

EFFECT OF METHANOL EXTRACT OF *MUSA PARADISIACA* (LINN) STEM JUICE ON CHEMICALLY INDUCED ACUTE INFLAMMATION

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ABSTRACT

The methanol extract of *Musa paradisiaca* (MEMP) at the dose of 200 and 400 mg/kg orally was tested for anti-inflammatory activity in some acute models viz. xylene induced ear lap oedema, carrageenan induced paw oedema and dextran induced paw oedema model. Ibuprofen at the dose of 50 mg/kg was used as standard. MEMP showed dose dependent activity against all the three models and the results were significant ($p < 0.05$) compared with the control group.

Thus the present study indicates that the methanol extract of *Musa paradisiaca* stem juice possesses significant anti-inflammatory activity.

Keywords: Anti-inflammatory activity, *Musa paradisiaca*, Xylene, Carrageenan, Dextran

INTRODUCTION

Musa paradisiaca (Linn) commonly known as Banana belonging to the family Musaceae¹ is an indigenous plant to India. Besides its traditional use for the treatment of diarrhoea, dysentery, intestinal lesions in ulcerative colitis, diabetes, spur, uraemia, nephritis, gout, hypertension and cardiac disease², it has many therapeutic value in the different parts of the plant. Different phytochemicals have been isolated from various parts of the plant which include carbohydrate, Catecholamine such as norepinephrine, serotonin, dopamine, Several flavonoids and related compounds (Leucocyanidin, quercetin and its 3-O-galactoside, 3-O-glucoside, and 3-O-rhamnosyl glucoside) were isolated from the unripe pulp of plantain. Acyl steryl glycosides such as sitoindoside-I, sitoindoside-II, sitoindoside-III, sitoindoside-IV and steryl glycosides such as sitosterol gentiobioside, sitosterol *myo*-inosityl- β -D-glucoside has been isolated from fruits of *M. paradisiaca*².

An extensive literature survey did not afford any information regarding its effect on inflammation and thus the present study was undertaken to investigate its effect on some acute inflammatory models.

MATERIALS AND METHODS

Plant Extract

The stem of *Musa paradisiaca* was collected in the month of November 2011 from Kalyani, Nadia, West Bengal, and India. It is identified by the Botanical survey of India, Howrah, India. A voucher specimen (PG 344) was retained in our laboratory for further reference.

The white inner part of the stem was cut down into pieces, and then it was crushed by the help of Mechanical crusher for the extraction of juice. About 5 litre of juice was collected and it was going to be filtered. About 150ml of juice was lyophilized and get a gummy material then it was treated with methanol. The methanol extract was concentrated in vacuum and kept in a vacuum dessicator for complete removal of solvent. The yield was 0.2751 gm of concentrated material. Preliminary qualitative analysis of methanol extract showed the presence of steroid, flavonoid, and saponin. The methanol extract of *Musa paradisiaca* (MEMP) was used for the study.

Drugs and Chemicals

Carrageenan was purchased from S.D.Fine chemicals Ltd. Mumbai, India. Dextran from Sigma, and Xylene from SISCO Research Laboratory, Mumbai, India. Ibuprofen obtained from Cipla Ltd. Mumbai, India as a gift sample. The solvents and chemicals were of analytical grade and used as received.

Animals

Swiss albino female mice (20 \pm 2g), Wister albino male rats (130-170g) were used for the present studies. They were housed in clean polypropylene cages (38 \times 23 \times 10 cm) with not more than six animals per cage and maintained standard laboratory condition (temperature 25 \pm 2 $^{\circ}$) with dark and light cycle (12/12 h). They are allowed to standard pellet diet (Hindustan Lever, Kolkata, India) and water *ad libitum*. The animals were acclimatized to laboratory condition for seven days before commencement of experiments. Ethical clearance was obtained from University Animal Ethical Committee for using animals in the present study methods.

Toxicity Study

Acute toxicity was determined according to the method of Litchfield and Wilcoxon (Litchfield and Wilcoxon, 1949)³ by observing the number of deaths of mice in different groups (n=10) treated with MEMP in the dose range of 200-2000mg/kg.

Anti-inflammatory Study

Xylene induced Model

The rats were divided into four groups containing six rats in each group.

- Group I: 3.0 ml/kg of vehicle (0.25% of Carboxy methyl cellulose), p.o. once daily for 7 days
- Group II: MEMP at the dose 200 mg/kg, p.o., once daily for 7 days.
- Group III: MEMP at the dose of 400 mg/kg, p.o., once daily for 7 days.
- Group IV: Ibuprofen at the dose of 50 mg/kg, p.o., once daily for 7 daily.

Three hrs after the last dose administration, 0.5 ml of xylene was spread on the left ear lap and after two hours the animals were sacrificed under ether anaesthesia and both the ear laps were cut and weighed separately. Weight difference between the two laps was calculated. The anti-inflammatory activity is expressed as following (Gupta et al, 2003)⁴

$$\text{Anti inflammatory activity (\%)} = (1-D/C) \times 100$$

Where D is the change in weight of ear lap in treated group and C is the change in weight of ear lap in control (Untreated).

Carrageenan induced rat paw oedema

The rats were divided into four groups containing six rats in each group. Acute inflammation was induced according to the method of

Winter and Poster, 1957.⁵ 0.1 ml of 1.0% of carrageenan in normal saline (0.9% NaCl) was injected to the sub planter region of left hind paw. The extract was suspended in 0.25% Carboxymethylcellulose (CMC) and administrated once to the rats 1 hr before carrageenan injection.

Different groups were treated as follows:

- Group I: Carrageenan + 0.25% CMC(3.0 ml/kg);
- Group II: Carrageenan + MEMP 200 mg/kg, p.o.;
- GroupIII: Carrageenan + MEMP 400 mg/kg, p.o.;
- Group IV: Carrageenan + Ibuprofen 50 mg/kg, p.o.

The paw diameter was measured at 0 hr and 3 hr after carrageenan injection with the help of slide callipers. The anti-inflammatory activity was evaluated based on the ratio of the changes in paw diameter in treated and untreated groups as per the formula given below:

$$\text{Anti-inflammatory activity (\%)} = (1-D/C) \times 100$$

Where D is the changes in paw diameter in treated group and C is the change in paw diameter in control (Untreated) group.

Table 1: Effect of MEMP on xylene induced oedema model. Values are mean \pm S.E.M. number of rats= 6.*p<0.05; **p<0.01 Vs Group I (Control group).

Groups	Difference of weight between left ear lap and right ear lap	% of inhibition
Group I	43 \pm 2.15	-----
Group II	40 \pm 2.23*	6.98
Group III	37 \pm 2.33*	13.95
Group IV	33 \pm 1.95**	23.26

Table 2: Effect of MEMP on carrageenan induced paw oedema model. Values are mean \pm S.E.M. number of rats= 6.*p<0.01 Vs Group I (control group)

Groups	Paw diameter (mm)		% of inhibition
	0hr	3hr	
Group I	3.56 \pm 0.76	7.08 \pm 1.07	-----
Group II	3.68 \pm 1.04	6.93 \pm 1.02	7.67
GroupIII	3.81 \pm 0.88	6.75 \pm 1.05*	16.48
Group IV	3.59 \pm 0.98	6.22 \pm 0.96*	25.28

Table 3: Effect of MEMP on Dextran induced paw oedema model. Values are mean \pm S.E.M. number of rats =6. **p<0.01,*p<0.01 Vs Group I (Control group).

Groups	Paw diameter (mm)		% of inhibition
	0hr	3hr	
Group I	3.57 \pm 0.76	7.20 \pm 1.04	-----
Group II	3.45 \pm 0.97	5.90 \pm 1.08*	14.60
GroupIII	3.45 \pm 0.88	6.31 \pm 1.15**	21.49
Group IV	3.33 \pm 0.89	6.42 \pm 1.03**	32.51

DISCUSSION

Xylene induced oedema model serves as a preliminary model to evaluate a compound or extract for anti-inflammatory activity.MEMP at the dose of 200 and 400 mg/kg showed significant and dose dependent activity in this model (Table 1).

Carrageenan induced paw oedema is a commonly used model and the inflammation can be divided into two phases: first phase is mediated by the release of histamine and serotonin followed by kinin release and then prostaglandins from tissue arachidonic pathway in the later phase (Ogonowski et al, 1997)⁶.MEMP showed significant and dose dependent activity against carrageenan induced paw oedema. The extract also showed remarkable activity against dextran induced paw oedema model. It is mediated by histamine and serotonin. It also induces fluid accumulation which contains little

Dextran induced rat paw oedema model

The animals were treated exactly the way done in carrageenan induced model but instead of carrageenan, here 0.1 ml of dextran (1.0% W/V in normal saline) was used as the oedemogen.

Statistical Analysis

The experimental results were expressed as the mean \pm S.E.M. Statistical analysis was carried out using student's *t- test* and p<0.05 was considered significant.

RESULTS

MEMP showed significant and dose dependent anti-inflammatory activity in all the tested models. MEMP 200 mg/kg and 400 mg/kg showed 6.98 and 13.95% of inhibition in xylene induced ear lap oedema while the standard drug ibuprofen (50 mg/kg) showed 23.22% inhibition (Table1).

MEMP at the dose of 200 and 400 mg/kg and ibuprofen at the dose of 50 mg /kg showed 7.67, 16.48 and 25.28% inhibition of paw oedema compared to control group in carrageenan induced model (Table 2) while those in dextran induced paw oedema model were found to be 14.60, 21.49 and 32.51% inhibition respectively (Table 3). All the results were statistically significant (p<0.05).

protein and few neutrophils whereas carrageenan induces protein rich exudation containing large number of neutrophils (Kumar & Robbin, 1995)⁷. Whatever may be the type of exudation, the extract showed inflammation in both models (Table 2&3). This indicates that probably MEMP has activity against inflammatory mediators like histamine and serotonin. However, different and specific models, using these mediators as edemogen should be employed to confirm this notion.

Thus from the present study showed that MEMP has significant anti-inflammatory activity against chemically induced acute inflammation.

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