



RESEARCH ARTICLE

Study of the Anti-ulcerogenic Activity of the Methanolic Extracts of *Polycarpaea corymbosa* lam. (Caryophyllaceae) in Wistar Rats

Sindhu Subramanian*, Manorama Srirangan

*PG and Research Dept. of Botany, Kongunadu Arts and Science College (Autonomous),
Coimbatore-29, Tamilnadu, India.*

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ABSTRACT

Polycarpaea corymbosa Lam. (Caryophyllaceae) is a commonly used plant in Indian traditional system of medicine. In the current study anti-ulcer activity of aerial and root methanol extracts of the plant were investigated using aspirin plus pylorus ligation ulcer model. The extract were also subjected to toxic potential and found to be non-toxic up to 2000 mg/kg dose level. Anti-ulcer activity was evaluated by measuring the ulcer index, gastric content, total and free acidity and pH of gastric fluid in aspirin plus pylorus ligation ulcer model. In this model, *Polycarpaea corymbosa* at doses of 200 mg/kg produced significant reduction in gastric volume, free acidity and ulcer index compared to control. Therefore, the study concludes that the aerial methanolic extract of *Polycarpaea corymbosa* possesses potentially useful anti-ulcer activity in aspirin plus pylorus ligated model in rats.

KEYWORDS

Polycarpaea Corymbosa, Anti-Ulcer Activity, Aspirin Plus Pylorus Ligation Ulcer Model

INTRODUCTION

Peptic ulcers and erosions are probably the results of an imbalance between the aggressive and defensive mechanism in gastric duodenal mucosa.^{1,2,3} Gastric ulcer is a benign lesion of the gastric mucosa, which occurs at a site where the mucosal epithelium is exposed to acid and pepsin. Stress, smoking, nutritional deficiencies and ingestion of non-steroidal anti-inflammatory drugs can contribute to increase the incidence of gastric ulcer.⁴ Some other factors, such as inadequate dietary habits, excessive ingestion of non-steroidal anti-inflammatory agents, stress, Hereditary predisposition and infection by *Helicobacter pylori*, may be responsible for the development of peptic ulcer.⁵

Today, there are two main approaches for treating peptic ulcer, the first deals with reducing the production of gastric acid and the second with enforcing gastric mucosal protection.^{6,7} The interest in the use of plant extracts in the treatment of several diseases is widespread in many parts of the world, and medicinal plants stand out as important sources of new therapeutic approaches. Thus, identification of potential agents through natural sources is still essential for effective and safe antiulcer therapy.

Polycarpaea corymbosa is an herb belonging to the family Caryophyllaceae, a large group of medicinal plants and cosmopolitan in distribution. The whole plant of *Polycarpaea corymbosa* have been used in folk medicine especially in rural areas, for the treatment of various diseases like antidotes, jaundice, skin rashes and inflammations. An attempt has been

***Address for Correspondence:**

Sindhu Subramanian

PG and Research Dept. of Botany,
Kongunadu Arts and Science College (Autonomous),
Coimbatore-29, Tamilnadu, India.

E-Mail Id: ssindhu389@gmail.com

made in the present study to evaluate the antiulcer actions of methanolic extract of *Polycarpaea corymbosa*.

MATERIALS AND METHODS

Collection of Plant & Authentication

The aerial part of the *Polycarpaea corymbosa* was collected from the Chennimalai, Erode district. The plant was authenticated by Botanical Survey of India, Southern Circle, Coimbatore (No. BSI/SCR/5/23/2011-12/Tech. 1391).

Preparation of Extract

The aerial parts of the *Polycarpaea corymbosa* was collected, dried and powdered to get coarse particles. The dried coarse powder (50gm) was Soxhleted using methanol for 8 hours. After eliminating the solvent under reduced pressure, the dried material yielded 13g of the crude methanolic extract.

Animals

Experiments were conducted using adult female Wistar rats weighing 180–200 g, housed at $22 \pm 2^\circ\text{C}$ under 12-h light/12-h dark cycle (lights on at 06:00 h) and with access to food and water *ad libitum*. They were deprived of food for 16 h prior to experiments. The experimental protocols were approved by Institutional Animal Ethical Committee (Reference no. 659/02/a/CPCSEA).

Acute Toxicity

Acute oral toxicity study was performed as per OECD-423 guidelines (acute toxic class method). Albino mice (n =6) of either sex was selected by random sampling technique and were used for the study. The animals were kept fasting overnight providing only water, after which the extracts were administered orally at the dose level of 5mg/kg b.wt. by oral gavage and observed for 14 days. Mortality was not observed upto 2000 mg/kg b.wt. Which was considered as LD50 cut off dose? So, 2000mg/kg was selected for the experiment as maximal dose.

Aspirin plus Pylorus Ligation Induced Ulcer

The rats were divided into 7 groups (n=6). Methanolic extract of aerial and root extract of *Polycarpaea corymbosa*, aspirin and standard antiulcer drug ranitidine were prepared with 0.5% Carboxy methyl cellulose, as vehicle and administered orally once daily at a volume of 10 ml/kg b.wt. For 7 days using oral gavage needle.

Group I: Rats administered with 0.5% CMC, served as untreated control.

Group II: Rats received aspirin alone (200 mg/kg b.wt.) and served as ulcer control group,

Group III: Rats treated with aerial methanol extract (200 mg/kg b.wt.),

Group IV: Rats treated with root methanol extract (200 mg/kg b.wt.)

Group V: Rats received Ranitidine (20 mg/kg b.wt.).

From days 5 to 7, animals in group II to V received aspirin at a dose of 200 mg/kg b.wt., 2 h after the administration of respective drug treatment. Animals in all groups were fasted for 18 h after the assigned drug treatment and were anaesthetized with anesthetic ether. The abdomen was cut open by a small midline incision below the xiphoid process and pylorus portion of stomach was lifted out and ligated. Precaution was taken to avoid traction to the blood supply. The stomach was sutured and replaced carefully and the abdomen wall was closed in two layers with interrupter sutures. The animals were deprived of water during post-operative period.^{8,9} After 4 h of pyloric ligation, the animals were sacrificed, the stomach was opened, and the gastric secretion was collected. Ulcer index was determined by the method of Dias *et al.*¹⁰ from the glandular part of the stomach. Biochemical assay of the following parameters was performed. Free and total acidity were measured by the method of Anoop and Jegadeesan.¹¹ Pepsin activity of gastric juice was determined by the method of Debnath *et al.*¹² Total carbohydrates (TC) were estimated in terms of total hexose, hexosamine and fucose by Goel *et al.*¹³ method. Protein

content (PR) was determined by the method of Lowery *et al.*¹⁴

Statistical Analysis

All the results were expressed as mean ± Standard Error (SE). The data was analysed statistically using ANOVA followed by Dunnett's T test.

RESULTS

In pylorus ligation induced ulcer model methanolic aerial and root extract of *Polycarpaea corymbosa* at the dose level of 200mg/kg b.wt. produced a reduction in the ulcer index, gastric volume raised gastric pH (Table 1), free acidity, total acidity (Fig 1), Total pepsin, protein and carbohydrate significantly when compared to ranitidine treated animal (Fig 2).

Table 1: Effect of *Polycarpaea corymbosa* on volume of gastric secretion, pH and ulcer index in pylorus ligation induced ulcer model.

Group	Gastric juice volume	pH	Ulcer index
I (Normal)	4.52±0.2	5.60±0.31	-
II (Aspirin induced)	3.93±0.3	3.28±0.22	5.3±0.7
III (Aerial extract)	3.41±0.07	3.06±0.69	2.6±0.34
IV (Root extract)	4.48±0.13	4.67±0.72	3.3±0.09
V (Ranitidine)	3.86±0.45	5.81±0.11	0.88±0.2

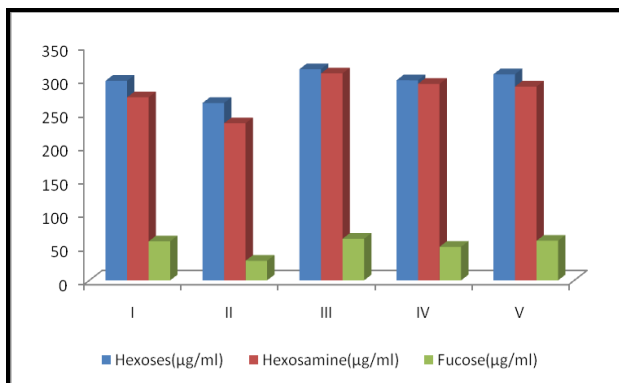


Figure 1: Effect of *Polycarpaea corymbosa* in Total carbohydrate in aspirin induced pylorus ligation induced ulcer model

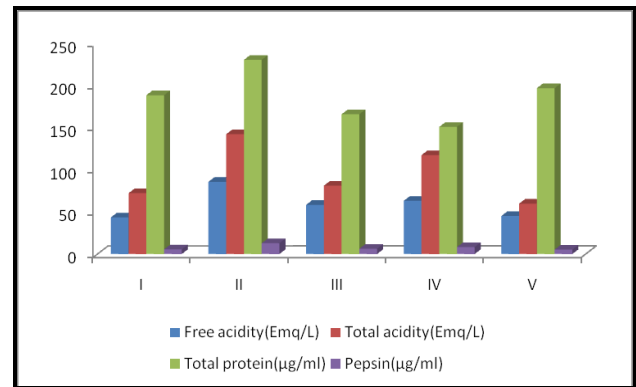


Figure 2: Effect of *Polycarpaea corymbosa* on Free acidity, total acidity, Total protein and pepsin in aspirin induced pylorus ligation induced ulcer model

DISCUSSION

Aspirin treatment caused a significant increase in the ulcer index, pepsin activity, free and total acidity, volume of gastric juice and decreased mucus production. It has been proposed that in pyloric ligation, the digestive effect of accumulated gastric juice and interference of gastric blood circulation are responsible for induction of ulceration.¹⁵ In our study, *Polycarpaea corymbosa* aerial extract decreased the gastric volume and gastric acid secretion significantly by pretreatment with aspirin. Prostaglandins are known to have an antisecretory effect on gastric acid production.¹⁶ Hence it is assumed that the antiulcer and acid secretion inhibitory effect of *P.corymbosa* may be mediated through prostaglandins.

The anti-ulcer activity of the plant of *P.corymbosa* was evaluated by employing aspirin plus pylorus ligation ulcer model. NSAID's like aspirin causes gastric mucosal damage by decreasing prostaglandin levels through inhibition of PG synthesis.¹⁷ Methanol extract of *P.corymbosa* was significantly effective in protecting gastric mucosa against aspirin induced ulcers at all the dose levels tested. The extracts of the *P.corymbosa* has significantly protected the gastric mucosa showed reduced values of lesion index as compared to control group suggesting its potent cytoprotective effect. It has been proposed that in pyloric ligation, the digestive effect of

accumulated gastric juice and interference of gastric blood circulation are responsible for induction of ulceration.¹⁸ The antiulcer activity of *P.corymbosa* extract in pylorus ligation model is evident from its significant reduction in gastric volume, total acidity, free acidity, ulcer index and increase in pH of gastric juice. Animals treated with *P.corymbosa* extracts significantly inhibited the formation of pylorus ulcer in the stomach and also decreased both acid concentration, gastric volume and increased the pH values. Therefore, it is suggested that *P.corymbosa* extracts can suppress gastric damage induced by aggressive factors.

Gastric ulcer is often a chronic disease and it may persist for 10-20 years characterized by repeated episodes of healing and re-exacerbations. The ulcer healing activity of the plant extract may be due to antisecretory property associated with an enhancement of the local healing process, which was comparable with the standard drug ranitidine (H₂-antagonist). Flavonoids are reported to have antiulcer activity. It is suggested that *P.corymbosa* and its active constituent's such as flavonoid emerge as more effective therapeutic agent to counter act gastric ulcer incidence and ulcer healing. More diligent work is required for the clear understanding of mechanism of action with chemically identified active principles. However, in the present study, the plant shows a potent antiulcer activity which justifies its ethnomedical claims.

CONCLUSION

The methanol extracts of the aerial part of *P.corymbosa* showed significant antiulcer activity which is evident from the data obtained. *P. corymbosa* having a tremendous potential deserves a special attention of the scientific fraternity to emerge as a milestone for medical science of this millennium due to its safety profile and can be a potent natural and safe alternative to conventional antiulcer treatment. However there is a shortage of clinical trial regarding its potency and efficacy.

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