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COMPARATIVE STUDIES OF ANTIPYRETIC, ANALGESIC AND ANTI-INFLAMMATORY ACTIVITIES AMONG *ALOE VERA*, *TERMINLLIA CHEBULA* AND *TAMARINDUS INDICA* OF THEIR AQUEOUS EXTRACTS IN EXPERIMENTAL ANIMAL

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ABSTRACT
Inflammation, pain and pyrexia underlie several pathological conditions. Synthetic drugs, i.e. NSAIDs, opioids and corticosteroids are clinically most important drugs used for the treatment of inflammatory disorders**.** These drugs may limit their use for long term because of their adverse effect. Therefore, the research for new analgesic and anti-inflammation agents are critically needed. Many plant products are used as anti-inflammatory agents to cure the inflammatory pain and swelling which still lack a proper screening process. Thus, the ultimate goal would be to obtain anti-inflammatory agents that are effective with minimal to no adverse effects when administered over a long-term period. Three traditionally used plants were selected like *Aloe vera*, *Terminalia chebula* and *Tamarindus indica* for their anti-inflammatory, analgesic and antipyretic activities and compared with standard drug. The least anti pyretic activity was found for *Aloe vera Lam* even at higher dose i.e. 400 mg/kg body weight. For analgesic activity, all the extract of three plants at doses of 200 mg/kg and 400 mg/kg showed significant increase in reaction time than control group in 30 and 60 minutes after drug administration which was comparable to the standard drug i.e. Indomethacin. All the plant extract are showing anti-inflammatory effects. Among all the plant extract *Aloe vera* Lam at 200 mg/kg showing minimum activity but in case of *Tamarindus indica* at higher dose i.e. 400 mg/kg showed maximum inhibition of edema i.e. 48% at 12th hrs. Need further studies to elucidate the exact mechanism by which these activities were expressed.

KEYWORDS: *Aloe vera, Terminalia chebula* and *Tamarindus indica.*

INTRODUCTION
Inflammation, pain and pyrexia underlie several pathological conditions.[1] Synthetic drugs, i.e. NSAIDs, opioids and corticosteroids are clinically most important drugs used for the treatment of inflammatory disorders, however their long term use may induce toxic effects including; gastrointestinal ulcers, bleeding, renal disorders etc. The typical characteristics of inflammation are redness, swelling, heat, pain, and dysfunction. Therefore, there are always interactions between pain and inflammation. Analgesics are a kind of medicines in general which can relieve the feeling of pain. Conventional analgesics play an important role in pain therapy, but they always cause kinds of adverse effects during clinic use.[2] The same as the analgesics, nonsteroidal anti-inflammatory drugs (NSAIDs) are the primary therapy for diseases with a chronic inflammatory response, but long-term use often causes severe side effects, including cardiovascular and gastrointestinal complications that limit their development.[3,4] Therefore, the research for new analgesic and anti-inflammation agents are critically needed. In the last few decades, people had discovered many plants with analgesic property and numerous herbal preparations are being suggested as analgesics.[5] Meanwhile, due to the wide range of pharmacological activities with less side effects, there are many reports about anti-inflammatory activities of components from Indian traditional medicine, including alkaloids, saponins, flavonoids, terpenoids, volatile oils, coumarin, aldehydes, and ketones.[6,7]

Current treatment of inflammatory diseases involves mainly interrupting the synthesis or action of critical mediators that drive the host's response to injury. Narcotic, steroidal and non-steroidal anti-inflammatory drugs (NSAIDs) are currently are the current treatment options against inflammation. However, the available drugs have reduced efficacy against inflammatory

conditions due to adverse effects and relatively high potency. For example, steroidal drugs are in use as anti-inflammatories due to their specific mechanisms of action that are considered to be responsible for their adverse effects as well. Steroidal anti-inflammatories inhibit basal physiological function such as leukotriene inhibition. The side effects include hypertension due to analogy of the steroidal drugs to the steroid hormones. The non-steroidal drugs have relatively fewer and less adverse effects than the steroidal that include gastrointestinal bleeding and improper clotting of blood.[8] Therefore, there is a need for treatment options that have both of these characteristics. Despite the adverse effects of NSAIDs, studies conducted have postulated that regular long-term use of low dose NSAIDs has been associated with a significant reduction in the incidence of numerous cancers by approximately 40%. Thus, the ultimate goal would be to obtain anti-inflammatory agents that are effective with minimal to no adverse effects when administered over a long-term period. The agents would have the dual role of treating inflammation and preventing development of chronic and degenerative diseases. Plants have been considered to be sources of the new anti-inflammatory agents due to their extensive use in folk medicine globally to treat various ailments.[9] In the Indian system of medicine, tamarind has wide therapeutic application including inflammation, diabetes, constipation, indigestion and flatulency.[10] Throughout Southeast Asia, the tamarind fruit poultice is applied to foreheads of fever sufferers.[11] The seeds of T. indica are reported to possess pharmacological activities such as antidiabetic and hypoglycemic, antioxidant, antiulcer, anti-venom, hepatoprotective, antibacterial, inhibition of nitric oxide production and serine proteinase inhibitor.[12] Fruits and leaves of T. indica are reported with anti-asthmatic, hepato protective and antimicrobial activities.[13] The tamarind leaves are one of the constituents of an Ayurveda formulation called Kottamchukkadi Taila which is applied topically and massaged for the treatment of rheumatism, body stiffness, pain, inflammation and disorders. Folkloric uses include application of leaf poultice on inflamed ankles and joints to reduce swellings and pain. Tamarind fruit pulp is applied topically on inflammatory swellings and rheumatism to relieve pain.[14,15] T. indica bark is reported to possess anti-inflammatory, analgesic and wound healing activity.[16]

In traditional medicine and Ayurveda, many plant products are used as anti-inflammatory agents to cure the inflammatory pain and swelling which still lack a proper screening process. In the northern region of West Bengal, traditional Ayurveda practice uses *Aloe vera* as a potent anti-inflammatory agent. The gel-like layer under the leaf of the plant, actually the parenchyma cells, is traditionally known to decrease inflammatory pains.

In Southeast Asia. The fruit of *T. chebula* has been used extensively as an astringent, anti-tussive, anti-diarrheal, and anti-bleeding agent. *T. chebula* has been shown anti-oxidant and cyto protective activities in rat primary hepatocytes, liver, and kidney, and protective effects against drug-induced gastric, intestinal, hepatic, and renal damages. Recent studies reported anti-inflammatory activities of *T. chebula* in systemic and local anaphylaxis and LPS-stimulated RAW264.7 cells.[17,18] Anti-inflammatory, analgesic and antipyretic activities all three plants were investigated at two different doses and compared with standard drug.

MATERIAL AND METHOD

Material

After collection of all three plants it was identified and authenticated by a pharmacologist and letter a voucher specimen (No.IU/PHAR/HRB/7/11) was deposited at the Dept. of Pharmacognosy Integral University Lucknow Uttar Pradesh India. Aqueous extractions of all these three plants were done according to standard procedure.

Aloe vera Linn

For aqueous extraction of *Aloe vera* Leaves were collected, washed in cold water; spines around the leaves were removed using a knife after which the leaves were sliced. Two hundred grams of the sliced material were mixed with of distilled water and blended in an electric blender for 3 min to obtain 400% (w/v) extract. The blended material was squeezed through a muslin cloth. The filtrate was freeze-dried at -50°C under vacuum using a lyophiliser and kept in a freezer at −20°C until use. Various dose levels of the *Aloe vera* were made by reconstituting the extract at concentration of 1% (w/v).[19]

Terminalia chebula Retz

Fresh fruits of *Terminalia chebula* were used in this experiment. The plant specimens for the purpose of study were collected. Preparation of extract of *Terminalia chebula* shade dried fruits of *Terminalia chebula* were grounded to fine powder in an electric grinder. About 890 grams of grinded powdered material were extracted with 80% ethanol at a temperature of 60˚C for about 48 hours. The mixture was filtrated in stepwise processes. While volume is reduced, it was then poured in watch glass of large surface area to make it more condensed and allow the rest solvent to evaporate. While the condensed filtrate turned into a gummy concentrate, it was obvious that we found the crude ethanolic extract. The crude ethanolic extract was further evaporated to dryness to obtain the dried ethanolic extract. The percentage yield of extract was 12.1% w/w with respect to the original air dried powder was obtained. The extract was finally stored in air tight container in a refrigerator at 2˚C - 8˚C for further use in the experiment.[20] After that during experiment dose was adjusted as per dosing schedule following standard procedure.

Tamarindus indica L

The extraction was performed using maceration technique.[21] The coarse powder of *Tamarindus indica* seeds (100g) was subjected to maceration for 72 h at

room temperature using 500 ml methanol. The extract was filtered and the solvent was evaporated under vacuum to obtain powdered residue. After that during experiment dose was adjusted as per dosing schedule following standard procedure.

For analgesic activity

To evaluate the analgesic activity of different plant extract by hot plate method, two different concentration of extract were used, 200 and 400 mg/kg body weight for each plant extract. For the preparation of standard solution Indomethacin 10mg/kg body weight adjusted by dissolving in distilled water.

Antipyretic activity

Control group, received distilled water in dose of 5.0 ml/kg. Different plant extract were adjusted to 200 mg/kg and 400 mg/kg respectively for oral administration. The initial rectal temperatures of all rats were recorded. Then fever was induced by injecting suspension of 12.5% dried Brewer's yeast in normal saline subcutaneously in a dose of 1 ml/100 g body weight of rats. For the preparation of standard solution Indomethacin10mg/kg body weight adjusted by dissolving in distilled water. After 1 h of induction of fever, the respective test drugs were administered and distilled water was given to control group. The rectal temperature was recorded by digital thermometer (EIE Instruments, Ahmedabad) after 3 h, 6 h and 9 h of drug administration. The difference between final and initial rectal temperature were registered for each time interval. The maximum reduction in rectal temperature in comparison to control group was recorded.

Anti-inflammatory activity

For anti-inflammatory activity of different plant extract required concentration of sample solution used were 200 mg/kg and 400 mg/kg body weight respectively. For the preparation of standard solution of 10 mg/kg body weight prepared in 5ml normal saline (0.9% NaCl solution). For preparation of injectable carrageenan suspension, 50 mg carrageenan was accurately weighed and then it was dissolved slowly in WFI (water for injection) by gentle heating in water bath. Finally the volume was adjusted up to 5 ml with WFI. The whole process will produce carrageenan 1% suspension. The suspension was kept in 50˚C ± 2˚C in water bath for maintaining its homogeneous nature.

Animals and experimental design

Animal handling during the experimental procedure was done as per university guidelines and animal ethics. The rats were allowed free access to standard commercial rat pellets (Hindustan Lever Li, India). Clean water was provided ad libitum throughout the experimental periods. In all the experiments animals were categorized as following

Group I: 200 mg/kg b.w as per oral for each plant extract.

Group II: 400 mg/kg b.w as per oral for each plant extract.

Group III: 10 mg/kg b.w as per oral as standard drug (Indomethacin).

Group IV: Control group received only 1 ml saline water (0.91 % w/v).

Analgesic activity

Hot Plate Method Rats were placed on an UgoBasile hot plate at 55°C ±1°C. Response time was recorded as the time elapsed before the mouse responded (by licking, flicking of a hind limb or jumping). Only rats with a control response time of 4–9s were included in the study. 0.9 % Saline (5 ml/kg b.w), indomethacin (10 mg/kg b.w) and graded dosage levels of all three plant extracts (200 and 400 mg/kg b.w p.o) were administered to rats in group I and group II respectively. The reaction time of animal was noted down at 0, 30, 60, 90, 120, 150 and 180 minutes after the treatment. Thirty Wistar rats, of either sex, weighing 120±35 g were used.

Details about hot plate procedure for analgesic activity

A hot plate consisting of an enclosed insulated container (21 cm high X 45 cm deep X 50 cm wide) with a copper surface was used. The surface was heated with water to a temperature of 55 _+ 0.5°C using a circulating water pump (Model K-2/R, Lauda). In the hind paw lick-only procedure, an open-bottom glass container (9.5 cm high x 18 cm diameter) with a 7.5 cm diameter hole in the top was used to confine the rats to the heated surface. In the hind paw lick-or-jump procedure, a glass container (22 cm high × 16 cm diameter) with an open top and bottom was used. The surface temperature of the hot plate was monitored by a surface temperature probe (YSI 408) connected to an electronic thermometer (Model 43, Yellow Springs Instrument, Yellow Springs, OH). Testing was conducted in an isolated room. The animal was placed through the top opening of the container onto the heated surface. In the hind paw lick-only procedure, a large watch glass was used to cover the opening, whereas in the hind paw lick-or-jump procedure the top remained open. Latency to respond to the heat stimulus was measured to the nearest 0.01 sec with a Micronta LCD Quartz stopwatch. In the hind paw lick-only procedure, licking of the hind paw was used as the endpoint for determination of response latency, whereas in the hind paw lick-or-jump procedure either licking of the hind paw or jumping was used. A jump was defined by all 4 paws leaving the heated surface. The plate was wiped to remove urine and feces after every use. Prior to experimental treatment animals were screened on the hot plate. In the hind paw lick-only procedure, those exhibiting latency times greater than 12 sec were excluded from further experimentation. In the hind paw lick-or-jump procedure, animals exhibiting latencies greater than 18 sec were excluded from the experiment. Animals that met the screening criteria were then weighed and randomly assigned to a treatment group. It should be noted that the choice of a 12 sec screening

latency for hind paw lick-only was historical and resulted in the exclusion of up to 25% of animals pretested on the hot plate. Pre drug response latencies greater than 12 sec were rarely observed under hind paw lick-or-jump screening; accordingly, fewer animals were excluded from testing. A minimum of 30 min were allowed to elapse between screening and drug treatment. Latencies were recorded at 1 and 3 h post-treatment, except as otherwise noted. Data presented are for the 1 h time point (time of peak effect on hot plate response latencies), except as noted in the legend for Fig. 5. During drug testing a 60 sec cut-off was used. Animals failing to respond before the cut-off were removed from the hot plate and assigned a latency of 60 sec. Animals were sacrificed following the last time point aerial-righting procedure apparatus. The test apparatus consisted of a meter stick mounted vertically above a table surface covered by a foam rubber pad. Markers were clipped to the meter stick at 5 cm intervals to indicate the distance to the mat. Testing was conducted in an isolated room. The animal was held in an inverted position by the back of the neck and the base of the tail at specific heights above the mat before being dropped. Animals were released with a quick outward movement of the hands, care being taken not to impart rotation to the rat. The minimum height required for the rat to land with all 4 paws in flat contact with the surface at the time of first contact was taken as the measure of motor function. Latencies were recorded at 30 and 60 min post treatment. Data presented are for 30- or 60 min time points (time of maximum motor impairment) as noted in the figure legend. During drug testing a 55 cm cut-off was used. Animals failing to land successfully within the cut-off were assigned a height of 55 cm.

Antipyretic Activity in Rats

All experimental groups of rats (12 in each group) were injected subcutaneously with 10 ml/kg-body weight 15% yeast solution to induce pyrexia. The rectal temperature of each animal was recorded before and 24 h after the yeast injection. Thereafter, all the three plant extracts of the test group were treated orally with 1 ml having 200mg /kg b.w and 400 mg/kg b.w crude suspension. Control group was given 1 ml normal saline and the standard reference was treated with 1 ml (10 mg/kg body weight) aqueous solution of Indomethacin. Post treatment rectal temperature of each animal was recorded at 45, 90 and 150 min. Each result was calculated as the mean of three readings.

Anti-inflammatory studies

Anti-inflammatory activities Carrageenan-induced rat paw oedema. Distilled water (DW) and indomethacin were administered intra peritoneally (i.p) to rats in group I (negative control; 5 ml/kg b.w) and group II (positive control; 10 mg/kg b.w) respectively. The extracts of all three plants were administered 200 mg/kg and 400 mg/kg b.w p.o respectively. An hour later, rats were injected with 0.05 ml of 1% carrageenan suspension into the foot pads of the left hind paws. Linear diameters of the injected paws were measured using a micrometer screw gauge (Sterling Manufacturing Co., India) for four hours at one hour intervals. Increases in the paw diameter were taken as an indication of paw oedema. The percentage inhibition of inflammation was computed using the formula. Where: D0 = the average inflammation (hind paw oedema) of the negative control group at a given time period; DT = the average inflammation (hind paw oedema) of the treated group at a given time period.

Detail procedure about anti-inflammatory activity

The anti-inflammatory activity of the extracts of all three plants was evaluated using the carrageenan induced hind paw edema method developed by.[22] The edema of paw was measured with the help of digital plethysmomter. Young Wister rats, weighing 150-250 g, were randomly divided into four groups, each containing six rats.

Plethysmometer

The digital plethysmometer 7140 is a volume meter; designed for accurate measurement of the rat paw swelling. It consists of water filled Perspex cell into which the rat paw is dipped. A transducer of original design, which records small difference in water level caused by volume displacement; operates on a graphic LCD read out which shows the exact volume of the paw (control or treated).

Principle

The measuring cell consists of two vertical inter-connected Perspex tube; the larger one is used to measure the displacement of water. The water level in the smaller tube, which contains the transducer, follows the change in level of water in the larger tube. Therefore proportional changes in water level occur when something is dipped in. It conductance is linearly proportional to the water level but is also affected by water conductivity, which in turn depends on its ions contents and temperature. A sophisticated electronic circuit monitored by the compensator electrodes, corrects the level of electrons. Thus the reading generates signal proportional to the water-level only and hence to the volume of the dipped object.

Procedure

The rats were given free access to water and food. The rats were kept under observation for 24 h. Right hind paw edema was induced in all three groups of animals by sub planter injection of 0.1 ml of a 1% w/v homogeneous suspension of carrageenan in distilled water. In all the animal groups received test and standard carrageenan was injected half an hour later the administration of dose. The swelling of the injected paw was measured immediately (0 h) and at 0.5, 1, 2, 3, 4, 5, 6, 8, 12 and 24 h after injection using a digital plethysmometer. The amount of paw swelling was determined from time to time and expressed as percent edema relative to the initial hind paw volume. The mean values of percentages were determined for each time interval. Percentage

inhibition of edema produced by each group was calculated against the respective control group using the following formula.

$$\% \text{ Inhibition} = \frac{\% \text{ Edema (Control)} - \% \text{ Edema (test)}}{\% \text{ Edema (test)}}$$

Where, Mean edema = Mean of final paw volume – Mean of initial paw volume

$$\% \text{ Paw Edema} = \frac{\text{Final volume of Paw} - \text{Initial Paw volume}}{\text{Initial Paw Volume}} \times 100$$

RESULT AND DISCUSSION

Statistical evaluation of analgesic activity of all three plant extract at two different doses by hot plate method: The mean of minimum reaction time of the heat induced pain was calculated using statistical software. There is standard error found for each mean value in sample number of 6. These values are shown in (Table 1). Here, 0 min is the reading found in hotplate before treatment. In the hot plate method, all the extract of three plant sat doses of 200 mg/kg and 400 mg/kg showed significant increase in reaction time than control group in 30 and 60 minutes after drug administration which was comparable to the standard drug i.e. Indomethacin. The maximum reaction time was found in 30 minutes for *Tamarindus indica* at 200 and 400mg/kg body weight (12.013 ± 1.07 and 13.91 ± 1.271 respectively). Before treatment mean value of all three plant extract at different concentration were less than control. Hot plate method is the most significant method to evaluate the analgesic activity of a plant extract or chemical compound. The paws of mice and rats are very sensitive to heat at temperatures which are not damaging the skin. The responses are jumping, withdrawal of the paws and licking of the paws. The time until these responses occur is prolonged after administration of analgesics compound. In this study, Indomethacin (10 mg/kg body weight) used as a standard and two doses (200 mg/kg and 400/kg body weight) of all three plant extract where evaluated. Effect of all three plant extract at two different doses in hot plate method is shown in the (Table1).

Table. 1: Changes in the reaction of different treatments after doses administration in course of time values are mean ± SEM, n=6 significance at P <0.05 compared to the control.

Treatment	0 min	30 min	60 min	120 min	180 min
Control	8.13±0.719	8.10±0.867	7.97±1.09	8.056±0.981	8.031±0.901
***Aloe* vera Lam**					
200 mg/kg	5.66±0.369	7.69±0.113	8.67±0.723	7.53±0.195	7.69±0.361
b. 400 mg/kg	6.019±0.685	8.01±0.524	8.93±0.135	7.85±0.981	7.23±0.141
***Terminalia chebula* Retz.**					
200 mg/kg	6.59±0.298	10.981±1.03	9.98±0.714	8.35±0.587	7.69±0.218
b. 400 mg/kg	5.98±0.310	9.29±1.102	8.99±0.935	6.015±0.567	6.359±0.189
Tamarindus indica					
200 mg/kg	6.98±0.135	12.013±1.07	11.98±0.799	9.67±0.76	8.134±0.259
b. 400 mg/kg	5.91±0.916	13.91±1.271	12.96±0.967	8.38±0.794	7.78±0.613
Indomethacin standard at standard dose 10 mg/kg body wt.	7.128±0.619	8.019±0.228	9.312±0.71	11.013±0.201	10.012±0.613

The analgesic activity is expressed as "mean value using following statistical analysis method. The statistical analysis was carried by one way Analysis of variance test (ANOVA) to compare the effects on treatment groups before and after treatment with control group and Dunnet's multiple "t" tests were used to determine the effect of each treatment against control group. P values <0.05 (95% confidence limit) was considered statistically significant, using software SPSS V 20.0. The null hypothesis (H0) was assumed that there was no difference in effects of treatments between the treatment groups compared with control group and alternate hypothesis (H1) was assumed there was significant difference in effect of treatment between the treatment groups compared with control group.

Antipyretic activity

The antipyretic study showed that all the plants extract have capacity to reduced body temperature. The least activity was found for *Aloe* vera Lam even at higher dose i.e. 400 mg/kg body weight. Body temperature of experimental animal was not come to normal even after 2 hrs mention in (table 2).

Table. 2: Effect of all plant extract at two different doses on Brewer's induced pyrexia.

Group	Dose	Rectal temperature (^{0}C)		Rectal temperature (^{0}C) after treatment		
		Normal	3 hours after indication of pyorrhea	1 hr	2 hr	3 hr
1. Control	2 ml Distilled water	39.29±0.001	41.04±0.003	40.9±0.0128	39.8±0.002	39.4±0.016
***2. Aloe vera* Lam**	200 mg/kg	39.3±0.003	41.13±0.0012	40.61±0.0028	40.3±0.0018	39.41±0.0029
	400 mg/kg	39.41±0.004	41.20±0.007	40.19±0.0027	39.91±0.002	39.35±0.0081
***3. Terminaliachebula* Retz**	200 mg/kg	39.35±0.0123	41.17±0.013	40.85±0.0091	39.79±0.0013	39.43±0.0011
	400 mg/kg	39.40±0.0021	41.14±0.0138	40.34±0.0036	39.35±0.00125	39.27±0.0015
4. Tamarindus indica	200 mg/kg	39.45±0.005	41.09±0.029	39.99±0.0138	39.31±0.00228	39.43±0.0016
	400 mg/kg	39.39±0.0021	41.05±0.017	39.80±0.00310	39.41±0.0035	39.31±0.00135
5. Indomethacin	10 mg/kg	39.03±0.0013	41.16±0.013	39.19±0.0015	39.10±0021	39.05±0.0025

All values are expressed as mean ± (SEM), n=6

After administration of higher dose and result was not significant in compression with standard drug. But in case of *Terminalia chebula* Retz body temperature of experimental animal was come to normal after 2 hours administration of higher dose. In case of *Tamarindus indica* body temperature of experimental animal was come to normal after 2 hours administration of lower dose result was significant in compression with standard drug.

Anti-inflammatory study

The anti-inflammatory activity of all plant extracts evaluated using the carrageenan-induced hind paw edema method using digital Plethysmometer. All the plant extract are showing anti-inflammatory effects. Among all the plant extract *Aloe vera* Lam at 200 mg/kg showing minimum activity but in case of *Tamarindus indica* at higher dose showed maximum inhibition i.e. 48% at 12th hrs. The rat's left footpad became edematous soon after injection of carrageenan and reached its peak at 12 h (38.81 %). Mean percent edema and % inhibition of inflammation of all the groups were calculated and mentioned in Table 3. Infect Indomethacin has greater activity than all the plant extracts. There is need of further investigation to elicit which particular compound was responsible for activity.

Table. 3: Anti-inflammatory effects of all plant extracts at two different dose and Indomethacin in carrageenan-induced rat paw edema.

Group	Formulation	N	Mean Wt. ±SD (g)	Time (h)	Mean % Edema ± SD	% Inhibition
I	**Control (carrageenan only)**	6	180.0±12.2	1	28.52±1.33	
				2	41.27±1.34	
				3	75.35±2.32	
				6	56.94±2.35	
				12	38.81±1.57	
II	***Aloe vera* Lam** a. At 200 mg/kg body weight	6	195.0±13.2	1	27.92±1.56	2.103
				2	40.01±2.17	3.053
				3	72.11±1.51	4.299
				6	52.16±1.47	8.394
				12	35.35±1.32	8.915
	b. At 400 mg/kg body weight	6	185±9.54	1	26.81±1.36	5.99
				2	36.23±2.32	12.21
				3	65.1±1.12	13.60
				6	45.76±1.43	19.63
				12	29.91±1.56	22.93
III	***Terminalia chebula* Retz.** *a.* At 200 mg/kg body weight	6	183±9.31	1	26.47±1.22	7.181
				2	36.69±2.33	11.09
				3	66.1±1.55	12.27
				6	48.46±3.73	14.89
				12	29.35±2.43	24.37
	b. At 400 mg/kg body weight	6	182.0±11.23	1	24.43±1.41	14.34
				2	31.99±2.64	22.48
				3	55.11±2.25	26.86
				6	41.412±3.84	27.27
				12	27.35±1.26	29.52

IV	***Tamarindus indica*** a. At 200 mg/kg body weight	6	188.0±13.2	1	24.41±1.84	14.41
				2	31.92±2.14	22.65
				3	54.1±3.71	28.20
				6	40.42±1.32	29.01
				12	24.05±1.59	38.03
	b. At 400 mg/kg body weight	6	182±11.54	1	24.43±1.12	14.34
				2	29.94±2.72	27.45
				3	51.15±3.23	32.11
				6	31.06±1.83	45.45
				12	20.09±1.32	48.23
V	**Indomethacin 10 mg/kg body weight**	6	184±12.41	1	22.41±2.73	21.42
				2	25.94±2.81	37.14
				3	42.15±3.83	44.06
				6	20.05±2.54	64.73
				12	10.01±1.42	74.20

N = Number of rats in each group; SD = Standard deviation.

CONCLUSION

The anti-inflammatory activity expressed by all the three plants. But *Tamarindus indica* L are more active and it was comparable to Indomethacin. Need further studies to elucidate the exact mechanism by which this activity was expressed.

CONFLICT OF INTEREST: None.

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