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Anti-Inflammatory Activity of *Mimosa hamata* (Willd.)

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ABSTRACT

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

Keywords: *Mimosa hamata*, anti-inflammatory activity, carrageenan induced paw edema, cotton pellet granuloma.

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INTRODUCTION:-

Inflammation is defined as the local response of living mammalian tissues to injury due to any agent. It is a body defence reaction to prevent the spread of injurious agent and to remove the necrosed cells and tissues. Inflammation may be caused by like bacteria, viruses, fungi, parasites, antigen-antibody reaction. Mechanical trauma, organic and inorganic poisons and foreign bodies. Inflammation involves two basic processes early inflammatory response later followed by healing. Signs of inflammation include redness, swelling, heat, pain, loss of function. There are two types of inflammation, Acute and Chronic. Acute inflammation is of short duration and represents the early body reaction, resolves quickly and is usually followed by healing. Chronic inflammation is defined as prolonged process in which tissue destruction and inflammation occur at same time.[1]

1. An acute transient phase characterised by local vasodilation and increased capillary permeability.

2. A subacute phase, characterised by infilteration of leukocytes and phagocytic cells.

3. A chronic proliferative phase, in which tissue degeneration and fibrosis occurs[1].

Genus *Mimosa* (family: Mimosaceae) has about 400 species which are mainly shrubs & small trees in tropics. About 8 species are found in India, with medicinal importance[2] while some are of ornamental use. *Mimosa pudica* the curious plant in the genus is a creeping form. Because of the way it folds its leaves when touched, it is known as touch-me-not plant. *Mimosa hamata* also folds its leaves when touched[3]. *Mimosa hamata* is a much straggling shrub occurring in tropics & widely distributed in India & Pakistan[4]. The plant is used for urinary complaints & as a tonic against general weakness. A paste of leaves is applied over glandular swellings & is used in dressing for sinus, sores & piles[5]. Its roots possess contraceptive efficacy while seeds are used as blood purifier[6]. Various bioefficacies viz., antifungal activity of deprotenized leaf extract[7,8] . Antibacterial activity of alcoholic extract of aerial parts, antiviral activity of methanolic extract of roots[2] and Antioxidant activity[9] have been reported.

The major phytoconstituents present in *Mimosa hamata* (Willd.) include 4-ethylgallic acid from fresh flowers, triterpene saponin B (3-O-Larabinosyl-D-glucosyl morolic acid), mimonoside A, B, C and saponin A (3-O-D-glucosyl-L-rhamnosyl morolic acid) from the roots, ethylgallate and gallic acid from leaves.[13]

The plant *Mimosa hamata* (Willd.) belonging to the family Mimosaceae is being selected for phytochemical investigations to pin point various pharmacological activities. The said plant has been reported to possess

antibacterial, antiviral & antioxidant properties.[7,8,2,9] . It was found that no substantial work of the plant was carried out for its anti-inflammatory activity.

MATERIALS AND METHODS

Plant material:-

For the present study roots, stems and leaves of *M. hamata* plant was collected from Methwade, Tal. Sangola, Dist. Solapur (Maharashtra) and was authenticated at Botanical Survey of India, Pune. The voucher specimen will be deposited in the institution and in 'Herbarium' Department of Botany, Solapur University, Solapur during the month of September 2015. The plant material was dried under shade at room temperature for about 15 days. The dried plant samples were powdered by mechanical grinder and sieved to give particle size 40- 100 mm. The powder was stored in polythene bags at room temperature before extraction.

Preparation of Alcoholic extract:

The collected roots, stems and leaves were shade dried, reduced to a coarse powder in a mechanical grinder to obtain of desired particle size (40# sieve).About 200 gm of powdered material was subjected to exhaustive extraction with 90% alcohol in a soxhlet extractor at a temperature of 60 – 70 ^{0}C, concentrated on a rotary flash evaporator at 50 ^{0}C (Superfit, India), and finally to dry powder. Some part of the total extract was reserved for phytochemical investigation and rest of the extract was used for biological activity.

Preliminary phytochemical analysis:

The ethanolic extract was then subjected to preliminary phytochemical analysis to assess the presence of various phytoconstituents; it revealed the presence of flavonoids, carbohydrate, glycosides, tannins. Preliminary Thin layer chromatography studies also confirmed these constituents [10].

Animals: Wistar albino rats weighing 175-225g of either sex maintained under standard husbandary conditions (temp 23±2^{o}C, relative humidity 55±10% and 12 hours light dark cycle) were used for the screening. Animals were fed with standardlaboratory food and ad libitum during the study period. The experiments were performed after the experimental protocols approved by the institutional animal ethics committee, India 2009.

Toxicity studies: Acute toxicity study was performed for ethanolic extract according to the acute toxic classic method as per OECD guidelines[11]. Female albino rats were used for acute toxicity study. The animals were kept fasting for overnight providing only water, after which dose of 300mg/kg was administered orally and observed for 14 days. If mortality was observed in two animals out of three animals, then the dose administered was assigned as toxic dose. If the mortality was observed in one animal, then the same dose was repeated to confirm the toxic dose. If mortality was not observed, the procedure was repeated for further higher doses such 50, 200 & 2000mg/kg body weight. The animals were observed for toxic symptoms for 72 h [12].

Preparation of carrageenan suspension

Suspension of carrageenan sodium salt 1% was prepared by sprinkling 100mg of carrageenan powder in 10 mL of saline (0.9% NaCl) and set aside to soak for 1 hour, and then the suspension was mixed thoroughly using magnetic stirrer.

Preparation of sodium CMC suspension

Stock suspension of sodium CMC was prepared by triturating the powder sodium CMC (1g) finely in 2.5 ml of water, 1:10 dilution of this stock solution made in distilled water was used for suspending the test and standard drugs.

A) Evaluation of acute anti-inflammatory activity:-

Carrageenan induced rat paw oedema model [14].

Among the many methods used for screening of anti-inflammatory drugs, one of the most commonly used techniques is based upon the ability of such agents to inhibit the oedema produced in the hind paw of the rat after injection of phlogistic agent. Various measuring systems used for the assessment of induced oedema in the paw include: volume, paw thickness, paw weight and painfulness to monitor the development of the induced oedema in the paw. Acute hind paw oedema is induced either in mice or in rats by injecting 0.05mL to 0.1mL of 1%w/v carrageenan which reaches a peak oedema level at 2-3hrs after carrageenan injection. Although oedema can be induced by many other phlogistic agents like dextran, formaldehyde, 5-hydroxytryptamine, histamine, bradykinin, prostaglandin E1 etc for routine screening, carrageenan induced oedema model is employed.

Anti-inflammatory activity was assessed using carrageenan induced rat paw oedema method. The ethical clearance was obtained before the experiment from the Institutional Animal Ethics Committee (Registration number 1406//PO/a/11/CPCSEA). The male Wistar rats, weighing between 100-150g, were procured from National Toxicology Centre, Pune and housed in Animal House of Sahyadri College of Pharmacy, Methwade, Sangola. Rats were kept in the polypropylene cages and fed on a standard laboratory diet with water *ad libitum.* The animals were exposed to alternate cycle of 12 h of darkness and light each. Rats were divided into 9 groups of six animals each.

Group I: Rats were served as control.
Group II **:** Rats were received 0.1 ml of 1% carrageenan (s.c.),2.5 ml of 0.5% w/v sodium carboxy methyl cellulose (C.M.C); p.o.

Group III: Rats were received Aceclofenac sodium (10 mg/kg/p.o.)

Group IV: Rats were received 1.0ml of ethanolic extract of stems of *Mimosa hamata* (200 mg/kg/o.p)
Group V **:** Rats were received 1.0ml of ethanolic extract of stems of *Mimosa hamata* (400mg/kg/o.p)

Group VI: Rats were received 1.0ml of ethanolic extract of leaves of *Mimosa hamata* (200 mg/kg/o.p)
Group VII**:** Rats were received 1.0ml of ethanolic extract of leaves of *Mimosa hamata* (400mg/kg/o.p)

Group VIII: Rats were received 1.0ml of ethanolic extract of roots of *Mimosa hamata* (200 mg/kg/o.p)
Group IX **:** Rats were received 1.0ml of ethanolic extract of roots of *Mimosa hamata* (400mg/kg/o.p)

One hour later, the rats of group III, IV, V were challenged by subcutaneous injection of 0.1 ml of 1%w /v solution of carrageenan into the planter side of the left hind paw. The paw was marked with ink at the level of lateral malleolus and immersed in mercury up to this mark. The paw volume was measured plethysmographically immediately after injection (0 h) and followed by every hour till the 6th hr after injection of carrageenan to each group. The paw volume up to the tribiotural articulation was measured at 0,

1, 2, 3, 4 and 5th hours. The difference between the initial and subsequent reading gave the actual oedema volume.

Percent inhibition of inflammation was calculated using the formula,

$$\% \text{ Edema Inhibition} = Vc\text{-}Vt/Vc \times 100$$

where 'Vc' represents oedema volume in control and 'Vt', oedema volume in group treated with test extracts. The values obtained from each group were expressed as Mean ± Standard deviation. Dunnet's t- test was done to compare the statistical significant changes between control, Carrageenan induced paw odema, Aceclofenac treatment rats and with extract treatment. The significant levels between the groups was compared using row wise comparison between Initial with different hours.

Anti-inflammatory activity by carrageenan induced paw edema:-

Sr. No.	Test Material	Mean increase in paw volume ± SEM				
		1 hr	2 hr	3 hr	4 hr	5 hr
1	Control	0.24 ±0.01	0.24 ±0.01	0.24 ±0.01	0.24 ±0.01	0.24 ±0.01
2	Carrageenan (1% w/v)	0.69 ± 0.06	1.11 ± 0. 04	1.87 ± 0.04	2.09 ± 0.06	1.98 ± 0.07
3	Aceclofenac (10mg)	0.57 ± 0.04 (17 %)	0.45 ± 0.07 (59 %)	0.37 ±0.02* (80.21%)	0.34 ± 0.05** (83.73%)	0.29 ± 0.03*** (85.35%)
4	ESMH (200mg/kg)	0.64 ± 0.01 (7%)	0.58 ± 0.05 (47 %)	0.52 ± 0.04 (72.19%)	0.47± 0.05* (77.51%)	0.40 ± 0.05** (79.79%)
5	ESMH (400 mg/kg)	0.61 ± 0.03 (11%)	0.56 ± 0.08 (49.54%)	0.49 ± 0.06 (73.79%)	0.42 ± 0.04** (79.90%)	0.37 ± 0.03** (81.31%)
6	ELMH (200mg/kg)	0.67 ± 0.03 (3%)	0.62 ± 0.08 (44.14%)	0.59 ±0.02 (68.44%)	0.56 ± 0.03* (73.20%)	0.52 ± 0.01* (73.73%)
7	ELMH (400 mg/kg)	0.65 ± 0.04 (5%)	0.61 ± 0.06 (45.04%)	0.57 ± 0.04 (69.51%)	0.53 ± 0.09* (74.64%)	0.49 ± 0.04** (75.25%)
8	ERMH (200 mg/kg)	0.68 ± 0.07 (1.44%)	0.6 4 ± 0.03 (42.34%)	0.60 ±0.07* (67.91%)	0.57 ± 0.01* (72.72%)	0.53 ± 0.08* (73.23%)
9	ERMH (400 mg/kg)	0.65 ± 0.05 (5%)	0.61 ± 0.05 (45.04%)	0.56±0.04* (70.05%)	0.51 ± 0.09* (75.59%)	0.47 ± 0.07** (76.25%)

Statistical analysis was carried out by ANOVA followed by the Dunnet's test at the significance level of $p<0.01$

Groups	Initial paw volume	5 hr	Difference in Paw	Inhibition percentage
Control	0.24 ±0.01	0.24 ±0.01	0.00	-
Carrageenan (1% w/v)	0.69 ± 0.06	1.98 ± 0.07	1.29	-
Aceclofenac (10mg)	0.57 ± 0.04 (17 %)	0.29 ± 0.03*** (85.35%)	0.28	49.12%
ESMH (200mg/kg)	0.64 ± 0.01 (7%)	0.40 ± 0.05** (79.79%)	0.24	37.5%
ESMH (400 mg/kg)	0.61 ± 0.03 (11%)	0.37 ± 0.03** (81.31%)	0.24	39.34%
ELMH (200mg/kg)	0.67 ± 0.03 (3%)	0.52 ± 0.01* (73.73%)	0.15	22.38%
ELMH (400 mg/kg)	0.65 ± 0.04 (5%)	0.49 ± 0.04** (75.25%)	0.16	24.61%
ERMH (200 mg/kg)	0.68 ± 0.07 (1.44%)	0.53 ± 0.08* (73.23%)	0.15	22.05%
ERMH (400 mg/kg)	0.65 ± 0.05 (5%)	0.47 ± 0.07** (76.25%)	0.18	27.69%

n = 6, * - P <0.05, **P<0.001 compared to control, standard drug

STATISTICAL ANALYSIS

The statistical analysis of the evaluation of the anti-inflammatory activity of ethanolic extract of leaves, roots and stems of *Mimosa hamata* against the carrageenan induced paw oedema in albino rats were analyzed using ANOVA followed by Dunnett's t test and expressed as mean ± SEM.

B) Evaluation of chronic anti-inflammatory activity:-

Cotton pellet induced granuloma[15]:-

The method of Winter and Porter was used to study chronic inflammation in rats

Albino Wistar rats were randomly divided into eight groups of six animals in each group were taken anaesthetized with ether. The axillary skin was shaved and disinfected with 70% ethanol. An incision was made and by a blunt forcep subcutaneous tunnels were formed and a sterilized cotton pellet (50±1mg) was placed in both axillas. All the animals in each group were treated in the following way

Group-1: Served as Toxicant control, which received orally 1ml/kg of 1% sodium CMC solution daily for 8 days following subcutaneous implantation of cotton pellets.

Group-2: Termed as Standard and received Aceclofenac sodium 10mg/kg p.o. once daily orally for 8 days following subcutaneous implantation of cotton pellets.

Group-3: Received 200mg/kg stems extract of *Mimosa hamata* once daily orally for 8 days following subcutaneous implantation of cotton pellets.

Group-4: Received 400mg/kg stems extract of *Mimosa hamata* once daily orally for 8 days following subcutaneous implantation of cotton pellets.

Group-5: Received 200mg/kg roots extract of *Mimosa hamata* once daily orally for 8 days following subcutaneous implantation of cotton pellets.

Group-6: Received 400mg/kg roots extract of *Mimosa hamata* once daily orally for 8 days following subcutaneous implantation of cotton pellets.

Group-7: Received 200mg/kg leaves extract of *Mimosa hamata* once daily orally for 8 days following subcutaneous implantation of cotton pellets.

Group-8: Received 400mg/kg leaves extract of *Mimosa hamata* once daily orally for 8 days following subcutaneous implantation of cotton pellets.

On the 9th day, the animals were sacrificed by cervical dislocation and blood was collected by cardiac puncture. The cotton pellets along with granuloma tissue were removed and weighed immediately for wet weight. The pellets were dried in an oven at 60°C until a constant weight was obtained.

The granuloma tissue formation and exudate formation was calculated using the following formulae:

Measure of granuloma tissue formation = constant dry weight – initial weight of pellet Measure of exudate formation = wet weight of pellet - constant dry weight of pellet.

The level of inhibition of granuloma tissue development was calculated using the expression:

$$\% \text{ inhibition of granuloma tissue formation} = \frac{\text{WgrC-WgrT X 100}}{\text{WgrC}}$$

Where, WgrC = weight of granuloma tissue of the Toxicant control group; WgrT = weight of granuloma tissue of the treatment group

Effect of stems, roots and leaves of *M. hamata* in Cotton Pellet Granuloma Method

Gr. No.	Treatment (mg/kg)	Increase in weight of pellets (mg)	% inhibition
1.	Distilled water	58.56 ± 0.39	-
2.	Aceclofenac sodium (10mg/kg)	30.02 ± 1.19***	48.73
3.	ESMH (200mg/kg)	35.18 ± 0.26*	39.92
4.	ESMH (400mg/kg)	33.54 ± 0.3**	42.72
5.	ERMH(200mg/kg)	50.42 ± 0.52	13.9
6.	ERMH(400mg/kg)	48.38 ± 0.31	17.38
7.	ELMH(200mg/kg)	51.24 ± 1.06	12.5
8.	ELMH (400 mg/kg)	49.73 ± 0.83	15.07

Statistical Analysis:

Values are expressed as Mean ± SEM, n=6 in each group. Data was analyzed by one way ANOVA followed by Dunnett's Test. *P < 0.01 as compared to control group, that means statistically significant.

RESULTS:-

Preliminary phytochemical screening of ethanolic extract of the leaves, stems and roots of *Mimosa hamata* (Willd.) revealed the presence of bioactive components like flavanoids, carbohydrate, glycosides and tannins.

Carrageenan induced paw edema model was used for the evaluation of anti-inflammatory activity of the ethanolic extract of *M. hamata* roots, leaves and stems. There was a dose-dependent, significant reduction in carrageenan-induced rat paw edema at 200 and 400 mg/kg of extract and at 10 mg/kg Aceclofenac over a period of 5 hrs as shown in Table .

Carrageenan induced edema is commonly used as an experimental animal model for acute inflammation and is believed to be biphasic, of which the first phase is mediated by the release of histamine and kinins and then prostaglandin in the later phase. So, the effect of the ethanolic extract against inflammations produced by these individual mediators was studied.

Flavonoids and other phenolics compounds of plant origin have been reported as antioxidants and as scavengers of free radicals. Considering that antioxidants can also exert anti-inflammatory effects.

In the carrageenan induced acute inflammation,

Group 3 treated rats (i.e. standard drug Aceclofenac in a dose of 10 mg/kg, b.w., p.o., treated rats) showed significant activity ($p<0.001$) at 1st and 2nd hour with respective percentage inhibitions of 17% and 59% with respect to Group-1 rats (i. e. controlled rats). It showed highly significant($p< 0.001$) activity starting from 3rd and lasting up to 6th hour. The percentage inhibitions were observed to be 80.21%, 83.73%, 85.35 respectively

Group 4 rats (i.e. ethanol extract of stems of *Mimosa hamata* 200 mg per kg b.w., p.o.) showed significant activity from 1st and 2nd hour with respect to percentage inhibition of 7% and 47.00% when compared to Group-1 rats (i. e. controlled rats). The extract appears to show highly significant activity from 3rd to 5th with percentage and division of extract 72.19%, 77.51%, 79.79%

Group-5 rats (i.e. ethanol extract of stems of *Mimosa hamata* in a dose of 400 mg/kg b.o. p.o) showed significant anti-inflammatory activity at 1st and 2nd hour with percentage inhibition of 11% and 49.54% when compared to group -1 rats (i.e. controlled rats). The extract appeared to showed highly significant activity from 3rd to 5th hr with respect to 73.79%, 79.90%, 81.31% when compared to group-1 rats (i.e. controlled rats)

Group- 6 rats (i.e. ethanolic extract of leaves of *Mimosa hamata* 200 mg/kg b.w.p.o.) appears to show significant anti-inflammatory activity a 1st and 2nd hour with percentage inhibition of 3% and 44.14 % respectively. It appears to show a highly significant ($p<0.001$) anti-inflammatory activity from 3rd to 5th hour with respect to percentage inhibition of 68.44%, 73.20%,73.73% when compared to group -1 rats (i.e controlled rats)

Group- 7 rats (i.e. ethanolic extract of leaves of *Mimosa hamata* 400 mg/kg b.w.p.o.) appears to show significant anti-inflammatory activity a 1st and 2nd hour with percentage inhibition of 5% and 45.04 % respectively. It appears to show a highly significant ($p<0.001$) anti-inflammatory activity from 3rd to 5th hour with respect to percentage inhibition of 69.51%, 74.64%, 75.25% when compared to group -1 rats (i.e controlled rats)

Group- 8 rats (i.e. ethanolic extract of roots of *Mimosa hamata* 200 mg/kg b.w.p.o.) appears to show significant anti-inflammatory activity a 1st and 2nd hour with percentage inhibition of 1.44% and 42.34 % respectively. It appears to show a highly significant ($p<0.001$) anti-inflammatory activity from 3rd and 5th hour with respect to percentage inhibition of 67.91%, 72.72%, 73.23% when compared to group -1 rats (i.e controlled rats)

Group- 9 rats (i.e. ethanolic extract of roots of *Mimosa hamata* 400 mg/kg b.w.p.o.) appears to show significant anti-inflammatory activity a 1st and 2nd hour with percentage inhibition of 5% and 45.04 % respectively. It appears to show a highly significant ($p<0.001$) anti-inflammatory activity from 3rd and 5th hour with respect to percentage inhibition of 70.05%, 75.59%,76.26% when compared to group -1 rats (i.e controlled rats)

The cotton-pellet granuloma is widely used to evaluate the transudative and proliferative components of the chronic inflammation. The moist weight of the pellets correlates with transuda, the dry weight of the pellet correlates with the amount of granulomatous tissues[16,17]. Chronic inflammation occurs by means of the development of proliferate cells. These cells can be either spread or in granuloma form. Non-steroidal anti-inflammatory drugs decrease the size of granuloma which results from cellular reaction by inhibiting granulocyte infiltration, preventing generation of collagen fibers and suppressing mucopolysaccharides[18,19] order to assess the efficacy of the extract against proliferative phase of inflammation, we selected carrageenan-induced air-pouch model in which tissue degradation and fibrosis occurs. During the repair process of inflammation, there is proliferation of macrophages, neutrophils, fibroblasts and multiplication of small blood vessels occurs, which are the basic sources of forming a highly vascularised reddish mass, termed granulation tissue[20,21]. Thus, in this model the extract significantly reduced infiltration of macrophages, monocytes, neutrophils and others. These results indicate that the extract may alter the action of endogenous factors that are involved in the migration of these substances to the site of inflammation. The extract showed significant $P < 0.01$ anti-inflammatory activity in cotton wool induced granuloma and thus found to be effective in chronic inflammatory condition, which reflected its efficacy in inhibiting the increase in the number of fibroblasts and synthesis of collagen and mucopolysaccharides during granuloma tissue formation.

Chronic inflammatory conditions was induced in animals by inserting the cotton pellets subcutaneously. The results of cotton pellet granuloma method revealed that ethanolic extract of stems 400mg/kg of *Mimosa hamata* (Willd.) was found to decrease the weight of granuloma significantly (42.72%) than the ethanolic extract of stems of *M hamata* at 200mg/kg (39.92%)

DISCUSSION:

A large number of herbal drugs are reputed to have excellent medicinal value, and are in use for the treatment of several ailments. In folk medicine, various indigenous drugs are used, in single and/or in combined forms, for treating different types of inflammatory and arthritic conditions, with considerable success. Although the use of these drugs has a sound tradition, and their medicinal uses and general safety are well known to native people, their use has yet to be rationalized in therapeutics, using the current methodology. Scientific studies are therefore required to assess their safety and efficacy. Inflammation is associated with various clinical conditions like arthritis, cancer and vascular diseases. Anti-inflammatory drugs, presently available for the treatment of inflammation of various kinds, have undesirable side effects such as causing peptic ulcers. Therefore efforts are focused on obtaining plant derived anti-inflammatory agents, which are as potent as the currently available NSAID's. An attempt was made in our laboratory to evaluate anti-inflammatory activity of extracts of stems, roots and leaves of *Mimosa hamata* (Willd.).

According to the phytochemical evaluation studies performed on stems, roots and leaves of *Mimosa hamata* (Willd.) revealed the presence of compounds like flavonoids, carbohydrate, glycosides and tannins.

Acute anti-inflammatory activity can be evaluated by using rat paw edema which can be induced by carrageenan, histamine, albumin, etc. Chronic inflammatory conditions can be induced in animals by inserting the cotton pellets subcutaneously.

In the present study, the acute anti-inflammatory activity of ethanolic extracts of *Mimosa hamata* (Willd.) roots, stems and leaves was assessed by carrageenan induced rat paw edema.

Standard drug, Aceclofenac sodium, which is a NSAID, appears to show significant ($p<0.01$) inhibition of first phase and highly significant ($p<0.01$) inhibition of second phase, indicating its effectiveness as NSAID in acute inflammation.

Ethanolic extracts of stems of M*imosa hamata* have shown significant ($p<0.01$) anti-inflammatory activity. Ethanolic extract of stems at 200 mg/kg showed the maximum effect at 3rd hr (72.19%) while ethanolic extract at 400 mg/kg showed the maximum effect at 5th hr (81.31%) in comparison with standard Aceclofenac (85.35%). Hence both the extracts were found to be effective in chronic inflammation.

Our investigation revealed that the ethanolic extract of stems of *Mimosa hamata* 200 mg/kg and 400 mg/kg are having highly significant inhibition ($p<0.01$) from 3rd and 5th hour indicating the possible inhibition of mediator of acute inflammation in this phase i.e. prostaglandin.

In the present study, the chronic anti-inflammatory activity of ethanolic extracts of *Mimosa hamata* (Willd.) roots, stems and leaves was assessed by cotton pellet granuloma. The ethanolic extract of stems 400 mg/kg of *Mimosa hamata* (Willd.) was found to decrease the weight of granuloma significantly (42.72%) than the ethanolic extract of stems of *M hamata* at 200 mg/kg (39.92%)

From the above studies it is quite apparent that the ethanolic extract of stems of *Mimosa hamata* 200 mg/kg and 400 mg/kg was found to be effective in both acute and chronic inflammatory models and cotton pellet granuloma model compared to ethanolic extract of leaves and roots. In both model they exhibited anti-inflammatory effect in a dose dependent manner which can be comparable with that of Aceclofenac. The study justifies its use in inflammation as suggested in the folklore medicines.

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