.98 ± 0.78	3.7 ± 0.40	3.6 ± 0.20
2	Pentazocine	4.1 ± 0.40	9.2 ± 0.43	11.9 ± 0.85	10.2 ± 0.30	5.2 ± 0.80
3	Petroleum ether extract	3.80 ± 0.25	7.20 ± 0.28	8.20 ± 0.28	9.20 ± 0.40	5.40 ± 0.35
4	Methanolic extract	4.00 ± 0.40	7.92 ± 0.28	10. 5 ± 0.47	6.02 ± 0.47	4.25 ± 0.40

TABLE 4: % ANALGESIA INDUCED BY EXTRACTS AT DIFFERENT INTERVALS OF TIME

Treatment ↓ Time (min) →	% Analgesia ($T_t - T_c$ / 20 – T_c × 100)				
	0	30	60	90	120
Pentazocine	3.04%	33.94%	49.43%	39.87 %	9.75%
Petroleum ether extract	1.21%	21.71%	26.34%	33.74%	10.97%
Methanolic extract	1.46%	26.11%	40.69%	14.23%	3.96%

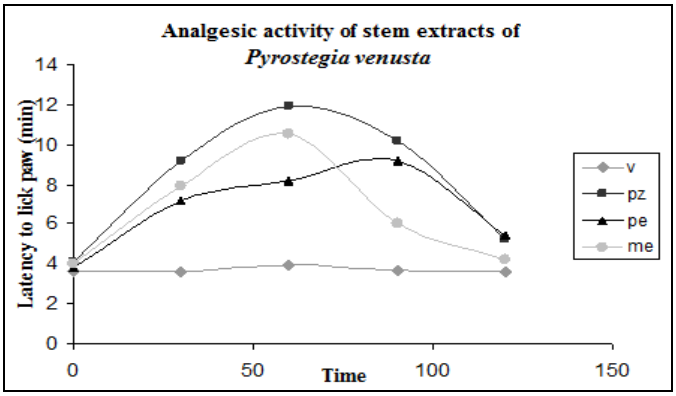

FIG. 3: ANALGESIC ACTIVITY OF STEM EXTRACT OF *PYROSTEGIA VENUSTA*

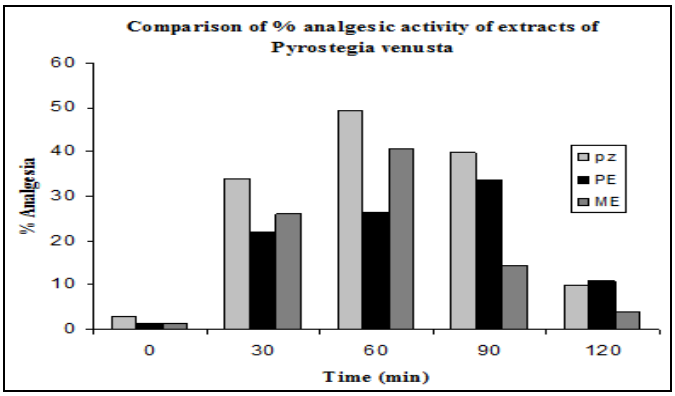

FIG. 4: COMPARISON OF % ANALGESIC ACTIVITY OF EXTRACT OF *PYROSTEGIA VENUSTA*

Stem extracts of *Pyrostegia venusta* demonstrated the analgesic activity at dose of 50 mg/kg body weight. At the end of one - hour percent analgesia induced by petroleum ether extract is 26.34% and that by total methanolic extract is 40.69% **Table 3** and **4**, **Fig. 3** and **4**.

The % analgesia was calculated using below mentioned formula.

$$\% \text{ Analgesia} = T_t - T_c / 20 - T_c \times 100$$

T_t = time required to lick paw in test animal.
T_c = time required to lick paw in control animal.

CONCLUSION: The stems of *Pyrostegia venusta* (Ker Gawl.) Miers, Bignoniaceae, are commonly used in traditional Brazilian medicine for the treatment of various inflammatory diseases. Our previous study demonstrated that the methanolic and pet. ether extract attenuated the sickness behavior in mice, supporting the popular use of stems of *Pyrostegia venusta* as treatment for the general symptoms of flu and cold (Veloso *et al*., 2010). However, its pharmacological actions have not been completely investigated to date. The present study demonstrated that the methanolic and pet. ether extract of the stems of *Pyrostegia venusta* display antianalgesic and anti - inflammatory properties. Because the extract did not produce any mortality in mice even at a dose of 5 g/kg, it may be considered relatively safe.

The method employed for anti-inflammatory evaluation was carrageenan induced hind paw edema in rats. The total methanolic extract exhibited 54.31 inhibition of paw edema, whereas petroleum ether extract showed 43.10 % inhibition. Which was comparable to standard drug ibuprofen. It revealed that *Pyrostegia venusta* stem extract has potent anti-inflammatory activity. Analgesic activity used for the screening of extracts for analgesic activity was hot plate method. Both the extracts displayed analgesic effects comparable to standard drug pentazocine. Petroleum ether extract produced 26.34% analgesia and methanolic extract produced 40.69% analgesia at the end of 1 h at the dose of 50 mg/kg.

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CONFLICT OF INTEREST: The authors declare no conflict of interest.

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