International Journal of Current Pharmaceutical Research
Vol 1 Issue 1, 2009

Research Article

ANTI -INFLAMMATORY AND ANALGESIC ACTIVITY OF BARK EXTRACT OF *PTEROSPERMUM ACERIFOLIUM*

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ABSTRACT

The role of ethanolic extract of *Pterospermum acerifolium* bark extract on different anti inflammatory and analgesic models. The extract demonstrated significant anti inflammatory activity against carrageenan induced, mediators induced and arachidonic acid induced rat paw oedema, significant inhibition of acetic acid induce writhing and tail clip induced anagesia were observed to occur with the extract. On the basis of finding it may inferred that P.acerifoiimum is an anti-inflammatory analgestic agent that blocks histamine and serotonin pathway.

Key words: Paw oedema, Analgesic, Arachidonic acid, *Pterospermum acerifolium*

INTRODUCTION

Inflamation is the complex biological response of vascular tissue to harmful stimuli ,such as pathogens ,damaged cells on irritants. Inflammatory disease are a major cause of morbidity of the working force through out world. Inflammatory response of the body are achieved by the increase movement of plasma and leucocyte from the blood in to the insured site.

Although inflammatory disease are oldest known to mankind , there is no substintial progress in the therapeutic regimen of inflammation in terms of efficacy and safty.Many commerciably avaiable product have produce a dramatic symtomatic imrovement in inflammatory condition but can not arrest the prgress of disease prosess and all of them shared some undesirable side effect.

Pterospermum acerifolium wild (Sterculiaceae) commonly known as 'Kanak champa' is a shurbs distributed in tropical Asia. It has been traditionally used for blood troubles, inflammation, ulcer, tumors, leprosy and for small pox eruptions (wealth of India).

In an earlier study in our laboratory, the ethanolic extract of P. acerifolium were found to possess antiulcer activity.

The work was aimed at the scientific validation of the ethnopharmacological calim about anti inflammatory and analgesic properties of the bark extract.

Materials and methods

Plants materials P. acerifolium bark were collected from East Midnapur (West Bengal, India) in July 2007 and authenticated by comparison with a voucher. Specimen in Botanical Survey of India, Kolkata.

One kg of the air dried barks were blended to a fine powder and extracted with Pet. Ether, chloroform and ethanol for 6 days (144hours). The extract was concentrated using a rotavapor. The extract was dissolved in normal saline before orally administrating 150 and 300 mg /kg of the extract to the rats. The preliminary investigation for the inflammatory activity on rat paw edema induced by carrageenan.

Phytochemical screening

The extract and its fraction were tested by the librman Burchard, Ferric

chlorides, Magnesium tracings and Vanillin sulphuric acid tested to determine the presence of sterols phenolic compound, flavonoids and saponins respectively.

Chemicals

Indomethacin (sigma) carrageenan. (sigma), histamine (Fluka) and serotonin (SHT) (Fluka) were used.

Animals

Wistar rats (140 – 150g) of both sexed were used for the studies. The rats were obtained from the department of Ph. Cology Jadavpur University, Kolkata-32. The animals were housed in cages under standard laboratory conditions (12:12 hours light/ dark cycle at 25 $\pm$ 2^0 C). They had free access to standard commercial diet and water. The animals were divided into groups of six and fasted for 12 hours, before the experiments. The ethical guidelines for the investigation of animals used in experiments were followed in all tests.

Carrageenan induced Rat paw edema

Carrageenan. (type –1, 0.1 ml of 1% w/v solution) was injected into the planter aporeurosis of the right hind paw of the rats (winter, et al, 1962). The control vehicle or P. acerifolium extract. (150 and 300 mg/kg oral) were fed orally 30min prior to the injection of the carrageenan.. The paw volume was then measured just before and on hourly basis following carrageenan administration using the volume displacement method of with the help of plenthysmometer (Bhatt, et al, 1977).

Mediators induced rat paw oedema:-

The method of Parmar and Ghosh (1978) was essentially followed for this experiment 0.1ml solution of histamine base (10^{-3} g/ml; 1hr), serotonin (10^{-3}g/ml; 30min) and prostaglandin E_2 (10^{-6}g/ml; 30min) were injected into the hind paw after 30min following administration of P. acerifolium extract (150mg/kg and 30mg/kg; oral or indomethacin (20mg/kg oral) to the test groups of rats. The oedema volume was determined. The respective dosage of the mediators and the time interval for determination of oedema volumes are indicated in parenthesis against each.

Arachidonic acid induced rat paw oedema

Paw oedema was induced by injecting 0.1ml of 0.5% (w/v) arachidonic acid (in 0.2 M carbonate buffer; PH 8.43 – 8.56) into the suhplanter tissue of the right hand. Paw of male rats (n-6 in each group). The test groups were pretreated 2hrs earlier with indomethacin (20mg/kg; oral) or 30min. earlier with P. acerifolium extract (150 or 300mg/kg oral). Volume displacement was measured prior to and in after arachidonic acid injection (Martino et al, 1987).

Acetic acid induced writhing

Control vehicle, P. acerifolium extract (150 and 300mg/kg) and Indomethacin (20mg/kg) were administered orally to different groups of animal and 30minutes later 3% (v/v) acetic acid (0.1ml/10g mice, i.p.) was injected into each animal and the number of writhing response were recorded for a period of 20min (Koster, et al; 1959).

Tail clip induced Analgesia

P. acerifolium extract (150 and 300mg/kg; oral), Pethidine (10mg/kg, i.p.) and control vehicle (oral) was administered to different groups of mice (pre-screened). Following the administration of the test substance. And the response (i.e. attempt to remove the applied clip from the tail) of each animal was determined (Bianchi, et al: 1954).

Results

Results are given in tables

Table 1: Effect of *P. acerifolium* extract and Indomethacin on time course of carrageein induced rat paw oedema [Results are mean ± SE, n=6] [Dose of P. acerifolium extract (T1 = 150mg/kg, T2 = 300mg/kg oral) and Indomethacin N = 20mg/kg.

Treatment	Mean Oedema Volume (ml) at different intervals following Carrageenin injection					
	1st Hr.	2nd Hr.	3rd Hr.	4th Hr.	5th Hr.	6th Hr.
Control	0.36 ± 0.04	0.52 ± 0.02	0.65 ± 0.03	0.67 ± 0.01	0.59 ± 0.02	0.56 ± 0.01
T_1	0.32 ± 0.01	0.41 ± 0.01*	0.45 ± 0.03*	0.42 ± 0.02*	0.37 ± 0.03*	0.36 ± 0.03*
T^2	0.14 ± 0.03**	0.21 ± 0.02*	0.15 ± 0.02*	0.07 ± 0.03*	0.06 ± 0.03*	0.06 ± 0.01*
N	0.017 ± 0.02*	0.26 ± 0.01**	0.13 ± 0.01*	0.04 ± 0.02*	0.03 ± 0.03*	0.02 ± 0.03*

P value vs. control (by students 'T' test) **P <0.01, * P<0.001

Table 2 : Effect of *P. acerifolium* extract on oedema induced by different mediators (results are mean + SE n=6) Dose of P. acerifolium extract (T1 = 150mg/kg, T2 = 300mg/kg; oral) and Indomethacin (N = 20mg/kg; oral)

S. No.	Histamine induced mean oedema volume (ml)				Serotonine induced mean oedema volume (ml)				PGE2 induced mean oedema volume (ml)			
	Control	T_1	T_2	N	Control	T_1	T_2	N	Control	T_1	T_2	N
1.	0.47	0.36	0.17	0.08	0.34	0.39	0.17	0.11	0.24	0.28	0.11	0.09
2.	0.27	0.33	0.18	0.06	0.51	0.35	0.12	0.01	0.34	0.17	0.33	0.14
3.	0.26	0.25	0.23	0.19	0.45	0.33	0.20	0.10	0.46	0.29	0.33	0.24
4.	0.29	0.17	0.18	0.15	0.38	0.34	0.17	0.15	0.40	0.19	0.36	0.16
5.	0.34	0.27	0.15	0.17	0.36	0.25	0.20	0.06	0.28	0.49	0.26	0.14
6.	0.37	0.33	0.18	0.11	0.50	0.39	0.05	0.20	0.24	0.28	0.15	0.16
Mean ± SE	0.33 ± 0.03	0.28± 0.03	0.165 ±0.02**	0.12± 0.02	0.42 ±0.03	0.35 ±0.02	0.13± 0.02*	0.10± 0.03*	0.32 ± 0.04	0.28 ±0.05	0.257 ±0.04	0.15 ± 0.02**
Inhibition %	_	13.64	50.00	61.82	_	16.62	69.05	75	_	13.20	21.16	52.45

'P' value vs. control (by student 'T' test) P <0.01, P<0.001

Table 3: Effect of *P. acerifolium* extract on Arachidonic acid induced rat paw oedema (results are mean ± S E n=6) [Doses of P. acerifolium extract (T1=150mg/kg; T2 = 300mg/kg oral) and indomethacin N = 20mg/kg; oral]

Animal No.	Mean Oedema volume (ml)			
	Control	T_1	T_2	N
1.	0.74	0.41	0.28	0.15
2.	0.68	0.55	0.23	0.12
3.	0.67	0.51	0.25	0.13
4.	0.64	0.49	0.23	0.07
5.	0.70	0.44	0.43	0.14
6.	0.62	0.46	0.29	0.22
Mean ± SE	0.64 ± 0.05	0.48 ± 0.22**	0.285 ± 0.33*	0.14 ± 0.02*
Inhibition %	-	2500	50.25	78.13

P value vs. control (by students 'T' test) **P <0.01, * P<0.001

Table 4: Effect of P. acerifolium extract on acetic acid induced writhing in mice (results are mean + SE mean + SE; n=10) [Doses of P. acerifolium extract (π=150mg/kg; T2 = 300mg/kg; oral) and indomethacin (N=20mg/kg, oral].

Animal No.	Number of writhing observed			
	Control	T_1	T_2	N
1.	24	31	30	9
2.	32	27	32	6
3.	36	32	26	3
4.	35	33	28	10
5.	30	30	30	5
6.	32	29	35	4
7.	30	38	27	11
8.	26	32	30	8
9.	39	39	33	14
10.	33	32	32	8
Mean ± SE	32.2 ± 1.44	31.8 ± 1.29	30.3 ± 0.88	7.8 ± 1.06*
Inhibition %	-	-	-	75.78

P value vs. control (by students 'T' test) * P<0.001

Table 5: Effect of P. acerifolium extract and pethidine on tail clip induced analgesia in mice (results are mean ± SE mean ± SE) [Doses of P. acerifolium extract (T1 =15mg/kg T2= 300mg/kg; oral and pethidine (10mg/kg, i.p.]

Drug	No. of Animal tested	No. of animals abstained from removing the clip after the following time gaps		Analgesic action in comparison to control
		15 Min.	30 Min.	
Control	10	0	0	-
T_1	10	0	0	0%
T_2	10	0	0	0%
Pethidine	10	10	10	100%*

P value vs. control (by students 'T' test) * P<0.001

Discussion

The results of this study indicate the bark extract of P.acerifolium possess acute and chronic inflammatory activity against various phlogistic agents.

Carrgeenin induced rat paw oedema is usually biphasic in nature (Lo et al 1987) and it has been observed that 2nd phase of the oedema in effectively inhibited by commonly used steroids and NSAIDs (vinegar et al 1969), that the early phase in carrageenan paw might be a result of trauma caused by injection. Although, the phase in found to be transient in nature and it could be detected following the measurement of paw volume in the first hour following carrageenan administration. Further it has been suggested that the first phase is mainly mediated by release of various inflammatory mediators, namely histamine, serotonin, and bradykinin, surrounding the damaged tissue while the 2nd phase is due to generation of eicosaroids derived from the metabolism of arochidonic acid (vinergar et al, 1987). Studies with P. acerifolium extract showed that following oral administration there is significant inhibition of carrageenin induced paw at does of 150 and 300mg/kg (oral). These observation indicate the effectiveness of the P. acerifolium extract against oedema formation (a cardial sign of inflammation). It was further observed that the paw volume in the control group of animals. Significantly increased with time and attend a maximum value at the end of 4hours. Thus our observation is in conformity with earlier reports of vinegar et al (1969). However P. acerifolium extract and Indomethacin (standard anti-inflammatory agent) significantly reduced the paw volume in both phases of inflammation. The P. acerifolium extract also significantly reduced histamine and serotonin induced paw inflammation similar inhibitory activity was also observed in PGE_2 induced paw oedema. Where percentage of inhibition was comparatively less than that of histamine and serotonin. Thus our finding indicated this effectiveness of orally administered P. acerifolium in reducing the oedemogenic activity of the various mediators involved in the early phase of inflammation.

The cytokines increase the synthesis of PGE_2 in circumventicular organs. The PGE_2 so formed causes an increase in cyclic AMP which in turn stimulates hypothalamus toelevate the body temperatine. However despite of

effectiveness of P. acerifolium extract against PGE_2 induced inflammation.

In many instances, it has been observed that both inflammation and pain can co-exist, and this may also be co-related. So, it could be advantageous for an ideal anti inflammatory drug to possess. Simultaneous analgesic activity. According to previous reports the tail clip induced analgesic response was found to be more sensitive for the centrally acting analgesics, where as acetic acid induced abdominal writhing (in mice) has been commonly used for the detection of central and peripheral analgesic (palanichamy and Nagrajan; 1990 Fukawa et al, 1980). According to collier et al (1968) acetic acid is known to act indirectly by inducing the release of endogeneous mediators, which in turn stimulate the no ciceptive neurous that are sensitive to NSAIDs and opiods. Where as the analgesic response produced by acetic acid may also be attributed to lipoxygenase products (Levini et al, 1984). In present study, P. acerifolium extract in effective against both acetic acid induced writhing as well as the tail clip induced model of analgesia. Thus our findings suggest that bioactive flavounes or polyphenoles might not necessarily exhibit anti inflammatory activity with simultaneous analgesic response. Therefore considering the present state of affairs with conventional NSAIDs. the P. acerifolium extract might as a cheaper and convenient alternative against anti inflammatory state.

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