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ANALGESIC AND ANTI-INFLAMMATORY ACTIVITY OF HYDROALCOHOLIC EXTRACT OF ROOTS OF *AEGLE MARMELOS*

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ABSTRACT

The aim of the present study is to determine the analgesic and anti-inflammatory activity of hydroalcholic extract of roots of *Aegle marmelos*. The extract was found to have significant anti-inflammatory activities by carrageenan caused inflammation. This effect is almost comparable to Indomethacin or slightly less. *Aegle marmelos* extract found to have significant analgesic activity by thermal stimulation pain. The effect is almost comparable to Diclofenac and Morphine sulphate or slightly less. *Aegle marmelos* in the dose of 100 mg per kg and 200 mg per kg of body weight increased paw licking (Eddy' s hot plate) time. The results of dose level *Aegle marmelos* 100 mg per kg and 200 mg per kg of body weight are comparable to the indomethacin, as seen from the studies. The results of dose level of *Aegle marmelos* 100 mg/kg and 200 mg/kg body weight are comparable to the Diclofenac and morphine sulphate, as seen from the studies.

KEYWORDS: Analgesic and anti-inflammatory activity; Hydroalcoholic extract; *Aegle marmelos*; Diclofenac; Morphine.

INTRODUCTION

Inflammation is a term used for the local response of living mammal's tissue to wound because of an agent. It is our body`s defence reaction in order to remove or reduce the spread of the injurious agent and also to eliminate the consequent necrosis tissues and cells. Pain is a irritating sensory and also emotional experience linked with potential or actual tissue damage. Pain is subjective every time and there are no specific tests which qualitatively or can quantitatively measure the pain. The reported toxicity of synthetic drugs has made the people to go for an alternative remedy from plant source that could be safe, easily available and less in cost. There are various herbs used to heal the inflammation. Basil can be a seed, fruit, leaf, flower, or bark, which is used for its therapeutic assets. Herb is used in herbal medication also recognized as botanic medicines or as phyto-therapy or phyto-medicine income a plant or part of plant used to synthesize medicines to backing the curing course during sickness and illness. Herbal medicines are a vital part of both old-style and contemporary system of medicine. Analgesic and anti-inflammatory activity of *Aegle marmelos* was determined.

Medicinal plants are sources of chemical substances with potential therapeutic effects and literature has documented plants with putative analgesic and anti-inflammatory activities.[4] The documentary evidence for many herbal formulations used for pain and inflammation, related to its safety and efficacy is lacking. To establish the use of herbal medicines in a scientific way with valid evidence, WHO and ICMR are encouraging wide spread researches on herbal drugs.[5] *Aegle marmelos* (Bael) is an Indian plant, which has enormous therapeutic value in traditional systems of medicine. It belongs to the family Rutaceae and grows in dry forest, shivaliks and found all over India and Asian countries. The different parts of Bael tree are used for various therapeutic purposes, such as for treatment of fever, arthritis, fractures, healing of wounds, asthma, anaemia, jaundice, diarrhoea, typhoid, hypertension, diabetes mellitus and neurological disorders in traditional systems of medicine.[6] With this back ground this study has been undertaken to evaluate the analgesic and anti-inflammatory activity of the ethanolic extracts of leaf and fruit pulp of *Aegle marmelos* in albino rats.

MATERIALS AND METHODS

Preparation of extract

Fruits were collected from herbal garden of Oriental university, Indore M. P., during August 2016. It was dried in shade. The dry fruits were crushed, balanced (240 g) and jam-packed in soxhlet device for removal.

The powdered drug was extracted with hydroalcoholic solvent (70:30) until drug was completely extracted and dried under vacuum condition.

Chemicals

Indomethacin (Sigma), Diclofenac (Sigma) and Morphine sulphate (Sigma) and all other chemicals were of analytical grades.

Animals

Wistar albino rats of any sex weighing between 150-180 gm were procured from animal house of Department of Pharmacy, Oriental University, Indore (M.P). The animals were stabilized for 1 week; they were maintained in standard condition at room temp; normal light dark cycle. They had been given standard pellet diet and water ad-libitum throughout the course of the study.

METHODS

Analgesic and anti-inflammatory activity

Anti-inflammatory activity

Masculine wistar albino rats (150-180 gm) were used. These faunae were got from the animal house, OCPR Oriental University, Indore. The faunae were kept in a group of 5 under ecologically precise condition with allowed admission of water and diet. Food was suspended overnight proceeding to experiment. Animal are alienated in 4 sets each comprising 5 animals group 1 aided as controller it receive only automobile, group Il as standard which received Indomethacin pure (10 mg/kg), group Ill received Aegle marmelos extract (100 mg/kg) and group IV receive Aegle marmelos extract (200 mg per kg). Paw edema was persuaded by single 0.1 ml sub-plantar dose of carrageenan (200g per paw) in the right hind paw of aware rats (150-180 gm). Carrageenan recognized to outcome in atleast neutrophil related edematous irritation. Rat paw size was restrained instantly formerly the dose of the "irritant" substances and at consistent certain time interval (I, 2, 3, 4 hour) after injection each of the Aegle marmelos hydroalcoholic extract (100mg/kg), (200 mg per kg) equivalent volume of vehicle by means of a plethysmograph graph.

Analgesic activity

Eddy's hot plate method

Male Wistar albino rats (150-180 gm) were second-hand. These animals were gotten from the animal house, OCPR, Oriental Univerity, Indore the animals were kept in a group of 5 under ecologically skilful condition with allowed admittance of water and nutrition. Food was suspended over night proceeding to experiment. Animal are divided in to five groups each comprising 5 animal. Group 1 served as controller it acknowledged only vehicle, group II as standard which received Diclofenac (10mg/kg). Group Ill as standard which received Morphine sulphate (5mg,'kg), group IV received *Aegle marmelos* extract (100 mg/kg) and group V receive *Aegle marmelos* extract (200 mg per kg). The basal response period was (the cut off time 15 sec to prevent tissue injury) detected by hind paw thrashing and hurdle reply in animals when located on the burning plate preserved at continual temp (55 ^{0}C). The response period was again note at 0, 15, 30, and 60 min after the treatment.

RESULTS

Table 1: Percentage body weight gain during acute poisonousness lessons.

S. No.	Groups	Treated	Number of animals	% body weight (grams)		
				Day 0	Day 14	weight in gm
1	Group I	Control	5	143.59±7.37	169.25±8.00	18.1
2	Group Il	*Aegle marmelos*	5	132.41±11.36	155.36±15.75	17.4

Paw edema

The Paw edema volume values were reduced significantly in treated group of *Aegle marmelos* 0.50±0.020 ($p<O.05$) and 0.44±0.042 ($p<O.05$) associated to control group, which was 0.59±0.069. Indomethacin also significantly reduced paw edema volume 0.18±0.024 ($p<O.05$).

Paw licking

The Paw licking time were increased significantly in treated group of *Aegle marmelos* 4.60 ± 0.81 ($p<0.05$) and 5.80 ± 0.37 ($p< 0.05$) associated to control group, which was 4.40 ± 0.22. Diclofenac and Morphine sulphate were also significantly increased paw licking time 11.40 ± 0.74 ($p<O.001$) and 10.60 ± 0.50 ($p<O.05$) respectively.

Table 2: Effect of hydroalcoholic extract of *Aegle Marmelos* on carrageenan induced paw edema.

Group	No of animals	Treated	Dose mg per kg	Paw edema volume (ml)			
				I hour	2 hour	3 hour	4 hour
Group I	5	Control		0.62±0.074	0.60±0.074	0.60±0.071	0.59±0.069
Group II	5	Indomethacin	10	0.29±0.017**	0.26±0.017**	0.20±0.015**	0.18±0.024**
GroupIII	5	*Aegle mannelos* extract	100	0.65±0.020*	0.59±0.028*	0.54±0.028*	0.50±0.020**
Group	5	*Aegle marmelos* extract	200	0.56±0.041*	0.52±0.039*	0.46±0.036*	0.44±0.042**

Values are stated as mean ± SEM, five rats in 1 group
*** Significant (p<0.05) **significant (p<0.01) associated to control**

Table 3: Analgesic effect of hydroalcoholic extract of *Aegle Marmelos* by eddy's hot plate.

Group	No of animal	Treated	Dose mg/kg	Time taken to lick the paw					
				0 min	15min	30min	60min	90min	120min
Group I	5	Control	-	4.60±0.40	5.00±0.44	5.40±0.40	4.80±0.37	4.60±0.24	4.40±0.22
Group II	5	Diclofenac	10	3.80±0.37	7.40±0.50**	10.80±0.66**	11.60±0.60**	12.00±0.70**	11.40±0.74**
Group III	5	Morphine sulphate	5	4.80±0.58	13.00±0.31**	13.00±0.31**	11.40±0.50**	11.40±0.40**	10.60±0.50**
Group IV	5	*Aegle Marmelos extract*	100	3.40±0.24	6.00±0.31*	7.60±0.67*	9.20±0.58*	7.40±0.60*	4.60±0.81*
Group IV	5	*Aegle Marmelos extract*	200	3.00±0.31	6.40±0.67*	10.00±0.54*	10.20±0.37*	7.80±0.37	5.80±0.37*

Values are requested as mean ±SEM, n= 5 rates in one group

- **Significant (p<0.05) **Significant (p<0.01) compound to control**

DISCUSSION

Aegle marmelos Plant contains various chemical like alkaloid, flavonoid and naphthaquinones, etc. The progress of carrageenan induced oedema is bi-phasic; the 1st phase is credited to the proclamation of histamine, 5-hydroxy tryptamine and kinins, while the 2nd phase is linked to the proclamation of prostaglandins.[12] Therefore, Administration of carrageenan induced the proclamation of histamine, 5 hydroxy tryptamine and kinins. Histamine encourages bond of leukocyte to vascular endo-thelium by stating union molecule selection on endothelial cell exterior, confiscating leukocyte at the provocative spot.

The prostaglandins are unanimously unconstrained on tissue injury, and are extant in the provocative exudates. It is obvious that PG's, predominantly PGE2 plays an imp part in several aspects of the provocative process. PG's fusion is contingent on the action of enzyme compound prostaglandin synthetase. PG's show a share in the erythema, oedema, agony and temperature related with irritation either by straight action or by alerting the receptors to other substances unconfined by tissue injury such as bradykinin and histamine. Indomethacin highly strong inhibitor of P G mixture and suppress neutrophil motility which treat inflammation.

Thermal stimulation of pain by eddy's hot plate in paw and by tail immersion in tail may leads to release histamine from mast cells and potassium, both of which excite nociceptors and produce pain Thermal stimulation may also produce Subs P, a polypeptide. The *Aegle marmelos* has direct or indirect action over this and that was the result of its analgesic action.

Diclofenac is peripherally acting analgesic. It act by peripheral mechanism. i.e. when a aching incentive is functional to a subtle part like skin, a sequence of events occurs that are eventually recognized as a aching feeling. Delicate tissues contain painful receptors known as 'nocicepetors'. 2 marvels happen via the nociceptors, the 1st is receptor initiation or transduction in which biochemical, thermal or powered energy is interpreted to an electro-chemical nerve instinct in the main afferent nerve. The 2nd occurrence is broadcast of the impulses as oblique electro-chemical info to constructions in the CNS that read the sign as pain.[14]

Morphine sulphate is centrally acting analgesic. It act by central mechanism There may exist dissimilar pain conveying paths, counting the spino reticular, spino thalamic, spino cervical and dorsal column areas. The side spinothalamic area have supposed to be the leading spinal cord path for gesturing pain in beings, as cuts of this area results in the nonappearance of pain under the cut. The transmission region of the spino-thalamic area and that of some dorsal column nuclei appear to overlap in the thalamus and low threshold stimulation of the dorsal column by electric or biochemical resources can disturb the movement of pain indication broadcast.

The extract of *Aegle mannelos* shows significant result with the both type of analgesic this mean that our drug may act through the central analgesic pathway because it is active in the first phase just like morphine sulphate.

CONCLUSION

This study was undertaken to assess the analgesic and anti inflammatory activity due to hydroalcoholic extract of fruit of the plant *Aegle marmelos*. The extract was

found to have significant anti inflammatory activities by carrageenan caused inflammation. This effect is almost comparable to indomethacin or slightly less. *Aegle marmelos* extract found to have significant analgesic activity by thermal stimulation pain. The effect is almost comparable to Diclofenac and Morphine sulphate or slightly less. *Aegle marmelos* in the dose of 100 mg per kg and 200 mg per kg of body weight increased paw licking (Eddy' s hot plate) time.

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