WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 6.805
Volume 5, Issue 5, 896-904. Research Article ISSN 2277– 7105

EVALUATION OF ANTIULCER ACTIVITY OF AERIAL PART OF *ARGEMONE MEXICANA* LINN

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Article Received on
02 March 2016,
Revised on 23 March 2016,
Accepted on 11 April 2016
DOI: 10.20959/wjpr20165-6089

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ABSTRACT

On the contrary in India, herbal drugs are an integral part of the Indian system of medicine (Ayurveda) which is an ancient and main stream system. The antiulcer activity of aerial part of *Argemone mexicana* was investigated on ethanol induced model and indomethacin induced model albino wistar rats. In both models the ulcer index was common and it is determined. Ethanolic extract of dose 300 mg/kg and 600mg/kg p.o. produced significant inhibition of gastric lesions induced by ethanol induced and indomethacin induced ulcers. The extract 300mg/kg and 600mg/kg showed significant reduction in gastric acidity and ulcer index as compared to control. Phytochemical analysis showed the presence of glycosides, tannins, alkaloids, saponins and flavonoids. Therefore results of this study indicate the ethanolic extract of aerial part of *Argemone mexicana* possesses antiulcer activity.

KEYWORDS: Antiulcer activity, *Argemone mexicana,* Aerial part, Ethanolic extract.

INTRODUCTION

Peptic ulcers are defects in the gastrointestinal mucosa that extend through the muscularis mucosa. Peptic ulcer results due to over production of gastric acid (or) decrease in gastric mucosal production. They persist as a function of the acid or peptic activity in gastric juice. Normally the stomach wall is protected by the mucosa against irritation of gastric acid. When the mucosa is damaged or when the stomach produces so much gastric acid that the protective lining is eroded with subsequent inflammation or necrosis, a local ulcer will develop. Peptic ulcer occurs in that part of the gastrointestinal tract (g.i.t.) which is exposed to gastric acid and pepsin It results probably due to an imbalance between the aggressive

(acid, pepsin, bile, and H. pylori) and defensive (gastric mucus and bicarbonate secretion, prostaglandins, nitric oxide, innate resistance of the mucosal cells) factors.[1]

The most ulcers are caused either by infection with a bacterium called Helicobacter pylori or by long-term use of aspirin or other nonsteroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen. In either case, damages the barrier of mucus that normally protects the stomach and duodenum from the powerful acids and enzymes that the body produces to digest food.[2] The *Argemone mexicana* plant is commonly grown plant and used as medicinal preparation. The herb native of west Asia, grows in Uttar Pradesh, Hoshiarpur and Jullundur in Punjab, Rajasthan and Madhya Pradesh. *Argemone mexicana* belongs to Kingdom- Planate, Division- Magnoliophyta, Order- Ranunculales, Family- Papaveraceae, Genus- *Argemone,* Species- *Argemone mexicana*. It is erect prickly herb abounding throughout, in areas up to 1,500m elevation on road side and waste places. [3]

Argemone mexicana has number of health benefits like hepatoprotective activity[4], antioxidant activity[5], *in vitro* antitrichomonal activity[6], peripheral analgesic activity[7], antibacterial and antifungal activity[8], anthelmintic activity[9], *in vitro* anti-cancer activity[10], antidiabetic activity[11], and wound healing activity.[12] The whole plant is good tonic, depurative. The flowers are bitter, digestive, astringent, and stomachic. The root are useful in guinea-worm infestation, skin diseases, leprosy, pruritus.[13] In the traditional ayurvedic books it is reported that it possesses antiulcer activity and used in the treatment of ulcer. Hence the present study was undertaken with the aim of exploring the anti ulcer activity of *Argemone mexicana* linn.

MATERIAL AND METHODS

Plant material

The plant was identified on the basis of its vernacular name Mexican poppy and its morphological characteristics. The aerial part of identified *Argemone mexicana* linn was collected from near OPJS University, Churu, Rajasthan..

The plant was identified and authenticated by **Dr. Zia ul Hasan**, Prof. Botany Saifia Science College, (Barkatulla University) Bhopal (M.P.). Voucher specimen number is **317/Bot/Saifia/2012**.

Extraction of plant material

The Aerial part is dried in shade. Then moderately coarse powder of the aerial part (branches, flowers, leaves and stems) of *Argemone mexicana* linn. subjected to successive soxhlet extraction with solvents (petroleum ether, chloroform, and ethanol and aqueous) in increasing order of polarity from non polar to polar.[14],[15] The extracts were concentrated to dry residue by distillation (temperature 40-60C with vacuum) and dried completely in a desiccator and weighed. The yield of the ethanol extract is 29% while aqueous extract is 24.3%. The extracts were subjected to phytochemical and pharmacological screening.

Phytochemical screening

It was noted that phytochemical screening shows equal presence of carbohydrate in all extracts except ethanol extract while fats and oils are positive in pet. ether & chloroform extract. Steroids, glycosides, saponins and alkaloids, volatile are present strongly in ethanol extract while marginally in chloroform extract. These are not found in pet. ether extract. Phenolics and flavonoids compounds are positive in ethanol extract, marginally in chloroform extract & nil in pet. ether extract. The alcoholic extract showed significant results and it contains phenolic compound, alkaloid, glycosides, flavonoids, saponins and tannins. So we take the ethanolic extract for pharmacological study at the dose 300 and 600 mg/kg.

Animals used

Albino wistar rats (150-200) of either sex and of approximate same age were used in this study. They were housed in clean polypropylene cages under standard conditions of humidity (50 ± 5 %), temperature (25±2°C) and light (12 h light/12 h dark cycle) and fed with a standard diet (Hindustan lever Ltd. Bangalore, India) and water ad labium. The animals were fasted for 24 h before the onset of each activity. The animal received the drug treatment by oral gavages tube.

Acute oral toxicity study

Acute oral toxicity study of aerial part extract of the *Argemone mexicana* linn. was carried out by following fixed dose method of CPCSEA, OECD guidelines 423. The albino rats weighing between 100-150 gm were used for the study. Mortality and toxic symptoms in the treated animals were observed continuously for the 24 hrs and next 7 days. The acute oral toxicity of the ethanolic extract was determined in rats. Nine rats randomly divided into three groups (n=3) received oral administrations of 300, 600, and 2000 mg/kg of the extract respectively and were observed for 24 h for death. The additional upper dose 5000 mg/kg

body weight. The experimental protocol was performed in Faculty of Pharmacy, OPJS University, Churu with due permission from institutional animal ethical committee (Reg. No. 778/03/C/CPCSEA) and accordance with CPCSEA guidelines.

Evaluation of antiulcer activity

1- Ethanol induced ulcer model[16]

Albino wistar rats (150-200gm) of either sex and of approximate same age were used in this study. They were housed in clean polypropylene cages under standard conditions of humidity (50 ± 5 %), temperature (25±2°C) and light (12 h light/12 h dark cycle) and fed with a standard diet (Hindustan lever Ltd. Bangalore, India) and water ad labium.

Rats were divided into five groups, each group consists of six animals. All groups of animals received following treatments for 7 days.

Group 1 (Normal control)- vehicle 5ml/kg p.o.

Group 2 (Standard-I)- ranitidine at the dose of 30 mg/kg p.o.

Group 3 (Standard-II)- misoprostol at the dose of 100µg/kg p.o.

Group 4 (Test-I)- ethanolic extract of aerial part of *Argemone mexicana* at the dose of 300mg/kg p.o.

Group 5 (Test-II)- ethanolic extract of aerial part of *Argemone mexicana* at the dose of 600 mg/kg p.o.

Animals are fasted for 24h before the performing experiment. On the 7th day, 1h after final dose of treatment, the gastric ulcers were induced in rats by administering 90% ethanol (5ml/kg). After 1h animals were sacrificed by cervical dislocation and stomach was incised along the greater curvature and examined for ulcers index with 10X magnifying lens.

Calculation of ulcer index and percentage ulcer inhibition

Scoring of ulcer

Ulcer index has been calculated by adding the total number of ulcers per stomach and the total severity of ulcers per stomach. Scoring of ulcer can be done as-

• 0: normal colored stomach

• 0.5: red coloration

• 1: spot ulcers

• 1.5: haemorrhagic streak

• 2: ulcers

• 3: perforation

Calculation of ulcer Index

$U1 = U_N + U_S + U_P \times 10^{-1}$

U1 = Ulcer Index

UN = Average of number of ulcer per animal

US = Average of severity score

UP = Percentage of animal with ulcer

Mean ulcer score for each animal was expressed as ulcer index. The percentage of ulcer inhibition was determined as follows

$$\% \text{ inhibition of Ulcer Index} = \frac{(\text{Control mean ulcer index} - \text{test mean ulcer index})}{\text{Control mean ulcer index}} \times 100$$

2- Indomethacin induced ulcer model[17]

Albino wistar rats (150-200gm) of either sex and of approximate same age were used in this study. They were housed in clean polypropylene cages under standard conditions of humidity (50 ± 5 %), temperature (25±2°C) and light (12 h light/12 h dark cycle) and fed with a standard diet (Hindustan lever Ltd. Bangalore, India) and water ad labium.

The gastric ulcers were induced by administering indomethacin (IND; 5 mg/kg. p.o) for five days. The animals were then treated ethanolic extract of aerial part of *Argemone mexicana* at the dose of 300 and 600 mg/kg, respectively once daily for another five days, after the induction of ulcer, while the control group received only vehicle. Animals are fasted for 24h before the performing experiment. The rats were sacrificed on the fifth day after the test solutions administration and the ulcer index was determined. Briefly, the animals were divided into four groups (n = 6) and treated with the respective test solutions as given below.

(i) Group 1 (normal control) - vehicle + vehicle.

(ii) Group 2 (Standard) - 5 mg/kg IND + 100 µg/kg misoprostol.

(iii) Group 3 (Test-I) - 5 mg/kg IND + 300 mg/kg ethanolic extract of aerial part of *Argemone mexicana*.

(iv) Group 4 (Test-II) - 5 mg/kg IND + 600 mg/kg ethanolic extract of aerial part of *Argemone mexicana*.

Statistical analysis

The data were represented as Mean ± SEM. The data of antiulcer activity of ethanolic extract of aerial part of *Argemone mexicana* were analyzed by one way analysis of variance (ANOVA) followed by Dunnett's test. 'P' value less than 0.05 was considered as statistically significant.

RESULTS AND DISCUSSION

Acute oral toxicity

Acute oral toxicity studies have revealed that the ethanolic extract of aerial part of *Argemone mexicana* show slight CNS depression for few hours after treatment at the dose of 5000 mg/kg. However, there was no sign of toxicity or mortality up to 7 days indicates that extract is relatively safe.

Ethanol induced ulcer model

Ethanol induced ulceration in control group had produced ulcer in all animals. However, the ulcer index showed significant dose dependent reduction in the animal pretreated with ethanolic extract of *Argemone mexicana* 300 mg/kg (UI; 4.38 ± 0.66) and 600 mg/kg (UI; 4.12 ± 0.69). It indicated 68.51% gastro protection at 300 mg/kg and 70.38% gastro protection at 600 mg/kg as compared with ulcerated control. The results indicate that the higher dose of ethanolic extract of *Argemone mexicana* i.e. 600 mg/kg was effective in protecting ulcers in ethanol induced rats.(table-1)

Indomethacin induced ulcer model

Argemone mexicana extract showed dose dependent reduction of ulcer index in indomethacin treated rats. When compared to control ($P<0.001$) it showed reduction in content of acid in stomach tissue in indomethacin treated ulcer group. Administration of misoprostol and both the doses of *Argemone mexicana* extract significant reduction in the development of gastric ulcers induced by indomethacin, is dose dependent.(table-2)

Table-1 Ulcer index and %healing in ethanol induced ulcer model

Group	Treatment	Dose mg/kg, p.o.	Ulcer index (±SEM)	% Inhibition
I	Normal Control	5 ml/kg	13.91±1.89	-
II	Standard-I	30 mg/kg	2.42±0.31**	82.60
III	Standard-II	100µg/kg	2.32±0.31**	83.32
III	Test-I	300 mg/kg	4.38±0.66**	68.51
IV	Test-II	600 mg/kg	4.12±0.69**	70.38

Result are expressed as mean ± SEM (n=6). Statistical comparison was performed by using one way ANOVA coupled with Dunnett's test.* P<0.05, **P<0.001 were consider statistically significant when compared with control group.

Control Std- I Std-II

Test-I Test-II

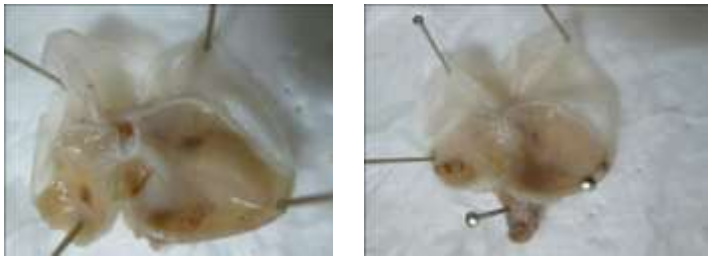
Fig-1 Ulcer in ethanol induced ulcer model

Table-2 Ulcer index and %healing in indomethacin induced ulcer

Group	Treatment	Dose mg/kg, p.o.	Ulcer index (±SEM)	% Inhibition
I	Normal Control	5 ml/kg	14.16±1.86	-
II	Standard	100µg/kg	4.13±0.67**	70.83
III	Test-I	300 mg/kg	7.43±1.00**	47.52
IV	Test-II	600 mg/kg	6.25±1.02**	55.86

Result are expressed as mean ± SEM (n=6). Statistical comparison was performed by using one way ANOVA coupled with Dunnett's test.* P<0.05, **P<0.001 were consider statistically significant when compared with control group.

Control **Standard**



Test-I **Test-II**

Fig-2 Ulcer in indomethacin induced ulcer model

CONCLUSION

The present study indicated that the ethanolic extract of aerial part of *Argemone mexicana* possess anti-ulcer activity in animal models. Ethanolic extract shows gastroprotective activity and gastric anti secretary activity when compared with that of reference drug (ranitidine and misoprostol). The extract is nontoxic even at relatively higher concentrations. The test-II (600 mg/kg) shows better result than test-I (300 mg/kg). The antiulcer activity is probably due to the presence of bioactive compounds like phenolics compounds, glycoside, alkaloids, flavonoids, saponins and tannins. Further studies are required to confirm the exact mechanism underlying the ulcer healing and protecting property of the extract and to identify the chemical constituents responsible for it.

ACKNOWLEDGEMENT

The authors express gratitude Asst. prof. Dr Anurag, Faculty of Pharmacy, OPJS University, Churu, Rajasthan, for his kind support.

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