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Anti-inflammatory activity of *Moringa oleifera* stem bark extracts against carrageenan induced rat paw edema

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ABSTRACT

The ethanolic and aqueous extracts of the stem bark of Moringa oleifera were tested to study the effects on the inflammatory reaction, using the technique of carrageenan induced paw edema in albino rats. Both the ethanolic and alcoholic extract showed significant anti-inflammatory activity comparable to the reference standard Diclofenac sodium.

Key words: Anti-inflammatory activity, *Moringa oleifera*, Carrageenan.

INTRODUCTION

The plant *Moringa oleifera* Lam (Moringaceae) is the most widely cultivated variety of the genus *Moringa* and is distributed in the sub-Himalayan ranges of India, Sri-Lanka, Mexico, Arabia and South Western Africa. The stem bark of *Moringa oleifera* removes all kinds of pain, good vesicant, expectorant, stimulant and abortifacient. The decoction of the root bark is used as a stimulant, analgesic and diuretic. The pods are edible, seeds are useful as purgative, antipyretic, cures eye diseases, head complaints and are used in venereal affections [1].

Stem bark of *Moringa oleifera* contains 4-Hydroxymellein, β -sitosterol and vanillin [2]. The present study was undertaken to screen the anti-inflammatory activity of the stem bark of *Moringa oleifera*.

EXPERIMENTAL SECTION

The stem bark of *Moringa oleifera* were collected from the local areas of Mangalore district, Karnataka, India during December 2007 and were authenticated by Prof. Gopalakrishna Bhat, Department of Botony, Poorna Prajna College, Udupi.

Preparation of Extracts

The powdered plant material (500 g) was successively extracted with ethanol in a soxhlet apparatus. The water extract was obtained by cold maceration (three cycles). The liquid extracts were concentrated separately and dried under vacuum. The dried extracts (ethanol and water) were preserved in a desiccator until further use.

Animals

Healthy Wistar albino rats of either sex and of approximately the same age, weighing about 150-250 gm were used for the study. They were fed with standard chow diet (Pranav Agro Industries Ltd., Sangli, Maharastra) and *ad libitum*. They were housed in polypropylene cages maintained under standard condition (12 hour light, 12 hour dark cycle; $25 \pm 3^\circ\text{C}$, 35-60 % humidity). The experimental protocol was subjected to the scrutiny of the Institutional Animal Ethical Committee and was cleared by the same before starting.

The acute toxicity studies of ethanol and aqueous extracts were carried out according to OECD guidelines. 300 mg/kg dose of both the extracts was found non-toxic in mice and was taken for the further study.

Anti-Inflammatory Activity

The ethanol and aqueous extracts were evaluated for their anti-inflammatory activity by carageenan induced rat paw edema method[3]. The animals were divided into four groups of six animals each. First group serving as control received Tween 80 (1%, 10 ml/kg p.o), second and third groups were receiving the aqueous and alcoholic extracts (300 mg/kg). The fourth group served as positive control and received Diclofenac sodium 25 mg/kg body weight. Food was withdrawn overnight, but adequate supply of water was given to the rats before the experiment. The drugs were given orally with the help of an oral catheter. After one hour, a subplantar injection of 0.1 ml of 1 % solution carageenan was administered in the left hind paw to all the five groups. The paw volume was measured with the help of plathysmograph immediately after injection. The paw volume was again measured after 3 hours. The average paw of swelling in a group of extracts treated rats were compared with control group (treated with vehicle) and the standard (Diclofenac sodium).

Statistical analysis

Results expressed as mean \pm S.E., were evaluated by unpaired student T test. Values of $p < 0.05$ were considered statistically significant.

RESULTS AND DISCUSSION

The aqueous and ethanolic extract of the stem bark of *Moringa oleifera* showed significant reduction in the edema volume at a dose of 300 mg/kg body weight, which is comparable to standard (Table 1) drug Diclofenac sodium. Indigenous drug systems can be source of variety of new drugs which can provide relief in inflammation, but their claimed reputation has to be verified on a scientific basis. Ethanolic extract showed maximum anti-inflammatory activity.

Treatment	Dose	Volume displaced in ml					
		0 hr	1 hr	2 hr	3 hr	4 hr	5 hr
Control	-----	0.43± 0.008	0.71± 0.008	0.75± 0.007	0.81± 0.010	0.89± 0.007	0.99± 0.008
Diclofenac Sodium	25 mg/kg	0.42± 0.003 (2.32)	0.46± 0.005 ^b (35.21)	0.48± 0.005 ^b (36.00)	0.50± 0.005 ^b (38.27)	0.53± 0.007 ^b (40.45)	0.55± 0.010 ^b (44.44)
Ethanolic extract	300 mg/kg	0.43± 0.0008 (0.00)	0.51± 0.005 ^a (28.16)	0.55± 0.006 ^a (26.66)	0.60± 0.007 ^a (26.92)	0.64± 0.008 ^a (28.08)	0.69± 0.020 ^a (30.30)
Aqueous extract	300 mg/kg	0.43± 0.006 (0.00)	0.54± 0.030 ^b (23.94)	0.59± 0.007 ^b (21.33)	0.62± 0.005 ^b (23.46)	0.66± 0.007 ^b (25.84)	0.72± 0.003 ^b (27.27)
<i>Results expressed as Mean ± S.E.M (n=6), a-p<0.05, b-p<0.01, Figures in parenthesis indicate percentage inhibition.</i>							

However, the activity produced by both the extracts was found to be less effective than the reference standard Diclofenac sodium. Edema represents the early phase of inflammation in carageenan induced paw edema and is the simplest and most widely used model for studying anti-inflammatory activity. The paw edema induced by the subplantar injection of carageenan in rats is biphasic, the first phase 1 hr. involves the release of serotonin and histamine while the second phase (over 1 hr.) is mediated by prostaglandins, the cyclooxygenase products and the continuity between two phases is provided by kinins[4]. Both extract showed significant anti-inflammatory activity at 5 hr. against carageenan injection suggesting that the extracts predominantly inhibit the release of prostaglandins like substance[5]. The percentage of paw edema was found to be better with the alcoholic extract than the aqueous extract. The activity may be attributed due to the presence of 4-Hydroxymellein, β -sitosterol and vanillin.

Table-1: Anti-inflammatory activity of *Moringa oleifera* extracts on Carageenan induced paw edema in rats

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