RESEARCH ARTICLE

COMPARISON OF ANTIULCER ACTIVITY OF *Curcuma longa* WITH *Mentha piperita**

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ABSTRACT

In this study, the ulcer was induced in Albino Wistar rats by water immersion stress, 1 ml of 99.5 percent Ethanol, orally and 200 mg/kg Aspirin plus Pylorus ligation. Antiulcer activity of aqueous extract of Curcuma longa (500 mg/kg, p.o) and Mentha piperita (500 mg/kg, p.o) was monitored by estimating ulcer index, free and total acidity, lipid peroxidation in stomach tissue and antioxidant enzyme levels such as glutathione, catalase and super oxide dismutase. In all models, pretreatment with aqueous extract of Curcuma longa and Mentha piperita showed significant antiulcer activity by reduction in ulcer index, free and total acidity, lipid peroxidation, and increased GSH, Catalase and SOD level in the rat stomach. Curcuma longa is potent and shows superior efficacy than Mentha piperita.

INTRODUCTION

Ulcer is the one of the most common disorder that people suffer from. It is a wound inside the stomach or duodenum (Ashok Kumar *et al.,* 2011). Ulcer is due to an imbalance between aggressive factors-acid, pepsin, *H. pylori* and NSAID's and local mucosal defensive factors-mucus bicarbonate, blood flow and prostaglandins (Shanthi *et al.,* 2011). Various synthetic antiulcer drugs presently available in market include antacids, proton pump inhibitors, anticholinergics, histamine H_2-antagonists and cytoprotectives for preventing or treating the various types of ulcers (Vyawahare *et al., 2009).*

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Herbal medicine is fast emerging as an alternative treatment to available synthetic drugs for treatment of ulcer possibly due to lower costs, availability, fewer adverse effects and perceived effectiveness (Sini *et al.,* 2011). Turmeric (*Curcuma longa* Linn.) of family Zingiberaceae and Mint (*Mentha piperita* Linn.) of Lamiaceae family have proved to have anti-ulcer activity. As these are the components in our regular diet, an attempt is being made to compare the anti-ulcer potential of Turmeric and Mint using, Water immersion stress induced ulcer in rats, Aspirin plus Pylorus ligation induced gastric ulcer in rats and Ethanol induced ulcer. This will enable us to increase the frequency of the more potent of these two in diet for prophylactic/curative purpose.

MATERIALS AND METHODS

Drugs and Chemicals: Topfer's reagent, Ellman's reagent, Thiobarbituric acid, EDTA (Ethylene Diamino Tetra acetic acid) was procured from S.D fine chemicals, Mumbai, India. Omeprazole and Ranitidine were obtained from Orchev Pharma Pvt. Ltd, Gujarat, India.

Plant material: The aqueous extracts of *Curcuma longa* and *Mentha piperita* were obtained from "Green Chem, Herbal Extracts and Formulations", Bangalore-560071.

Experimental Animals: Laboratory bred Wistar rats of either sex weighing 150 ± 5 gm were obtained from Drug Control Laboratory, Bangalore. The animals were housed in a well-ventilated animal house, at room temperature of

25 ± 3°C, under natural day and night cycle as per the guidelines of "Committee for the Purpose of Control and Supervision on Experiments on Animals" (CPCSEA) for at least one week prior to use. The rats had free access to standard rat chow (Amrut Laboratory Animal feed, Karnataka, India) and provided water *ad libitum*. The Institutional Animal Ethics Committee's approval was obtained before carrying out the experiment (Registration N0. 152/99/CPCSEA).

Evaluation Of Antiulcer Activity:

Wistar rats (150 ± 5 gm) of either sex were fasted for 24 hours prior to the experiments and divided into 5 groups of 6 animals each. Group I was vehicle control, Group II was ulcer control, Group III was treated with standard Omeprazole, 20 mg/kg p.o in water immersion stress induced ulcer (Malairajan *et al.,* 2008) and Ranitidine, 50 mg/kg p.o in ethanol and aspirin plus pylorus ligation induced ulcer (Londonkar and Poddar 2009), Group IV was treated with *Curcuma longa,* 500 mg/kg, p.o. for 5 days (Khandare *et al.,* 2006), GroupV was treated with *Mentha piperita,* 500 mg/kg, p.o. for 5 days (Al-Mofleh *et al.,* 2006).

Water Immersion Stress Induced Ulcer In Rats

Stress ulcers were induced by forced swimming of rats in the glass cylinder containing water to the height of 35 cm maintained at 25°C for 3 hours. After the last drug treatment on day 5, the animals were allowed to swim in water for three hours, and sacrificed by cervical dislocation.

Ethanol Induced Ulcer Model

After 1 hour of the last drug treatment on day 5, animals were administered with 1 ml of 99.5 percent of ethanol to induce gastric ulcer. Animals were sacrificed by cervical dislocation one hour after administration of ethanol.

Aspirin Plus Pylorus Ligation Induced Gastric Ulcer In Rats

Aspirin 200 mg/kg, once daily were administered to all the animals for three days. On the fourth day pylorus was ligated following 18h fasting. Four hours after the pyloric ligation, the animals were sacrificed by cervical dislocation.

In all the three models, after the animals were sacrificed, the stomach was dissected out and contents were collected into tubes for estimation of free acidity, total acidity. The stomach was cut open along the greater curvature, washed with saline and examined for ulcer score and ulcer index (Banji *et al.,* 2010). The stomach tissue homogenate was prepared using 0.15M KCl and lipid peroxidation, glutathione, catalase and super oxide dismutase (Muthusamy *et al.*, 2009) were estimated.

STATISTICAL AN ALYSIS

Results are expressed as mean ± SEM. Statistical significance was assessed using One-way Analysis of variance (ANOVA) followed by Dunnett's multiple comparison test.

RESULTS

Pretreatment with aqueous extract of *Curcuma longa* and *Mentha piperita* showed significant reduction in ulcer index, free and total acidity, lipid peroxidation and increase in GSH, Catalase and SOD level in the rat stomach. (Table 1, 2, 3 and Fig 1)

Table 1: Effect of *Curcuma longa* and *Mentha piperita* on Ulcer index, Free acidity, Total acidity and antioxidant enzymes in water immersion stress induced ulcer in rats.

Group	Treatment	Ulcer index	Free acidity (mEq/dl)	Total acidity (mEq/dl)	Lipid peroxidation (nmol/mg tissue)	Glutathion (µ mol/g tissue)	Catalase (units/mg tissue)	Superoxide dismutase (units/mg tissue)
Vehicle control	1ml/kg p.o. water as vehicle	0	24.28 ± 0.1641	35.2 ± 0.1600	1.221 ± 0.0010	7.420 ± 0.4171	100.91 ± 1.448	28.28 ± 0.08016

Ulcer control	Forced swimming for 3 hours	10.49 ± 0.3354#	60.3 ± 0.0258#	75.08 ± 0.03073#	4.492 ± 0.0012#	1.556 ± 0.03078#	65.36 ± 1.538#	17.75 ± 0.1432#
Omeprazole	20mg/kg b.wt, suspended in vehicle +Forced swimming for 3 hours	3.38 ± 0.1054*	31.71 ± 0.1302**	43.74 ± 0.1167**	1.416 ± 0.0019*	5.133 ± 0.0586**	92.885 ± 1.541**	25.55 ± 0.237**
Curcuma longa	500mg/kg b.wt. suspended in vehicle + Forced swimming for 3 hours	5.083 ± 0.1667*+	41.43 ± 0.04944**+	55.03 ± 0.02108**+	2.277 ± 0.0013*+	3.186 ± 0.024**+	83.706 ± 1.147**+	22.6 ± 0.100**+
Mentha piperita	500mg/kg b.wt, suspended in vehicle + Forced swimming for 3 hours	8.499 ± 0.2789*	56.03 ± 0.02108*	72.05 ± 0.03416*	3.142 ± 0.0006*	2.821 ± 0.06296*	72.24 ± 1.538*	19.5 ± 0.1897*

Values expressed as mean ± SEM, n=6, ANOVA followed by Dunnett's Multiple Comparison Test, #p<0.001 when compared with vehicle control, **p<0.001, *P<0.01 when compared with ulcer control, +P<0.001 when compared with *Mentha piperita*.

Table 2: Effect of *Curcuma longa* and *Mentha piperita* on Ulcer index, Free acidity, Total acidity and antioxidant enzymes in Ethanol induced ulcer in rats

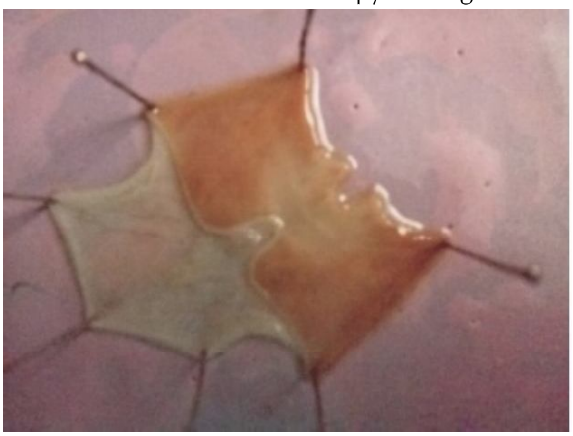
Group	Treatment	Ulcer index	Free acidity (mEq/dl)	Total acidity (mEq/dl)	Lipid peroxidation (nmol/mg tissue)	Glutathion (µ mol/g tissue)	Catalase (units/ mg tissue)	Superoxide dismutase (units/mg tissue)
Vehicle control	1ml/kg p.o. water as vehicle	0	25.05 ± 0.03416	35.03 ± 0.02108	1.224 ± 0.009	7.639 ± 0.03078	102.05 ± 1.145	29.29 ± 0.08497
Ulcer control	Ethanol, 1 ml / 150±5 gm of rat	10.69 ± 0.3333#	61.15 ± 0.0500#	76.28 ± 0.07491#	4.494 ± 0.0018#	1.24 ± 0.03265#	66.50 ± 1.450#	18.4 ± 0.09633#
Ranitidine	50mg/kg b. wt, suspended in vehicle + Ethanol, 1ml/150±5 gm of rat	3.424 ± 0.2713*	32.08 ± 0.03073**	44.28 ± 0.06541**	1.430 ± 0.0010*	5.522 ± 0.04487**	91.74 ± 2.903*	26.06 ± 0.1844**
Curcuma longa	500mg/kg b.wt, suspended in vehicle + Ethanol, 1ml/150±5 gm of rat	5.0916 ± 0.2007*+	42.06 ± 0.03333**+	54.93 ± 0.08819**+	2.279 ± 0.0014*+	3.303 ± 0.0293**+	82.55 ± 3.081*+	23.34 ± 0.096**+
Mentha piperita	500mg/kg b.wt, suspended in vehicle + Ethanol, 1ml/150±5 gm of rat	8.532 ± 0.3575*	57.08 ± 56.98*	72.98 ± 0.1014*	3.146 ± 0.0016*	2.724 ± 0.04867*	74.53 ± 2.114	20.64 ± 0.1580*

Values expressed as mean ± SEM, n=6, ANOVA followed by Dunnett's Multiple Comparison Test, #p<0.001 when compared with vehicle control, **p<0.001, *P<0.01 when compared with ulcer control, +P<0.001 when compared with *Mentha piperita*.

Table 3: Effect of *Curcuma longa* and *Mentha piperita* on Ulcer index, Free acidity, Total acidity, and antioxidant enzymes in Aspirin plus pylorus ligation induced ulcer in rats

Group	Treatment	Ulcer index	Free acidity (mEq/dl)	Total acidity (mEq/dl)	Lipid peroxidation (nmol/mg tissue)	Glutathion (µ mol/g tissue)	Catalase (units/mg tissue)	Superoxide dismutase (units/mg tissue)
Vehicle control	1ml/kg p.o. water as vehicle	0	24.8 ± 0.1438	35.01 ± 0.05426	1.225 ± 0.0010	7.323 ± 0.2179	100.865 ± 2.254	29.67 ± 0.04919
Ulcer control	200mg/kg aspirin+ pylorus ligation	10.71 ± 0.3162#	62.1 ± 0.05164#	77.06 ± 0.03333#	4.490 ± 0.0014#	1.795 ± 0.04734#	67.62 ± 2.746#	18.56 ± 0.2353#
Ranitidine	50mg/kg b. wt, suspended in vehicle + 200mg/kg aspirin+ pylorus ligation	3.449 ± 0.4167*	33.08 ± 0.04773**	45.05 ± 0.03416**	1.431 ± 0.0010*	5.863 ± 0.04487**	92.88 ± 2.350*	26.24 ± 0.2249**
Curcuma longa	500mg/kg b.wt, suspended in vehicle + 200mg/kg aspirin+ pylorus ligation	5.1 ± 0.2236*+	43.3 ± 0.08165**+	55.08 ± 0.03073**+	2.282 ± 0.0011*+	3.405 ± 0.0307**+	84.85 ± 2.296*+	24.82 ± 0.104**+
Mentha piperita	500mg/kg b.wt, suspended in vehicle + 200mg/kg aspirin+ pylorus ligation	8.5412 ± 0.3516*	55.28 ± 0.04014*	70.08 ± 0.03073*	3.150 ± 0.0010*	2.870 ± 0.04867*	75.68 ± 1.776	21.94 ± 0.08989*

Fig 1 : Effect of *Curcuma longa* and *Mentha piperita* on Ulcer Index in Aspirin plus pylorus ligation induced gastric ulcers in rats



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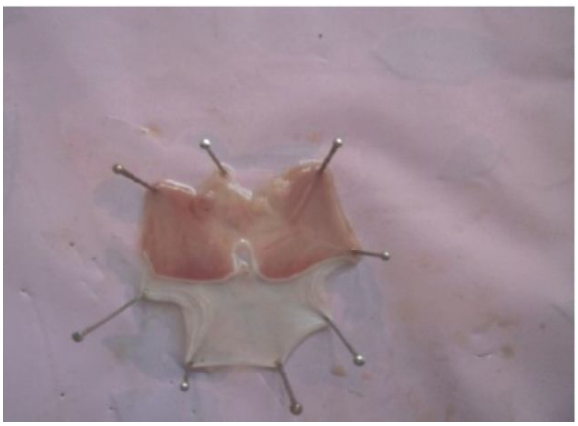

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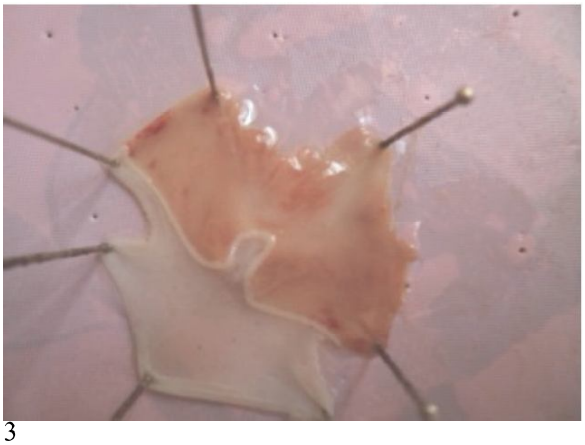

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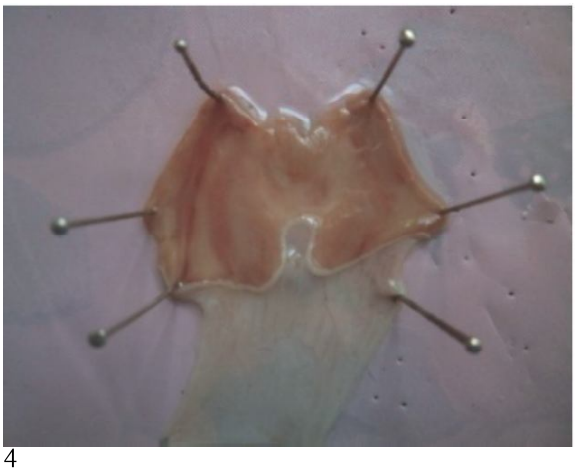

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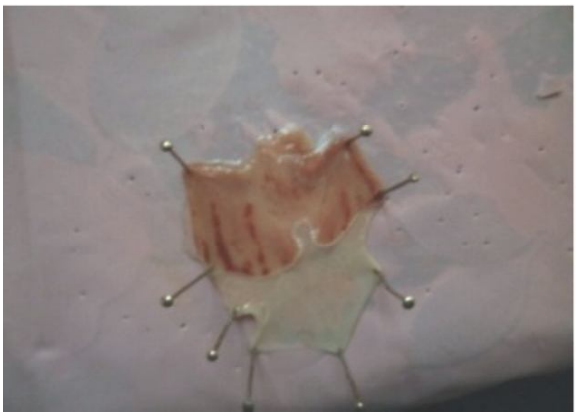

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1-Vehicle control, 2- Control- Pylorus ligation induced ulcer rat stomach; 3 - *Standard-* ranitidine 50 mg/kg , 4 - *500 mg/kg of Curcuma longa* treated rat stomach, and 5 - *500 mg/kg Mentha piperita* treated rat stomach.

As shown in the above pictures, ulceration is prominently seen in picture 2 compared to picture 1 i.e. vehicle control. Whereas, picture 4 and 5 have less ulcer compared to picture 2. Picture 3 shows no ulceration after ranitidine treatment. Picture 4 has less ulcer compared to picture 5.

DISCUSSION

Water immersion stress provides both essential stress as well as physiological stress to the animal. It is reported that free radicals may play a major role in stress-induced gastric injury. *Curcuma longa and Mentha piperita* has been reported to possess antioxidant activity (Al-Mofleh *et al.,* 2006). Normally, the increase in damage due to O_2 is contained by dismutation with SOD. SOD converts the reactive O_2 to H_2O_2, which if not scavenged by the CAT causes lipid peroxidation by an increase in the generation of hydroxyl radicals (Meera and Rana, *2006)*. Hence, a decrease in SOD and CAT levels in rats may lead to an increase in the accumulation of these reactive products and LPO resulting in tissue damage. Treatment with *Curcuma longa* and *Mentha piperita* both reversed these oxidative changes induced by stress. Hence it can be stated that, the anti-oxidant activity in gastric mucosal homogenates is due to a decrease in LPO levels and increase in SOD and CAT levels. The decrease in ulcer index could be due to an increase in SOD and CAT level. Thus the ulcer protective activity of *Curcuma longa* and *Mentha piperita* may be attributed to its anti oxidant effect. Aqueous extract of *Curcuma longa* was found to have better efficacy than *Mentha piperita* in providing protection against ulcer due to antioxidant activity.

In case of ethanol induced method, the cytoprotective action has been decreased by ethanol due to inhibition of synthesis of

endogenous prostaglandin, which promotes the formation of ulcer (Muralidharan and Srikanth, 2009). The protective effect of *Curcuma longa* and *Mentha piperita* against ethanol induced ulcer in rats showed the anti-ulcer activity by decreasing the ulcer scores, total acidity, free acidity, lipid peroxidation and the glutathione, catalase and superoxide dismutase. This is due to its antioxidant activity and free radical scavenging activity (due to the presence of flavonoids). Aqueous extract of *Curcuma longa* was found to have better efficacy than *Mentha piperita* in providing protection against ulcer.

Aspirin along with pylorus ligation is found to be a very effective model for induction of ulceration in rats. Aspirin causes mucosal damage by interfering with prostaglandin synthesis, increasing acid secretion and back diffusion of H^+ ions. In pylorus ligation, the digestive effect of accumulated gastric juice and interference of gastric blood circulation are responsible for the induction of ulceration (Divya *et al., 2011)*. The Anti-ulcer property of *Curcuma longa* and *Mentha piperita* in pylorus ligation model is evident from its significant reduction in free acidity, total acidity, ulcer index and lipid peroxidase and increased superoxide dismutase, catalase, and glutathione level, the former being more superior to latter.

Preliminary phytochemical analysis of *Curcuma longa* and *Mentha piperita* reported the presence of flavonoids in earlier studies (Shah and Mello,2004) and (Araujo and Leon, 2001). Flavonoids have antisecretory and cytoprotective properties which increase capillary resistance and cause an improvement in microcirculation and make the cells less injurious to ulcer aggressive factors. These would be able to stimulate mucus, bicarbonate and prostaglandin secretion and counteract with the deteriorating effects of reactive oxidants in gastrointestinal lumen. Therefore, the antiulcer activity of *Curcuma longa* and *Mentha piperita* may also be attributed to its flavonoid content. To conclude, Aqueous extract of *Curcuma longa* was found to have better efficacy than *Mentha piperita* in providing protection against ulcer in rats.

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KERALA VETERINARY SCIENCE CONGRESS 2012

The 4th KERALA VETERINARY SCIENCE CONGRESS is to be held at Hotel SP Grand Days, Thiruvananthapuram on the 10th and 11th November 2012. Those who missed the first call letter are requested to visit www.ivakerala.com, www.worldvet.org for more details. Oral presentation, Poster/ Video presentations are expected in the scientific sessions. Those interested may please rush their entries. The paper's will be selected by the review committee constituted by the association. The following sessions are included

- Session I-ANIMAL HEALTH SCIENCE
- Session II-ANIMAL PRODUCTION & MANAGEMENT
- Session III- (A) BASIC VETERINARY SUBJECTS AND SOCIAL SCIENCE &
  (B) FIELD VETERINARY EXPERIENCES

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