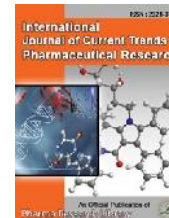




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## Research Article

## Open Access

### Evaluation of Anti-Ulcer activity of *Capsicum annuum* fruit extract by using Pylorus Ligation Model

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#### ABSTRACT

Many herbalists believe that *Capsicum annuum* (cayenne) is the most useful and valuable herb in the herb kingdom, not only for the entire digestive system, but also for the heart and circulatory system. Because it acts as a catalyst and it increases the effectiveness of other herbs when used along with them. Because of its ability to stimulate the circulatory and digestive systems, it has a tonic and antiseptic affect as well. The present study aims to evaluate the anti-ulcer activity of *C. annuum* chloroform extract. Anti-ulcer activity was evaluated by Pylorus ligation model (shay model) in rats (adult male albino; weighing 180 to 220 g). Changes in the gastric secretion volume, pH, Ulcer Index, Free acidity and Total acidity and Acid volume were observed in rats. *C. annuum* antagonized histaminic effects on gastric juice volume, pH and pepsin activities. Fraction also inhibited gastric ulcer formation induced by Pylorus ligation model in this study. The anti-ulcer effects of *C. annuum* found comparable to the Ranitidine, a reference anti-ulcer agent.

**Keywords:** *Capsicum annuum*, cayenne, chloroform, Anti-ulcer, Pylorus ligation, Ranitidine

#### ARTICLE INFO

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## 1. Introduction

Gastro intestinal disorders are one of the severe classes of human ailments causing maximum discomfort, morbidity and mortality. A peptic ulcer is one of the gut disorders. It is defined as lesion of gastric or duodenal mucosa occurring at a site where the mucosal epithelium is exposed to acid and pepsin. Gastric and duodenal ulcers are common pathologies that may be induced by a variety of factors such as stress, alcohol consumption, cigarette smoking and *Helicobacter pylori*. Especially consumption of alcohol for a prolonged period, smoking of cigarette, consumption of NSAIDs are causing peptic ulcer.[1]

The role of free radicals plays important role in mucosal damage to cause peptic ulcer. Symptoms of peptic ulcers are belching, bloody or dark tarry stools, chest pain, fatigue, heart burn, indigestion, nausea, vomiting, weight loss etc., normally chronic dietary control and pharmacological treatment is adopted for treating peptic ulcer.<sup>2</sup> There are several classes of drugs such as H<sub>2</sub> - blockers, proton pump inhibitors, neutralizing acid secretion, ulcer healing drugs, ulcer protective's, and anti *H. pylori* drugs to treat ulcers. Several side effects such as arrhythmias, impotence, gynaecomastia, haemotopeptic changes etc., are associated with the various synthetic drugs used in the management of peptic ulcers are restricting the chronic usage of these agents.[3]

A large proportion of the world population avails themselves of a variety of complementary and alternative medicine (CAM) interventions. However, although not widely appreciated, there are thousands of randomized controlled trials (RCTs) that have addressed the efficacy of CAM. [4] Peppermint (alone or in combination) has supportive evidence for use patience with dyspepsia, irritable bowel syndrome and as an intraluminal spasmolytic agent during barium enemas or endoscopy. Ginger appears to be effective in relieving nausea and vomiting due to motion sickness or pregnancy. Probiotics were useful in childhood diarrhoea or in diarrhoea due to antibiotics, one particular formulation prevented pouchitis. Acupuncture appeared to ameliorate post operative nausea and vomiting and might useful elsewhere. [5] There is even a suggestion that homeopathy has efficacy in treatment gastrointestinal problems or symptoms.

Recent studies have shown that Cayenne pepper has been described by some herbalists and physicians as the catalyst herb. Many herbalists believe that cayenne is the most useful and valuable herb in the herb kingdom, not only for the entire digestive system, but also for the heart and circulatory system. Because it acts as a catalyst, it increases the effectiveness of other herbs when used with them. Because of its ability to stimulate the circulatory and digestive systems, it has a tonic and antiseptic affect as well. Hot peppers inhibit the growth of *H. pylori*, the bacteria that cause specific types of ulcers. The present study reveals that *C. annuum* extract may show effects against gastric problems. This research was aimed at investigating the protective role of *C. annuum* for gastric

problems to support or refute the claims by traditional herbalists in India.

## 2. Materials and Methods

### Collection of Plant Materials:

*Capsicum annuum* fruits were collected from southern region of Andhra Pradesh from dry semi-arid zones and dried for 10 days. Dried fruits were measured for moisture content value; the percentage of moisture content should be less than 5%.

### Drugs and chemicals:

Ranitidine procured from Kopran Pvt. Ltd, India and all other chemicals and reagents used were of analytical grade, procured from SD fine chemicals Pvt. Ltd. India.

### Animals

Male Wistar albino rats (150-200 g) were used for this study. The study was approved by the Ethics Committee for animal experimentation (1016/a/06/CPCSEA/003/2009). The animals were obtained from the parent institute and kept in animal house in standard conditions. All animals were fasted 24 h prior to the experimental procedure.

### Induction of Ulcers:

The rats were fasted for 48 hours before the experiment but with free access to water and just two hours before starting the experiment the water also were removed. One hour after drug or saline administration, under light ether anaesthesia the abdomen was opened by small midline incision below the xiphoid process, pyloric portion of the stomach was slightly lifted out and lygated avoiding traction to the pylorus or damage to its blood supply the stomach is replaced carefully and the abdominal wall closed by interrupted sutures. Nineteen hours later, the pylorus lygated rats were sacrificed by ether over dosing and their stomachs were dissected out after lygating the esophagus at cardiac end. Each stomach was cut opened along the greater curvature and the contents were collected into a centrifuge tube, then the mucosa was washed under slow running tap water and the number and size of ulceration was scored. The gastric juice collected from each stomach was centrifuged and its volume was measured. Free and total acidity were estimated titrimetric ally with 0.1 N NaOH using methyl orange and phenolphthalein as indicators.

### Treatment protocol:

Animals were divided into six groups (n = 6), Group 1: Normal control group received saline, Group 2: received Ranitidine (26.57mg/kg), Group3: received *C. annuum* juice (200mg/kg) Group 4: receive *C. annuum* juice (400mg/kg) per orally. Treatment group receives drug for a period of one month. After pylorus ligation stomachs were excised, washed with saline, and were examined for ulcer index.

**Ulcer Index:** The stomach was removed and fixed on a cork plate and the number and severity of the ulcers was registered using Severity Score -Normal coloured stomach [0], Red colouration [0.5], Spot ulcer[1], Hemorrhagic streaks [1.5], Ulcers 3 but 5[2], Ulcers > 5[3].

### Determination of Free acidity and Total acidity

A known amount of gastric residue was titrated with 0.1 N NaOH. To this two drops of Methyl orange reagent was added which changes to a salmon colour when all the free

hydrochloric acid is neutralized. This was noted as free acidity. The total acidity was determined by titration using phenolphthalein as indicator.

**Acid volume:** The stomach was removed and the contents were drained into a graduated centrifuge tube through a small nick along the greater curvature adjacent to pyloric ligation. The volume of the juice was measured.

**Determination of pH:** The contents were drained into a graduated centrifuge tube. The tubes were centrifuged at 3000 rpm for 10 minutes and the centrifuged, samples were decanted and analyzed for pH (using broad range pH paper).

**Statistical analysis:** All values were expressed as Mean  $\pm$  SEM. (n = 6 in each groups). One way ANOVA followed by Tukey test was applied to test for significance of biochemical data of the different groups. Significance is set at  $p < 0.001$ .

### 3. Results and discussions

**Ulcer index:** A prominent decrease in ulcer index was observed in groups treated with ranitidine (II), *C. annuum* extract (III, IV) groups respectively when compared to control group (I). Percentage inhibition of ulcers for group treated with chloroform extract of *C. annuum* was comparable with that of the standard group (II) (Table-1).

#### Free acidity (FA)

The groups receiving standard drug ranitidine, *C. annuum* chloroform extract showed a significant decrease in FA on comparison with the control (I) group (Table 1) its values determined by following formula. Figure 1 shows the effect of *C. annuum* on free acidity

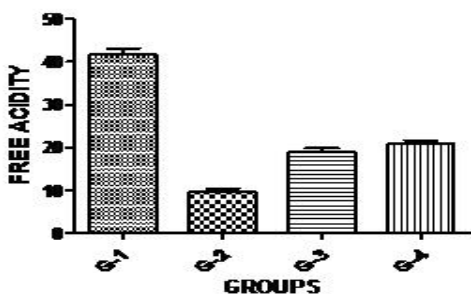


Figure 1: Effect of *C. annuum* on free acidity

**Total acidity (TA):** A significant decrease in TA was observed in groups treated with standard drug, chloroform extract of *C. annuum* (II, III, IV) respectively on comparison with the control group (I) (Table 1). Figure 2 shows the Effect of *C. annuum* on Total Acidity.

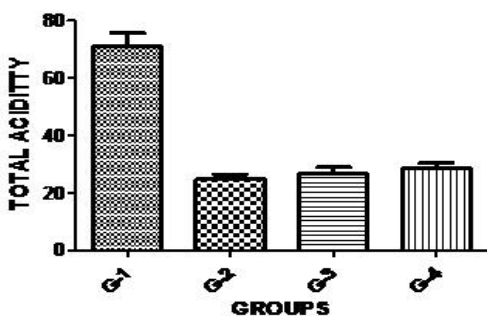


Figure 2: Effect of *C. annuum* on Total Acidity

**Gastric volume:** A significant decrease in acid volume was observed in standard group (II) when compared to the control group (I) after 19 hrs of pylorus ligation. But, no significant increase in acid volume was observed in *C. annuum* chloroform extract groups (III, IV) respectively when compared to the control group (I) (Table 1). Figure 3 shows the Effect of *C. annuum* on Gastric volume

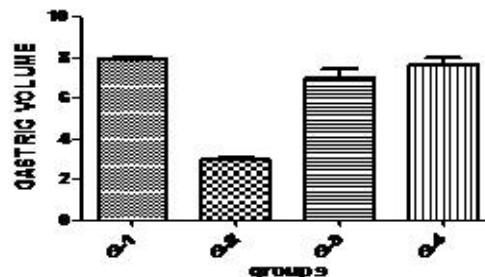


Figure 3: Effect of *C. annuum* on Gastric volume

**Gastric pH:** Gastric pH values are determined by using PH meter The group (II) treated with standard drug ranitidine and *C.annuum* chloroform extract to groups (III, IV) respectively showed a significant increase in gastric pH on comparison with the control (I) group (Table 1). Figure 4 shows the pH values of Gastric juice.

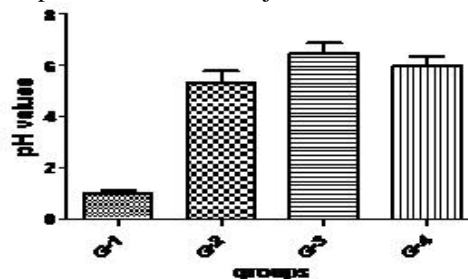


Figure 4: pH values of Gastric juice

**Histopathology:** After collecting the gastric contents and cut into small pieces from each group were fixed in 10% (v/v) formalin solution and subsequently embedded into the paraffin wax. Sections of 5 $\mu$ m thick were cut in a microtome and mounted on the glass microscope slides using standard techniques. After staining with hematoxylin-eosin, the sections were examined under light microscope and photographed. Figure 5 (a-d) shows the Macroscopic view of pylorus ligated induced ulcer in Control, Standard, Low dose, high dose treatment animals. [6]

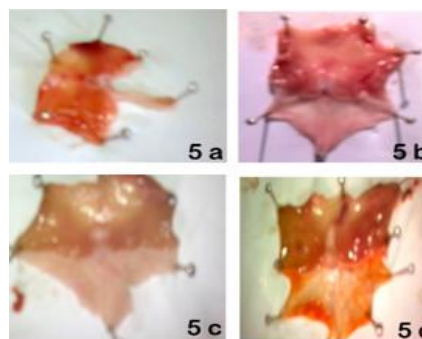


Figure 5: a: Control animals (group - I); 5 b: Standard animals (group -II); 5 c: Low dose animals (group -III); 5 d: High dose (animals group - IV)

**Table 1:** Effect of *C. annuum* on ulcers

S. No	Parameter	Control Group (Group I)	Standard Group(Group II)	<i>C. Annuum</i> Low dose (200mg/kg) (Group III)	<i>C. Annuum</i> High dose (400mg/kg) (Group IV)
1	Acid Volume	7.91±0.13	2.94±0.09***	7.02±0.39 <sup>ns</sup>	7.66±0.31
2	pH VALUES	1.01±0.13	5.33±0.47***	6.50±0.38***	6.01±0.34***
3	Free Acidity	41.67±1.47	9.83±0.60***	19.00±0.89***	20.83±0.79***
4	Total acidity	71.17±4.37	24.83±1.57***	26.83±2.040***	28.67±1.62***
5	Ulcer Index	6.58±1.06	1.25±0.21***	2.333±0.40***	3.25±0.59

#### 4. Conclusion

The antiulcer activity of *C. annuum* was evaluated by pylorus ligation model (Shay rat model), the chloroform extract of *C. annuum* has shown gastro protective effect a significant decrease in ulcer index, acid volume, total acidity, free acidity and significant increase in gastric pH were observed, there by chloroform extract of *C. annuum* exhibited potential anti-ulcer activity. At the low concentration of *C. annuum* extract was found to be more effective than the high dose and comparable to that of the standard drug (Ranitidine). Hence, the results obtained in this study were proved that the efficacy of chloroform extract of *C. annuum* has antiulcer activity, supporting that capsicum is protective for Gastric mucosa.

#### 5. Acknowledgements

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