ANTI-INFLAMMATORY ACTIVITY OF TYPHA ANGUSTATA (TYPHACEAE)

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Summary

The aim of this study was to investigate the Anti-inflammatory Activity of methanol and petroleum ether extracts of inflorescence of *Typha angustata*. Anti-inflammatory Activity of methanol and petroleum ether extracts of inflorescence of *Typha angustata* (100, 200, 400 mg/kg, p.o.) was studied in rats using Carrageenan induced hind paw edema and Histamine induced hind paw edema method. Both methanol and petroleum ether extracts showed maximum anti-inflammatory effect when compared with control group. The results shows that methanol extract (100, 200, 400 mg/kg, p.o.) significantly ($p<0.05$) inhibited Carrageenan induced hind paw edema. The studies clearly indicate that the anti-inflammatory activity of methanol extract is due to the bioactive principles of methanol extract of *Typha angustata* inflorescence.

Key Words: *Typha angustata*, Anti-inflammatory activity, Carrageenan, Histamin.

Introduction

Typha (meaning “marsh” in Greek) is a monocot genus of the monotypic family Typhaceae with about 12 species distributed in the tropical and temperate regions of the world in marshes and wetlands of varied depth[1]. Folk people of the Mithila region have been using the long fibrous leaves of the plant to weave 2-2.5 inch-thick strong mattresses (“Shitalpati”) for use as a course kind of bed-sheet since olden times. Plant leaves of *T. angustata* may probably be used with memory foam and high resiliency base foam to create an innovative and modern bed mattress with help from modern technology. Pollens are yet another source of protein used as additive in making bread, porridge etc[2]. It is also known as elephant grass. The whole plant, woody soft inflorescence, root and pollens are used medicinally. Wood inflorescence was applied like medicated cotton wool on wound and ulcers for healing[3].

The leaves are diuretic[4]. The pollen is astringent, desiccant, diuretic, haemostatic and vulnerary and, used in the treatment of nose bleeds, haematemesis, haematuria, uterine bleeding, dysmenorrhoea, postpartum abdominal pain and gastralgia, scrofula and abscesses. The seeds are haemostatic. The rootstock is supposedly astringent and diuretic[5]. Its pollen has been used medicinally from remote antiquity in the east as a diuretic and a styptic[6]. Xu *et al. (*1986) isolated seven crystalline compounds from the inflorescence of *Typha angustitata*[7]. These compounds were vanillic acid, E-p-hydroxy-cinnamic acid, protocatechuic acid, E-Pro-penoic acid-3-(hydroxyphenyl)-2,3-dihydropropyl ester, succinic acid, p-hydroxybenzaldehyde and D-mannitol. Plant contains three steroids [β-sitosterol, (20S) 24-methylenlophenol, and stigmast-4-ene-3,6-dione] and three fatty acids [α– linolenic, linoleic, and an unidentified $C_{8:2}$]. Roots are rich in polysaccharides. Flavonoids are present in shoots and flowering heads. An allelopathic sterol - (20S)-4 alpha-methyl-24-methylenecholest-7-en-3 beta-ol has been reported from *Typha latifolia*, and, it is probably also present in *T. angustata*.

Medicinally active principles in *T. angustifolia* have been mainly identified as flavonoids[8].

Materials and Method

The inflorescence of *Typha angustata* was collected from Nashik, Maharashtra, India. The plant was authenticated at Department of Botany, K.T.H.M. College of Art, Commerce and Science, Nashik (M.S.). The dried wood was milled with the help of pulveriser, sieved with 60 mesh and stored in air-tight container at 25^0C.

Preparation of Extracts

The inflorescence of *Typha angustata* was shade dried, coarsely powdered (1kg) and successively extracted with petroleum ether (60-80°), chloroform and methanol in the increasing order of polarity in a soxhlet extractor. The yield of the crude extracts was 2.02%, 3.58%, 13.13% for petroleum ether, chloroform and methanol extracts respectively. The crude extracts were subjected to preliminary phytochemical screening; which showed the presence of tannins, flavonoids, sterols, triterpenes and glycosides.

Test Animals

Wistar rats (100-150gm) were obtained from Serum Institute, Pune. Animals were housed in groups of five at an ambient temperature of 25 ± 1°C. Animals had free access to food and water. Animals were deprived of food but not water 4 h before the experiment. The Institutional Animal Ethical Committee approved the protocol of this study.

Chemicals and Drugs

Aspirin (Research Lab, Mumbai), Carrageenan (Sigma, Mumbai), Pet ether and methanol were obtained from Modern Scientific, Nashik

Test Samples and Standards

Pet ether extract (100, 200, 400 mg/kg), methanol extract (100, 200, 400 mg/kg) before oral administration. Carrageenan and Aspirin were prepared in 2% gum acacia suspension

Anti-inflammatory Activity

Carrageenan Induced Rat Paw Edema

Rats in groups of five each were treated with vehicle, Pet ether extract (100, 200, 400 mg/kg), methanol extract (100, 200, 400 mg/kg) one hour prior to Carrageenan injection. 0.1ml of 1% Carrageenan was injected into the sub plantar tissue of left hind paw of each rat. Swelling of Carrageenan injected foot was measured at 0, 1, 2, 3, 4 hr using Plethysmometer (UGO Basile, Italy) [9]. The right hind paw was injected with 0.1 ml of vehicle. Diclofenac sodium (10 mg/kg p.o.) was used as reference agent.

Histamine Induced Rat Paw Edema

Inflammation in rats was produced by Histamine according to the reported method [10]. Rats in groups of five each were treated with vehicle, Pet ether extract (100, 200, 400 mg/kg), methanol extract (100, 200, 400 mg/kg) one hour prior to Histamine injection. 0.1ml of 1% Histamine was injected into the sub plantar tissue of left hind paw of each rat. Swelling of Histamine injected foot was measured at 0, 1, 2, 3, 4 hr using Plethysmometer (UGO Basile, Italy). The right hind paw was injected with 0.1 ml of vehicle. Diclofenac sodium (10 mg/kg p.o.) was used as reference agent.

Statistical Analysis

All values shown as mean ± SEM. Statistical analysis was performed using one-way analysis of variance (ANOVA) followed by Dunnett's test $P<0.05$ was considered statistically significant.

Results and Discussion

The results of anti-inflammatory activity of inflorescence of *Typha angustata* against Carrageenan induced inflammation as shown in Table1 and Table 2.

Table 1. Effect of Methanol and Pet ether extract (100, 200, and 400 mg/kg) on Carrageenan Induced Rat Paw Edema

Treatment (mg/kg)	Mean increase in paw volume (ml)					% Decrease in paw volume
	0 hr	1 hr	2 hr	3 hr	4 hr	
Control	1.034 ± 0.057	1.604 ± 0.089	1.878 ± 0.036	2.093 ± 0.12	2.158 ± 0.12	---
Aspirin	0.96 ± 0.050	1.313 ± 0.18	1.412 ± 0.21*	1.596 ± 0.19**	1.598 ± 0.14**	68.62
TAM (100)	1.002 ± 0.057	1.464 ± 0.11	1.784 ± 0.12	1.882 ± 0.20	1.871 ± 0.096*	44.72
TAM (200)	1.128 ± 0.12	1.514 ± 0.17	1.726 ± 0.18	1.86 ± 0.14*	1.624 ± 0.12*	46.44
TAM (400)	0.802 ± 0.051	1.118 ± 0.096	1.242 ± 0.10	1.278 ± 0.058**	1.446 ± 0.061*	46.69
TAP (100)	0.978 ± 0.056	1.434 ± 0.10	1.486 ± 0.16	1.804 ± 0.20	1.844 ± 0.11	42.54
TAP (200)	0.8 ± 0.054	1.306 ± 0.091	1.433 ± 0.098	1.768 ± 0.054	1.786 ± 0.056*	44.76
TAP (400)	1.128 ± 0.11	1.543 ± 0.17	1.738 ± 0.18	1.888 ± 0.15*	1.612 ± 0.12*	45.34

Each value is presented as Mean ± SEM (P<0.05) one way ANOVA followed by Dunnett's test

Table 2. Effect of Methanol and Pet ether extract (100, 200, and 400 mg/kg) on Histamine Induced Rat Paw Edema

Treatment (mg/kg)	Mean increase in paw volume (ml)					% Decrease in paw volume
	0 hr	1 hr	2 hr	3 hr	4 hr	
Control	0.831 ± 0.035	1.222 ± 0.10	1.537± 0.085	1.405 ± 0.084	1.328 ± 0.12	---
Aspirin	0.90 ± 0.063	1.171 ± 0.082	1.056 ± 0.10**	1.095 ± 0.089*	1.096 ± 0.072*	26.21
TAM (100)	0.663 ± 0.056	1.276 ± 0.041	1.249± 0.052	1.233 ± 0.045	1.255 ± 0.032	15.02
TAM (200)	0.71 ± 0.021	1.219 ± 0.019	1.215± 0.028*	1.219 ± 0.012	1.218 ± 0.025	15.68
TAM (400)	0.621 ± 0.046	1.198 ± 0.038	1.1688 ± 0.045*	1.174 ± 0.037*	1.170 ± 0.036	22.73
TAP (100)	0.653 ± 0.057	1.206± 0.040	1.295 ± 0.013	1.227 ± 0.042	1.216 ± 0.033	10.39
TAP (200)	0.7066 ± 0.020	1.209± 0.018	1.226 ± 0.034	0.221± 0.016	1.215 ± 0.026	11.47
TAP (400)	0.62 ± 0.043	1.201± 0.040	1.220 ± 0.048*	1.213 ± 0.037	1.211 ± 0.036	19.88

Each value is presented as Mean ± SEM (P<0.05) one way ANOVA followed by Dunnett's test

The inflorescence of *Typha angustata* (100, 200, and 400mg/kg p.o.) significantly ($p<0.05$) inhibited Carrageenan induced paw edema. But the methanol extract showed maximum inhibition of paw edema when compared to the control group. The anti-inflammatory activity produced by all the extracts of *Typha angustata* was found to be more effective than the reference standard aspirin. The percentage inhibition of edema at 4hr after Carrageenan challenge produced by pet ether and methanol extracts of *Typha angustata* and standard aspirin was 20.98 and 37.10 respectively.

Edema represents the early phase of inflammation in Carrageenan induced paw edema and is the simplest and most widely used acute inflammatory model for studying anti-inflammatory agents[11]. The development of Carrageenan induced edema is believed to be biphasic of which the first phase is mediated by release of histamine, serotonin and kinins in the first hr after injection of Carrageenan in 3 hrs and second phase is related to release of prostaglandin like substance in 4 hrs along with neutrophils originated free radicals, such as hydrogen peroxide, superoxide and hydroxyl radicals[12, 13]. It is evident from results that all the extracts of *Typha angustata* showed significant anti-inflammatory activity at 4 hrs against Carrageenan induced rat paw edema. The involvement of endogenous substances such as PGs may be minimized in this model. In the present study, maximum anti-inflammatory effect of inflorescence of *Typha angustata* may be attributed to the presence of flavonoids as evident by preliminary phytochemical investigation[14].

Thus, it can be concluded that methanol extracts (100, 200, and 400 mg/kg) of the inflorescence of *Typha angustata* posses anti-inflammatory properties which are probably mediated via inhibition of prostaglandin synthesis and may have a potential benefit for the management of pain and inflammation.

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