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Evaluation of antiulcer activity of carica papaya root

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ABSTRACT

Gastric ulcer is a common disease with multiple etiologies. In present study the anti ulcer activity of aqueous Carica papaya root extract on ethanol induced gastric ulcer is investigated in Wistar rats of either sex. Thirty (30) rats weighing between 180 and 250 g were randomly divided into five groups. Group 1 served as the negative control (distilled water), groups 2 served as the (positive control), group 3 and 4 received 200 mg/kg and 400 mg/kg Carica papaya root extract respectively, while group 5 received 40mg/kg rabeprazole and served as standard group. Two weeks after the oral administration, gastric ulcer was induced in all rats with ethanol (1 ml of 200g orally). Gastric juice volume, gastric acidity, ulcer index and percentage ulcer inhibition were determined. The results showed that the extract protected the gastric mucosa against ethanol effect. C. papaya extract significantly reduced the gastric juice volume and gastric acidity ($p<0.05$) in dose dependent manner when compared with the control [1]. The percentage ulcer inhibition was significantly high ($p<0.05$) in rats treated with the extract when compared with the control and the effect is similar to that of rats treated with rabeprazole. This study shows that C. papaya root extract may possess gastro protective effects against ethanol induced gastric ulcer in rats [2].

Keywords: Anti ulcer, Aqueous Carica papaya root extract, Ethanol induced gastric ulcer, Negative control, positive control, Rabeprazole, Gastric juice volume, Gastric acidity, Ulcer index, Ulcer inhibition.

INTRODUCTION

Gastric ulcer is a common disease with multiple etiologies, defined as a discontinuity in the gastric mucosa penetration through the muscularis mucosa [3]. It usually results from the imbalance between the gastric mucosal protective factors, i.e., the gastric mucosal barrier and the aggressive factors, to which the mucosa is exposed. Aggressive factors which promote gastric mucosal injury include gastric hydrochloric acid (HCl), mucosal hypo perfusion [4], free oxygen radicals, and ethanol, etc. Among them, alcohol consumption is the greatest contributor to gastric ulceration [5]. Consumption of excessive alcohol usually elevates the riskof gastric mucosal damage.

Thus, the experimental model of ethanol-induced gastric mucosal damage in rats is often employed to screen the compounds for anti-ulcer activity in that it serves as the leading cause of gastric ulcer in humans. The papaya tree belongs to a small family — Caricaceae having four genera in the world. The genus Carica Linn. is represented by four species in India, of which Carica papaya Linn is the most widely cultivated and best-known species. Among the other species, C. cauliflora Jacq., C. pubescens Lenne & K. Koch and C.

quercifolia Benth. & Hook.f. ex Hieron are possible sources of breeding material for inducing frost and virus resistance in cultivated papaya. The fruits, leaves and latex, root obtained from papaya plant are used medicinally and for various other purposes. Papain, a major chemical compound extracted from fruit and stem latex is used in brewing and wine making and in the textile and tanning industries [4]. Papaya contains broad spectrum of phytochemicals including, polysaccharides, vitamins, minerals, enzymes, proteins, alkaloids, glycosides, fats and oils, lectins, saponins, flavonoids, sterols, etc. [6].

MATERIALS AND METHODS

Plant collection

The plant of Carica papaya root was collected from surroundings of Tiruvannamalai, Tamil Nadu and it was authentified by Dr.P.Jayaraman, Ph.D. Institute of harbal Plant anatomy research centre, No.4, 2nd treet, Sacthi nagar, west Tambaram, Chennai.

Preparation of extract

The root pieces were shade-dried and made into a coarse powder to get a uniform particle size and then used for extraction. A weighed quantity of the powder was then subjected to continuous hot extraction in Soxhlet apparatus and the residual marc was collected. The extract was filtered through a cotton plug, followed by Whatmann filter paper (no.1). The extract was evaporated under reduced pressure using an evaporator at a low temperature (40-60°C) until all the solvent had been removed to give an extract sample [7].

Experimental animals

Wister albino rats weighing 150-200 g were used for the study. Thirty rats were divided into five (5) groups, each group consisting of six animals. Group I received distilled water (negative control), group II served as positive control, group III rats were given 200 mg/kg of C. papaya root extract, group IV rats were given 400 mg/kg of C. papaya root extract and the group V received 40 mg/kg of rabeprazole [8]. The treatment in all the groups was single dose for fourteen consecutive days through gavages.

Pylorus Ligated method of ethanol induced gastric ulcer

The ulcer protective effect of AECPR was studied as per the method of (Shay et al., 1945). In pyloric ligation induced ulcers, ulcers are caused by accumulation of acidic gastric juice in stomach. Wister strain albino rats were divided into 5 groups; each group consists of 6 animals. All animals received treatment for 5 days. Group 1 served as the negative control (distilled water), groups 2 served as the (positive control), group 3 and 4 received 200 mg/kg and 400 mg/kg Carica papaya root extract respectively, while group 5 received 40mg/kg rabeprazole and served as standard group [9] were formed. Albino rats were fasted for 24 h with free access to water prior to the tests. Under light ether anesthesia, the abdomen was opened by a small midline incision below the xiphoid process; the pyloric portion of the stomach was slightly lifted out and ligated, avoiding traction to the pylorus or damage to its blood supply [10]. The stomach was replaced carefully and the abdominal wall closed by interrupted sutures. Control vehicle, AECPR and standard drug (40mg/kg rabeprazole) were administered orally immediately after pyloric ligation. After 4h of pyloric ligation, the animals were sacrificed with excess of anesthetic ether and stomach was dissected out; the gastric contents were drained into graduated tubes and its volume, pH, total acidity were determined [11]. Glandular portion of stomach was cut open along the greater curvature and inner surface examined for ulceration. Stomach was rinsed under a stream of water and pinned flat on a corkboard and the ulcer score was calculated.

Determination of pH of gastric content

1 ml of the gastric juice was collected, and pH was directly measured by using pH strip [11].

Table 1. Determination of pH of gastric content.

Sl. No	Treatment	pH
01	Control	2.126 ± 0.070
02	Positive control	2.930±0.432[a**]
03	200 mg/kg of AECPR	3.387± 0.049[b**]

04	400 mg/kg of AECPR	3.580± 0.094[c**]
05	40mg/kg of Rabeprazole	3.832±0.049[d**]

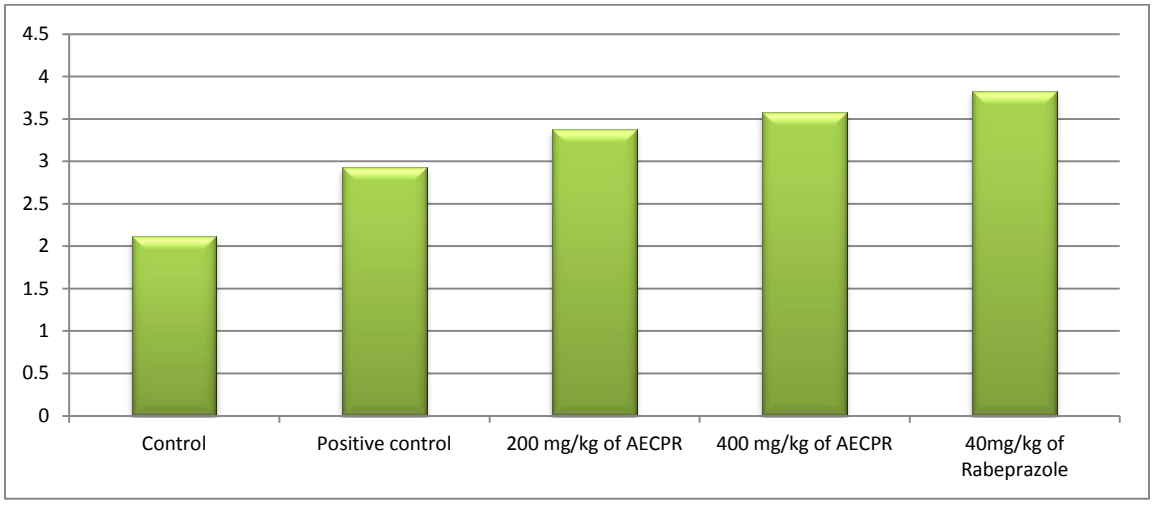

Fig.1 determination of pH of gastric content.

Determination of ulceration index

The mucosa was flushed with saline and the stomach was pinned on frog board and their lesions were examined and scored macroscopically, using hand lens Ulcer index (UI) was measured by the following formula:

$$\frac{\text{Total ulcer score}}{\text{Number of animals ulcerated}}$$

A significant (P<0.01) increase in the ulcer index is observed in the ethanol induced group when compared to the control group. AECPR 200mg/kg and 400mg/kg treated group have shown a significant (P<0.01) decrease in the ulcer index and rabeprazole treated group have shown a significant (P<0.01) decrease in the ulcer index when compared to the ethanol induced group [13]. The results were shown in Fig.2

Table 2. Determination of ulcer index.

S.No	Group	Ulcer index (mm)
01	Control	5.333 ± 0.32
02	Positive control	2.930±0.432[a**]
03	200 mg/kg of AECPR	1.830 ± 0.9220[b**]
04	400 mg/kg of AECPR	1.09 ± 0.9220[c**]
05	40mg/kg of Rabeprazole	0.671±0.20[d**]

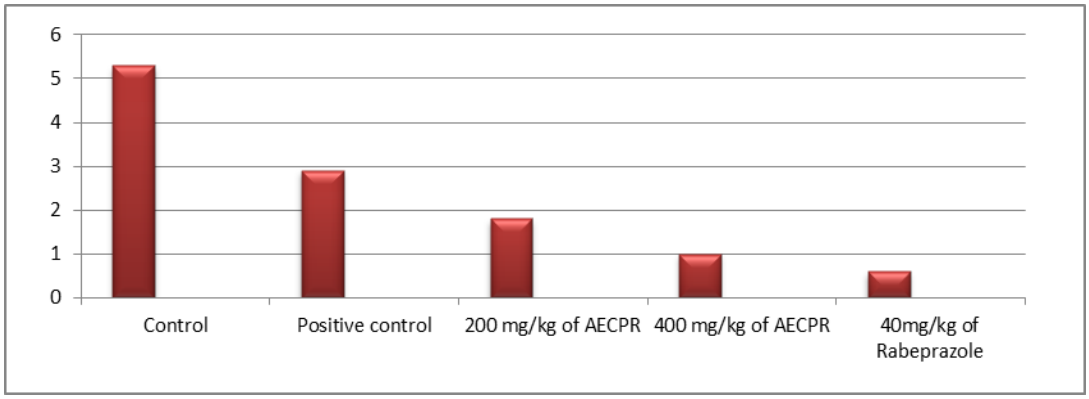

Fig.2 Determination of ulcer index.

Determination Gastric volume

A significant (P<0.01) increase in the gastric volume level is observed in the pylorus ligated group when compared to the control group. AECPR 200mg/kg and 400mg/kg treated group have shown a significant decrease in the gastric volume level and Rabeprazole treated group have shown a significant decrease in the gastric volume level when compared to the pylorus ligated group [14]. The results were shown in Fig.3

Tabul.3 Determination Gastric volume

S.No	Group	Gastric volume (ml/4 h)
01	Control	4.364 ± 0.1520
02	Positive control	$8.823\pm0.2836^{a**}$
03	200 mg/kg of AECPR	$6.548\pm0.1763^{b**}$
04	400 mg/kg of AECPR	$5.122\pm 0.1167^{c **}$
05	40mg/kg of Rabeprazole	$3.547\pm 0.1302^{d **}$

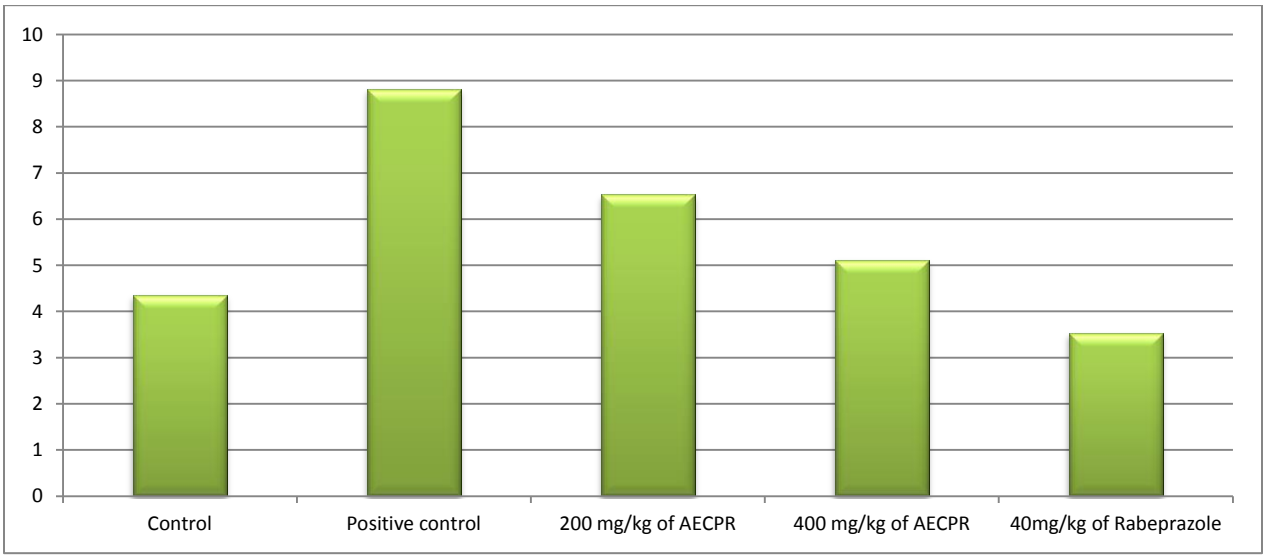

Fig.3 Determination Gastric volume

Percentage Ulcer inhibition

The percentage ulcer protection was calculated using the formula [15, 16]:

Ulcer Protection Percentage = 1 – (Ut / Uc) *100

Where,

Ut = Ulcer index of treated group.

Uc = Ulcer index of the control group.

Table.4 Percentage Ulcer inhibition

S.No	Group	Ulcer inhibition (%)
01	Control	-
02	Positive control	45.1%
03	200 mg/kg of AECPR	65.7%
04	400 mg/kg of AECPR	79.8%
05	40mg/kg of Rabeprazole	87.5%

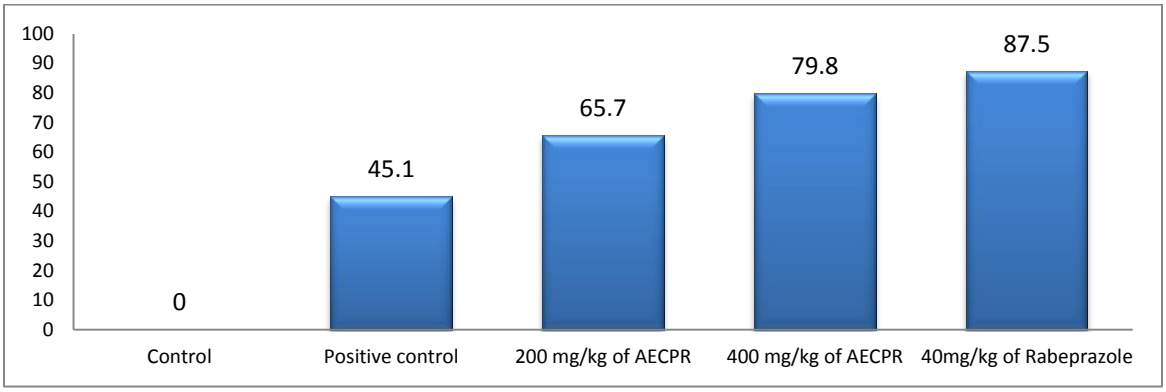

Fig.4 Percentage Ulcer inhibition

DISCUSSION

The anti ulcer activity of the Carica papaya root extract was studied using ethanol ulcer model. This model is one of the common causes of gastric ulcer in human. Ethanol induced gastric injury is associated with significant production of oxygen free radicals leading to increased lipid peroxidation, which causes damage to cell and cell membrane [8]. The C. papaya root extract has significantly protected the gastric mucosa against ethanol challenge as shown by significant reduction in gastric juice volume, gastric acidity and ulcer index as compared to control group suggesting its potent gastro protective effect on ethanol induced gastric ulcer in rats.

The mechanism of action of the extract in reducing gastric secretion in pylorus ligation model may probably involve proton pump inhibition is similar to rabeprazole. Also iss possible that the extract irreversibly inhibits the H+/K+ATPase (the proton pump) in the acid secretory pathway [18, 19, 20]. It reduce both basal and stimulated gastric acid secretion is reduced. Another possible reason for the action of this extract may be as a result of its anti oxidant properties, although antioxidant assay was not investigated in this study, but some studies have revealed the antioxidant properties of the extract [21, 22].

CONCLUSION

The present study showed that Aqueous extract of Carica papaya root have shown significant effect on the ulcer induced by one Models such as pyloric ligation Model of ethanol induced gastric ulcer. The maximum ulcer protection of AECPR has been shown in the pyloric ligation Model of ethanol induced gastric ulcer and significant effect was found at both 200 mg/kg and 400 mg/kg dose levels.

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