

ANTIOXIDANT AND ANTIULCER ACTIVITY OF *ABRUS PRECATORIUS* LEAF EXTRACT AGAINST ACETIC ACID-INDUCED GASTRIC ULCER IN RATS

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ABSTRACT

Objective: The present study deals with the study of antiulcer activity of *Abrus precatorius* leaf extract in acetic acid-induced gastric ulcers was studied in rats.

Methods: In the present study, *A. precatorius* leaf extract was carried out in antiulcer activity against acetic acid-induced gastric ulcer in rats. *A. precatorius* at doses of 150 mg/kg and 300 mg/kg were administered orally once daily for 10 days.

Results: It was found that extract significantly reduced ulcer index. The plant leaves made gastric anti-secretory effect by decreasing gastric volume and acidity. Then, gastric mucin was increased, which showed gastric cytoprotective effect. The plant showed the prevention effect of increased lipid peroxidation during ulceration by acetic acid. Activities of the antioxidant enzymes were enhanced during ulceration by this plant leaves.

Conclusion: Leaves of *A. precatorius* Linn. could decrease acetic acid-induced gastric ulcers in rats and this antiulcerogenic activity was mediated through antioxidant defense mechanism.

Keywords: Alcoholic extract, Acetic acid, Omeprazole, Gastric ulcer.

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INTRODUCTION

A. precatorius Linn. has been used in Hindu medicines from very early times, as well as in China and other ancient cultures [1]. The plant was considered beneficial for the hair and the seeds extract is used in the treatment of ulcer and skin infection [2]. Seeds of the plant are very much attractive, used in ornaments, but are highly poisonous. Seeds are used as antidiabetic activity, antioxidative activity, antibacterial, and anti-inflammatory analgesic activity [3-6]. Other uses of the plant are observed in cancer and in malaria [7,8]. Phytochemical constituents of the plant are abricin, abrin, abrisin, abrine, abraline, abrasine, abrusgenic acid methyl ester, abruslectone, abrusic acid, anthocyanins, etc. [9]. Anti-peptic ulcer activity of the leaves of *A. precatorius* Linn. in albino rats was also observed [10]. In the present study, the effect of *A. precatorius* Linn. leaves on acetic acid-induced gastric ulcer in albino rats and the possible mechanism involved therein are being reported.

MATERIALS AND METHODS**Plant material and authentication of plant**

A. precatorius Linn. leaves were collected in the month of July 2017 from herbal garden of College of Pharmacy, Geetanjali University, Udaipur, and identified by Dr. Smriti Foujdar, Associated Professor, Banasthali Vidyapith, Jaipur. The collected leaves were shade dried and then crushed to coarse powder with mechanical grinder. The powder was stored in air-tight container which was used for extraction.

Preparation of extract

The collected leaves were treated 2-3 times with tap water to remove adhering dust and allowed to dry in shade. The dried material was crushed to coarse powder with mechanical grinder. It was then passed through sieve number of 40. A weighed quantity (150 g) of the powder was subjected to continuous hot extraction in Soxhlet apparatus with ethanol as a solvent and extracted until the solvent became colorless. Extract was then evaporated by vacuum evaporator.

Chemicals

All chemicals (Laboratory reagent) were purchased from (Central Drug House) R. S. Enterprises, Jaipur.

Experimental animals

Albino rats (150-200 g) of either sex were used for the study. Rats were kept for at least a week in the experimental wing of the animal house at 25°C-28°C and humidity 60%-65% with 12 h light and dark cycle. Animals were fed on laboratory diet with water *ad libitum*. Six rats were used for each set of experiment. The animal experiment was approved by the Ethics Committee of Geetanjali University.

Acute toxicity study

Albino rats of either sex weighing 150-200 g were used in the study. Acute oral toxicity study was performed as per OECD-423 guideline. The animals were divided into three groups (n=3) and were fasted overnight before drug administration.

Experimental procedure**Induction of gastric ulcer**

Albino rats of either sex weighing between 150 and 200 g were selected and divided into five groups (n=6) animals. Overnight fasted rats treated with ether anesthesia, anterior and posterior walls of stomach clamped with forceps. About 0.2 ml of 40% acetic acid solution was injected into clamped portion. After 45 s, acid removed, deep round ulcers developed on anterior and posterior walls. Respective treatments (control, standard, and test) were started on the 3rd-10th days. Rat sacrificed on the 10th day. The stomach was removed and the gastric lesions were evaluated by examining the inner gastric surface.

- Group I: Normal control
- Group II: Acetic acid induced (40% acetic acid 0.2 ml in subserosal membrane)
- Group III: 20 mg/kg omeprazole + Acetic acid
- Group IV: Ethanolic extract of *A. precatorius* at a dose of 150 mg/kg + Acetic acid

- Group V: Ethanolic extract of *A. precatorius* at a dose of 300 mg/kg + Acetic acid.

Ulcer index

After the incision of the stomach at the greater curvature, the ulcers were observed. Moreover, the number of ulcers was counted using a magnifying glass and the diameter of the ulcers was measured using Vernier calipers. The following arbitrary scoring system was used to grade the incidence and severity of lesions [11].

- The ulcer index was determined using the formula $Ulcer\ index = 10/X$
Where, X = Total mucosal area/Total ulcerated area
- Based on their intensity, the ulcers were given scores as follows:
0 = no ulcer, 1 = superficial mucosal erosion, 2 = deep ulcer or transmural necrosis, and 3 = perforated or penetrated ulcer
- Percentage protection was calculated using the formula $Percentage\ protection = 100 - U_t/U_c \times 100$
Where, U_t = Ulcer index of treated group
 U_c = Ulcer index of control group.

Biochemical estimations

Collected gastric juice from the rat's stomach was centrifuged and its volume and pH were measured. Gastric juice was further used for the estimation of free and total acidity as described by Solanki et al. [12], pepsin content by the method of Satyavati et al. [13], mucin by our methods, and total protein by the method of Molgaard et al. and Rashmi et al. [14,15].

Statistical analysis

The values were expressed as mean ± standard error of mean and were analyzed using one-way analysis of variance using the Statistical Package for the Social Sciences (SPSS) 20th version. Differences between means were tested employing Duncan's multiple comparison test and statistical significance was set at p<0.05.

RESULTS AND DISCUSSION

Acute toxicity study

Result of acute oral administration of powdered leaves of *A. precatorius* Linn. in various doses of 0.1, 0.6, 1, 4, and 5 g/kg indicated no mortality up to 72 h after treatment. All rats were healthy and active during the experimental period.

Antigastric ulcer activity of *A. precatorius* Linn.

Results relating to the effects of *A. precatorius* Linn. and omeprazole against acetic acid-induced gastric ulcer in rats are shown in Table 1.

Acetic acid produced massive ulcers in glandular part of rat's stomach. Incidence of ulceration was 100%. Acute dilatation and hemorrhage were seen in stomach. In one rat, perforation of the stomach was noted. Ulcer index came 72.04 ± 1.54 . Pre-treatment of rats with *A. precatorius*

Table 1: Effect of *Abrus precatorius* Linn. leaves extract acetic acid-induced gastric ulcer in albino rats

Group	Ulcer index	Percentage ulcer protection
Group I – control (normal)	1.24±2.22	92
Group II – acetic acid (disease control)	72.04±1.54	-
Group III – acetic acid+omeprazole (20 mg/kg)	9.32±2.10**	87.62
Group IV - acetic acid+APE (150 mg/kg)	45.82±2.00*	28.76
Group V – acetic acid+APE (300 mg/kg)	35.91±1.54**	54.89

Results were in mean±SEM, each group had six rats, *p<0.05, **p<0.001. SEM: Standard error of mean, APE: *Abrus precatorius* extracts

Linn. leaves gave significant protection (28.76%, and 54.89% by the doses of 150 mg/kg and 300 mg/kg, respectively) to the animals from forming ulcers by acetic acid. Omeprazole (20 mg/kg), however, gave 87.62% protection.

Anti-secretory effect

Results are shown in Table 2.

In control rats, volume and pH of gastric juice were 1.36 ± 0.05 and 1.92 ± 0.09 , respectively. Acetic acid increased volume of gastric juice (3.68 ± 0.06) and decreased its pH (1.63 ± 0.07) in rats. Changes were statistically significant (p<0.001). Pre-treatment of rats with *A. precatorius* Linn. leaves, however, could decrease volume of gastric juice (1.868 ± 0.08) and increase its pH (2.8 ± 0.06). Effects were comparable to that of omeprazole as in this group gastric juice; volume and pH were 1.35 ± 0.05 and 4.14 ± 0.12 , respectively.

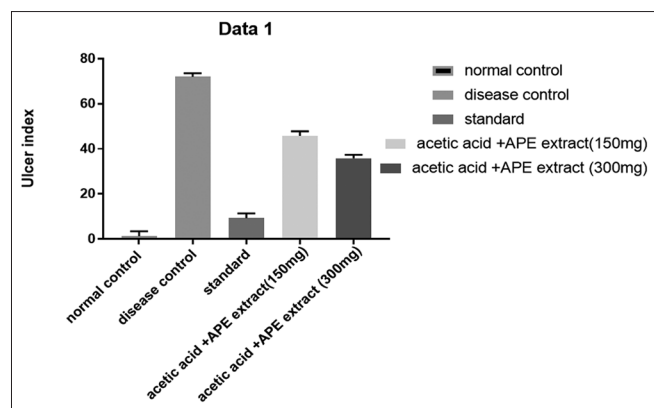


Fig. 1: Graphical representative of ulcer index (%)

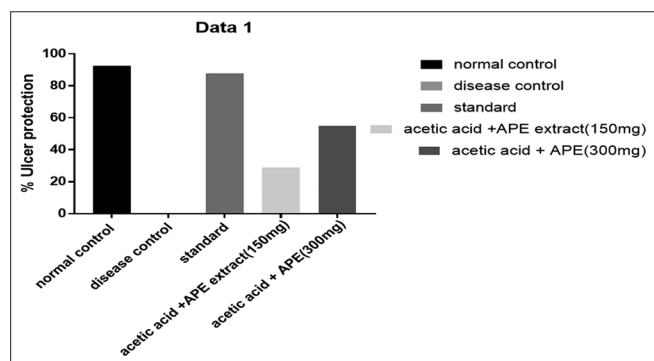


Fig. 2: Graphical representative of percentage ulcer protection

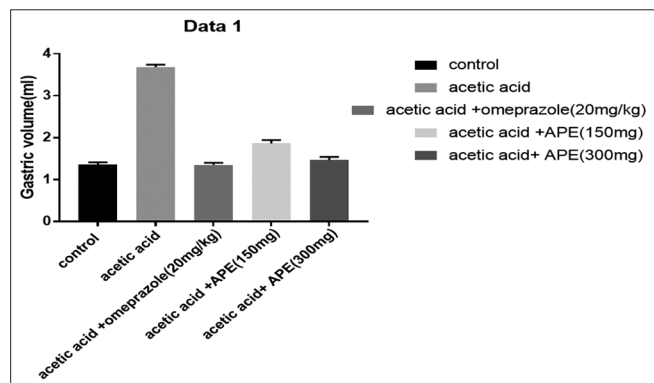


Fig. 3: Graphical representative of gastric volume (ml)

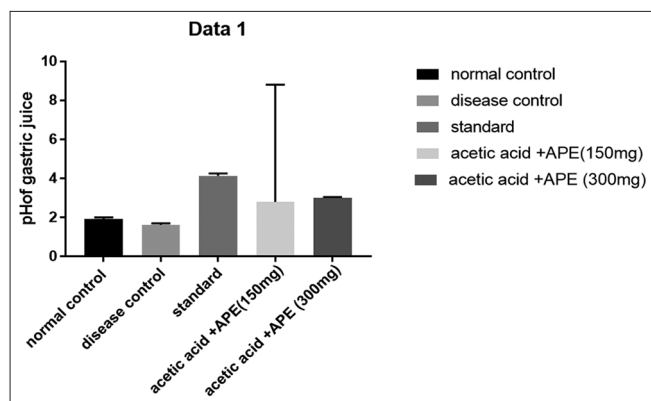


Fig. 4: Graphical representative of pH of gastric juice

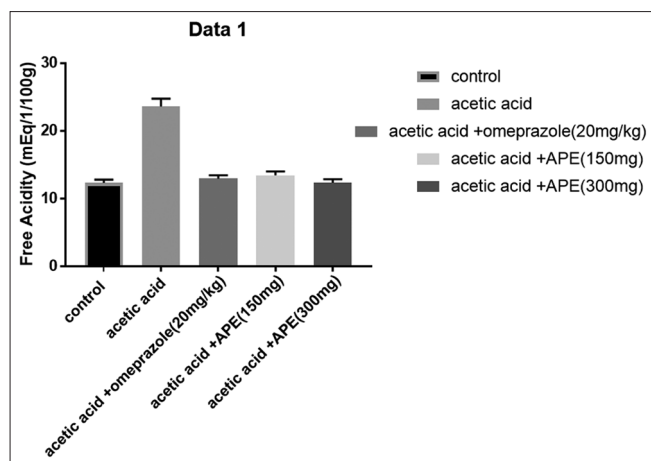


Fig. 5: Graphical representative of free acidity

Effect of *A. precatorius* Linn. leaves on gastric acidity

Table 3 showed effects of *A. precatorius* Linn. leaves and omeprazole on free and total acidity of gastric juice during acetic acid-induced gastric ulcer in rats.

Omeprazole significantly increased both free and total gastric acidity. Free and total gastric acidity of control rats were 12.31 ± 0.48 and 32.29 ± 0.54 , respectively. For acetic acid group values came 23.60 ± 1.16 (free acidity) and 74.24 ± 2.93 (total acidity). *A. precatorius* Linn. leaves could decrease free and total gastric acidity (13.45 ± 0.57 and 43.76 ± 0.95 , respectively). Omeprazole also decreased raised free and total gastric acidity during acetic acid-induced gastric ulcers.

CONCLUSION

Leaves of *A. precatorius* Linn. could decrease acetic acid-induced gastric ulcers in rats and this antiulcerogenic activity was mediated through antioxidant defense mechanism.

This antiulcer activity is helpful in further experimental analysis in future.

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Table 2: Effect of *Abrus precatorius* Linn. leaves on volume and pH of gastric juice during acetic acid-induced gastric ulcer in albino rats

Group	Gastric volume (ml)	pH of gastric juice
Control (normal)	1.36±0.05	1.92±0.09**
Acetic acid (disease control)	3.68±0.06**	1.63±0.07**
Acetic acid+omeprazole (20 mg/kg)	1.35±0.05**	4.14±0.12**
Acetic acid+APE (150 mg)	1.868±0.08**	2.8±0.06**
Acetic acid+APE (300 mg)	1.478±0.07**	3.01±0.04**

Results were in mean±SEM, each group had six rats, **p<0.001. SEM: Standard error of mean, APE: *Abrus precatorius* extracts

Table 3: Effect of *Abrus precatorius* Linn. leaves on free and total gastric acidity during acetic acid-induced gastric ulcer in albino rats

Group	Free acidity (mEq/1/100 g)	Total acidity (mEq/1/100 g)
Control (normal)	12.31±0.48	32.29±0.54
Acetic acid (disease control)	23.60±1.16**	74.24±2.91**
Acetic acid+omeprazole 20 mg/kg)	12.95±0.49**	34.35±1.95*
Acetic acid+APE (150 mg)	13.45±0.57**	43.76±0.95**
Acetic acid+APE (300 mg)	12.35±0.52*	40.76±0.51**

APE: *Abrus precatorius* extracts

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