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# Evaluation of Anti-Ulcer Activity of Hydroalcoholic Extract of *Aegle marmelos* (L.) Correa. (Haeam) Unripe Fruit Using Indomethacin and Pylorus Ligation Induced Gastric Ulcer in Wistar Rats

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**Keywords:** Anti-ulcer activity, Indomethacin, Pylorus ligation, *Aegle marmelos* (L.), Correa unripe fruit

**ABSTRACT**

Peptic ulcer is one of the major disorders of Gastrointestinal tract, for which a large number of traditional and modern medicines are being utilized. The purpose of the present study is to investigate the phytoconstituents and anti-ulcer activities of the Hydroalcoholic Extract of *Aegle marmelos* (L.) Correa. (HAEAM) unripe fruit on wistar rats. Preliminary phytochemical analysis of HAEAM showed the presence of carbohydrates, alkaloids, triterpenoid, glycosides, steroids and sterols, phenols, tannins, saponins, flavonoids, proteins and amino acids, terpenes and also showed the absence of gums and mucilage, oxalate, phytate, ascorbic acid. HAEAM at the doses of 200 mg/kg body weight and 400 mg/kg body weight orally was administered to evaluate Anti-ulcer activity by using Indomethacin induced gastric ulcer for 14 days and Pylorus ligation induced gastric ulcer for 16 days in Wistar rats. Treatment with HAEAM decreased ulcer index in both Gastric ulcer induced models. Treatment with HAEAM increased Percentage inhibition of ulcer in both Gastric ulcer induced models. HAEAM showed significant decrease in Total protein (TP), Serum Glutamate Oxaloacetic acid Transaminase (SGOT), Serum Glutamate Pyruvate Transaminase (SGPT) and showed increased in Superoxide dismutase (SOD) and Catalase (CAT) when compared to Indomethacin induced group. HAEAM significantly decreased Free acidity, Total acidity and Gastric volume, Serum Glutamate Oxaloacetic acid Transaminase (SGOT), Serum Glutamate Pyruvate Transaminase (SGPT) when compared to pylorus ligation induced group.

## INTRODUCTION

Peptic ulcer occurs in gastrointestinal tract (G.I.T.) which is exposed to gastric acid and pepsin, *i.e.* stomach and duodenum. The pathophysiology of these disorders has focused on an imbalance between aggressive (acid, pepsin, bile and *H. pylori*) and defensive or protective force (gastric mucus and bicarbonate secretion, prostaglandins, nitric oxide, innate resistance of the mucosal cells) factors in the stomach [1]. Peptic ulcer disease (PUD), also known as a peptic ulcer or stomach ulcer, is a break in the lining of the stomach, first part of the small intestine or occasionally the lower oesophagus. An ulcer in the stomach is known as a gastric ulcer while that in the first part of the intestines is known as a duodenal ulcer [2]. The lifetime risk for developing a peptic ulcer is approximately 10% [3]. Infection of the stomach mucosa with *Helicobacter pylori* a Gram negative spiral-shaped bacterium is generally considered to be a major cause of gastro-duodenal ulcer [4]. Various factors can also contribute to the formation of gastric ulcer such as the frequent use of Nonsteroidal anti-inflammatory drugs (NSAIDs), Genetic tendency, Medicine, consumption of alcohol, Cigarette smoking, stress, Bile salts and pancreatic enzymes, Toxins secreted by micro-organisms, Hypersecretory states [5]. Several drugs are widely used to prevent or treat gastro-duodenal ulcers; these include H2 receptor antagonists (Cimetidine, ranitidine), proton pump inhibitors (Omeprazole, lansoprazole) and cytoprotectives (Misoprostol) [6] Antacids, e.g. Aluminium hydroxide and Magnesium hydroxide, are often used to neutralize excess gastric acidity in the stomach. The success of antiulcer drugs in the treatment of gastric ulcer is usually overshadowed by various side effects and due to problems associated with recurrence after treatment, there is therefore the need to seek alternative drug sources against GI ulcers. Compared to synthetic drug, drug derived from plants are frequently considered to be less toxic with few side effects. Utilization of bael (*Aegle marmelos*) fruit in day-to-day life has a great nutritional, environmental as well as commercial importance. Compounds purified from bael (*Aegle marmelos)* fruit have been proven to have biological potential against several diseases like diabetes, gastric ulcer and hyperlipidaemia [7]. It should also be indicated that the therapeutic activities including antiulcer, antidiabetic, antihyperlipidaemic, antioxidant, anticancer, antimicrobial, radioprotective, anti-inflammatory, antipyretic, analgesic and antispermatogenic effects on various animal models [8].

## MATERIALS AND METHODS

### Plant materials

Freshly collected unripe fruits of *Aegle marmelos* (L.) Correa. were thoroughly washed under running water to remove adherent impurities. Fruits were chopped and the pulp along with pericarp and seeds were subjected to shade drying at room temperature and coarsely powdered (mesh #40). 400g of coarse powder was extracted with hydroalcoholic (80:20) in Soxhlet apparatus. The obtained extract was concentrated under reduced pressure to obtain a reddish brown semi-solid mass. The obtained crude extracts were weighted and stored at low temperature (4 to 8°C) for further analysis. The percentage yield was calculated by using following formula.

$$\textbf{Percentage yield (\%w/w)} = \frac{\text{Weight of extract obtained (g)}}{\text{Weight of plant material used}} \times 100$$

### Preliminary Phytochemical Analysis

HAEAM was subjected to preliminary phytochemical screening for the presence or absence of phytoconstituents like carbohydrates, alkaloids, triterpenoid, glycosides, steroids and sterols, phenols, tannins, saponins, flavonoids, proteins and amino acids, terpenes, gums and mucilage, oxalate, phytate, ascorbic acid [9].

### Experimental animal studies

Wister rats of either sex weighing 180 to 250 g were used for this study. The animals are divided into five groups. They were housed six per cage under standard laboratory conditions at a room temperature at 22±2°C with 12 hr light/dark cycle. The animals were provided with standard pellet chow ad libitum. Animals acclimatized to laboratory conditions one week prior to initiation of experiments. Ethical committee clearance was obtained from IAEC (Institutional Animal Ethics Committee) of CPCSEA (Committee for the Purpose of Control and Supervision of Experiments on Animals).

### IAEC Reference no:

Reg No. 14/321/PO/Re/S/01/CPCSEA Date: 12.10.2018

**Experimental Gastric Ulcers**

**Indomethacin Induced Gastric ulcer:**

Group I: Control animal treated with normal saline

Group II: Indomethacin (40 mg/kg p.o) induced ulcer

Group III: Indomethacin (40 mg/kg p.o) induced ulcer and treated with Omeprazole (20 mg/kg p.o)

Group IV: Indomethacin (40 mg/kg p.o) induced ulcer and treated with HAEAM (200 mg/kg p.o)

Group V: Indomethacin (40 mg/kg p.o) induced ulcer and treated with HAEAM (400 mg/kg p.o)

Group I was treated with normal saline. Group II was treated with indomethacin (40 mg/kg p.o) on 14$^{th}$ day. Group III was treated with Omeprazole (20 mg/kg p.o) 30 min prior to induction of gastric ulcer on the 14$^{th}$ day and Group IV and V were treated with HAEAM 200 mg/kg p.o and HAEAM 400 mg/kg p.o respectively for 14 days. On 14$^{th}$ day after the last dose (Group II, III, IV, V) after fasting for 24 hrs, the gastric ulcer was induced to all the groups using indomethacin (40 mg/kg p.o) except group I and sacrificed 4 hours treatment [10]. The stomach was cut open along with the greater curvature and the contents drained into small beakers, centrifuged and subjected to assess antiulcer activity. The inner surface of stomach was examined for ulcer index. Parameters of Percentage inhibition of ulcer, SOD, CAT, Total protein, SGOT and SGPT were then performed.

**Pylorus ligation Induced Gastric ulcer:**

Group I: Control animal treated with normal saline

Group II: Pylorus ligation induced ulcer

Group III: Pylorus ligation induced ulcer and treated with Omeprazole (20 mg/kg p.o)

Group IV: Pylorus ligation induced ulcer and treated with HAEAM (200 mg/kg p.o)

Group V: Pylorus ligation induced ulcer and treated with HAEAM (400 mg/kg p.o)

Group I was treated with normal saline. Group II was treated with pylorus ligation on 16th day. Group III was treated with pylorus ligation and Omeprazole (20 mg/kg p.o) administered 30 min prior to the test on 16th day. Group IV and V were treated with (HAEAM) 200 mg/kg and 400 mg/kg p.o respectively for 14 days. Group II, III, IV and V were fasted for 24 hrs, care being taken to avoid coprophagy. On 16th day pylorus ligation was performed. Rats were anaesthetized with the help of anaesthetic ether; the abdomen was opened by a small midline incision below the xiphoid process. Pylorus portion of the stomach was slightly lifted out and ligated, avoiding traction to the pylorus or damage to its blood supply [11,12]. The stomach was replaced carefully and the abdominal wall was closed by interrupted sutures. Rats were sacrificed by an overdose of anaesthetic ether after 4 hours of pylorus ligation. The abdomen was cut opened, cardiac end of the stomach was dissected out and the contents were drained into small beaker. The inner surface of stomach was examined for ulcer index. Parameters of Percentage inhibition of ulcer, Free acidity, Total acidity, Gastric volume, SGOT and SGPT were then performed.

**Physical parameters**

**Ulcer index [13]**

Ulcer index is measured by using following formula:

$$\mathbf{UI = UN + US + UP \times 10^{-1}}$$

Where,

UI = Ulcer index, UN = Average of number of ulcer per animal

US = Average of severity score, UP = Percentage of animal with ulcers

**Scoring of ulcer**

0 = Normal coloured stomach, 0.5 = Red colouration, 1 = Spot ulcer

1.5 = Haemorrhagic streaks, 2 = Ulcers ≥ 3 but ≤ 5, 3 = Ulcers > 5

**Percentage inhibition [13]**

Percentage inhibition of ulceration is calculated as below:

$$\text{Percentage Inhibition} = (UI_{\text{negative control}} - UI_{\text{treatment}}) / UI_{\text{negative control}} \times 100$$

**Biochemical parameters**

Stomach contents were drained in small beaker for the estimation of Free acidity [14], Total acidity [14], Gastric volume [14]. Stomach tissue homogenate prepared for the estimation of SOD [15], CAT [16], and Total protein [17]. Animals were sacrificed and blood was collected for the estimation of SGOT [18], SGPT [18].

**RESULTS**

**Phytochemical investigation**

Hydroalcoholic extract of *Aegle marmelos* (L.) Correa. unripe fruit (HAEAM) showed the presence of carbohydrates, alkaloids, triterpenoid, glycosides, steroids and sterols, phenols, tannins, saponins, flavonoids, proteins and amino acids, terpenes and showed the absence of gums and mucilage, oxalate, phytate, ascorbic acid.

**Indomethacin induced gastric ulcer**

There was significant increase in Ulcer index in group II, III, IV, V ($p<0.001$) when compared to group I. There was significant decrease in Ulcer index in group III, IV, V ($p<0.001$) when compared to group II. There was significant decrease in Percentage inhibition of ulcer in group II, III, IV, V ($p<0.001$) when compared to group I. There was significant increase in Percentage inhibition of ulcer in group III, IV, V ($p<0.001$) when compared to group II. There was significant decrease in SOD in group II, III, IV, V ($p<0.001$) when compared to group I. There was significant increase in SOD in group III, IV, V ($p<0.001$) when compared to group II. There was significant decrease in CAT in group II, III, IV, V ($p<0.001$) when compared to group I. There was significant increase in CAT in group III ($p<0.001$), IV (ns), V ($p<0.01$) when compared to group II. Results shown in Table 1 and Figure 1.

There was significant increase in Total protein in group II, V ($p<0.001$), III ($p<0.05$), IV (ns) when compared to group I. There was significant decrease in Total protein in group III, IV ($p<0.001$), V ($p<0.05$) when compared to group II. There was significant increase in SGOT in group II, IV ($p<0.001$), III, V ($p<0.01$) when compared to group I. There was significant decrease in SGOT in group III, V ($p<0.001$), IV (ns) when compared to group II. There was

significant increase in SGPT in group II, IV ($p<0.001$), III ($p<0.05$), V ($p<0.01$) when compared to group I. There was significant decrease in SGPT in group III, IV, V ($p<0.001$) when compared to group II. Results shown in Table 2 and Figure 2.

**Pylorus ligation induced gastric ulcer**

There was significant increase in Ulcer index in group II, III, IV, V ($p<0.001$) when compared to group I. There was significant decrease in Ulcer index in group III, IV, V ($p<0.001$) when compared to group II. There was significant decrease in Percentage inhibition of ulcer in group II, III, IV, V ($p<0.001$) when compared to group I. There was significant increase in Percentage inhibition of ulcer in group III, IV, V ($p<0.001$) when compared to group II. There was significant increase in Free acidity in group II, IV ($p<0.001$), III, V (ns) when compared to group I. There was significant decrease in Free acidity in group III, IV, V ($p<0.001$) when compared to group II. There was significant increase in Total acidity in group II ($p<0.001$), III, V (ns), IV ($p<0.01$) when compared to group I. There was significant decrease in Total protein group III, IV, V ($p<0.001$) when compared to group II. Results shown in Table 3 and Figure 3.

There was significant increase in Gastric volume in group II, III, IV, V ($p<0.001$) when compared to group I. There was significant decrease in Gastric volume in group III, IV, V ($p<0.001$) when compared to group II. There was significant increase in SGOT in group II, IV ($p<0.001$), III ($p<0.05$), V ($p<0.01$) when compared to group I. There was significant decrease in SGOT in group III, V ($p<0.001$), IV ($p<0.01$) when compared to group II. There was significant increase in SGPT in group II, IV ($p<0.001$), III, V (ns) when compared to group I. There was significant decrease in SGPT in group III, IV, V ($p<0.001$) when compared to group II. Results shown in Table 4 and Figure 4.

**Table 1: Effect of HAEAM on Ulcer index, % inhibition of ulcer, SOD and CAT in Indomethacin induced gastric ulcer**

| Group | Ulcer Index | % Inhibition of ulcer | SOD (mmol/min/mg/ tissue) | CAT (Moles of $H_2O_2$ consumed/min) |
|---|---|---|---|---|
| I | 0±0 | 100 | 243.67± 3.48 | 112.33± 2.60 |
| II | 15.43± 0.45 $a^{***}$ | 0 $a^{***}$ | 139.67± 2.60 $a^{***}$ | 59.67± 2.73 $a^{***}$ |
| III | 4.45 ± 0.23 $a^{***}b^{***}$ | 72.52±1.44 $a^{***}b^{***}$ | 212.00± 5.20 $a^{***}b^{***}$ | 81.00± 2.08 $a^{***}b^{***}$ |
| IV | 8.33± 0.35 $a^{***}b^{***}$ | 46.01±0.57 $a^{***}b^{***}$ | 171.67±4.91 $a^{***}b^{***}$ | 64.66± 2.60 $a^{***}b^{ns}$ |
| V | 5.40± 0.28 $a^{***}b^{***}$ | 64.67±0.88 $a^{***}b^{***}$ | 212.66±2.73 $a^{***}b^{***}$ | 75.00± 2.89 $a^{***}b^{**}$ |

**Table 2: Effect of HAEAM on Total Protein, SGOT and SGPT in Indomethacin induced gastric ulcer**

| Group | Total protein (g/dl) | SGOT (U/L) | SGPT (U/L) |
|---|---|---|---|
| I | 2.883± 0.077 | 100.00± 3.60 | 53.33± 2.40 |
| II | 6.377± 0.415 $a^{***}$ | 168.33± 6.01 $a^{***}$ | 123.67± 4.70 $a^{***}$ |
| III | 5.390± 0.267 $a^{*}b^{***}$ | 129.67± 4.26 $a^{**}b^{***}$ | 70.33± 03.93 $a^{*}b^{***}$ |
| IV | 5.823± 0.104 $a^{ns}b^{***}$ | 151.66± 4.41 $a^{***}b^{ns}$ | 91.00± 2.08 $a^{***}b^{***}$ |
| V | 3.840± 0.096 $a^{***}b^{*}$ | 131.33± 4.67 $a^{**}b^{***}$ | 72.66± 3.38 $a^{**}b^{***}$ |

**Table 3: Effect of HAEAM on Ulcer index, % inhibition of ulcer, Free acidity and Total acidity in Pylorus ligation induced gastric ulcer**

| Group | Ulcer index | Percentage inhibition of ulcer | Free Acidity (mEq/L) | Total Acidity (mEq/L) |
|---|---|---|---|---|
| I | 0±0 | 100 | 23.80± 0.88 | 50.99± 2.07 |
| II | 11.52± 0.48 $a^{***}$ | 0 $a^{***}$ | 59.47± 0.87 $a^{***}$ | 91.05± 3.30 $a^{***}$ |
| III | 3.67± 0.34 $a^{***}b^{***}$ | 69.05±0.53 $a^{***}b^{***}$ | 26.35± 1.51$a^{ns}b^{***}$ | 52.67± 2.54 $a^{ns}b^{***}$ |
| IV | 5.76± 0.33 $a^{***}b^{***}$ | 51.67±0.88 $a^{***}b^{***}$ | 38.58± 1.17 $a^{***}b^{***}$ | 66.01± 2.83 $a^{**}b^{***}$ |
| V | 4.05± 0.15 $a^{***}b^{***}$ | 64.87±0.58 $a^{***}b^{***}$ | 28.16± 1.37$a^{ns}b^{***}$ | 54.92± 2.34 $a^{ns}b^{***}$ |

**Table 4: Effect of HAEAM on Gastric volume, SGOT and SGPT in Pylorus ligation induced gastric ulcer**

| Group | Gastric volume (ml) | SGOT (U/L) | SGPT (U/L) |
|---|---|---|---|
| I | 1.41± 0.08 | 101.97± 2.38 | 55.33± 0.88 |
| II | 6.09± 0.15 $a^{***}$ | 152.67± 5.04 $a^{***}$ | 97.00± 2.65 $a^{***}$ |
| III | 2.98± 0.08 $a^{***}b^{***}$ | 116.00± 1.53 $a^{*}b^{***}$ | 62.00± 2.52 $a^{ns}b^{***}$ |
| IV | 4.88± 0.07 $a^{***}b^{***}$ | 133.67± 3.38 $a^{***}b^{**}$ | 75.33± 2.60 $a^{***}b^{***}$ |
| V | 3.05± 0.10 $a^{***}b^{***}$ | 120.33± 2.60 $a^{**}b^{***}$ | 60.33± 3.18 $a^{ns}b^{***}$ |

The values are expressed as mean ± SEM of 6 animals.

Comparisons were made between:

- Group I vs Group II, III, IV,V is considered as “a”
- Group II vs Group III, IV, V is considered as “b”

Statistical significance test for comparison was done by One way ANOVA followed by Dunnett’s test.

Symbols represent statistical significance * $p<0.05$, ** $p<0.01$, *** $p<0.001$, ns –non significant

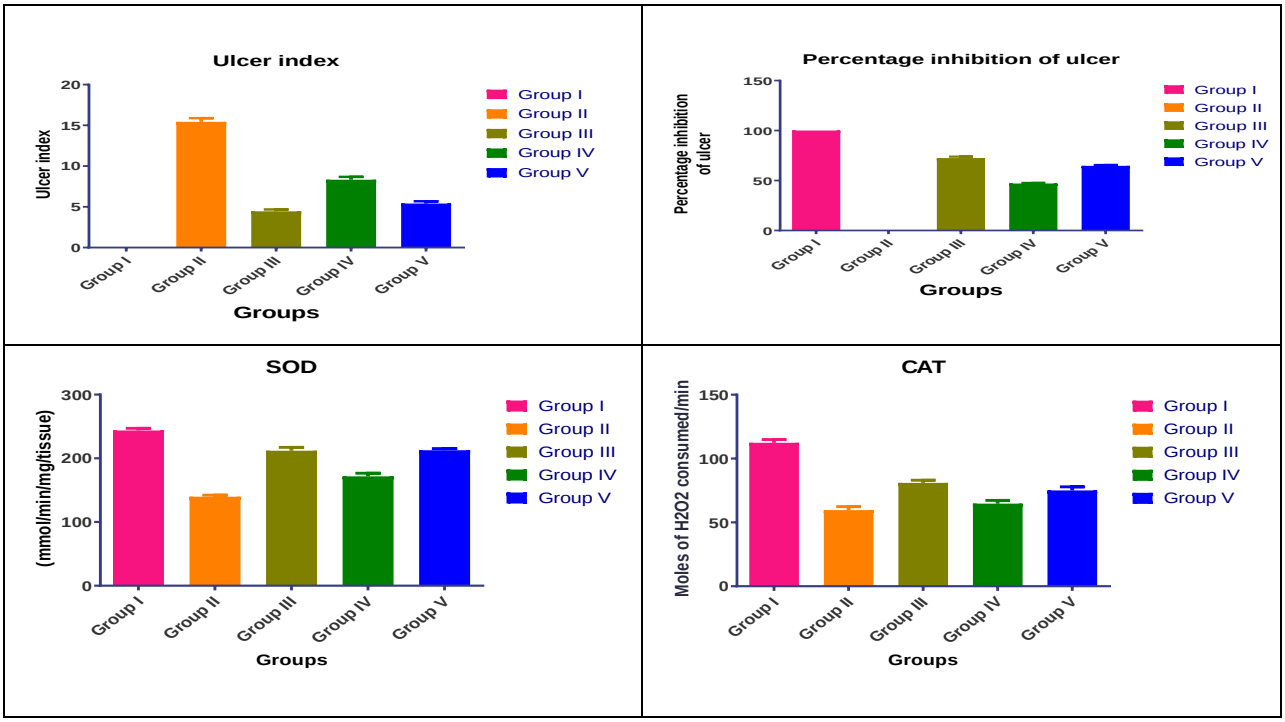


**Figure 1: Effect of HAEAM on Ulcer index, % inhibition of ulcer, SOD and CAT in Indomethacin induced gastric ulcer**

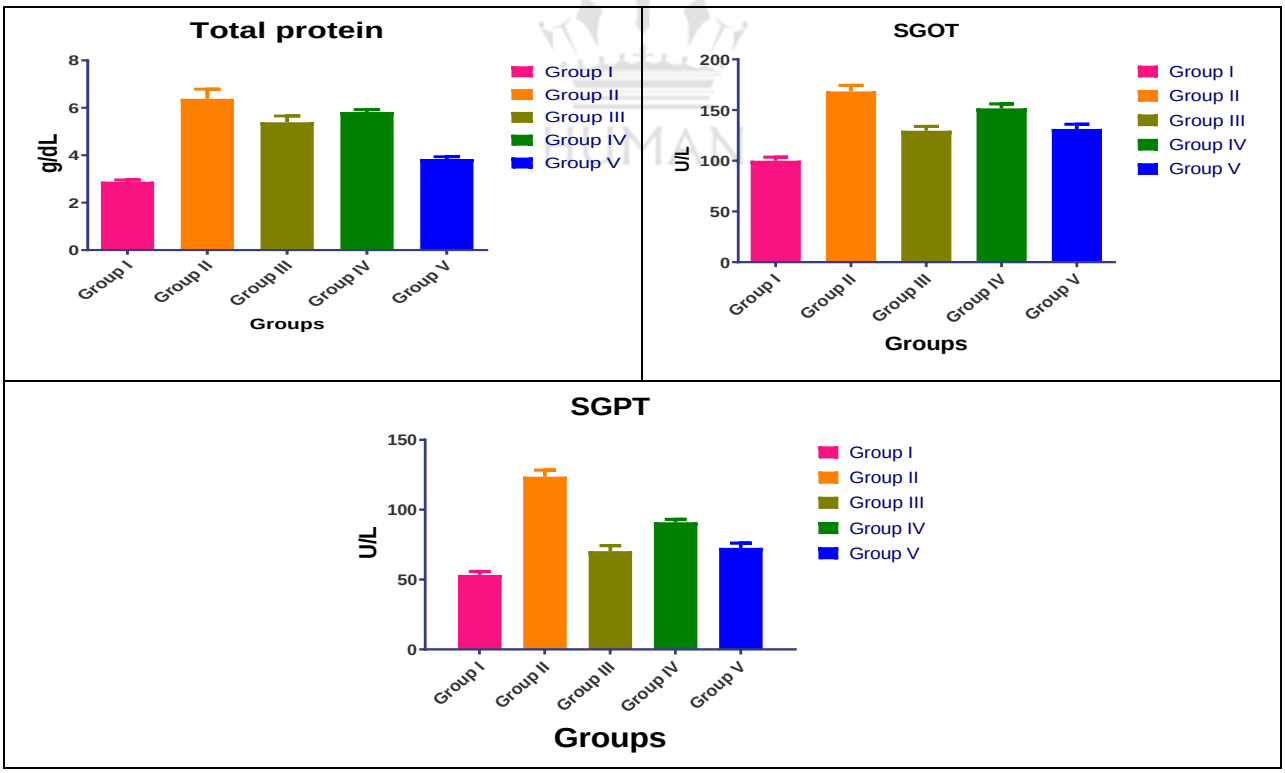


**Figure 2: Effect of HAEAM on Total Protein, SGOT and SGPT in Indomethacin induced gastric ulcer**

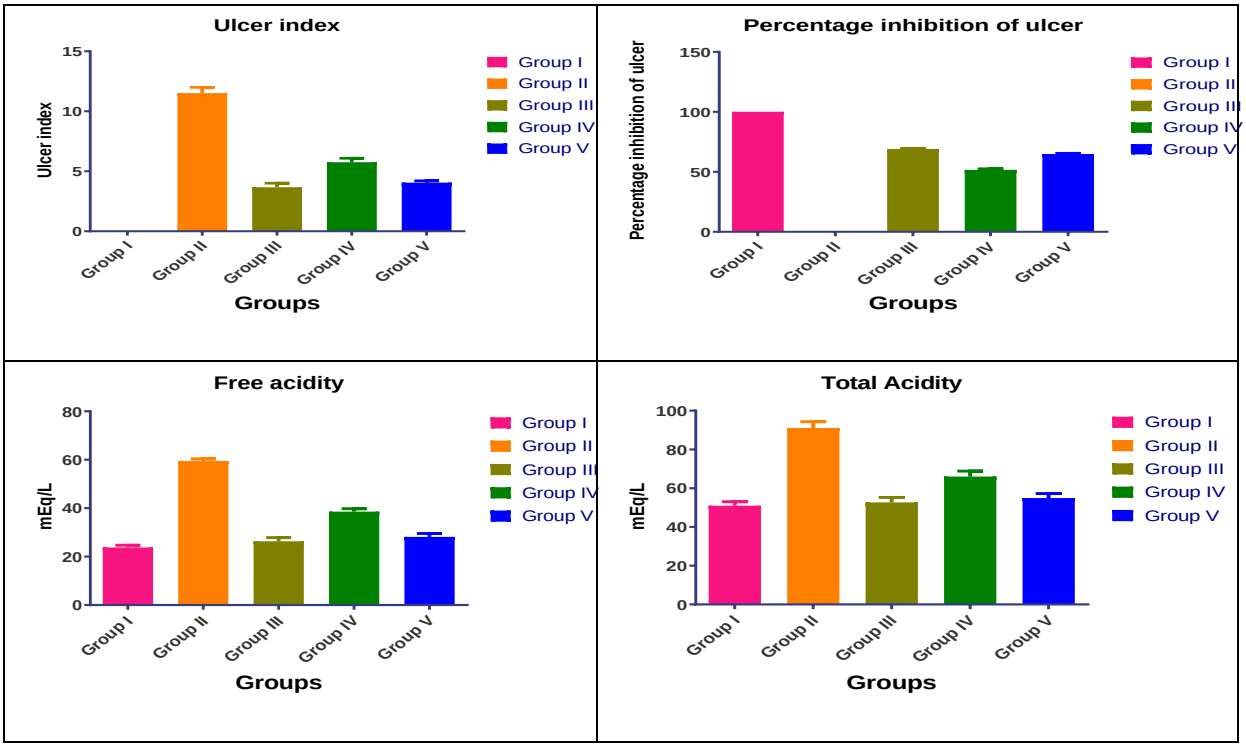


**Figure 3: Effect of HAEAM on Ulcer index, % inhibition of ulcer, Free acidity and Total acidity in Pylorus ligation induced gastric ulcer**

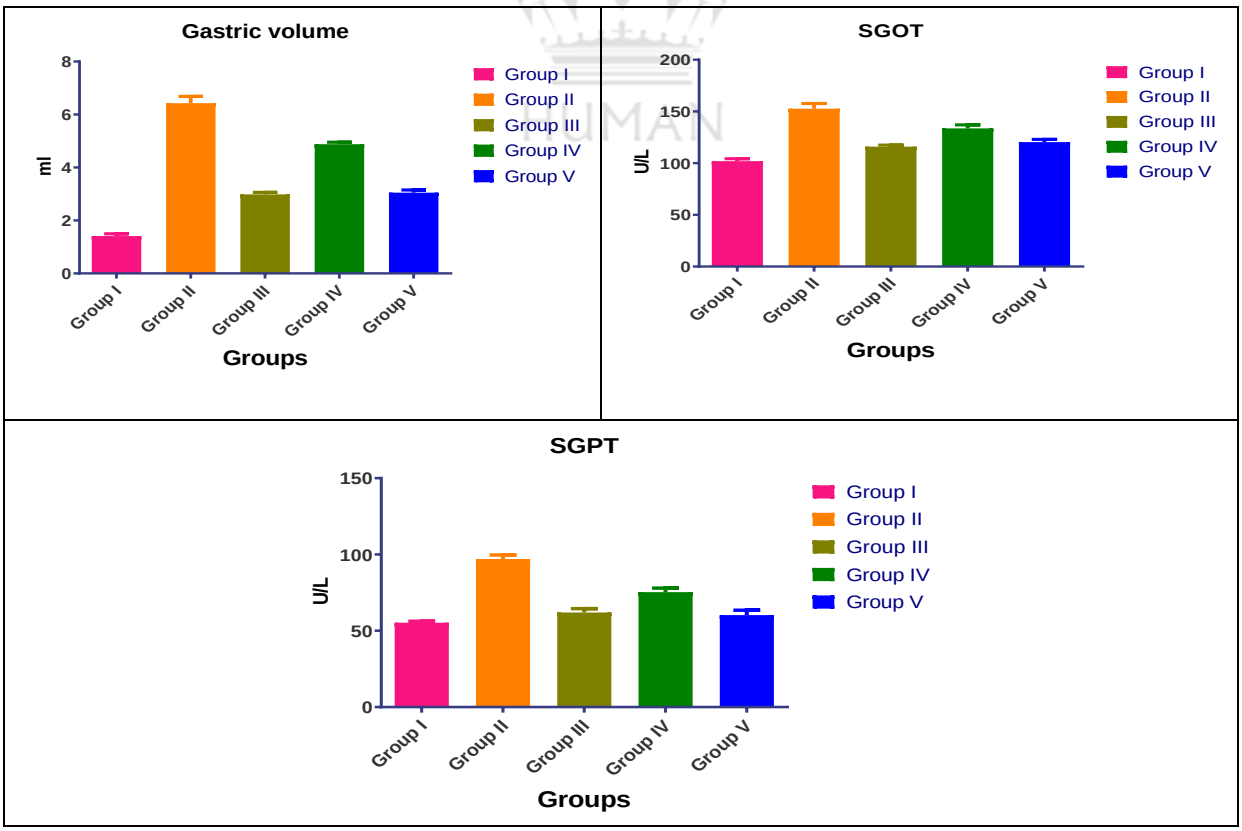


**Figure 4: Effect of HAEAM on Gastric volume, SGOT and SGPT in Pylorus ligation induced gastric ulcer**

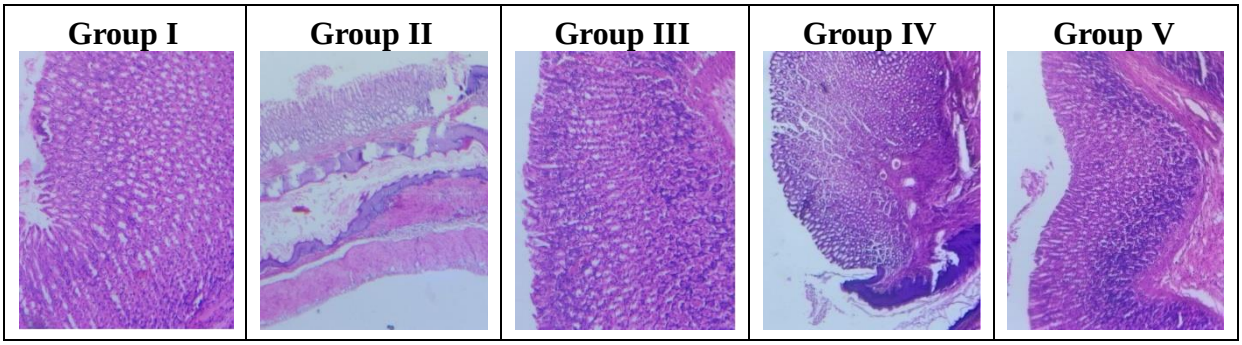


**Figure 5: Histopathological slides of different groups are shown below (Indomethacin induced gastric ulcer model)**

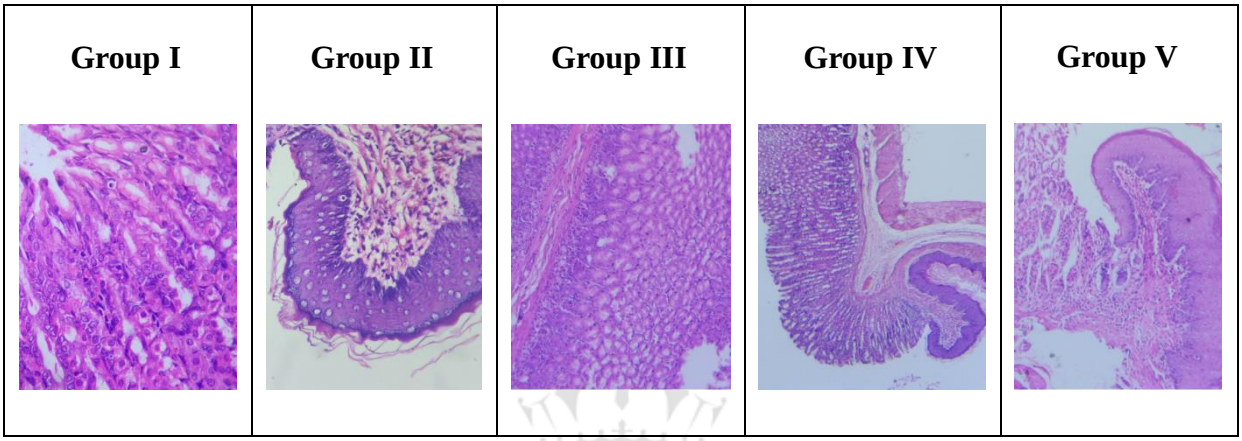


**Figure 6: Histopathological slides of different groups are shown below (Pyloric ligation induced gastric ulcer model)**

## DISCUSSION AND CONCLUSION

Peptic ulcer is the most common GIT disorder in the present day life of the industrialized and civilized world. It is a chronic inflammatory disease characterized by ulceration in the regions of upper gastrointestinal tract where parietal cells are found and where they secrete hydrochloric acid (HCl) and pepsin. Various factors can contribute to the formation of gastric ulcer such as the infection of stomach by *H pylori*, use of NSAIDs, stress and consumption of alcohol.

The current medicinal treatment of peptic ulcer is generally based on the inhibition of gastric acid secretion by histamine $H_2$- antagonists, proton pump inhibitors, and anti-muscarinics, as well as on acid independent therapy provided by sucralfate and bismuth cholinergics [19]. However, the majority of these drugs produce adverse reactions, such as hypersensitivity, arrhythmia, impotence, gynecomastia and hematopoietic changes [20]. For examples, H2

receptor antagonists (e.g. cimetidine) may cause gynecomasia in men and galactorrhea in women [21] while proton-pump inhibitors (e.g. omeprazole and lansoprazol) can cause nausea, abdominal pain, constipation and diarrhea [22].

Indomethacin is a dual COX-1/COX-2 inhibitor, which leads to decrease in Prostaglandin $E_2$ synthesis. $PGE_2$ and $I_2$ are predominantly synthesized by the gastric mucosa and are known to inhibit the secretion of gastric acid and stimulate the secretion of mucus and bicarbonate. Hydrophobic surfactant-like phospholipids secretion in the gastric epithelial cells is also stimulated by the prostaglandin. It is well known that inhibition of prostaglandin synthesis, which is essential for mucosal integrity and regeneration, will trigger the mucosal lining damage [23]. Extensive damage to the gastric mucosa by indomethacin leads to increase neutrophils infiltration into the ulcerated gastric tissue. These neutrophils, which are a major source of inflammatory mediators, inhibit gastric ulcer healing by mediating lipid peroxidation through the release of highly cytotoxic and tissue damaging reactive oxygen species such as superoxide, hydrogen peroxide and myeloperoxidase derived oxidants [24]. The decreased level of SOD and CAT in indomethacin induced group may be due to the increase in generation of reactive free radicals which can create an oxidative stress in the cell [25]. As SOD converts the reactive superoxide radical to $H_2O_2$ which CAT further convert it into water and oxygen, which if not scavenged by CAT, can cause LPO by the generation of hydroxyl radicals and tissue damage. In the present study, HAEAM showed increase level of SOD and CAT which indicates antioxidant activity of HAEAM. It is observed that HAEAM reduces ulcer index and increased formation of ulcer inhibition compared to indomethacin induced group which suggests the possible role of HAEAM in strengthening of gastric mucosa as antiulcer agent. HAEAM showed decrease Total protein content in the gastric juice signifies decreased in leakage from the mucosal cells indicating increased mucosal resistance whereas indomethacin induced group showed increased total protein which further shows antiulcer activity. Liver enzymes such as SGOT and SGPT levels are increased which may be due to the ulcer induction indicating the damage to the gastric mucosa whereas it showed reduced in SGOT and SGPT level in HAEAM treated groups indicating its antiulcer activity.

Digestive effect of the accumulated gastric juice is believed to be responsible for producing ulcers in the pylorus ligated rats. Pylorus ligated ulcers are thought to be caused due to increase in presence of acid and pepsin in the stomach. The essential criteria, which

determine the status of mucosal defense barrier against the offensive assault of acid-pepsin is the quality and quantity of gastric mucus secretion. Increase in mucus secretion, bicarbonates and prostaglandin synthesis by the gastric mucosal cells can prevent gastric ulceration by several mechanisms including reduction of the stomach wall friction during peristalsis, alter mucosal blood flow and acting as an effective barrier to the back diffusion of hydrogen ions [25-27]. HAEAM inhibit ulcer percentage and reduce ulcer index in Pyloric ligation induced ulcers. HAEAM treated groups showed significant decrease in Free acidity, Total acidity, and Gastric volume which indicate both gastric antisecretory and gastric cytoprotective effects. It is also observed that liver enzymes such as SGOT and SGPT level are increase which may be due to the ulcer induction indicating the damage to the gastric mucosa whereas it showed reduced in SGOT and SGPT level in HAEAM treated groups indicating its antiulcer activity.

Omeprazole is a proton pump inhibitor which has been widely used as an acid inhibitor agent for the treatment of disorders related to gastric acid secretion for about 15 years [28]. Omeprazole inhibits acid secretion by acting on the hydrogen-potassium exchanger ($H^{+,}$ $K^{+}$-ATPase) for the apical plasma membrane of the gastric mucosa [29]. Omeprazole is highly selective for the proton pump and undergoes catalyzed conversion into active form within the acid forming space. The active inhibitors react with SH (thiol) group of the proton pump, resulting in inhibition of acid formation [30]. The HAEAM treated groups showed antiulcer activity comparable to omeprazole.

In conclusion, the present study of the *Aegle marmelos* (L.) Correa unripe fruit possesses significant Antiulcer activity in animal models like Indomethacin induced gastric ulcer and Pylorus ligation induced gastric ulcer which also has a gastric antisecretory, acid neutralizing effect and antioxidant activity. The anti-ulcer activity is probably due to the presence of bioactive compounds like Flavonoids and Tannins which may be acting through above said receptor. The histopathological studies suggested that no haemorrhage, inflammation and congestion of the stomach were seen in HAEAM treated group which indicate the healing of the ulcer in the stomach. Further studies are required to confirm the exact molecular level mechanism underlining the ulcer healing and protecting property of the extract and to identify the chemical constituents responsible for it.

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