

**NONPOLAR EXTRACT OF MUSA PARADISIACA FRUIT AS AN
ANTIULCEROGENIC AGENT**

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Summary

The medicinal properties of unripe plantain banana (*Musa paradisiaca* L) are part of the traditional folk medicine in the treatment of ulcer. The unripe plantain bananas are astringent and used to treat diarrhea and most importantly 'Ulcers'. In this project we have examined dried unripe banana for antiulcerogenic activity in mice by indomethacin induced gastric lesions. Unripe plantain banana were collected, authenticated and extracted with petroleum ether and alcohol successively. The extracts were vacuum dried and screened for anti-ulcerogenic action in mice. The activity was compared with standard formulation (Marketed). The ulcer index and histopathology report showed that the petroleum ether extract is having better protective action than alcohol extract and standard formulation. It can be concluded that certain nonpolar components may be responsible for antiulcerogenic activity.

Key words: *Musa paradisiacal*, plantain banana, nonpolar extract, antiulcerogenic, ulcer index, histopathology.

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Introduction

Musa paradisiaca L (Musaceae) is called as banana commonly. Plantain is native to Southeast Asia and India and cultivated in tropical and subtropical regions. The banana plant is large herb with succulent, juicy stem which is cylinder of leaf petiole sheaths. Leaves are tender, smooth, oblong or elliptical and fleshy stalked. It is green colored. Plant has large, long oval, tapering, and purple buds. Flowers are white colored. Banana fruit develops from female flower. Fruit is a berry turns from deep green to yellow color. It is oblong, cylindrical and blunt to pronouncedly 3-angled, somewhat curved and horn like. Different parts of this plant (fruit, pulp, leaves) has been used in folk medicine for the treatment of peptic ulcer, pain, asthma, burns, diabetes, dysentery, headache, inflammation, rheumatism and tuberculosis.¹ The fruits are picked when they are unripe and starch rich, but when they ripen the starch turns into simple sugars. The name "Plantain" refers to *M. paradisiaca* which requires cooking before it is eaten. Tannins and phenols were identified from the stem and a flavonoid, Leucocyanidin was isolated from unripe plantain banana. Plantain banana extracts are having wound healing activity in rats.² A glycemic agent of *M. paradisiaca* is useful in the management of diabetes.³ Flavonoids from the plant are having antioxidant activity.⁴ A peptic ulcer refers to an eroded lesion in the inner lining of the stomach and the adjoining intestinal tract called the duodenum. The ulcer located in the stomach is known as a gastric ulcer, and located in the duodenum is called a duodenal ulcer. Usually, both are grouped together and termed as peptic ulcer. The present research was undertaken to validate folk antiulcerative property of banana and to compare it with standard formulation available in market.

Materials and methods

Plant material

The fruit of *M. paradisiaca* L was collected from Ahmednagar district, Maharashtra in October 2008 and authenticated from Dr. A.R. Kakrale, Department of Horticulture, M.P.K.V, Rahuri. A voucher specimen was maintained in the department (No. TMB-34).

Extraction of anti-ulcerogenic factors from banana

Banana fruit powder was subjected to successive solvent extraction using petroleum ether and ethanol in Soxhlet extractor. Extracts were vacuum dried and were assessed for biological activity against indomethacin induced ulceration by prophylactic procedures.

Animals

Swiss albino mice of either sex were used for this experiment. Animals were housed in standard laboratory conditions and were fed with standard diet. All the experimental protocol was approved by institutional animal ethical committee.

Antiulcerogenic screening

In this procedure banana was used to prevent or inhibit ulceration induced by indomethacin⁵. The animals were allowed to settle in cages for 24 hrs before experiment was started. Animals were divided into four groups of six animals in each. First group received vehicle (10% tween 80 in saline water), second group received alcohol extract (200 mg/kg, p.o.), third group received petroleum ether extract (200 mg/kg, p.o.) and fourth group received standard formulation sucralfate (50 mg/kg, p.o.). After one hour gastric lesions were induced by indomethacin. Animals were anesthetized under ether anesthesia after 3 hrs of indomethacin treatment. The stomachs were dissected out; slit along the greater curvature, the mucosal side was gently cleaned and examined under magnification (10 X) by 2 observers unaware of the treatment. Ulcer index was calculated and histopathology of the gastric mucosa was studied for checking extent of damage.

Scoring (Ulcer Index)

The method of scoring was a modification of the method of Robert and Nezamis (1958)⁶, in that we increased the number of categories scored. All scoring was carried out by the same observer in all experiments and the identity of the treatments was withheld until scoring was completed. The scorings was performed as per table 1.

Table 1. The scoring categories used to assess the severity of lesions (ulcer index) induced by indomethacin on the mice stomach

Lesion	Score	
	Each	Maximum
Deep linear ulcers > 10 mm length	4	4
Deep linear ulcers < 10 mm length	2	14
Circular ulcers 1-2 mm diameter	1	-
Circular ulcers < 1 mm diameter	0.5	-
Microscopically visible erosions as fraction of 24 cm ²	2	2
Fraction of stomach showing evidence of hemorrhage	2	2
Fraction of stomach showing transparency to back lighting	2	2

Results

1. Ulcer index

Results from ulcer index showed that petroleum ether extract protected the gastric mucosa against indomethacin-induced ulceration, which is comparable to standard sucralfate (Table 2).

Table 2. Ulcer index/scores observed in various groups.

Sr. No	Treatment	Lesions	Ulcer index/Score
1	vehicle	Deep linear ulcers	4
2	Ethanol extract	Linear ulcer	3
3	Petroleum ether extract	Redness	2
4	Sucralfate formulation	Linear ulcer	2

2. Histopathology

A. Control group

Section revealed gastric mucosa with adjacent keratinized stratified squamous epithelium. Mucosa shows tiny ulcerations at places. The lamina propia and sub mucosa shows moderate inflammatory infiltrate composed of predominantly neutrophils and few lymphocytes. Muscle layer and serosa shows congested blood vessels (Figure 1A).

B. Alcohol treated group

Section revealed predominantly gastric mucosa with intact mucosal lining epithelium. No ulcerations are noted on the surface. Lamina propia and sub mucosa show moderate lympholytic infiltrate with presence of lymphoid follicles at places. Muscle coat and serosa show mild thickening and congestion (Figure 1B).

C. Petroleum ether treated group

Section revealed predominantly keratinized stratified squamous epithelium with small bit of gastric mucosa. Gastric mucosal lining is intact no ulceration is noted and shows only spares inflammatory infiltrate in the lamina propia and submucosa. Muscle layer and serosa unremarkable (Figure 1C).

D. Sucralfate treated group

Section revealed gastric mucosa with adjacent tiny keratinized stratified squamous epithelium. Mucosa shows tiny superficial ulcerations at places. Lamina propia and sub mucosa shows moderate inflammatory infiltrate composed of neutrophils, lymphocytes and plasma cells. Muscle layer and serosa show mild congestion (Figure 1D).

Figure 1. Histopathology of gastric mucosa of mice treated with various treatments.

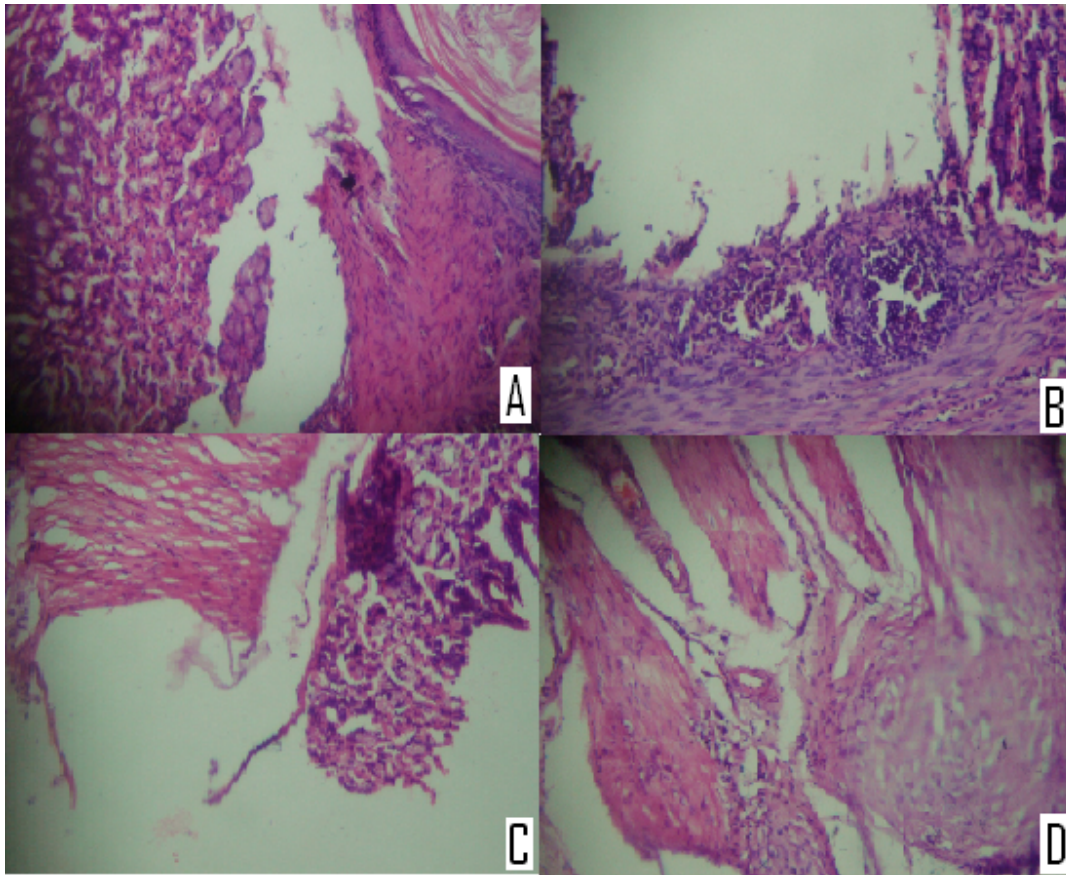


Fig. A. Section of gastric mucosa of mice treated with control

Fig. B. Section of gastric mucosa of mice treated with alcohol extract

Fig. C. Section of gastric mucosa of mice treated with sucralfate formulation

Fig. D. Section of gastric mucosa of mice treated with petroleum ether extract

Discussion

The results show that various preparations of dried powdered unripe plantain banana possess anti- ulcerogenic activity against indomethacin-induced gastric ulceration in mice. Banana possesses activity in inhibiting the induction of ulcers by indomethacin and it is also effective in these ulcers once formed. Its mechanism of action appears to be by stimulating the growth of gastric mucosa.

From the results i.e. ulcer index and histopathology reports it is clear that petroleum ether extract of *M. Paradisiaca* is showing better protective action than ethanol extract and commercially available agent, Sucralfate. The regenerated mucosa cells would rapidly seal damaged areas with a secretory layer of mucus and prevent further erosions due to gastric HCL and pepsin. Hence it can be concluded that nonpolar constituents may be responsible for the action.

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