



## Anti inflammatory activity of *Mangifera indica* L. Var. *Rasapuri* Root extracts

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### ABSTRACT

The present study deals with the investigation of phytochemically evaluated aqueous extract of leaves of *Mangifera indica* L. Var. *Thotapuri* for its anti-inflammatory activity. The activity was evaluated by carrageenan induced rat paw edema method for acute inflammation and cotton pellet granuloma method for chronic inflammation. The standard drug used was Diclofenac sodium (10 mg/kg) for both the models. In these methods, ethyl acetate and ethanol extracts at a dose level of 300 mg/kg has shown significant activity which is comparable to that of the standard.

**Keywords:** Anti-inflammatory, *Mangifera indica*, Carrageenan induced paw edema, Cotton Pellet granuloma.

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### INTRODUCTION

Inflammation is defined as local response of living mammalian tissue to injury due to any agent. Inflammation manifests usually in form of painful swelling associated with some changes in skin covering the site [1].

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 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 which are present at the site of inflammation and is characterized by simultaneous destruction and healing of the tissue from the inflammatory process [2].

Several experimental models of paw oedema have been described. Carrageenan-induced paw oedema is widely used for determining the acute phase of the inflammation. Histamine, 5-hydroxytryptamine and bradykinin are the first detectable mediators in the early phase of carrageenan-induced inflammation [3], whereas prostaglandins are detectable in the late phase of inflammation [4].

The plant *Mangifera indica* L. (Anacardiaceae) has been reported for various therapeutic uses in traditional medicines such as, a fluid extract or the infusion of the bark is used in monorrhagia, leucorrhoea, bleeding piles and in case of haemorrhage from the lungs, also in nasal catarrh and for lumbrici. Leaf juice is useful in bleeding dysentery, aphonia or loss of voice. Midribs of the leaves calcined are used to remove warts of eyelids. Tender leaves dried and made into a powder are use full in diabetes. Smoke of the burning leaves is said to have a curative effect in some infections of the throat, in hiccup, etc. ashes of the leaves are popular remedy for burns and scalds.

Dried flowers in decoction or powder are useful in diarrhea, chronic dysentery and gleet. Gum of the tree is applied to cracked feet. Gum-resin from the bark is used in catarrhs and mixed with lime juice it is applied to scabies and other cutaneous affections. *Mangifera indica L.* is used in the Ayurvedic system of medicines for a variety of medicinal purposes [5].

However, literature survey reveals that not much work was reported for roots of this plant for above said activities. Hence it was planned to investigate the roots of the plant *Mangifera indica L.* varieties grown in Semi-malnad area for these activities.

## EXPERIMENTAL SECTION

### Preparation of plant extracts

The coarse powdered material was subjected to successive extraction with ethyl acetate and ethanol by increasing polarity. The physical parameters of the root extracts of *Mangifera indica* neelam L. mentioned in table.1.

### Preliminary phytochemical screening

Preliminary phytochemical study was performed [6]. The presence of phytoconstituents such as Steroids, Carbohydrates, Flavonoids, Amino Acids, Proteins, Phenolic Compounds and Tannins in Ethyl acetate and Ethanol extract reveals the presence of alkaloids, steroids, flavonoids, phenolic compounds and tannins.

### Anti-inflammatory activity

#### Carrageenan Induced Rat Paw Edema

This method was based on plethysmographic measurement of carrageenan-induced acute rat paw edema [7] produced by subplantar injection of carrageenan in hind paw of the rat. The method described by Wilhmi and Domenjoz [8] later on modified by Sirodia and Rao [9] was used for measuring the paw volume.

This procedure of measuring the paw volume required two operators, one for dipping the paw of the rat in potassium permanganate solution and another to measure and records the paw volume simultaneously.

For this study, albino rats (Wistar strain) of either sex weighing between 100-200 gms were used and divided into 4 groups of 4 animals each. The group I served as control and received Tween-80 (0.1%, 1 ml) solution orally. The group II received Diclofenac Sodium at a dose of 10 mg/kg body weight in Tween-80 (0.1%, 1 ml) and served as standard. The group III and IV received orally the ethyl acetate extract at the dose of 150 and 300 mg/kg body weight in Tween-80 (0.1%, 1 ml) solution. The groups V and VI received orally the ethanol extract at the dose of 150 and 300 mg/kg body weight in Tween-80 (0.1%, 1 ml) solution. These drugs were administered one hour before the injection of the irritant. After 1 hr all the animals were injected subcutaneously carrageenan solution (0.1%, 0.05 ml) to the right hind paw in the sub plantar region, immediately the paw volume was measured at 1 hour, 2 hours, 3 hours, 4 hours and 5 hours and also calculated percentage of inhibition in all the groups. Results are tabulated in table.2.

The percentage inhibition of paw volume was calculated by using the formula,

$$\left(1 - \frac{V_t}{V_c}\right) \times 100$$

Where,  $V_t$  = Mean increase in the paw volume in test animal group.

$V_c$  = Mean increase in the paw volume in control group.

Statistical analysis was carried to determine % protection.

### Chronic inflammation - Cotton pellet granuloma

The animals were grouped as described above to study the anti-inflammatory activity. The groups were fasted and treated with drugs/doses similar to that of carrageenan-induced hind paw edema. Sterile cotton pellets each weighing  $30 \pm 5$  mg were prepared and sterilized in a hot air oven at 123°C for 3 h. Each animal was placed under light with ether anesthesia and subcutaneously implanted four cotton pellets, one each into both the axillae and the groin region under aseptic conditions. The drugs were administered orally for seven days starting from the day of implantation of the pellets. All the animals had free access to drinking water and food. On the 8<sup>th</sup> day, all the animals

were sacrificed and the implanted cotton pellets were recovered, cleaned of surrounding tissues, and blotted with filter paper. These cleaned pellets were weighed and dried in a hot air oven overnight at 70°C and the dry weights were noted [10]. Results are tabulated in table.3.

Percentage inhibition of Granuloma Pouch in rats was calculated using the following formula:

$$\% \text{ Inhibition} = (\text{Control-Test})/\text{Control} \times 100$$

## RESULTS AND DISCUSSION

The ethyl acetate and ethanol extracts of the roots of *Mangifera indica L.* were tested for anti-inflammatory activity by carrageenan-induced rat paw edema method. The activity was compared with the standard drug Diclofenac sodium. Experimental results showed that both these extracts exhibited considerable anti-inflammatory activity when compared with the standard drug.

The results obtained as percentage inhibition of granuloma formation are shown in table.3. The results shown percentage inhibition of granuloma formation with 150 and 300 mg/kg dose ethyl acetate and ethanol extracts are (37.97%, 60.66%, 37.34% and 60.18%) respectively. The percentage inhibitions with aspirin (10 mg/kg) is (66.15%). Experimental results showed that both these extracts exhibited considerable anti-inflammatory activity when compared with the standard drug.

**Table.1**

Solvent	Yield (g)	Colour	Physical state
Ethyl acetate extract	14.3	Greenish brown	Gummy
Ethanol extract	29.5	Dark yellow	Dry powder

**Table.2**

Groups	Dose (mg/kg)	Paw volume after carrageenan injection									
		1 hr.		2 hr.		3 hr.		4 hr.		5 hr.	
		EV	EI (%)	EV	EI (%)	EV	EI (%)	EV	EI (%)	EV	EI (%)
Control	-	0.83 ± 0.07	-	0.88 ± 0.075	-	0.93 ± 0.06	-	0.90 ± 0.06	-	0.68 ± 0.03	-
Diclofenac Sodium	10	0.48 ± 0.04	42.16	0.31 ± 0.04***	64.77	0.21 ± 0.01***	77.41	0.35 ± 0.04	61.11	0.35 ± 0.04	48.52
Ethyl acetate	150	0.75 ± 0.09	9.6	0.61 ± 0.09	30.68	0.65 ± 0.08	30.10	0.52 ± 0.082	42.22	0.45 ± 0.064	33.82
Ethyl acetate	300	0.73 ± 0.075	12.0	0.063 ± .083	28.40	0.53 ± 0.08	43.0	0.46 ± 0.075*	48.88	0.39 ± 0.039	42.64
Ethanol	150	0.73 ± 0.054	12.04	0.66 ± 0.06	25.00	0.44 ± 0.045*	52.68	0.35 ± 0.045**	61.11	0.32 ± 0.03*	52.64
Ethanol	300	0.66 ± 0.06	25.00	0.51 ± 0.054*	42.04	0.34 ± 0.058**	63.44	0.30 ± 0.058***	66.66	0.24 ± 0.024*	64.70

Values are expressed as mean ± SEM (n=6).

EV – Oedema volume and EI – Oedema inhibition.

Significant at  $p < 0.05$ , \*\* highly significant at  $p < 0.01$ , \*\*\* Very highly significant at  $p < 0.001$

**Table 4**

Goups	Dose (mg/kg)	Dry weight (mg)	% Inhibition
Control	-	124.5 ± 1.53	-
Diclofenac Sodium	10	42.14 ± 1.18	66.15
Ethyl acetate	150	77.22 ± 1.70*	37.97
Ethyl acetate	300	48.97 ± 1.24**	60.66
Ethanol	150	78.01 ± 3.42*	37.34
Ethanol	300	49.57 ± 1.84**	60.18

Values are expressed as mean ± SEM (n=6).

\* Significant at  $p < 0.05$ , \*\* highly significant at  $p < 0.01$ .

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**CONCLUSION**

The present experimental study protocol showed that ethanolic and ethyl acetate extract of *Mangifera indica L.* elicited significant anti-inflammatory activity in carrageenan induced paw edema and cotton pellet granuloma model. In both model they exhibited anti-inflammatory effect in a dose dependent manner which can be comparable with that of Diclofenac Sodium. The phytochemical analysis revealed the presence of flavonoids. The flavonoids have potent anti-inflammatory activity by inhibiting prostaglandin synthesis [11].

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