 Free access

38,348 Views | 23 CrossRef citations to date | 0 Altmetric

Listen


Research Article

Effect of Leaves and Fruits of *Moringa oleifera*. on Gastric and Duodenal Ulcers

V.C. Devaraj, Mohammed Asad & Satya Prasad

Pages 332-338 | Accepted 13 Nov 2006, Published online: 07 Oct 2008

 Cite this article  <https://doi.org/10.1080/13880200701212924>


 Full Article

 Figures & data

 References

 Citations

 Metrics

 Reprints & Permissions

 View PDF

Abstract

The effect of different extracts of leaves and fruits of *Moringa oleifera*. Lam. (Moringaceae) on gastric and duodenal ulcers was evaluated by using different gastric ulcer models. The effect of different extracts (500 mg/kg, p.o.) of leaves and fruits of *Moringa oleifera*. Lam. on gastric and duodenal ulcers induced by 0.1N HCl and 5% acetic acid was evaluated. The results showed that the leaf extract (500 mg/kg, p.o.) significantly reduced the gastric and duodenal ulcers. The fruit extract (500 mg/kg, p.o.) also showed significant reduction in the gastric and duodenal ulcers. The results suggest that the leaves and fruits of *Moringa oleifera*. Lam. have a protective effect on the gastric and duodenal ulcers.

We Care About Your Privacy

We and our 845 partners store and/or access information on a device, such as unique IDs in cookies to process personal data. You may accept or manage your choices by clicking below, including your right to object where legitimate interest is used, or at any time in the privacy policy page. These choices will be signaled to our partners and will not affect browsing data. [Privacy Policy](#)

We and our partners process data to provide:

Use precise geolocation data. Actively scan device characteristics for identification. Store and/or access information on a device. Personalised advertising and content, advertising and content measurement, audience research and services development.

List of Partners (vendors)

 I Accept

Essential Only

Show Purpose

Introduction

Peptic ulcer is a breach in the gastric and duodenal epithelium associated with acute or chronic inflammation and is the most common gastrointestinal disorder in clinical practice. In spite of established antiulcer drugs, a rational therapy for peptic ulcer remains elusive, and a search for safer potential drugs is being carried out. The use of natural drugs in gastric ulcer has been reported (Sairam et al., [2001](#)).

The development and progression of gastric ulcer depends to some extent on the type of the food consumed by the patient. It has been shown that spicy food, fatty food, or food containing caffeine stimulates acid secretion in the stomach (Crawford, [2003](#)), and high-fiber diets such as potatoes, bananas, peas, beans, and so forth, reduce the development of duodenal ulcers (Maryland Medical Center Programs, [2004](#)).

Previous reports on the incidence of gastric ulcers in the South Asian population reveals that the occurrence is lower due to the type of food consumed by the people of this region; one of the foods that is speculated to protect against ulcers is *Moringa oleifera*. Lam. (Moringaceae) leaves (Jayaraj et al., [1998](#)). Furthermore, flower bud of *Moringa pterygosperma*., a synonym of *Moringa oleifera*. that is widely consumed in Pakistan, has been reported to possess antiulcer activity against aspirin-induced gastric ulcers in rats (Akhtar & Ahmad, [1995](#)). However, the effect of different extracts of leaves or fruits of *Moringa oleifera*. on gastric and duodenal ulcers is not known. The current study was undertaken to evaluate the effect of fruits and leaves of *Moringa oleifera*. on experim

Material

Collection

The leav

Bangalo

Institute

preserve



area of
nal Research
as been

The shade-dried leaves and fruits of the plant were subjected to Soxhlet extraction, and the extracts thus obtained were subjected to preliminary phytochemical analysis (Mukaherjee, [2002](#)).

Experimental animals

Albino Wistar rats weighing between 200 and 250 g were used. The institutional animal ethics committee approved the experimental protocol. Animals were maintained under standard conditions in an animal house approved by the Committee for the Purpose of Control, and Supervision on Experiments on Animals (CPCSEA), Government of India.

Acute toxicity study

The acute oral toxicity study was performed according to the OPPTS (Office of Prevention, Pesticide and Toxic Substance) Up and Down procedure (Health Effect Test Guideline, [2004](#)). The different extracts were suspended using 0.5% sodium carboxy methylcellulose and were administered orally. All the extracts of leaves and fruits were safe at a dose of 5000 mg/kg, p.o., and one-tenth of this dose was selected for evaluation of antiulcer activity.

Effect on gastric ulcers

Acetic acid-induced chronic gastric ulcer

Male Wistar rats were fasted for 24 h prior to the experiment. Under light ether anesthesia, a midline epigastric incision was made and the stomach was exposed.



The stor... al mucosal
area and... ocessing

The glandular portion of the stomach was then used for estimation of mucin content (Corne et al., [1974](#)), total proteins (Lowry et al., [1951](#)), antioxidant factors like superoxide dismutase activity (Eltner & Heupel, [1976](#)), total tissue sulfhydryl groups (Ellman, [1959](#)), and catalase activity (Link, [1988](#)).

Ethanol-induced ulcers

Male albino rats were fasted for 36 h before administration of 90% ethanol (1 mL/200 g). The leaf extracts (500 mg/kg, p.o.) were administered 1 h before ethanol administration. One hour after ethanol administration, the animals were sacrificed, stomach was isolated, and ulcer index was determined (Brzozowski et al., [1998](#)).

Cold restraint stress-induced ulcers

The animals were placed in a restraint cage, and the cage was placed at a temperature of 2°C for 3 h. The leaf extracts (500 mg/kg, p.o.) were administered 30 min prior to subjection of stress. The animals were sacrificed, stomach was isolated, and ulcer index was determined (Vincent et al., [1977](#)).

Effect on duodenal ulcers

Cysteamine-induced duodenal ulcers

Duodenal ulcers were induced by administering cysteamine hydrochloride (400 mg/kg, p.o.) twice at an interval of 4 h. Leaf extracts (500 mg/kg, p.o.) were administered 30 min prior to each dose of cysteamine hydrochloride. After 24 h of the first dose of

cysteamine, the animals were sacrificed, the stomach was opened, and the duodenum was cut longitudinally and cut into 1-cm segments. The ulcer index was determined (Brzozowski et al., [1998](#)).

The ulcer index was determined by the number of ulcers, 1 = superficial ulcer, 2 = deep ulcer, 3 = perforated or penetrating ulcer. The ulcer index was determined (Brzozowski et al., [1998](#)).

The ulcer index was determined (Brzozowski et al., [1998](#)).

Statistical analysis

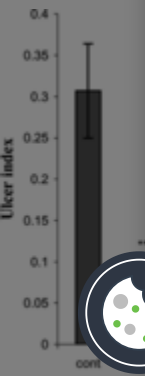
The statistical significance was assessed using one-way analysis of variance (ANOVA) followed by Dunnet's comparison test. For comparing nonparametric ulcer scores, ANOVA followed by non-parametric Dunn post test was used. The values are expressed as mean \pm SEM, and $p < 0.05$ was considered significant.

Results

Acetic acid-induced chronic gastric ulcers

The petroleum ether, acetone, and methanol leaf extracts of *Moringa oleifera*. showed a significant reduction in ulcer index when compared with control ($p < 0.001$). The acetone extract of the leaves was most potent; it produced a 79% decrease in the ulcer index. The fruit extracts of *Moringa oleifera*. and the chloroform extract of the leaves did not show any significant effect on ulcer index (Fig. 1). None of the treatments produced any significant effect on ulcer score (Fig. 2).

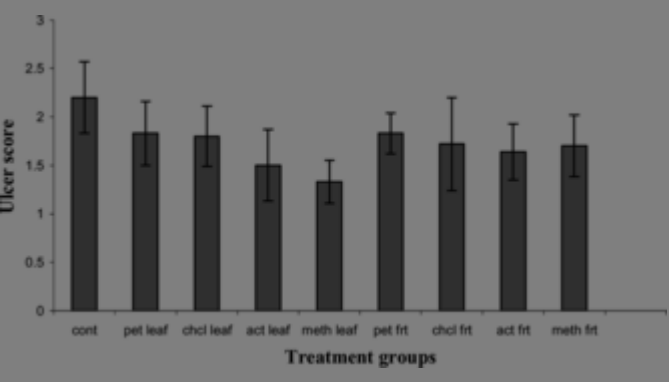
Figure 1 Effect of *Moringa oleifera*. on ulcer index in acetic acid-induced chronic gastric ulcer. All values are mean \pm SEM, $n = 5$ to 6 . $*p < 0.05$, $**p < 0.01$, $***p < 0.001$ when compared with control group. Cont, control; pet leaf, petroleum ether leaf extract (500 mg/kg p.o.); chcl leaf, chloroform leaf extract (500 mg/kg p.o.); act leaf, acetone leaf extract (500 mg/kg p.o.); meth leaf, methanol leaf extract (500 mg/kg); pet frt, petroleum ether fruit extract (500 mg/kg p.o.); chcl frt, chloroform fruit extract (500 mg/kg p.o.); act frt, acetone fruit extract (500 mg/kg); meth frt, methanol fruit extract (500 mg/kg).



Display full

Figure 2 Effect of *Moringa oleifera*. on ulcer score in acetic acid-induced chronic gastric ulcer.

compared with control group. Cont, control; pet leaf, petroleum ether leaf extract (500 mg/kg p.o.); chl leaf, chloroform leaf extract (500 mg/kg p.o.); act leaf, acetone leaf extract (500 mg/kg p.o.); meth leaf, methanol leaf extract (500 mg/kg); pet frt, petroleum ether fruit extract (500 mg/kg p.o.); chl frt, chloroform fruit extract (500 mg/kg p.o.); act frt, acetone fruit extract (500 mg/kg), meth frt, methanol fruit extract (500 mg/kg p.o.).



Display full size

Histologic examination of the ulcerated area revealed that there was a significant increase in regenerated glandular epithelium width after treatment with acetone extract of the leaves ($p < 0.05$) when compared with control. The collagen content in the ulcerated tissue was significantly increased by all the three extracts of the leaves, with acetone extract showing the maximum effect. No significant difference on capillary density in scar tissue was observed after treatment ([Table 1](#)).

Table 1.. Effect of Moringa oleifera. Lam. on regenerated glandular epithelium width and collagen content in ulcerated tissue

Download

Pylori

The acidity and gastric pH of the treated groups were significantly lower ($p < 0.05$) compared with the control group. The mucin content of the ulcerated tissue was significantly increased by all the three extracts of the leaves, with acetone extract showing the maximum effect. No significant difference on capillary density in scar tissue was observed after treatment ([Table 1](#)).

In this article

Table 2.. Effect of Moringa oleifera. leaf extracts on free acidity, total acidity, ulcer index, and total hexoses in pylorus-ligated rats

Download CSV

Display Table

Healing of indomethacin-induced gastric ulcers

The acetone and methanol leaf extracts of Moringa oleifera. showed a significant reduction in ulcer index ($p < 0.01$) and a significant increase in mucus content when compared with control. None of the treatments produced any significant effect on total protein and antioxidant factors like SOD activity, total tissue sulfhydryl group (glutathione), and catalase activity (Table 3).

Table 3.. Effect of Moringa oleifera. leaf extracts on indomethacin-induced ulcers

Download CSV

Display Table

Ethanol-induced gastric ulcers

The acetone and methanol leaf extracts of Moringa oleifera. showed a significant reduction in ulcer index when compared with control ($p < 0.05$). The petroleum ether extract did not show significant reduction in ulcer index when compared with control (Table 4).

Table
induc
cyste

Download CSV

Display Table

Stress-

All the th in ulcer

In this article

Ethanol-induced and indomethacin-induced gastric ulcer was employed to study the cytoprotective effect of the extracts. The acetone and methanol extracts of *Moringa oleifera*. leaves were effective in reducing ulcer index in both these models and significantly increased the mucus content in indomethacin-induced gastric ulcers. However, the leaf extracts of *Moringa oleifera*. were not effective in altering the antioxidant factors like SOD activity, total tissue sulfhydryl group (glutathione), and catalase activity suggesting that the healing of ulcers or prevention of development of gastric ulcers may not be due to antioxidant effect.

Stress plays an important role in ulcerogenesis. The pathophysiology of stress-induced gastric ulcers is complex. Stress-induced ulcers are probably mediated by histamine release with enhancement in acid secretion and a reduction in mucus production (Brodie & Hanson, [1960](#); Peters & Richardson, [1983](#)). The petroleum ether, acetone, and methanol extracts of *Moringa oleifera*. were effective in reducing the ulcers induced by stress. Cysteamine-induced duodenal ulcer in rat is a widely used model of peptic ulcer disease. Cysteamine hydrochloride inhibits the alkaline mucus secretion from the Brunner glands in the proximal duodenum and stimulates gastric acid secretion rate. Gastric emptying is also delayed, and serum gastrin concentration is increased (Parmar & Desai, [1993](#)). The acetone and methanol leaf extracts of *Moringa oleifera*. were effective in reducing the ulcer area in cysteamine-induced duodenal ulcers.

The acetone and methanol extracts of the leaves were effective in all the tested models of peptic ulcer disease, whereas the petroleum ether was effective only in healing chronic (of gastric ulcers in ulcers in secretion, increase methanol extracts due to reduction

 *Moringa* loids, and many present in the leaves is ves contain rutin, a f a et al., [2000](#)). T nol extracts of the leaves of the

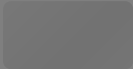
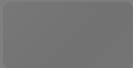
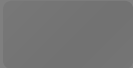


The results of the current study suggest that consumption of the leaves of *Moringa oleifera*. may be beneficial in healing of ulcers in patients suffering from peptic ulcer disease.

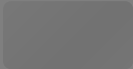
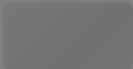
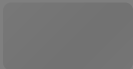
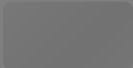
The authors are thankful to Prof. Suresh Nagpal, chairman, Krupanidhi Educational Trust, and Prof. Sunil Dhaminigi, secretary, Krupanidhi Educational Trust, for providing facilities to carry out the work. The authors are also thankful to Prof. Dr. Amit Kumar Das, principal, Krupanidhi College of Pharmacy, for his valuable suggestions during the work.

Linki



In this article

1. Akhtar AH, Ahmad KU (1995): Anti-ulcerogenic evaluation of the methanolic extracts of some indigenous medicinal plants of Pakistan in aspirin-ulcerated rats. J Ethnopharmacol 46: 1-6.
 | [PubMed](#) | [Web of Science ®](#) | [Google Scholar](#)
2. Asad M, Rajesh KS, Ahmad M (2003): Effect of administration of saline or glucose during fasting on the development of gastric ulcers in pylorus ligated rats. Ethiop Pharm J 16: 1-6.
[Google Scholar](#)
3. Brodie DAQ, Hanson HM (1960): A study of the factors involved in the production of gastric ulcers by the restraint technique. Gastroenterology 38: 353-360.
 | [PubMed](#) | [Web of Science ®](#) | [Google Scholar](#)
4. Brzozowski T, Konturek SJ, Kwiecien S, Pajdo R, Brzozowski I, Hahn EG (1998): Involvement of endogenous cholecystokinin and somatostatin in gastro protection induced by intra duodenal fat. J Clin Gastroenterol 27: 125-137.
 | [Web of Science ®](#) | [Google Scholar](#)
5. Casa CL, Villegas I, Lastra CA, Motilva V, Calero MJM (2000): Evidence for protective and antioxidant properties of rutin, a natural flavone, against ethanol induced gastric lesions. J Ethnopharmacol 71: 45-53.
 | [PubMed](#) | [Web of Science ®](#) | [Google Scholar](#)
6. Cornejo M, et al. (2000): Effect of the administration of a natural flavone on the stimulation of gastric acid secretion. J Ethnopharmacol 71: 45-53.
[PubMed](#)
7. Craigmiles LB, et al. (2000): Effect of the administration of a natural flavone on the stimulation of gastric acid secretion. J Ethnopharmacol 71: 45-53.
 | [PubMed](#) | [Web of Science ®](#) | [Google Scholar](#)
8. Debnath S, et al. (2000): Effect of the administration of a natural flavone on the stimulation of gastric acid secretion. J Ethnopharmacol 71: 45-53.
[PubMed](#)

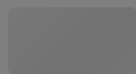
9. Desai JK, Goyal RK, Parmar NS (1999): Characterization of dopamine receptor subtypes involved in experimentally induced gastric and duodenal ulcers in rats. *J Pharm Pharmacol* 51: 187–192.
-  | [PubMed](#) | [Web of Science ®](#) | [Google Scholar](#)
10. Ellman GL (1959): Tissue sulfhydryl groups. *Arch Biochem Biophys* 82: 70–77.
-  | [PubMed](#) | [Web of Science ®](#) | [Google Scholar](#)
11. Elstner EF, Heupel A (1976): Inhibition of nitrite formation from hydroxyl ammonium chloride. A simple assay for super oxide dismutase. *Anal Biochem* 70: 616–620.
-  | [PubMed](#) | [Web of Science ®](#) | [Google Scholar](#)
12. Ganguly AK (1969): A method for quantitative assessment of experimentally produced ulcers in stomach of rats. *Experientia* 25: 1224.
-  | [PubMed](#) | [Google Scholar](#)
13. Goel RK, Das DG, Sanyal AK (1985): Effect of vegetable banana powder on changes induced by ulcerogenic agents in dissolved mucosubstances of gastric juice. *Indian J Gastroenterol* 4: 249–251.
- [PubMed](#) | [Google Scholar](#)
14. Hawk PB, Oser BL, Summerson HW (1947): *Practical Physiological Chemistry*, 12th ed. London, Churchill, p. 347.
- [Goog](#)
15. Health [am], OPPTS 870, 1 Enviro
[http](#)
[Go](#)
16. Jayara in relation to the dis 1076.



17. Kulkarni SK (1999): Handbook of Experimental Pharmacology, 3rd ed. New Delhi, India, Vallabh Prakashan, pp. 148-150.

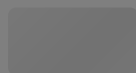
[Google Scholar](#)

18. Link EM (1988): Mechanism of pH dependent hydrogen peroxide cytotoxicity in vitro.. Arch Biochem Biophys 265: 362-372.



[PubMed](#) | [Web of Science ®](#) | [Google Scholar](#)

19. Lowry CH, Rosebrough NI, Farr AL, Randall RJ (1951): Protein measurement with Folin phenol reagent. J Biol Chem 193: 265-275.



[PubMed](#) | [Web of Science ®](#) | [Google Scholar](#)

20. Majumdar B, Chaudhri SGR, Ray A, Bandyopadhyay SK (2003): Effect of ethanol extract of Piper betle. Linn leaf on healing of NSAID-induced experimental ulcer—A novel role of free radical scavenging action. Indian J Exp Biol 41: 311-315.

[PubMed](#) | [Google Scholar](#)

21. Maryland Medical Center Programs (2004): Peptic ulcers. Available at http://www.umm.edu/patiented/articles/what_lifestyle_changes_recommended_peptic_ulcers_dyspepsia_000019_11.htm.

[Google Scholar](#)

22. Mukherjee PK (2002): Quality Control of Herbal Drugs (An Approach to Evaluation of Botanicals).

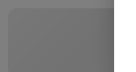
[Google Scholar](#)

23. Okabe S (2002): Effect of ethanol extract of Piper betle on healing of NSAID-induced experimental ulcers.

[Google Scholar](#)



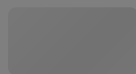
24. Okabe S (2002): Effect of ethanol extract of Piper betle on healing of NSAID-induced experimental ulcers.



25. Parmar NS, Desai JK (1993): A review of the current methodology for the evaluation of gastric and duodenal anti-ulcer agents. Indian J Pharmacol 25: 120-135.

[Google Scholar](#)

26. Peters MN, Richardson CT (1983): Stressful life events, acid hyper secretion, and ulcer disease. Gastroenterology 84: 114-119.



[PubMed](#) | [Web of Science ®](#) | [Google Scholar](#)

27. Ross IA (1999): Medicinal plants of the World. New Jersey, Humana Press, 234-235.

[Google Scholar](#)

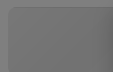
28. Sairam K, Rao ChV, Goel R K (2001): Effect of Centella asiatica. Linn on physical and chemical factors induced gastric ulceration and secretion in rats. Indian J Exp Biol 39: 137-142.

[PubMed](#) | [Google Scholar](#)

29. Shay H, Komarov SA, Fele SS, Meranze D, Gruenstein H, Siplet H (1945): A simple method for uniform production of gastric ulceration in rat. Gastroenterology 5: 43-61.

[Web of Science ®](#) | [Google Scholar](#)

30. Suzuki Y, Ishihara M, Segami T, Ito M (1998): Anti-ulcer effects of antioxidants, quercetin, α -tocopherol, nifedipine and tetracycline in rats. Jpn J Pharmacol 78: 435-441.



31. Szabo S (1990): Gastric ulcer. Am J

Pathol

[Goog](#)



32. Viri (1998): Food deprivation and gastric ulcer. J Gastroenterol Clin

Biol 1:

[PubM](#)

3. Wang JZ, Wuy J, Rao CM, Gao MT, Li WG (1999): Effect of recombinant human basic fibroblast growth factor on stomach ulcers in rats and mice. *Acta Pharmacol Sin* 209: 763–768.

[Google Scholar](#)

34. Xiao M, Yang Z, Jiu M, You J, Xiao R (1992): The anti-gastroulcerative activity of β -sitosterol- β -D-glucoside and its aglycone in rats. *Hua Xi Yi Ke Da Xue Xue Bao* 23(1): 98–101.

[PubMed](#) | [Google Scholar](#)

[Download PDF](#)

Related research

People also read

Recommended articles

Cited by
23

Medicinal plants in the treatment of *Helicobacter pylori* infections >

Maliheh Safavi et al.
Pharmaceutical Biology
Published online: 28 Nov 2014



Antiinfl

I C Eze
Internati
Publishe

Bioa

Fang W
Critical F
Publishe



In this article



Information for

Authors

R&D professionals

Editors

Librarians

Societies

Opportunities

Reprints and e-prints

Advertising solutions

Accelerated publication

Corporate access solutions

Open access

Overview

Open journals

Open Select

Dove Medical Press

F1000Research

Help and information

Help and contact

Newsroom

All journals

Books

Keep up to date



Taylor & Francis Group
an **informa** business

Accessib

Registered
5 Howick Pl



In this article

