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EVALUATION OF ANTIULCER ACTIVITY OF EMBLICA OFFICINALIS FRUIT EXTRACT IN RATS

M.Madhavi Kumari, Pretom Chakraborty

Department of Pharmacology, Avanthi Institute of Pharmaceutical Sciences, Tagarapuvalasa, Vijayanagaram, A.P, India

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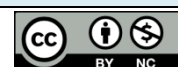
Abstract

The antiulcer activity of ethanolic extract of *Emblica officinalis* Fruit (EEEE) was investigated in pylorus ligation and ethanol induced ulcer models in experimental rats. In both models the common parameter determined was ulcer index. Ethanolic extract of *Emblica officinalis* fruit at a dose of 150 and 300mg/kg produced significant inhibition of the gastric lesions induced by pylorus ligation induced ulcer and ethanol induced gastric ulcer. The extract (150mg/kg and 300mg/kg) showed significant ($p < 0.05$) reduction in gastric volume, free acidity and ulcer index as compared to control. This present study indicates that EEEO have potential anti-ulcer activity in both models. The findings of this study confirmed that EEEO has anti-ulcer pharmacologic activity due to one or more of the secondary metabolites present in it. Therefore, this study validates its anti-ulcer use in Ethiopian folk medicine. Further investigations on isolation of specific phytochemicals and elucidating mechanisms of action are needed.



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*Corresponding Author

M. Madhavi Kumari

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In the Indian system of medicine, *Emblica officinalis*, is an important medicinal plant used for the prevention and treatment of gastric ulcers. It is also used as a stomachic, laxative, antioxidant, antiinflammatory, antipyretic, etc.[4,5] Hence, the present study is chosen to screen the antiulcer properties of an aqueous extract of the fruits of EO using Pyloric ligation induced gastric ulcer and Ethanol-induced gastric ulcer model.

Introduction

Peptic ulcer disease, or PUD, is a prevalent health issue that affects a large population. A "peptic ulcer" is a local defect or excavation caused by an aggressive inflammatory response leading to disruption of the stomach and/or duodenum's mucosa. An imbalance between offensive (pepsin and acid) and defensive (mucin, prostaglandins [PGs], biocarbonate, nitric oxide, growth factors, and other peptides) components is part of the pathogenesis of PUD. In addition to the negative effects of acid, reactive oxygen species, particularly the hydroxyl radical (OH), are significant in the oxidative destruction of mucosa that occurs in different kinds of ulcers [1,2]. Peptic ulcers is wound in the lesions that are most often affected in younger to older adults population, but this may diagnosed in young adult life. They often appear without obvious sign and symptom, after a period of days to months of active phase of disease, it may heal with or without drug treatment. It also affect because of bacterial infections with *H. Pylori* [3].

Materials and Methods

Plant material collection

The *Emblica officinalis* fruit was collected from the Botanical garden and was identified and authenticated from Botanical Department. The plant material was cleaned, reduced to small fragments, air dried under shade at room temperature and coarsely powdered in a mixer. The powdered material was stored or taken up for extraction process.

Preparation of ethanolic extract

Shade dried fruits material was coarsely powdered and subjected to extraction with petroleum ether by maceration. The extraction was continued till the defatting of the material had taken place. Defatted powdered of *Emblica officinalis* Fruit has been extracted with ethanol solvent using maceration process for 48 hrs, filtered and dried using vacuum evaporator at 40°C (yield of extract was 9.40% with respect to dry material). Just prior to use, the substance was dissolved in physiological saline solution.

Preliminary Phytochemical Screening

Preliminary phytochemical screening of the plant extract was carried out for the analysis of Alkaloids, Carbohydrates, Tannins, Saponins, Steroids, Phenols, and Flavonoids as per the standard methods [6].

Pharmacological evaluation

Acute Oral Toxicity

The acute oral toxicity of ethanolic extracts of *Emblica officinalis* Fruit was determined by using rats which were maintained under standard conditions. The animals were fasted 12 hour prior to the experiment, up and down procedure OECD guideline no. 425 were adopted for toxicity studies. Animals were administered with single dose of individual extract up to 2000mg/kg and observed for its mortality during 14days and 21days study period (long term) toxicity and observed up to 14days for their mortality, behavioral and neurological profiles [7, 8].

Screening for Anti-Ulcer Activity of ethanolic extracts of *Emblica officinalis* Fruit

The ethanolic extracts of *Emblica officinalis* Fruit were tested for antiulcer activity using various methods like pyloric ligation induced gastric ulcer and Ethanol-induced gastric ulcer.

- **Pyloric ligation in rats**

Animals were divided into four (I-V) groups.

Group I - Normal (distilled water)

Group II- Control (pyloric ligation)

Group III - EEEO (150mg/kg) Single dose

Group IV – EEEO (300mg/kg) Double dose

Group V - Ranitidine (20mg/kg)

The animals were divided into 5 groups, each consisting of six rats. Control group received distilled water only. Second group of rats are pyloric ligated. Third and fourth groups received EEEOs in a dose of 150 and 300 mg/kg. The fifth group of animals received Ranitidine in the dose of 20mg/kg as a reference drug for ulcer protective studies. After 45 min of the treatment, pyloric ligation was done by legating the pyloric end of stomach of rats of respective groups under ether anesthesia at a dose of 35mg/kg of body weight. Ligation was done without causing any damage to the blood supply of the stomach. Animals were allowed to recover and stabilize in individual cages and were deprived of water during post-operative period. Rats were sacrificed after 4hr of surgery and ulcer scoring was done. Gastric juice was collected and gastric secretion studies were performed according to the standard procedure [9, 10].

Ethanol induced ulcer model of ethanolic extracts of *Emblica officinalis* Fruit

The ulcer was induced by administering absolute ethanol (1ml/200g). All the animals were fasted for 36 hours and then ethanol was administered to induce ulcer. The animals were divided into five groups, each consisting of six rats. The control group received distilled water, second group received ethanol. Third and fourth groups received EEEOs in a dose of 150 and 300 mg/kg. The fifth group of animals received Omeprazole in the dose of 20 mg/kg as a reference drug. They were kept in specially constructed cages to prevent coprophagia during and after the experiment. The animals were anaesthetized 1 hr later with anaesthetic ether and stomach was incised along the

greater curvature and ulceration was scored. A score for the ulcer was studied to pyloric ligation induced ulcer model. Mean ulcer score for each animal was expressed as ulcer index [11, 12].

Statistical Analysis

The values are represented as mean \pm S.E.M, and Statistical significance between treated and control groups was analyzed using of one way ANOVA, followed by Dennett's test where $P < 0.05$ was considered statically significant.

Results & Discussion

Phytochemical screening test

The freshly prepared extract of the leaves of *Emblica officinalis* Fruit was subjected to phytochemical screening tests for the detection of various active constituents. The extract showed the presence of alkaloids, tannins, steroids, phenolic and flavonoids, carbohydrates, saponins and glycosides in crude extract of *Emblica officinalis* Fruit.

Acute Toxicity Study

Administration of the *Emblica officinalis* Fruit extracts in rats at doses of 250 mg/kg by oral gavage did not reveal any adverse effects or signs of toxicity. Observations twice daily for fourteen days also did not reveal any drug related observable changes or mortality. Accordingly, the acute oral LD50 of the extractives was concluded to exceed 2000 mg/kg body weight, the highest dose tested in the study.

Anti-Ulcer Activity of Ethanolic Extracts Of *Emblica Officinalis* Fruit

Pyloric ligation in rats

Pyloric ligation induced gastric ulcer in pyloric ligation induced ulcer model, oral administration of EEEO in two different doses showed significant reduction in ulcer index, gastric volume, free acidity, total acidity compared to the central group. EEEO exhibited a protection

index of 71.1% and 80.1% at the dose of 150 and 300 mg/kg respectively, whereas Ranitidine as reference standard exhibited a protection index of 82.2% (Table 1).

Table 01: Effect of EEEO on various parameters in pyloric ligation induced gastric ulcers

Group	Treatment	Ulcer index	Free acidity meq/ltr	pH of gastric juice	Gastric Juice	Total acidity meq/ltr	Protection (%)
I	Normal (distilled water)	---	45.2± 0.1	1.31 ± 0.9	6.0 ±1.2	66.2± 0.5	---
II	Control (pyloric ligation)	19.2± 1.2	92.1± 1.0	4.02± 0.1	5.1 ±0.2	110.2± 0.1	---
III	EEE0 (150mg/kg)	5.2 ±0.3	40.1± 0.2	3.80±0.1*	4.6±1.0	78.1± 0.2	71.1 %
IV	EEE0 (300mg/kg)	4.0±0.2*	42.1±0.1*	5.22±0.2*	4.0±0.2*	60.1±0.1*	80.1%
V	Ranitidine (20mg/kg)	3.8±0.3*	40.1±0.3*	5.09±0.2*	3.5±0.1*	59.5±1.9*	82.2%

Ethanol-Induced Gastric Ulcer

In control animal, oral administration of absolute ethanol produced characteristic lesions in the glandular portion of rat stomach which appeared as elongated bands of thick, blackish red lesions. EEE0 has shown significant protection index of 69.1% and 70.6% with the dose of 150 and 300 mg/kg respectively whereas Ranitidine as reference standard showed protection index of 81.0% (Table 2).

Table 02: Effect of EEE0 on various parameters in ethanol induced gastric ulcers

Group	Treatment	Ulcer index	P ^H of Gastric Juice	Protection (%)
I	Normal (distilled water)	---	1.92 ± 0.1	---
II	Control (pyloric ligation)	16.1 ± 0.2	4.12 ± 0.1	---
III	EEE0 (150mg/kg)	6.1 ± 0.1	4.90 ± 0.2	69.1%
IV	EEE0 (300mg/kg)	3.5 ± 0.2*	5.70 ± 0.1*	70.6%
V	Omeprazole (20mg/kg)	3.0 ± 0.3*	5.10 ± 0.3*	81.0%

Values are expressed as mean ± SEM of observations, Statistical comparisons as follows: Significant *P <0.005 compared to control group.

In the present study EEE0 showed protection against gastric lesions in the experimental rats, reduced gastric volume, free acidity, total acidity and ulcer index thus showing the anti-secretory mechanism involved in the extracts for their anti-ulcerogenic activity. Ulcer index parameter was used for the evaluation of anti ulcer activity since ulcer formation is directly related to factors such as gastric volume, free and total acidity. The protection of EEE0 against characteristic lesions may be due to both reductions in gastric acid secretion and gastric cycloprotein or enhancement of the mucosal barrier through the increase production of prostaglandin and this may be due to the presence of glycosides. Further studies are needed for their exact mechanism of action on gastric acid secretion and gastric cytoprotection. The effects in all the 2 models studied were dose dependent.

Conclusion

Peptic ulcer disease is one of the most common gastrointestinal disorders. It mainly involves an imbalance between the offensive and defensive factors. Many synthetic drugs such as H₂ blockers, gastro protective and proton pump inhibitors are available in the market but they are showing many side effects. Medicinal plants and their products are considered to less side effects and more efficacy when compared to synthetic drugs. Many medicinal plants and natural analogues showed prominent anti-ulcer and gastro-protective activities. Pyloric ligation induced gastric ulcer and Ethanol-induced gastric ulcer model ethanolic extract of *Emblca officinalis Fruit*

at a dose of 150 and 300mg/kg body weight p.o was found to exhibit significant cytoprotective action when compared to control (pyloric ligation) group using Omeprazole 20mg/kg p.o as a standard drug. On the basis of the present results and available reports, it can be concluded that the anti-ulcer activity elucidated by *Emblca officinalis Fruit* could be mainly due to the modulation of defensive factors through an improvement of gastric cytoprotection and partly due to acid inhibition.

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Conflicts of Interest

The authors declare no conflicts of interest.

Author Contribution

Both are contributed equally

Financial Support

None

References

1. Bandyopadhyay U, Biswas K, Chatterjee R, Bandyopadhyay D, Chattopadhyay I, Ganguly CK, et al.

- Gastroprotective effect of Neem (*Azadirachta indica*) bark extract: Possible involvement of H⁽⁺⁾-K⁽⁺⁾-ATPase inhibition and scavenging of hydroxyl radical. *Life Sci* 2002;71:2845-65.
2. Waugh A, Grant A. Ross and Wilson Anatomy and Physiology in Health and Illness. 10th ed. Spain: Churchill Livingstone, Elsevier Ltd.; 2006.
 3. Dhikav V, Singh S, Pande S, Chawla A, Anand KS. Nonsteroidal drug-induced gastrointestinal toxicity: Mechanisms and management. *J Indian Acad Clin Med* 2003;4:315-22.
 4. Bandyopadhyay SK, Pakrashi SC, Pakrashi A. The role of antioxidant activity of *Phyllanthus emblica* fruits on prevention from indomethacin induced gastric ulcer. *J Ethnopharmacol* 2000;70:171-6.
 5. Pakrashi A, Pandit S, Bandyopadhyay SK, Pakrashi SC. Antioxidant effect of *Phyllanthus emblica* fruits on healing of indomethacin induced gastric ulcer in rats. *Indian J Clin Biochem* 2003;18:15-21.
 6. Paguigan ND, Castillo DH, Chichioco-Hernandez CL. Anti-ulcer activity of leguminosae plants. *ArqGastroenterol*. 2014;51(1):64-67.
 7. Mitra P, Ghosh T, Mitra PK. Anti gastric ulcer activity of *Amaranthus spinosus* Linn. leaves in aspirin induced gastric ulcer in rats and the underlying mechanism. *SMU Med J*. 2014;1(2):313-328.
 8. Raju D, Ilango K, Chitra V, Ashish K. Evaluation of anti-ulcer activity of methanolic extract of *Terminalia chebula* fruits in experimental rats. *J Pharm Sci Res*. 2009;1(3):101-107.
 9. Al-Radahe S, Ahmed KA, Salama S, et al. Anti-ulcer activity of *Swietenia mahagoni* leaf extract in ethanol-induced gastric mucosal damage in rats. *J Med Plants Res*. 2013;7(16):988-997.
 10. Mohod SM, Bodhankar SL. Evaluation of antiulcer activity of methanolic extract of leaves of *Madhuca indica* J.F Gmel in rats. *Pharmacologyonline*. 2011;3:203-213.
 11. S. Gopinathan, D. Naveenraj. Gastroprotective and Anti-ulcer activity of Aloe vera juice, Papaya fruit juice and Aloe vera and Papaya fruit combined juice in Ethanol induced Ulcerated Rats. 29-10-2013.
 12. P. Bharathi Dhasan, M. Jegadeesan, and S. Kavimani. Antiulcer activity of aqueous extract of fruits of *Momordica cymbalaria* Hook f. in Wistar rats. *Pharmacognosy Res*. 2010 Jan-Feb; 2(1): 58-61.