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Anti-inflammatory Activity of *Mimosa pudica* Linn. *(Mimosaceae)* Leaves : An Ethnpharmacological study

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Abstract

Anti-inflammatory activity of ethanolic extract of *Mimosa pudica* leaves was investigated at the doses of 200 and 400 mg/kg using carrageenan induced paw edema and cotton pellete granuloma technique in albino rats. The extracts showed significant activity in dose dependent manner as compared to control group. The observations suggested that the extract of *M. pudica* leaves were effective in exudative and proliferative phases of inflammation *i.e.* in acute and chronic inflammation. The results obtained indicate that *M. pudica* has an anti-inflammatory activity that supports the folk medicinal use of the plant.

***Keywords*:** *Mimosa pudica* leaves, Malwa region, anti-inflammatory activity, carrageenan induced paw edema, cotton pellete granuloma.

INTRODUCTION

Plants have been the traditional source of raw materials for medicine. A rich heritage of knowledge to preventive and curative medicines was available in ancient scholastic works included in the Atharva veda, Charaka, Sushruta, etc. An estimate suggests that about 13,000 plant species worldwide are known to have use as drugs. The trend of using natural products has increased and the active plant extracts are frequently for new drug discoveries and for the presence of active phytotherapeutic materials. [1]

Mimosa pudica L. (Mimosaceae) is a common plant in moist waste ground, lawns, open plantations and weedy thickets. It is native from Middle America and now widely distributed in all tropical areas. [2] *Mimosa pudica* Linn locally known as *chuimui* (Eng: Touch me not) in Malwa region, India, is traditionally used as an agent for birth control among rural people. This creeping perennial herb has been mentioned as a tribal medicine all over India. Traditionally *M. pudica* is used in the treatment of headache, migraine, insomnia, diarrhea, dysentery, fever, piles and fistula. Roots in the form of decoction are used to treat urinary complaints and in diseases arising from corrupt blood and bile. The paste of the leaves is applied to glandular swelling and dressing for sinus. [3-6] Only few pharmacological studies have been reported on leaves of *M.pudica* like hypoglycemic [7] and anticonvulsant activity. [8] In traditional practice of Malwa region leaves of this plant has been used to control swelling and dressing of wounds. The claim that the anti-inflammatory activity of *M. pudica* leaves is speculative and has not yet been documented. In the present study an attempt has been made to evaluate the anti-inflammatory efficacy of *M. pudica* leaves in validated models of rates.

MATERIALS AND METHODS

Plant material: *Mimosa pudica* Linn. (Mimosaceae) fresh leaves collected from the Govt. Medicinal garden, Ujjain, Malwa region, India in August 2009 were authenticated by the taxonomist of the department of botany, Vikram University, Ujjain. A voucher specimen (MP/13/2009/DBUV) is deposited in our Institute for future reference.

Preliminary Pharmacognosy and extraction: The leaves of *M. pudica* washed with distilled water to remove dirt and soil, and were shade dried. Routine pharmacognostic evaluation including organoleptic characteristics, macroscopic and microscopic observations was carried out to confirm the identity of the materials. The dried materials were powdered and passed through a 10-mesh sieve .The coarsely powdered material (400gm) was extracted thrice with ethanol (80%). The extracts were filtered, pooled and concentrated under reduced temperature on a rotary evaporator. The dried extract (yield 6.6%, w/w) was used for the present studies. Preliminary qualitative phytochemical screening of extract gives the positive test for tannins, steroids, alkaloids (mimosine), triterpenes and flavonoides glycosides, C-glycosylflavones. [8-10]

The dried extract was stored in airtight container in refrigerator below 10°C. For pharmacological experiments the extract was suspended in double distilled water containing carboxy methyl cellulose (1% w/v, CMC).

Test animals: Healthy wistar rats of either sex (150–200 g) with no prior drug treatment were used for all the present in vivo studies. The animals were fed on a commercial pellet diet

(Hindustan Lever, Bangalore, India) and water *ad libitum*. The animals were acclimatized to laboratory hygienic conditions for 10 days before starting the experiment. Animal study was performed in Division of pharmacology, B R Nahata College of Pharmacy, Mandsaur with due permission from institutional animal ethical committee (registration number 26/M.Ph/08/IAEC/BRNCOP) and the experiments were performed according to the current guidelines for the care of the laboratory animals. [11] All the chemicals used were of the analytical grade.

Acute toxicity study (ALD_{50}): The Oral acute toxicity [12] of ethanolic extract of *M. pudica* leaves was determined in albino mice, maintained under standard conditions. The animals were fasted overnight prior to the experiment. Fixed dose (OCED Guideline no. 420) method of CPCSEA was adopted for toxicity studies. [13] The tested extract was administrated orally. No mortality was observed at a dose of 4000mg/kg.

Anti-inflammatory activity: Anti-inflammatory activity was evaluated by two models carrageenan induced paw edema and cotton pellet granuloma.

Carrageenan-induced paw edema: Inflammation was induced by injecting 0.1ml of 1% w/v carrageenan sodium salt subcutaneously in the sub-plantar region of the rat right hind paw. [14] The *M. pudica* extract (200, 400mg/kg) or Diclofenac sodium was administered orally, 1 hr. before carrageenan injection while control group received saline (10ml/kg, p.o.). The hind paw volume was measured plethysmometrically before and after the carrageenan injection, at hourly intervals for 3hr.

$$\% \text{ inhibition of edema} = \left(\frac{Vc - Vt}{Vc} \right) x100$$

Where, V_T = mean paw volume of test group & V_C = mean paw volume of control group.

Cotton pellet granuloma: For cotton pellet granuloma, a 50 mg sterilized cotton pellet was implanted subcutaneously on the back of neck in rats under ether anesthesia. Animals in treated group received the extract (200 and 400 mg/kg, p.o.), once daily for 14 consecutive days. Animals in the control group received only the vehicle (10 ml/kg, p.o.). Diclofenac sodium (5mg/kg, p.o.) was given as reference drug in a fourth group. On the 14th day the animals were sacrificed with ether, the pellets granulomas were removed, fixed from extraction tissue, dried overnight at 55 ± 0.5^0C and weighed. [15]

Statistical Analysis: The result were expressed as mean ± SEM. Statistical Analysis was performed with one way analysis of variance (ANOVA) followed by student's *t*' test. P values less than 0.05 were considered to be statistically significant, when compared with control.

RESULTS AND DISCUSSION

The present study establishes the anti-inflammatory activity of *M.pudica* leaves, at different doses employed for screening of different phases of inflammatory process. In the best concerning carrageenan induced, the extract was found to possess significant ($p<0.001$) anti-inflammatory effects in dose dependent manner although less potent than diclofenac sodium (Table 1).

The development of carrageenan induced edema is believed to be biphasic of which the first phase is mediated by release of histamine, seritonin, and kinins in the first hour after injection of carrageenan and the second phase is related to release of prostaglandin like substances in 2-3 hours. [16] Results of the present study are suggesting that the extract predominantly inhibits the release of prostaglandin like substances from phlogenic stimuli. In addition flavonoid possesses anti-inflammatory activity and some of them also act as phospholipase inhibitors. [17-18] Such inhibitors are able to decrease inflammatory response to carrageenan in the rats. [19]

The results of current study for anti-inflammatory activity of *M. pudica* leaves against the cotton pellet granuloma technique (Table 2) established the anti-inflammatory activity of the said extract at different doses.

Table 1. Effect of ethanolic extract of *Mimosa pudica* leaves on carrageenan induced paw edema in rats.

Treatment	Dose (mg/kg)	Mean paw volume (ml)				
		0 hrs	1 hrs	2 hrs	3 hrs	4 hrs
Control	-	0.49±0.01	0.59±0.01	0.71±0.02	0.79±0.02	0.85±0.01
Diclofenac	5	0.50±0.01	0.57±0.01	0.63±0.01	0.64±0.01	0.58±0.01***
Mimosa pudica	100	0.47±0.04	0.56±0.01	0.63±0.014	0.67±0.01	0.65±0.01***
Mimosa pudica	200	0.53±0.09	0.63±0.12	0.67±0.09	0.70±0.06	0.67±0.08***

Values are mean ± sem (n=6); ***p<0.0001 as compared to carrageenan control.

Table 2: Effect of ethanolic extract of *Mimosa pudica* leaves on cotton pellet induced granuloma in rats.

Treatment	Dose mg/kg/day	Mean weight of the granuloma (mg)
Control	-	100.66 ± 1.43
Diclofenac	5	64.83 ±1.57***
Mimosa pudica	100	75.07 ±1.13***
Mimosa pudica	200	68.25 ±0.66***

Values are mean ± sem (n=6); ***p<0.0001 as compared to control.

The extract showed significant (p<0.001) anti-inflammatory effect in dose dependent manner. The repairing phase of inflammation is initiated as a proliferation of fibroblasts and a multiplication of small blood vessels. Proliferating cells penetrate the exudates, producing a highly vascularized reddened mass known as granulation tissue. [20] Significant reduction of the cotton pellete induced granuloma in rats by *M. pudica* leaves suggested that the extract was activity in the proliferative phase of inflammatory process.

CONCLUSION

The current study reveals the protective potential of *M. pudica* against an unpleasant sensory or emotional experience associated with actual or potential tissue damage or prescribed in terms of such damage (inflammation). Thus from the results obtained in the present investigation, it may be further concluded that the ethanolic extract of *M. pudica* possesses a potent anti-inflammatory activity against both exudative and proliferative phases of inflammation. The study also revealed that the ethnopharmacological claim to use as anti-inflammatory agents.

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