Vol 1 | Issue 1 | Jul –Dec 2010 | 17-20.

INTERNATIONAL JOURNAL
OF
PHYTOPHARMACY RESEARCH
www.phytopharmacyresearch.com

EVALUATION OF ANALGESIC AND ANTI-INFLAMMATORY ACTIVITIES OF *Xanthium strumarium L.*

***K.K. Senthil Kumar, P. Suresh, P. Chandrakamal, A. Pavan Kumar, D. Narayanamurthy, Afreen Nishath, M. Haritha**

*Department of Pharmaceutical science, St.Peter's College of Pharmacy, Kazipet, Warangal, Andhra Pradesh, India-506 001.

ABSTRACT

The petroleum ether extract of *Xanthium Strumarium L.* (Family-Compositae), was evaluated for analgesic and anti-inflammatory activity at the doses of 250 and 500 mg/kg body weight. The tail immersion and acetic acid writhing response in mice were used to assess analgesic activity. The acute toxicity study of the extract had shown no sign of toxicity up to a dose level of 2000mg/kg body weight. Carrageenan induced paw edema in rats, which is an acute model used to assess anti-inflammatory activity. The extract has inhibited paw edema in dose related manner. A dose dependent analgesic action was obtained against tail immersion and writhing test indicating that analgesic activity may be involved in the inhibition of the pain. Thus the petroleum ether extract of *Xanthium Strumarium L.* possess significant analgesic and anti-inflammatory activities.

KEYWORDS: *Xanthium Strumarium L.,* Anti-inflammatory, Analgesic, Writhing.

INTRODUCTION

Xanthium Strumarium L. compositae, is a common weed found in India. The whole plant, specially root and fruit, is used as medicine. According to ayurveda, *Xanthium Strumarium L.* is anthelmentic, antipyretic, antiepileptic, diuretic, cooling laxative, fattening, alexiteric, and tonic, digestive and improves appetite, voice, complexion, and memory. It cures leucoderma, poisonous bites of insects, salivation and fever. Seed yields semi-drying edible oil (30-35%). Which resembles sun flower oil and used in bladder infection, herpes can be used as manure where shell can be used as activated carbon [1].

On the basis of traditional use for treating anti inflammatory and analgesic. Since the effects of xanthium strumariumL has been experimentally not conformed. Therefore the aim of present investigation was to evaluate the claimed analgesic and ant inflammatory activity of *Xanthium strumarium L.* in albino wistar rats.

MATERIALS AND METHODS

Plant material

The whole plant of *Xanthium strumarium L.* was collected from Thirupathi, Talakona, Tirumala, Andhra Pradesh, India. The whole plant were dried under shade, powdered and stored in an air tight container.

Preparation of extract

The collected whole plant was dried at room temperature, pulverized by a mechanical grinder, sieved through 40mesh. About 120g of powdered materials were extracted with petroleum ether (60°-80°C) using soxhlet apparatus. The extraction was carried out until the extractive becomes colourless. The extracts is then concentrated and dried under reduced pressure. The solvent free semisolid mass thus obtained is dissolved in normal saline and used for the experiment. The percentage yield of prepared extract was around 9.3%w/w.

***Corresponding Author K.K.Senthil Kumar M.Pharm., (Ph.D) E mail:** kksenthil.a@gmail.com

Phytochemical analysis

The petroleum ether extract of *Xanthium Strumarium L.* was subjected to qualitative analysis for the various phyto-constituents. Standard methods were used for preliminary qualitative phytochemical analysis of extract [2].

Experimental Animals

Wister albino rats weighing between 150-200gm each were used for this experiment. They were procured from St.Peter's College of Pharmacy, Kazipet, Warangal, Andhra Pradesh,, India. The animals were kept under standard condition in an animal house approved by committee for the purpose of control and supervision of experiments on animals (CPCSEA). They were housed in polypropylene cages and maintained at 27±2^{o}C; The animals were given standard diet. Ethical committee clearance was obtained from IAEC (Institutional Animal Ethics Committee) of CPCSEA.

Acute toxicity study

Acute toxicity study of petroleum ether extract of *Xanthium Strumarium L.* was determined by acute toxic class method of OECD guidelines. In acute oral toxicity study mortality was not observed up to 2000mg/kg body weight [3].

Analgesic Activity of *Xanthium strumarium L.*

Writhing test

Abdominal constriction induced by intraperitoneal injection of acetic acid was carried out by method of Koster *et al.,* [4]. *Xanthium strumarium L.* extract was tested at 250 and 500 mg/kg, p.o and Indomethacin (10 mg/kg, p.o) a reference analgesic and anti-inflammatory drug, here the writhing inhibition produced by the PEXS was determined by comparing the reference drug. Intraperitoneal injection of acetic acid (0.7%) at a dose of 0.1 ml/10g of body weight was used to create pain sensation. The number of writhings was calculated for 10 min, 10 min after the application of acetic acid.

Tail Immersion test

The basal reaction time to radiant heat by placing the tip of the tail in a beaker of water maintained at 55°C was carried out. The *Xanthium Strumarium L.* extract was tested at 250 and 500 mg/kg, p.o and compared to the reference compound Indomethacin 10 mg/kg. p.o. Tail withdrawal is taken as the end point, a cut off point of 15 sec is observed to prevent the damage to the tail. The percent increase in reaction time at each time interval was calculated.

Anti-Inflammatory Activity of *Xanthium strumarium L.*
Carrageenan – Induced rat paw edema

Anti-Inflammatory activity was evaluated using the carrangeenan induced rat paw edema [5]. The *Xanthium Strumarium L.* extract was tested at 250 and 500 mg/kg, p.o and indomethacin 10mg/kg, p.o is a reference compound. The inhibition of the edema produced by the plant drug is compared to the reference drug. After one hour of the treatment of the drugs, 0.1 ml of 1% w/v carrageenan suspension was injected subcutaneously into the plantar surface of the right hind paw. The paw volume was measured by using plethysmometer up to 3 hours after carrageenan injection.

$$\text{Percentage edema} = \frac{V_t - V_o}{V_o}$$

V_t = Volumes for each group
V_o = Volume obtained for each group before any treatment

$$\text{Percentage inhibition of edema} = \frac{(V_o - V_t)\text{Control} - (V_t - V_o)\text{treated}}{(V_o - V_t)\text{Control}} \times 100$$

Statistical Analysis

The data were expressed as mean ± standard error mean (S.E.M). The significance of differences among the group was assessed using one way and multiple way analysis of variance (ANOVA). The test followed by Dunnett's test, p values less than 0.05 were considered as significance.

RESULTS
Analgesic activity
Writhing test

In case of the acetic acid writhing test, at doses of 250 and 500 mg/kg the PEXS inhibited the writhing responses and the number of writhes were significantly lower than the control group and the maximum inhibition is seen at 500 mg i.e., 64.01%. Indomethacin has produced as protective effect and exhibited 74.96% of inhibition at a dose of 10 mg/kg. (**Table 1**)

Tail immersion test

The PEXS at the doses of 250 and 500 mg/kg produced significant delay in response of tail withdrawal compared to control and it was higher at 500 mg/kg and the delay in response was higher by indomethacin at a dose of 10 mg/kg. **(Table 2)**

Anti-inflammatory study

The percentage inhibition of edema values of carrageenan induced rat paw edema in the table 3 was given. The PEXS in the doses of 250 mg and 500 mg/kg body weight showed 67.02% and 73.51%. Inhibition of edema and at 500 mg dose the inhibition was higher, however the indomethacin 10 mg/kg has exhibited a protective effect and the percentage inhibition of edema was 78.37%. (Table 3)

Table 1. Analgesic effect of petroleum ether extract of *Xanthium strumarium* L. (PEXS) in acetic-acid induced writhing test

Group	Design of treatment	Number of writhings	% inhibition
I	Control (Normal saline, 10 ml/kg)	54 ± 1.16	---
II	PEXS (250mg/kg bw, p.o)	34.43 ± 1.38***	36.24
III	PEXS (500 mg/kg bw, p.o)	19.43 ± 1.20***	64.01
IV	Indomethacin (10 mg/kg bw, p.o)	13.52± 1.57***	74.96

n=6, values are expressed as mean ± SEM, *P < 0.05, ** P < 0.01 when compared with control.

Table 2. Analgesic effect of petroleum ether extract of *Xanthium Strumarium L.* (PEXS) in tail immersion method.

Group	Design of treatment	Tail withdrawal in sec					
		0 min	15 mins	30 mins	60 mins	120 mins	180 min
I	Control (Normal saline,10 ml/kg, p.o)	2.52±0.21	3 ± 0.12	2.56± 0.33	2.79 ± 0.32	3.16 ± 0.31	2.83 ± 0.31
II	PEXS (250mg/kg bw, p.o)	3.18±0.32	4.6±0.42	5.11±0.46**	4.94 ± 0.72*	5.66±0.33*	5.76±0.50*
III	PEXS (500 mg/kg bw, p.o)	3.34±0.32	4.54±0.46	5.46±0.39**	5.24±0.36**	6.32±0.34**	7.2 ± 0.16**
IV	Indomethacin (10 mg/kg bw, p.o)	3.48±0.18	5.28±0.42*	6.3±0.23**	6.4 ± 0.42**	7.73±0.44**	9.17±0.82**

n=6, values are expressed as mean ± SEM, *P < 0.05, ** P < 0.01 when compared with control.

Table 3. Effect of Xanthium Strumarium L. on carrageenan induced paw edema

Group	Design of treatment	Mean paw volume (ml)						% inhibition after 180 mins
		0 min	15 mins	30 mins	60 mins	120 mins	180 mins	
I	Control (Normal saline, 10 ml/kg)	0.80 ± 0.01	1.10 ±0.04	1.49 ±0.03	1.18±0.03	1.84 ± 0.02	1.85±0.02	---
II	PEXS (250mg/kg bw, p.o)	0.83± 0.01	1.02 ±0.02	1.20±0.02*	1.08±0.02*	0.88 ±0.01**	0.61±0.01**	67.02
III	PEXS (500 mg/kg bw, p.o)	0.81±0.02	0.92±0.02**	1.02 ± 0.01	0.89 ±0.02**	0.70 ±0.01**	0.49±0.01**	73.51
IV	Indomethacin(10 mg/kg bw, p.o)	0.81± 0.01	0.85±0.02**	0.9 ± 0.02**	0.80±0.01**	0.6 ± 0.01***	0.40±0.01**	78.37

n=6, values are expressed as mean ± SEM, *P < 0.05, ** P < 0.01 when compared with control.

DISCUSSION

In the present study the potential analgesic and Anti-inflammatory effect of the petroleum ether extract of *Xanthium Strumarium L.* was investigated. The results indicate that the oral administration of PEXS exhibit a significant and dose dependent protective effect on chemical (acetic acid injection) and thermic (heat) painful stimuli at the doses of 250 and 500 mg/kg and indicates that PEXS possess both peripheral (writhe reduction) and central (prolongation of tail withdrawal) effects.

Carrageenan-induced edema has been commonly used as an experimental animal model for acute inflammation and is believed to be biphasic. The early phase (1–2 h) of the carrageenan model is mainly mediated by histamine, serotonin and increased synthesis of prostaglandins in the damaged tissues surroundings. The late phase is sustained by prostaglandin release and mediated by bradykinin, leukotrienes, polymorphonuclear cells and prostaglandins produced by tissue macrophages [6]. The inhibitory activity shown by the extract of *Xanthium Strumarium L.* (500 mg/kg, p.o) over a period of 3h in carrageenan-induced paw inflammation was quite similar to that exhibited by the group treated with indomethacin. These results indicate that it acts in later phases, probably involving arachidonic acid metabolites, which produce an edema dependent on neutrophils mobilization [7]. Thus, the results of the study would support the traditional use of *Xanthium Strumarium L.* in some painful and inflammatory conditions.

The intraperitoneal administration of agent acetic acid that irritate serous membranes provokes a stereotypical behavior in mice and rats which is characterized by abdominal contractions, movements of the body as a whole, twisting of dorsoabdominal muscles, and a reduction in motor activity and coordination [8]. The quantification of prostaglandins by radioimmunoassay in the peritoneal exudates of rats obtained after the intraperitoneal injection of acetic acid demonstrated high levels of prostaglandins $PGE_{2\alpha}$ and $PGF_{2\alpha}$ during 30 min after stimulus [9]. It should be taken into consideration that the mechanism involved in the genesis of the carrageenan-induced edema can cause the release of prostaglandins and kinins, among other substances [10]. The writhing test has shown results similar to that obtained in the edematogenic assay using carrageenan.

On the other hand, the lack of influence of extracts of *Xanthium Strumarium L.* on the reaction time of mice submitted to the tail immersion is consistent with the interpretation that its analgesic property does not have a central origin, having an analgesic effect in the acetic acid writhing test that is mostly mediated via a peripheral mechanism by interfering with the local reaction caused by the irritant or by inhibiting the synthesis, release and/or antagonising the action of pain mediators at the target sites [11].

Finally, the results of the present study confirm that *Xanthium Strumarium L.* has analgesic and anti-inflammatory activities. Therefore, the native practioners using this plant for treatment of pain and fever. There is a need for further studies in order to isolate the active ingredients in the plant that is responsible for its biological activities and to elucidate the mechanism of action of these active ingredients.

REFERENCES

1. Agharkar SP. Medicinal plants of Bombay presidency, PBI, Scientific Publishers, Jodhpur (India), 1991, 230.
2. Harbone JP. Phytochemical methods, a guide to modern technique of plant analysis *(Chapmann and Hall, London),* 1973, 1-271.
3. OECD 2002. Acute oral toxicity. Acute oral toxic class method guideline 423 adopted in: Eleventh Addendum to the OECD, guidelines for the testing of chemicals organisation for economical co-operation and development.
4. Koster R, Anderson M, De Beer EJ, Acetic acid analgesic screen, Federation proceedings, 18, 1959, 412-420.
5. Winter CA, Risley EA, Nuss GW. Carrageenan induced edema in hind paw of the rat as an assay for anti-inflammatory drugs, *Proc. Soc. Exp. Biol. Med III.* 1963, 544-547.
6. Brito ARMS, Antonio MA. Oral anti-inflammatory and antiulcerogenic activities of a hydroalcoholic extract and partitioned fractions of *Turnera ulmifolia* (Turneraceae). *Journal of Ethnopharmacology*. 61, 1998, 215–228.
7. Just MJ, Recio MC, Giner RM, Cullar MJ, Manez S, Bilia AR. Anti-inflammatory activity of unusual Lupane saponins from *Bupleurum fruticescens*. *Planta Medica.* 64, 1998, 404–407.
8. Bars D, Gozariu M, Cadden SW. Animal models of nociception. *Pharmacological Reviews. 5*3, 2001, 597–652.
9. Deraedt R, Jouquey S, Delevallee F, Flauhaut M. Release of prostaglandins E and F in an algogenic reaction and its inhibition. *European Journal of Pharmacology.* 61, 1980, 17–24.
10. Garcia-Leme J, Nakamura L, Leite MP, Rocha e Silva M. Pharmacological analysis of the acute inflammation process induced in rat's paw by local injection of carrageenan and heating. *British Journal of Pharmacology.* 64, 1973, 91–98.
11. Srinivasan K, Muruganandan S, Lal J, Chandra S, Tandan SK, Raviprakash V, Kumar D. Antinoniceptive and antipyretic activities of *Pongamia pinnata* leaves. *Phytotherapy Research.* 17, 2003, 259–264.