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ANTI-INFLAMMATORY AND ANALGESIC EFFECTS OF DIFFERENT EXTRACTS OF INDIAN *POLYGALA ERIOPTERA* IN EXPERIMENTAL ANIMALS

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ABSTRACT

Fractions of petroleum ether, chloroform, alcoholic, and water extracts of *Polygala erioptera* whole plant given by oral route at the dose of 2 mg/kg showed significant anti-inflammatory activities in rats. On the contrary, only the water fraction of methanol extract possesses a significant analgesic activity.

Key words : *Polygala erioptera,* Anti-inflammatory, Analgesic activity.

INTRODUCTION

Polygala erioptera Linn. a plant belonging to the family of Polygalaceae is grown as weed in most tropical countries[1,2]. It is widely distributed throughout the North Telangana districts of Andhra Pradesh. This plant is being for the treatment of pain, gastro-intestinal disorders and infectious diseases. It is widely used for healing of wounds and is also effective against bacteria, fungus and chronic white discharge[3,4]. There is no previous record and research work available on the traditional medicinal values of *Polygala erioptera.* Most of the ancient knowledge systems continued to survive by oral communication from generation to generation in rural as well as in tribal communities. The preliminary phytochemical studies reveal the presence of flavonoid glycosides: flavones, flavonoids, lignans, and fatty acids. Therefore, the present study was undertaken to demonstrate scientifically the antinociceptive and anti-inflammatory activities of the alcoholic and petroleum ether extracts of *Polygala erioptera* whole plant material in

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experimental animals.

EXPERIMENTAL

Plant material

Polygala erioptera Linn**.** whole plant material was collected freshly in and around our University campus, Warangal, South India. The plant material was identified in August 1996 and authenticated taxonomically by Dr. V. S. Raju, Department of Botany, Kakatiya University, Warangal. A voucher specimen of the collected sample was also deposited for the future reference.

Extraction and fractionation

Air-dried and powdered whole plant of *P. erioptera* was extracted with different solvents. The extracts were concentrated and fractionated to solid residues.

(i) Petroleum ether-Yield: 1.9 % of dry wt.

(ii) MeOH-Yield: 10.8 % dry wt. The concentrated extract was partitioned in the mixture hexane- MeOH-water (19 : 19 : 2). The methanol –water layer was concentrated and extracted consequently with Et_2O (yield: 1.2%), EtOAc (0.2%) and BuOH (0.6%); H_2O soluble part (7.3%)

(iii) Chloroform-Yield 14% of dry wt.

(iv) H_2O-Yield 15% of dry wt. A part of the extract after dialysis through cellophane gave cellophane (1.7%).

(v) From the another part of precipitate was afforded (1.4%) according to Wakabayashi et al[9].

The rest of the part was separated on Sephadex G-25 C with distilled water buffered at pH 7.5 yielding fraction of compounds with $M > 10^3$ (0.5%) and $M < 10^3$ (0.6%).

Test animals

Charles-Foster (CF) albino rats (110-130 g) of either sex were obtained from the animal house of Dept of Pharmaceutics, Banaras Hindu University, Varanasi. They were kept in the departmental animal house at 25 ± 2°C and relative humidity 45 – 51.5%, light and dark cycles of 10 and 14 h, respectively for 1 week before and during the experiments. The animals were provided with standard rodent pellet diet and water was allowed *ad*

libitum. Rearing up of animals in the experimental period and there upkeep during the entire experimental span confirmed to ethical guidelines laid down by Institutional Animal Ethical Committee (IAEC of BHU, India).

Anti-inflammatory effect : Carrageenan-induced rat paw edema

Anti-inflammatory activity was evaluated by measuring Carrageenan-induced paw edema according to Winter et al[5]. Inflammation was induced by injecting Carrageenan (sigma) (100 µg/rat) subcutaneously into the sub-planter region of the right hind paw. Rats were divided into groups of 10 animals each and treated with all the *P. erioptera* extract/fractions prepared at the oral dose of 2 mg/kg (1 h before Carrageenan injection). The control groups received saline (1 mL/kg) and indomethacin (2 mg/kg) was used as a reference compound.

Paw volume was measured before and 4 h after the Carrageenan injection using the modified plethysmometric methods according to Mokhort and Riabukha[6].

Analgesic effect : Paw-pressure test (Randall-Selitto)

Analgesic effect was evaluated by the paw-pressure test of Randall-Selitto[7] measuring the changes in the mechanical nociceptive threshold of the rats using an analgesimeter (Ugo Basile). A cut-off value of 500 g/cm^2 was used to prevent damage of the paw.

The induced paw hyperalgesia was assessed by injection of Carrageenan (100 µg /rat) subcutaneously into the sub-planter region of the right hind paw of the rat[5]. Rats divided into groups of 10 animals each were treated with all the *P. erioptera* extract or fractions at the oral dose of 2 mg/kg (1 h before carrageenan injection). The control group received saline (1 mL/kg). p.o. Dipyrone (200 mg/kg) was used as a reference compound. The nociceptive threshold was measured 4 h after Carrageenan administration.

Statistical analysis

The results were expressed as mean ± S.E.M. Student's t-test was used to verify the statistical significance at $P < 0.05$ between the treated and control groups.

RESULTS AND DISCUSSION

Whole plants of *P. erioptera* were extracted with petroleum ether, MeOH, $CHCl_3$ and H_2O, and then fractionated in order to obtain enriched fractions. A complete inhibition

of edema was shown with the EtOAc fraction of the MeOH extract, the water cellophane fraction and the petroleum ether extract. A significant effect was registered for all the other fractions with an inhibition of edema ranging form 27 to 70%. Moreover volatile fractions also showed an inhibition of 75% of edema (Table 1).

Table 1. Effect of oral administration[a] of extracts of *P. erioptera* on Carrageenan induced paw edema in rats

Treatment	Paw edema[b]	Inhibition (%)
Control (Saline, 1 mL/kg)	4.80 ± 0.60	-
Indomethacin	2.20 ± 0.10	54.2
Petroleum ether extract	No edema	100.0
MeOH extract		
Et_2O fraction	1.40 ± 0.06	70.8
EtOAc fraction	No edema	100.0
BuOH fraction	4.80 ± 0.60	-
H_2O fraction	3.00 ± 0.06	37.5
Chloroform extract	3.50 ± 0.03	27.1
H_2O extract		
Cellophane fraction	No edema	100
H_2O precipitate	1.80 ± 0.01	62.5
$M > 10^3$ fraction	3.20 ± 0.04	33.3
$M < 10^3$ fraction	2.00 ± 0.03	58.3
Volatiles	1.2 ± 0.01	75.0

[a]Administered at doses of 2 mg/kg.

[b]Paw edema in relative units (cm); All values are statistically different from controls, ($n = 10$; $P < 0.05$).

As far as the analgesic activity is concerned, only aqueous fraction of the MeOH extract showed tendency toward hyperalgesic effect (Table 2).

Table 2. Effect of oral administration[a] of extract, precipitate and fractions of *P. erioptera* on paw-pressure test in rats

Treatment	Pressure[b] (g/cm^2)	Variation (%)
Control (Saline, 1 mL/kg)	124 ± 10	-
Dipyrone (200 mg/kg)	170 ± 3*	+ 37.1
Petrolieum ether extract	104 ± 4*	- 16.1
MeOH		
Et_2O fraction	100 ± 10*	- 19.3
EtOAc fraction	100 ± 7*	- 19.3
BuOH fraction	1.34 ± 6	+ 8.1
H_2O fraction	210 ± 5*	+ 69.3
Chloroform extract	86 ± 5*	- 30.6
H_2O extract		
H_2O cellophane fraction	114 ± 6	- 8.1
H_2O precipitate	104 ± 7	16.1
M > 10^3 fraction	96 ± 5*	- 22.6
M < 10^3 fraction	130 ± 4	+ 4.8

[a]Administered at dose of 2 mg / kg.

[b]Values are mean ± S.E. (n = 10); *P < 0.05 vs. control; Student's t-test.

From the overall results, we can conclude that almost all the tested fractions showed a significant anti-inflammatory activity while only the aqueous fraction of MeOH extract showed a significant analgesic activity. These results led to the conclusion that different types of compounds contribute to the activity of *P .erioptera*.

Further studies are required to establish the mechanism of the anti-inflammatory and analgesic effects and the structure of the active compounds.

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