

Antiinflammatory Activity of Aerial Part of *Maerua apetala* Roth (Jacobs) Against Carrageenan Induced Paw Edema.

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ABSTRACT

The present study was conducted to evaluate the antiinflammatory activity in the ethanol extract of aerial part of *Maerua apetala*. The antiinflammatory activity was assessed by carrageenan induced paw oedema in albino rats. The aerial part extract of this plant were administered orally at doses of 100, 150 and 300 mg / kg body weight and the study was compared with a standard drug indomethacin (10 mg / kg). The highest dose of *Maerua apetala* aerial part extracts (300 mg / kg) produced a maximum inhibition of 84.17% at 3 hours after administration which was more effective. Further detailed studies are in progress for the isolation of single entity responsible for antiinflammatory activity and development of suitable formulations.

Keywords: *Maerua apetala*, Inflammation, Albino rats, Indomethacin.

INTRODUCTION

Inflammation is part of the complex biological response of vascular tissues to harmful stimuli, such as pathogens, damaged cells, or irritants. The classical signs of acute inflammation are pain, heat, redness, swelling, and loss of function. Inflammation is a protective attempt by the organism to remove the injurious stimuli and to initiate the healing process. Inflammation is not a synonym for infection, even in cases where inflammation is caused by infection. Although

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infection is caused by a microorganism, inflammation is one of the responses of the organism to the pathogen. However, inflammation is a stereotyped response, and therefore it is considered as a mechanism of innate immunity, as compared to adaptive immunity, which is specific for each pathogen^{1,2}.

Inflammation can be classified as either *acute* or *chronic*. Acute inflammation is the initial response of the body to harmful stimuli and is achieved by the increased movement of plasma and leukocytes (especially granulocytes) from the blood into the injured tissues. A cascade of biochemical events propagates and matures the inflammatory response, involving the local vascular system, the immune system, and various cells within the injured tissue. Prolonged inflammation, known as chronic inflammation, leads to a progressive shift in the type of cells present at the site of inflammation and is characterized by simultaneous destruction and healing of the tissue from the inflammatory process³.

Many synthetic drugs were now available in market to treat inflammation and pain, leading to side effects. Nature has provided a complete store-house of remedies to cure all ailments of mankind⁴. Plants have contributed lot of medicinal compounds being used today to treat diseases like cancer, hormonal imbalances, jaundice, diabetes, inflammation etc. Medicinal plants are very commonly available in abundance especially in the tropics. They are the vital sources of wide variety of chemicals from which novel anti-inflammatory agents can be discovered⁵. So, the herbal drugs of the utmost important and there is a need for the production of novel herbal drugs. Many herbal based remedies are believed to have a range of biomedical efficacies including treatment of inflammation, hyperlipemia, arteriosclerosis, osteoporosis and bone resorption etc⁶.

Maerua (Murva) is an important ayurvedic drug used as one of the ingredients in many Ayurvedic preparations. Ethanomedical survey reveals that Maerua is used to cure various diseases such as fever, stomach ache, skin infections, urinary calculi, diabetes mellitus, epilepsy, pruritis, rigidity in lower limbs, and abdominal colic⁷.

Maerua is a controversial drug. Amongst the many synonyms of this plant, one is '*Dhanurgunopayogya*' meaning 'the plant whose bark is being used for the bow-strings'. These synonyms have also contributed to the existing confusion. The plant which has tough fibers is the *Maerua*. There are many such fiber yielding plants are found in the vegetable kingdom. *Maerua* is an important controversial drug used in diseases like anaemia, fever, diabetes, stomach disorders, typhoid, urinary infection and cough⁸.

However, so far there is no systematic study on antiinflammatory activity has been reported in the literature. Hence the present study focuses on evaluating the anti-inflammatory activity of

aerial part of *Maerua apetala*. To our knowledge no report on the effect of this plant on experimental information. This study was therefore undertaken to evaluate the effect of ethanol extract of aerial part of *Maerua apetala* on antiinflammatory activity in carrageenan induced rat paw edema.

MATERIALS AND METHODS

The aerial parts of *Maerua apetala* Roth (Jacobs) were collected from Vattakottai, Kanyakumari District, Tamil Nadu. The collected samples were cut into small fragments and shade dried until the fracture is uniform and smooth. The dried plant material was granulated or powdered by using a blender and sieved to get uniform particles by using sieve No. 60. The final uniform powder was used for the extraction of active constituents of the plant material.

Preparation of Plant Extract For Antiinflammatory Activity: The dried aerial parts of *Maerua apetala* were powdered in a Wiley mill. Hundred grams of whole plant powder was packed in a Soxhlet apparatus and extracted with ethanol. The ethanol extract was concentrated in a rotary evaporator. The concentrated ethanol extract was used for antiinflammatory activity.

Animals: Adult Wistar Albino rats of either sex (150-200g) were used for the present investigation. Animals were housed under standard environmental conditions at temperature ($25\pm 20^\circ\text{C}$) and light and dark (12:12 h). Rats were fed with standard pellet diet (Goldmohur brand, MS Hindustan lever Ltd., Mumbai, India) and water *ad libitum*.

Acute Toxicity Study: Acute oral toxicity was performed by following OECD-423 guidelines (acute toxic class method), albino rats (n=6) of either sex selected by random sampling were used for acute toxicity study 9. The animals were kept fasting for overnight and provided only with water, after which the extracts were administered orally at 5mg/kg body weight by gastric intubations and observed for 14 days. If mortality was observed in two out of three animals, then the dose administered was assigned as toxic dose. If mortality was observed in one animal, then the same dose repeated again to confirm the toxic dose. If mortality was not observed, the procedure was repeated for higher doses such as 50, 100 and 2000 mg/kg body weight.

Anti-inflammatory activity

Carrageenan induced hind paw edema: Albino rats of either sex weighing 150-200 grams were divided into four groups of six animals each. The dosage of the drugs administered to the different groups was as follows. Group I - Control (normal saline 0.5 ml/kg), Group – II, III

and IV – ethanol extract of *M. apetala* (100 mg/kg, 150 mg/kg and 300 mg/kg, p.o.), Group V – Indomethacin (10 mg/kg, p.o). All the drugs were administered orally. Indomethacin served as the reference standard antiinflammatory drug.

After one hour of the administration of the drugs, 0.1 ml of 1% W/V carrageenan solution in normal saline was injected into the sub plantar tissue of the left hind paw of the rat and the right hind paw was served as the control. The paw volume of the rats were measured in the digital plethysmograph (Ugo basile, Italy), at the end of 0 min., 60min., 120min., 180min., 240min., 360min., and 480min. The percentage increase in paw edema of the treated groups was compared with that of the control and the inhibitory effect of the drugs was studied. The relative potency of the drugs under investigation was calculated based upon the percentage inhibition of the inflammation. Percentage inhibition was calculated using the formula;

$$\text{Percentage inhibition} = [(V_c - V_t)/V_c] \times 100$$

Where, V_t the percentage represents the percentage difference in increased paw volume after the administration of test drugs to the rats and V_c represents difference of increased volume in the control groups.

STATISTICAL ANALYSIS

The data were analyzed using student's t-test statistical methods. For the statistical tests a p values of less than 0.001, 0.01 and 0.05 was taken as significant.

RESULTS

In the present study, the antiinflammatory activity of ethanol extract of *M. apetala* was assayed in Albino rats using carrageenan-induced rat paw edema (acute inflammation) method. Table 1 shows that the antiinflammatory activity of ethanol extract of the aerial part of *M. apetala* significantly inhibited the rat paw edema at 3rd hr post carrageenan were 72.06%, 77.12% and 84.17% for 100, 150 and 300 mg/Kg of ethanol extract of *M. apetala* respectively (Fig-1). It shows that the plant extract have significant ($p < 0.001$) antiinflammatory effect and the results were compared with indomethacin (10mg/kg) and show percentage paw volume reduction of 80.14%.

DISCUSSION

In the present study the potential antiinflammatory effect of ethanol extract of aerial part of *M. apetala* was investigated. The results indicate that the oral administration of ethanol extract of aerial part of *M. apetala* exhibit a significant and dose dependent protective effect on chemical

Table 1: Effect of *M. apetala* aerial part extract on the Percentage inhibition of Carrageenan induced paw oedema

Treatment Groups	Dose mg/kg	Oedema volume (ml)				% Inhibition after 180 min
		0 min	60 min	120 min	180 min	
Group – I	Normal saline	28.16±1.23	81.93±1.84	101.66±1.65	131.84±1.84	
Group – II	100mg/kg	30.16±1.18	62.54±2.16	42.84±1.14**	36.83±1.08**	72.06
Group – III	150 mg/kg	29.96±1.34	51.63±1.69	38.22±1.39***	30.16±1.13***	77.12
Group- IV	300 mg/kg	32.65±1.18	43.69±1.68	31.84±1.28***	20.86±1.36***	84.17
Group- V	10 mg/kg	26.14±1.08	54.11±1.38	36.88±1.16***	26.18±1.13***	80.14

Each Value is SEM \pm 5 individual observations * $p < 0.05$; ** $p < 0.01$ *** p

< 0.001 , Compared paw oedema induced control vs drug treated rats

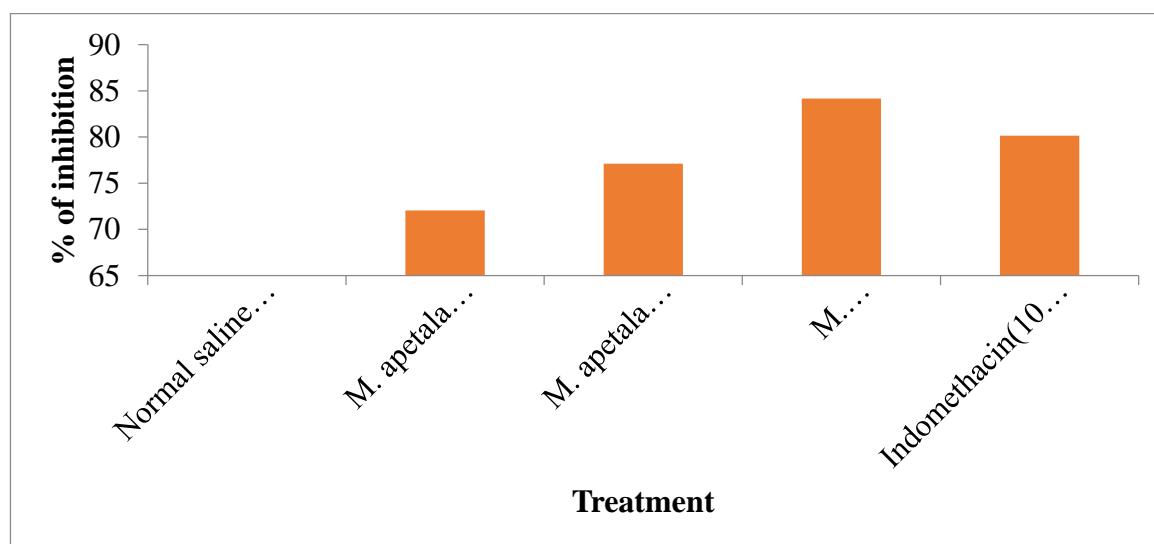


Fig.1: Effect of *M. apetala* aerial part extracts on the Percentage of inhibition after 180 min

(acetic acid injection) and thermic (heat) painful stimuli at the doses of 100,150 and 300 mg/kg and indicates that ethanol extract of aerial part of *M. apetala* possess both peripheral (writhe reduction) and central (prolongation of tail withdrawal) effects.

Carrageenan rat paw edema is the suitable method for evaluating the antiinflammatory activity and the inhibitory effect shown by the ethanol extract of aerial part of *M. apetala* (100, 150 and 300 mg/kg) is almost similar to that of the group treated with the indomethacin (10 mg/kg). Carrageenan induced rat paw edema is a suitable experimental animal model for evaluating the antiedematous effect of natural products¹⁰, and this is believed to be triphasic, the first phase (1hr after carrageenan challenge) involves the release of serotonin and histamine from mast cells, the second phase (2hr) is provided by kinins and the third phase (3hr) is mediated by prostaglandins, the cyclooxygenase products and lipoxygenase products¹¹. The metabolites of arachidonic acid formed via the cyclooxygenase and lipoxygenase pathways represent two important classes of inflammatory mediators, prostaglandins (products of the cyclooxygenase pathway) especially prostaglandin E2 is known to cause or enhance the valuable signs of inflammation, similarly, leukotriene B4 (product of lipoxygenase pathway) is a mediator of leukocyte activation in the inflammatory cascade¹². The mechanism of carrageenan induced edema is it causes the release of prostaglandins and kinins, the results indicate that the extract acts on both initial and later phases of inflammation. Thus, the results of the study would support the traditional use of *M. apetala* in some painful and inflammatory conditions. It can be concluded that the ethanol extract of *M. apetala* has anti-inflammatory activity against carrageenan induced paw edema in rats. This activity may be due to their content of flavanoids, steroids, saponins and carbohydrates. The ethanol extract of *M. apetala* (300mg/kg) showed better activity profile compared to the low dose hence it can be said to possess majority of the activity. This study demonstrates the efficacy of ethanol extract of *M. apetala* as an antiinflammatory agent and also scientifically justifies the use of this plant as an antiedematous agent in folk medicine, however, further studies are required to determine the constituents responsible for its antiinflammatory activity and further authenticate its mechanism of action.

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