

Antiulcer Activity of *Sida acuta* Burm.

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Abstract – The ethanol extract of *Sida acuta* Burm. (ALSA) whole plant was studied for its anti-ulcer activity against aspirin plus pylorus ligation induced gastric ulcer, HCl-ethanol induced ulcer, and water immersion stress induced ulcer (WISIU) in rats. We found that ALSA at a dose of 300 mg/kg, (orally) markedly decrease the incidence of ulcers in the first two models. ALSA showed reduction in gastric volume, free acidity, and ulcer index (53.69%). It has not reduced the total acidity significantly and no significant change in pH. It also showed 55.14% gastro protective activity, whereas standard drug sucralfate showed 94.85%. WISIU showed protection index 24.4%, whereas standard drug omeprazole (OMEZ) showed protection index 100%.

Keywords – antiulcer, *Sida acuta*, aspirin plus pylorus ligation ulceration, HCl-ethanol ulceration, water immersion stress ulcer

Introduction

Sida acuta Burm. (SA) (family Malvaceae) is a small herb which is widely distributed in hotter parts of India. It is used in alternative system of medicine as bitter tonic, diuretic, in nervous and urinary diseases, disorders of bile, chronic bowel complaints and in the rheumatic affections. It is also used in the treatment of intestinal worms, cures fever and headache (Krishnamurthi and Chada 1972; Nadkarni, 1954; Kirtikar and Basu, 1995; Ahmad *et al.*, 1976). Phytochemical studies reported the presence of creptolepine, ephedrine (Guntalika *et al.*, 1980), β -phenethylamine, quinazoline, carboxylated tryptamine alkaloids (Prakash, *et al.*, 1981), α -amyrin, ecdysterone (Krishna Rao *et al.*, 1984), heraclenol, β -sitosterol, acanthoside B, and syringin daucoglycoside (Chung-Kuo Chung and Yao Tsa Chih, 1993). The pharmacological studies reported in this plant were antifertility activity (Kholute *et al.*, 1978), antibacterial activity of seeds (Sushilkumar *et al.*, 1997), anti-inflammatory, hepatoprotective activity (Kurma Rao and Mishra, 1998), traditional healing for snakebites (Otero *et al.*, 2000), and antihepatotoxic actions (Ling-Ling Yang *et al.*, 1987). This diversified chemical present in the plant prompted us to carryout the anti-ulcerogenic evaluation of this plant. The alcoholic extract of the plant *Sida acuta*

has been evaluated by aspirin plus pylorus ligation induced gastric ulcer, HCl-ethanol induced ulcer, and water immersion stress induced ulcer in rats.

Experimental

Plant material – The whole plant of *Sida acuta* Burm. (SA) Malvaceae were collected from Kancheepuram Dist South India during September 2000 and authenticated by Professor P. Jeyaraman, Plant Anatomy Research Centre, Tambaram, Chennai-45; and the voucher specimen was deposited in the Asthagiri Herbal Research Foundation [AHRF 07] Chennai-59.

Extraction – Air-dried powdered plant materials were extracted by maceration with ethanol for 72 h. Then the extract was concentrated using rotary vacuum evaporator to get the solid mass. The yield obtained was 8.5%.

Animals – Wistar albino rats of both sex (150 - 200 g) and Swiss albino mice (25 - 30 g) were procured from Tamilnadu Veterinary College and Research Institute, Chennai. The animals were maintained in colony cages at 24 ± 2 °C relative humidity of 45-55% maintained under 12 h light and dark cycle (06 : 00 to 18 : 00 h light; 18:00 to 06 : 00 dark) and were fed with commercial pellet diet and water *ad libitum*. All animals were acclimatized for a week. ALSA extracts, ranitidine, sucralfate and omeprazole (OMEZ) were suspended in 1% sodium carboxy methyl

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Table 1. Effect of alcohol extract of *S. acuta* on gastric secretion, acidity, pH, and ulcer score in aspirin plus pylorus ligated rats

treatment mg/kg	volume of gastric secretion ml/100 g	free acidity mEq/l/100 g	total acidity mEq/l/100 g	pH	ulcer score	%ulcer inhibition
vehicle control (1% SCMC)	2.633 ± 0.042	225.00 ± 6.124	555.00 ± 7.500	2.200 ± 0.163	3.600 ± 0.200	
ranitidine 50 mg	1.317 ± 0.172	148.75 ± 13.475**	492.50 ± 20.736*	3.167 ± 0.166*	0.166 ± 0.166**	95.37
<i>S. acuta</i> 300 mg	0.950 ± 0.017**	150.00 ± 11.292**	507.50 ± 21.448**	2.500 ± 0.223	1.667 ± 0.333**	53.69

Each value is the mean ± S.E.M of six determinations.

P* < 0.05, P** < 0.01 Dunnet test as compared to control.

cellulose (SCMC) and used for anti-ulcer studies. Acute toxicity study was performed for the extracts to ascertain safe dose by acute oral toxic class method of Organization of Economic Co-operation and Development, as per 423 guidelines (OECD) (Donald J. Ecobichon, 1997).

Aspirin plus pylorus ligation induced gastric ulcer in rats – The ulceration in rats was induced as described by Goel *et al.*, (1985) by random sampling technique. All the animals received treatment along with aspirin 200 mg/kg once daily for 3 days. Ranitidine at a dose level of 50 mg/kg was administered as a standard drug for comparison. The extract at 300 mg/kg was administered orally by gavage. On the fourth day pylorus part was ligated following 36 h fasting (Shay *et al.*, 1945). Four hours after the pyloric ligation the animals were sacrificed by decapitation. The stomach was opened and the ulcer index was determined. The gastric content was titrated against 0.01 N NaOH to find out the free acidity and total acidity (Kulkarni, 1999). The results are presented in Table 1.

Ulcer lesion Index method – Ulcer lesion was induced by HCl-ethanol using Swiss albino mice of either sex selected by random sampling technique (Yesilada *et al.*, 1997). After 1 h all the animals were treated with 0.2 ml of HCl-ethanol mixture p.o (0.3 M hydrochloric acid and ethanol 60%) to induce gastric ulcer. Animals were killed by cervical dislocation one hour after administration of HCl-ethanol mixture and the stomach was excised and lesion index was determined by measuring each lesion along its greater length. Sucralfate 100 mg/kg, p.o. was administered as standard drug for comparison. The extract at 300 mg/kg was administered orally by gavage. The ulcer lesion index data are presented in Table 2.

Water immersion stress induced ulcer in rats – Stress ulcers were induced by forcing the Wistar albino rats of either sex to swim in the glass cylinder (height 45 cm, diameter, 25 cm) containing water to the height of 35 cm maintained at 25 °C for 3 h. OMEZ 20 mg/kg was administered as a standard drug. The extract was administered at a dose of 300 mg/kg p.o. After the drug treatment,

Table 2. Effect of alcohol extract of *S. acuta* against HCl-ethanol induced gastric lesion in mice

treatment	dose in mg/kg	mean ± S.E.M	% ulcer inhibition
control	1% SCMC	22.667 ± 3.509	
sucralfate	100 mg	1.167 ± 0.5426**	94.85
<i>S. acuta</i>	300 mg	10.167 ± 0.945**	55.14

Each value is the mean ± S.E.M of 6 determinations.

**P < 0.01 Dunnet test as compared to control value.

Table 3. Effect of alcohol extracts of *S. acuta* on water immersion stress induced ulcer in rats

treatment	dose in mg/kg	mean ulcer score ± standard error mean	% ulcer inhibition
vehicle control	1% SCMC	143.3 ± 12.01	
omeprazole	20 mg/kg	0.0 ± 0.0***	100
<i>S. acuta</i>	300 mg/kg	108.3 ± 10.775	24.4

Each value is the mean ± S.E.M of 6 determinations.

*P < 0.05, **P < 0.01, ***P < 0.001 dunnet test as compared to control value.

animals were allowed to swim in water for 3 h. The stomach of each animal was removed and severity of gastric ulcer was assessed in terms of mean ulcer index (Alphine and Word, 1969). The ulcer index data are presented in Table 3.

Statistical analysis – The statistical analysis of all the results was carried out using one-way ANOVA followed by Dunnet's multiple comparisons using graph pad in stat 3 and all the results obtained in the study were compared with the vehicle control group.

Results and Discussion

In aspirin plus pylorus ligation induced gastric ulcer, the ALSA exhibited significant reduction in gastric volume, free acidity and ulcer score. However the total

acidity was not decreased. In terms of percentage ulcer inhibition the ALSA showed 53.69% activity as compared to control. Ulcer index parameter was used for the evaluation of anti-ulcer activity since ulcer formation is directly related to factors such as reduction in gastric volume, decrease in free and total acidity. In case of vehicle control, aspirin plus pylorus ligation aggravated the acid secretion, which in turn caused increase in gastric volume, increased free and total acidity, low pH and increased ulcers. Oral administration of HCl-ethanol mixture at a dose of 2 ml to each mice was sufficient to induce ulcer. The extract at a dose of 300 mg/kg, p.o. showed significant reduction in ulcer lesion as compared with vehicle control group. Water immersion stress is one of the best models of stress in rats to induce ulcer. The model provides both emotional stress as well as physiological stress to the animal. The extract was not effective in reducing the ulcer in water immersion induced stress in rats.

Preliminary phytochemical investigations showed the presence of alkaloids and flavanoids, hence the antiulcer activity of *S. acuta* in this experimental model may be due to the alkaloids and flavanoids. The results demonstrated that *S. acuta* extract possessing antisecretory and cytoprotective mechanism. This interesting observation indicates that *S. acuta* extract can be a potential source for the treatment of ulcer. However, detailed study like isolation of active molecule and characterization is required to confirm the phytochemicals responsible for the activity.

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