



RESEARCH ARTICLE

Comparative evaluation of anti-gastric ulcer activity of root, stem and leaves of *Thalictrum foliolosum* DC in rats

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ABSTRACT

Anti gastric ulcer activity of root, stem and leaves of *Thalictrum foliolosum* DC, was studied against ethanol, hydrochloric acid, indomethacin, stress and pyloric ligation induced gastric ulceration in albino rats. Omeprazole was used as standard anti gastric ulcer drug. Significant anti gastric ulcer activity was noted in root, stem and leaves of *Thalictrum foliolosum* DC. Root of the plant, however, showed highest activity, which was comparable to that of omeprazole.

INTRODUCTION

Thalictrum foliolosum DC (family, *Ranunculaceae*) is a medicinal plant. It is a tall perennial rigid herb, present throughout the Himalayas from 5000 – 8000 ft. The plant has different names. In English it is called “Meadow rue” while in Hindi, Punjabi, Bengali and Nepali the plant is known as “Mamira”, “Chireta”, “Gurbiani” and “Dampate” respectively. The plant is bitter, pungent and slightly purgative. Herbal experts claimed that *Thalictrum foliolosum* DC improves eyesight and is useful in toothache, diarrhea and piles [1]. Naga tribes of Manipur use this plant to treat fever [2]. In Afghanistan the plant is used for treatment of eye problems [3]. Ethnic use of *Thalictrum foliolosum* DC in Sikkim is in peptic ulcer. Root juice of the plant two teaspoonful thrice a day is recommended for peptic ulcer patients [4].

Recently we have noted anti gastric ulcer activity of root of *Thalictrum foliolosum* DC in rats [5]. Comparative evaluation of

anti gastric ulcer activity of root, stem and leaves of *Thalictrum foliolosum* DC in experimental ulcer models was done and in this communication results of the experiments are being reported.

MATERIAL AND METHODS

Plant materials

Thalictrum foliolosum DC was collected from the medicinal plant garden of the University of North Bengal sometimes in October, 2012 and authenticated by the experts of the department of Botany of the said University. Voucher specimens of the plant were kept in the department for future use.

Test drug

Root, stem and leaves were separated from the plant. They were washed thoroughly, shade dried and powdered. Powdered materials were used as test drugs.

Experimental animals

Wistar strain albino rats of both sex were used for the study. The animals were housed in colony cages (4 rats/cage) and were kept for at least a week in the experimental wing of the animal house (room temperature 25–28 °C and humidity 60–65% with 12 h light and dark cycle) before experimentation. Animals were fed on laboratory diet with water ad libitum. For each set of experiment eight animals were used. The animal experiment had approval of the institutional ethics committee.

Chemicals

Indomethacin (Torrent Research Centre, Gandhinagar, India),

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Figure 1: *Thalicttrum foliolosum* DC

ethanol (Baroda Chemical industries Ltd., Dabhoi, India), HCl LR (Thomas baker, Mumbai, India), omeprazole (Kopran Pharma Ltd. Mumbai, India).

Production of gastric ulcers

Ethanol induced gastric ulcer [6]

Rats were fasted for 18 h when no food but water was supplied ad libitum. Gastric ulcers were induced by administering ethanol (95%, 1 mL/200g body weight) orally through a feeding tube. 1h after administration of ethanol, animals were sacrificed by cervical dislocation and the stomach was taken out and incised along the greater curvature. Stomach was then examined for the presence and nature of ulcers.

HCl induced gastric ulcer [7]

0.6M HCl (1 mL/200 g body weight) was orally administered to all rats. Rest part is same to that of ethanol induced gastric ulcer group.

Indomethacin induced gastric ulcer [7]

Indomethacin (10 mg/kg) was given orally to rats in two doses at an interval of 15 hrs. Rest part is same to that of ethanol induced gastric ulcer group.

Stress induced gastric ulcer [8]

Rats were fasted for 24h when no food but water was supplied ad libitum. Stress ulcer was induced by forced swimming in the glass cylinder (height 45 cm, diameter 25 cm) containing water to the height of 35 cm maintained at 25 °C for 3hrs. Rats were then sacrificed. Rest part was same to that of ethanol induced gastric ulcer group.

Induction of gastric ulcer by pyloric ligation method [7]

Rats were fasted for 24h when no food but water was supplied ad libitum. Under light ether anesthesia, abdomen was opened and the pylorus was ligated. The abdomen was then sutured. After 4h the rats were sacrificed with excess of anesthetic ether and the stomach was dissected out. Rest part was same to that of ethanol induced gastric ulcer group.

Acute oral toxicity study [9]

Acute toxicity studies were carried out on Swiss albino mice. In separate experiments the test drugs i.e. powdered root, stem and leaves of *Thalicttrum foliolosum* DC were given orally at doses of 100, 200, 500, 1000 and 3000 mg/kg to different groups of mice each group containing six animals. After administering the test

drug, the animals were observed for the first three hours for any toxic symptoms followed by observation at regular intervals for 24 hrs up to seven days. At the end of the study, the animals were also observed for general organ toxicity, morphological behavior and mortality.

Anti gastric ulcer study

Rats were divided into 5 groups

Group 1: Ulcerogenic drug or Method (Ethanol / HCl / Indomethacin / Stress / Pyloric ligation).

Group 2: Ulcerogenic drug or method + powdered root of *Thalicttrum foliolosum* DC.

Group 3: Ulcerogenic drug or method + powdered stem of *Thalicttrum foliolosum* DC.

Group 4: Ulcerogenic drug or method + powdered leaves of *Thalicttrum foliolosum* DC (Test drug was given orally 30 minutes prior to administration of ulcerogenic drug or method. Dose of the test drug was kept 1 g/kg body weight of the animal as per our earlier work [5]).

Group 5: Ulcerogenic drug or method + Omeprazole (8 mg/kg orally 30 minutes prior to administration of ulcerogenic drug or method). Omeprazole was used as per the method of Malairajan group [10].

Evaluation of ulcer index [11]

Gastric lesions were counted and the mean ulcerative index was calculated as follows:

1. Presence of edema, hyperemia and single sub mucosal punctiform hemorrhage.
 2. Presence of sub mucosal hemorrhagic lesions with small erosions.
 3. Presence of deep ulcer with erosions and invasive lesions.
- Ulcer index = (number of lesion I) x1 + (number of lesion II) x2 + (number of lesion III) x3.

Statistical analysis

The values were expressed as mean $\pm$ SEM and were analyzed using one-way analyses of variance [12] using Statistical Package for Social Sciences (SPSS). Differences between means were tested employing Duncan's multiple comparison tests and significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

Acute toxicity studies

Acute toxicity studies revealed that the test drugs (roots, stems and leaves of *Thalicttrum foliolosum* DC) did not produce any toxic symptoms when administered orally to mice in doses of 100, 200, 500, 1000 and 3000 mg/kg. Animals were healthy, cheerful and behaved normal throughout the experimental period. No death of animal was recorded during seven days of experiment.

Effect of root, stem and leaves of *Thalicttrum foliolosum* DC on ethanol induced gastric ulcer in albino rats (Table-1)

Ethanol produced gastric ulcers in all albino rats. There were adhesion, dilatation and bleeding in the stomach. Ulcers were superficial in nature. Ulcer index came 31.8 ± 1.72 . Pretreatment of rats with root, leave or stem of *Thalicttrum foliolosum* DC produced significant ($p < 0.001$) protection to the animals from formation of ethanol induced gastric ulceration.

Protections were 58.80%, 48.42% and 40.56% respectively for root, leaves and stem of *Thalictrum foliolosum* DC. Omeprazole produced more protection (68.23 %) in course of formation of gastric ulcer by ethanol. Ulcer index in this group came 10.1 ± 1.11 .

Effect of root, stem and leaves of *Thalictrum foliolosum* DC on HCl induced gastric ulcer in albino rats (Table-2)

HCl produced massive gastric ulcers in all the rats under study. Most of the ulcers were superficial in nature. Few ulcers were penetrating. There was bleeding in the stomach. Adhesion and dilatation were also noticed in stomach. Ulcer index came 29.2 ± 1.23 . Pretreatment of rats with root, leave or stem of *Thalictrum foliolosum* DC gave significant ($p < 0.001$) protection to the animals from HCl induced ulcers by 50.34% (ulcer index: 14.5 ± 1.01), 38.69% (ulcer index: 17.9 ± 1.23) and 35.27% (ulcer index: 18.9 ± 1.34) respectively. Omeprazole gave more protection (63.01%) to the rats from HCl induced gastric ulcers.

Effect of root, stem and leaves of *Thalictrum foliolosum* DC on Indomethacin induced gastric ulcer in albino rats (Table-3)

Indomethacin produced massive ulcers in stomachs of all rats. Adhesion and dilatation of the stomach were seen. In few, stomach bleeding was noted. Ulcer index came 30.1 ± 1.72 . Pretreatment with root, leave or stem of *Thalictrum foliolosum*

Table-1. Effect of root, leave and stem of *Thalictrum foliolosum* DC on ethanol induced gastric ulcer.

Groups	Ulcer index (mean $\pm$ SEM)	% Ulcer protection
Control	Nil	~
Ethanol	31.8 ± 1.72	~
Ethanol+ root of TF(1g/kg)	$13.1 \pm 1.32^{**}$	58.80
Ethanol+ leave of TF (1g/kg)	$16.4 \pm 1.44^{**}$	48.42
Ethanol+ stem of TF(1g/kg)	$18.9 \pm 1.23^{**}$	40.56
Ethanol+Omeprazole (8mg/kg)	$10.1 \pm 1.11^{**}$	68.23

Results were in mean $\pm$ SEM, Each group had eight rats, $^{**} p < 0.001$ TF: *Thalictrum foliolosum* DC

DC gave significant protection to the animals from formation of indomethacin induced gastric ulcers. Ulcer index came 15.6 ± 1.23 , 17.5 ± 1.31 and 19.8 ± 1.22 respectively with root, leave and stem of *Thalictrum foliolosum* DC. More protection was noted in omeprazole group. Ulcer index came 10.6 ± 1.11 .

Effect of root, stem and leaves of *Thalictrum foliolosum* DC on Swimming stress induced gastric ulcer in albino rats (Table-4)

All rats developed gastric ulcer by swimming stress. Ulcers were deep and penetrating. There were adhesion, dilatation and bleeding in the stomach. Ulcer index came 32.1 ± 1.34 .

Pretreatment of rats with root, leave or stem of *Thalictrum foliolosum* DC gave significant protection to the animals from

Table-2. Effect of root, leave and stem of *Thalictrum foliolosum* DC on hydrochloric acid (HCl) induced gastric ulcer.

Groups	Ulcer index (mean $\pm$ SEM)	% Ulcer protection
Control	Nil	--
HCl	29.2 ± 1.23	--
HCl+ root of TF(1g/kg)	$14.5 \pm 1.01^{**}$	50.34
HCl+ leave of TF (1g/kg)	$17.9 \pm 1.23^{**}$	38.69
HCl+ stem of TF(1g/kg)	$18.9 \pm 1.34^{**}$	35.27
HCl+Omeprazole (8mg/kg)	$10.8 \pm 1.55^{**}$	63.01

Results were in mean $\pm$ SEM, Each group had eight rats, $^{**} p < 0.001$ TF: *Thalictrum foliolosum* DC

formation of swimming stress induced gastric ulcers. Protections were 49.84%, 42.05% and 38.94% respectively with root, leave and stem of *Thalictrum foliolosum* DC. Omeprazole produced more protection (68.22%) in course of production of gastric ulcer by swimming stress.

Effect of root, stem and leaves of *Thalictrum foliolosum* DC on Pyloric ligation induced gastric ulcer in albino rats (Table-5)

Massive gastric ulcers were developed in all rats by pyloric ligation. Ulcers were penetrating associated with profused bleeding. Ulcer index came 28.5 ± 1.23 . Adhesion and dilatation of the stomach were also seen. Bleeding was also seen

Table-3. Effect of root, leave and stem of *Thalictrum foliolosum* DC on indomethacin (INDO) induced gastric ulcer.

Groups	Ulcer index (mean $\pm$ SEM)	% Ulcer protection
Control	Nil	~
INDO	30.1 ± 1.72	~
INDO + root of TF (1g/kg)	$15.6 \pm 1.23^{**}$	48.17
INDO + leave of TF (1g/kg)	$17.5 \pm 1.31^{**}$	41.86
INDO + stem of TF (1g/kg)	$19.8 \pm 1.22^{**}$	34.21
INDO + Omeprazole (8mg/kg)	$10.6 \pm 1.11^{**}$	64.78

Results were in mean $\pm$ SEM, Each group had eight rats, $^{**} p < 0.001$ TF: *Thalictrum foliolosum* DC

in the stomach. Pretreatment with root, leave or stem of *Thalictrum foliolosum* DC gave significant protection to the animals from formation of pyloric ligation induced gastric ulcer. Ulcer index came 14.1 ± 1.11 , 15.5 ± 1.34 and 18.0 ± 1.43 respectively with root, leave and stem of *Thalictrum foliolosum* DC. Omeprazole gave further protection to the animals from formation of pyloric ligation induced gastric ulcer. Ulcer index came 10.7 ± 1.16 that means 62.45% protection was achieved.

Gastric ulcer is a common disorder. In this disorder a discontinuity in the gastric mucosa is observed. There is medicine to treat ulcer [13]. These include drugs inhibiting

Table-4. Effect of root, leave and stem of *Thalictrum foliolosum* DC on Swimming Stress (SS) induced gastric ulcer.

Groups	Ulcer index (mean $\pm$ SEM)	% Ulcer protection
Control	Nil	~
SS	32.1 $\pm$ 1.34	~
SS + root of TF (1g/kg)	16.1 $\pm$ 1.37**	49.84
SS + leave of TF (1g/kg)	18.6 $\pm$ 1.48**	42.05
SS + stem of TF (1g/kg)	19.6 $\pm$ 1.44**	38.94
SS + Omeprazole (8mg/kg)	10.2 $\pm$ 1.12**	68.22

Results were in mean $\pm$ SEM, Each group had eight rats, ** p<0.001
TF: *Thalictrum foliolosum* DC

proton pump, receptor blocking drugs, drugs affecting central nervous system and drugs that affect the mucosal barrier [14-17]. Many of these drugs, however, do not fulfill all requirements and reports on clinical evaluation of these drugs show that there are incidences of relapses and adverse effects such as impotency, arrhythmias and haetopoietic changes occur[18]. Hence, the search for an ideal anti - ulcer drug continues and has also been extended to vegetables, medicinal plants, herbs etc. In search for new and novel molecules, which afford better protection and decrease the incidence of relapse.

In this direction several workers worked on medicinal plants. They found that many medicinal plants have anti gastric ulcer activity [19-24]. Report from this laboratory also claimed anti gastric ulcer activity of several plants of this region [25-27].

In the present study anti gastric ulcer activity of root, stem and leaves of *Thalictrum foliolosum* DC was noted against a variety of experimental ulcer models. It was observed that root had highest anti gastric ulcer activity but stem and leaves of the plant also possessed significant anti ulcer property.

According to the World Health Organization (WHO), 80% of the world's population relies on traditional medicine. Ayurvedic medicine from India, Traditional Chinese Medicine and various

Table-5. Effect of root, leave and stem of *Thalictrum foliolosum* DC on Pyloric Ligation (PL) induced gastric ulcer.

Groups	Ulcer index (mean $\pm$ SEM)	% Ulcer protection
Control	Nil	~
PL	28.5 $\pm$ 1.23	~
PL + root of TF (1g/kg)	14.1 $\pm$ 1.11**	50.52
PL + leave of TF (1g/kg)	15.5 $\pm$ 1.34**	45.61
PL + stem of TF (1g/kg)	18.0 $\pm$ 1.43**	36.84
PL + Omeprazole (8mg/kg)	10.7 $\pm$ 1.16**	62.45

Results were in mean $\pm$ SEM, Each group had eight rats, ** p<0.001
TF: *Thalictrum foliolosum* DC

other traditions around the world primarily use plants as the basis of their treatments. And, in this way medicinal plants save millions of lives worldwide. Thus there is increasing demand of medicinal plants. In the year 2011, 2000 tons of extract of *Coscinium fenestratum*, the medicinal plant used in cure of diabetes, were used by the pharma industry to prepare a wide range of formulations. Unfortunately, this tree is only found in the States of Orissa, Karnataka and Goa. Thus *Coscinium fenestratum* is now in the list of endangered species. Few more medicinal plants like *Saraca Asoca*, *Taxus Wallchiana* and *Decilipis Hamiltoni* etc. are also in the red-light category. In fact, a total of 315 medicinal plants are now under threat of extinction. This is due to habitat loss and degradation and obviously due to increasing demand of these plants for consumption in the name of medicine [28-33].

Further, in ethnic use roots of the medicinal plants are usually consumed. Thus roots of the medicinal plants are being continuously utilized by village people as well as by the herbal practitioners. This practice destroys the plant, which may be another cause of putting them in the list of endangered species. Under the circumstances, the present study is significant as it gives the message that not only root but stem and leaves of *Thalictrum foliolosum* DC also possessed anti gastric ulcer activity. Thus stem and leaves of the plant can be used, root may be escaped and the plant will be saved.

Conclusion

Root, leave and stem of *Thalictrum foliolosum* DC showed anti ulcer effect against ethanol, hydrochloric acid, indomethacin, swimming stress and pyloric ligation induced gastric ulcer in albino rats. Antiulcer activity in all cases was found statistically significant though root of the plant had maximum antigastric ulcer effect. The study thus gave a message that to treat gastric ulcer stem or leaves of *Thalictrum foliolosum* DC may be used. Roots may be escaped to save the plant from extinction.

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