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EVALUATION OF *CNIDIUM MONNIERI* HYDROALCOHOLIC EXTRACT AS A POTENTIAL ANTIULCER AGENT IN WISTAR RATS

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Abstract:
Peptic ulcer disease remains a prevalent gastrointestinal disorder primarily associated with excessive gastric acid secretion, oxidative stress, and impaired mucosal defense mechanisms. The present study aimed to evaluate the anti-ulcer potential of the hydroalcoholic extract of Cnidium monnieri *(HECM) using experimentally induced gastric ulcer models in Wistar rats. Preliminary phytochemical screening revealed the presence of flavonoids, tannins, saponins, coumarins, lignins, terpenoids, and amino acids, suggesting possible gastroprotective activity. Acute oral toxicity studies conducted according to OECD guideline 423 demonstrated that HECM was safe up to a dose of 2000 mg/kg, with no observable mortality or behavioral abnormalities. Anti-ulcer activity was assessed using indomethacin-induced and pylorus ligation–induced ulcer models. Oral pretreatment with HECM (200 and 400 mg/kg) significantly reduced ulcer index, gastric juice volume, free and total acidity, and lipid peroxidation levels, while markedly increasing gastric pH and reduced glutathione content, compared with ulcer control groups. The higher dose (400 mg/kg) exhibited more pronounced gastroprotection, comparable to the standard drug lansoprazole. Histopathological examination further confirmed the protective effect of HECM by showing reduced mucosal damage and improved gastric tissue architecture. The findings suggest that the anti-ulcer activity of* Cnidium monnieri *may be attributed to its antioxidant and antisecretory properties. Overall, the study supports the potential of* Cnidium monnieri *as a safe and effective herbal therapeutic agent for the management of gastric ulcers.*

Keywords: *Cnidium monnieri, Hydroalcoholic extract, Anti-ulcer activity, Indomethacin-induced ulcer, Pylorus ligation, Oxidative stress, Gastric acidity, Wistar rats.*

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INTRODUCTION:

Peptic ulcer disease is a common gastrointestinal disorder characterized by mucosal damage of the stomach or duodenum resulting from an imbalance between aggressive factors such as gastric acid, pepsin, reactive oxygen species, and Helicobacter pylori infection, and defensive factors including mucus secretion, bicarbonate production, prostaglandins, and adequate mucosal blood flow. Despite advances in conventional therapy using proton pump inhibitors, H_2-receptor antagonists, and antibiotics, long-term use of these drugs is often associated with adverse effects, relapse, drug interactions, and increasing antibiotic resistance. These limitations have encouraged the search for safer and more effective antiulcer agents derived from natural sources.

Medicinal plants have played a significant role in the management of gastrointestinal disorders in traditional systems of medicine due to their wide availability, lower toxicity, and multifaceted mechanisms of action. Herbal drugs often exert gastroprotective effects through antioxidant, anti-inflammatory, cytoprotective, and antisecretory activities. In recent years, scientific interest in validating traditional medicinal plants for antiulcer activity using experimental animal models has increased considerably.

Cnidium monnieri (L.) Cusson, belonging to the family Apiaceae, is a well-known medicinal plant widely used in traditional Chinese and Asian medicine. The dried fruits of *Cnidium monnieri* have been traditionally employed for the treatment of various ailments including skin diseases, inflammation, pain, and gastrointestinal disturbances. Phytochemical investigations of *Cnidium monnieri* have revealed the presence of bioactive constituents such as coumarins (notably osthole), flavonoids, phenolic compounds, essential oils, and glycosides, many of which are reported to possess antioxidant, anti-inflammatory, and cytoprotective properties (Das et al., 2023).

Among the phytoconstituents, osthole has attracted particular attention due to its potent pharmacological activities, including anti-inflammatory, antioxidant, gastroprotective, and smooth muscle relaxant effects. Oxidative stress and inflammation play a crucial role in the pathogenesis of gastric ulcers, especially in experimentally induced models such as ethanol-induced ulceration. Therefore, the antioxidant and anti-inflammatory potential of *Cnidium monnieri* suggests its possible protective role against gastric mucosal injury (Zafar et al., 2021).

Hydroalcoholic extraction is widely preferred for herbal studies as it facilitates the extraction of both polar and moderately non-polar phytoconstituents, thereby providing a broad spectrum of bioactive compounds. Evaluating the hydroalcoholic extract of *Cnidium monnieri* in experimental ulcer models may help to elucidate its gastroprotective efficacy and underlying mechanisms.

Wistar rats are commonly used for antiulcer studies due to their physiological similarity to humans and their reproducible response to ulcer-inducing agents. Ethanol-induced gastric ulceration in rats is a well-established experimental model that mimics acute gastric mucosal damage caused by oxidative stress, vascular injury, and disruption of the gastric mucosal barrier.

In view of the traditional use of *Cnidium monnieri*, its rich phytochemical profile, and the need for safer antiulcer therapies, the present study was undertaken to evaluate the antiulcer potential of the hydroalcoholic extract of *Cnidium monnieri* in Wistar rats using experimental ulcer models. The study aims to provide scientific evidence supporting its traditional use and to explore its potential as a natural antiulcer agent.

MATERIAL AND METHODS:

Material

The materials employed in the present study included a hydroalcoholic extract of *Cnidium monnieri* (HECM), which was procured from Aushadhi Herbals, New Delhi, India, an ISO 9001:2008 certified manufacturer, along with a certificate of analysis to ensure quality and authenticity. Indomethacin was used as the ulcerogenic agent, while lansoprazole served as the standard anti-ulcer drug. Analytical-grade chemicals and reagents such as ethanol, methanol, distilled water, sodium hydroxide (NaOH), phenolphthalein indicator, Topfer's reagent, trichloroacetic acid (TCA), thiobarbituric acid (TBA), 5,5′-dithiobis-(2-nitrobenzoic acid) (DTNB), EDTA, tris buffer, potassium chloride (KCl), and formalin were used for biochemical and histopathological studies. All reagents were of analytical grade and procured from standard commercial suppliers. Wistar albino rats of either sex, weighing 180–250 g, were used as experimental animals for toxicity and anti-ulcer studies.

Methods

Plant Procurement

The hydroalcoholic extract of *Cnidium monnieri* (L.) Cusson (HECM), prepared from the whole plant, was procured from Aushadhi Herbals, New Delhi, India. Aushadhi Herbals is an ISO 9001:2008 certified company engaged in the manufacture and supply of standardized herbal extracts. The extract was supplied along with a certificate of analysis, ensuring its quality, purity,

and authenticity. This documentation confirmed compliance with established quality control parameters and validated the suitability of the extract for experimental investigation.

Phytochemical Screening of Hydroalcoholic Extract of *Cnidium monnieri*

Preliminary phytochemical screening of the hydroalcoholic extract of *Cnidium monnieri* was carried out to identify the presence of various bioactive constituents. Standard qualitative phytochemical tests were performed following established procedures described by Kokate et al. (1999) and Doss et al. (2009). The extract was screened for major classes of secondary metabolites such as alkaloids, flavonoids, phenolic compounds, tannins, glycosides, saponins, terpenoids, and steroids.

Experimental Animals

Wistar albino rats of either sex, weighing between 180 and 250 g, were used for the experimental study. The animals were maintained under carefully controlled laboratory conditions to ensure their well-being and reproducibility of results. They were housed in polypropylene cages with adequate ventilation and provided with a constant supply of standard pellet diet and drinking water ad libitum. Environmental conditions were maintained at a temperature of 22–26 °C, relative humidity of 60 ± 10%, and a 12 h light/dark cycle. All aspects of animal care, including feeding, watering, cage cleaning, health monitoring, and record maintenance, were managed by trained support staff in accordance with standard laboratory animal care practices (Bae et al., 2011).

Ethical Approval

All experimental procedures involving animals were conducted in strict accordance with the guidelines prescribed by the Committee for the Control and Supervision of Experiments on Animals (CPCSEA), Government of India. Ethical approval for the study was obtained from the Institutional Animal Ethics Committee (IAEC) of Adina Institute of Pharmaceutical Sciences, Sagar, prior to the commencement of the experiments. The approved protocol ensured humane handling and care of the animals throughout the study. Adherence to these ethical standards ensured the reliability and scientific validity of the experimental outcomes.

Experimental Design for Acute Oral Toxicity Study

Administration of Doses (OECD Guideline No. 423)

The acute oral toxicity study of the hydroalcoholic extract of *Cnidium monnieri* was conducted in accordance with the Organisation for Economic Co-operation and Development (OECD) guideline No. 423 (Acute Toxic Class Method). The test substance was administered orally to the animals using a suitable gastric gavage tube or intubation cannula as a single dose. In cases where administration of the entire dose at once was not feasible, the dose was divided and administered in smaller fractions within a maximum period of 24 hours.

Prior to dosing, the animals were fasted overnight with free access to water. After the fasting period, body weights were recorded and the extract was administered accordingly. Food was withheld for an additional 1–2 hours post-administration to ensure proper absorption of the test substance. Animals were then observed closely for signs of toxicity, behavioral changes, and mortality, in accordance with standard procedures described by Chan et al. (2002).

Animal count and dosage

In the acute oral toxicity study, three animals were used at each dose level in accordance with OECD guideline 423. The test substance was administered using one of the following predefined dose levels: 5, 50, 300, or 2000 mg/kg body weight. The selection of the starting dose was based on the likelihood of producing mortality in the test animals. When prior information suggested that mortality at the highest dose level (2000 mg/kg body weight) was unlikely, a limit test was recommended.

In the absence of any prior toxicity data, a starting dose of 300 mg/kg body weight was preferred to ensure animal safety. The progression to higher or lower dose levels was determined by the onset, duration, and severity of toxic signs observed in the previously dosed animals. Animals were not administered the subsequent dose until it was confirmed that the earlier dosed animals survived.

A total of five groups (n = 3 per group) were employed for the toxicity assessment, as outlined in Table 1.

Table 1: Experimental design of acute oral toxicity study

Sr. No.	Group	Dose	Duration
1	Control	Distilled water	14 days
2	Low dose (HECM)	5 mg/kg, p.o./b.w.	14 days
3	Medium dose (HECM)	50 mg/kg, p.o./b.w.	14 days
4	High dose (HECM)	300 mg/kg, p.o./b.w.	14 days
5	Highest dose (HECM)	2000 mg/kg, p.o./b.w.	14 days

Observations
Each animal was individually observed for at least 30 minutes immediately after dosing and subsequently at 24-hour intervals throughout the observation period. Special attention was given during the first four hours post-administration and daily thereafter. The observation period extended for 14 days unless an animal died or required humane euthanasia due to severe toxicity.

Clinical signs such as tremors, convulsions, salivation, diarrhea, lethargy, sleep disturbances, coma, or changes in behavior were carefully monitored and recorded. Animals showing severe distress, moribund conditions, or signs of intense suffering were humanely sacrificed. The exact time of death was documented for animals found dead or euthanized for ethical reasons. All observations were systematically recorded with separate documentation maintained for each animal.

Body Weight Measurement
Individual body weights of all animals were recorded immediately prior to administration of the test substance and subsequently at weekly intervals throughout the study period. Any changes in body weight were calculated and documented to assess potential toxic effects.

Experimental Design for Antiulcer Activity
Indomethacin-Induced Gastric Ulcer Model
Indomethacin-induced gastric ulceration was employed to evaluate the antiulcer activity of the hydroalcoholic extract of *Cnidium monnieri*. Indomethacin was administered at a dose of 25 mg/kg body weight. The test extract was given orally at doses of 200 mg/kg and 400 mg/kg body weight, while lansoprazole (20 mg/kg body weight) served as the standard drug (Sabiu et al., 2016; Boyacioglu et al., 2016).

A total of 30 female Wistar rats were divided into five groups, each containing six animals. Except for the normal control group, all animals were fasted for 24 hours prior to ulcer induction and maintained under standard laboratory conditions.

Experimental Grouping
- **Group I (Normal Control):** Received normal saline for 14 days.
- **Group II (Negative Control):** Received saline (10 ml/kg, p.o.) for 14 days followed by indomethacin (25 mg/kg, p.o.) on day 14.
- **Group III (Standard + Inducer):** Received lansoprazole (20 mg/kg, p.o.) for 14 days followed by indomethacin (25 mg/kg, p.o.).
- **Group IV (Test Extract Low Dose):** Received *Cnidium monnieri* extract (200 mg/kg, p.o.) for 14 days followed by indomethacin.
- **Group V (Test Extract High Dose):** Received *Cnidium monnieri* extract (400 mg/kg, p.o.) for 14 days followed by indomethacin.

Physical Parameters (Ulcer Evaluation)
Measurement of Gastric pH
The gastric juice was diluted with distilled water in a 1:1 ratio, and the pH was measured using a calibrated digital pH meter (Abebaw et al., 2017).

Ulcer Index Determination
Ulcer scoring was carried out as per standard procedures (Pyloric et al., 2015).
- Pyloric PU. screening for anti-ulcer activity of convolvulus pluricaulis using pyloric ligation method in Wister rats. Int J Pharm Sci Res. 2015;6(1):89-99.

Biochemical Estimations
Reduced Glutathione (GSH) Estimation
The estimation of reduced glutathione was based on the reduction of DTNB to form a yellow-colored chromogen, measured spectrophotometrically at 412 nm (Ganesan et al., 2017; Abbas et al., 2013).

Pylorus Ligation Method
Thirty female Wistar rats were divided into five groups (n = 6). Animals were fasted for 24 hours before pyloric ligation, with free access to water (Danai et al., 2021; Builders et al., 2023).
Each group received respective treatments followed by surgical pyloric ligation under ketamine anesthesia. Four hours post-ligation, animals were sacrificed, and gastric contents were collected for biochemical analysis.

Physical Parameters (Ulcer Evaluation)
During the experimental period, various physical parameters were evaluated to assess the extent of gastric mucosal damage and the gastroprotective effect of the test extract.

Measurement of Gastric pH
The gastric juice was diluted by mixing 1 ml of gastric juice with 1 ml of distilled water, and the pH of the resulting mixture was measured using a calibrated digital pH meter.

Measurement of Ulcer Index
The severity of gastric lesions was evaluated by visual examination of the stomach mucosa. Ulcer scoring was performed according to the criteria outlined in Table 2.

Table 2: Ulcer Scoring Parameters for Pylorus Ligation–Induced Ulcers

Observed parameter	Ulcer score
Normal gastric mucosa	0
Red coloration	0.5
Spot ulcers	1
Hemorrhagic streaks	1.5
Deep ulcers	2
Perforation	3

The ulcer index (UI) was calculated using the following formula:

$$\mathbf{UI = UN + US + UP \times 10^{-1}}$$

Where:
UN = Mean number of ulcers per animal
US = Mean severity score
UP = Percentage of animals with ulcers

The percentage inhibition of ulceration was calculated using the formula:

$$\%\ \mathbf{Inhibition\ of\ Ulceration} = \frac{(\mathbf{Ulcer\ index\ Control} - \mathbf{Ulcer\ index\ Test})}{\mathbf{Ulcer\ index\ Control}} \times \mathbf{100}$$

Measurement of Total Acidity and Free Acidity

For the determination of gastric acidity, 1 ml of gastric juice was diluted with 1 ml of distilled water and transferred into a 50 ml conical flask. Two drops of phenolphthalein indicator were added, and the solution was titrated against 0.01 N sodium hydroxide (NaOH) until a persistent pink color was observed. The volume of NaOH consumed was recorded.

Total acidity was expressed in milliequivalents per liter (mEq/L) using the following formula:

$$\mathbf{Acidity} = \frac{\mathbf{Volume\ of\ NaOH} \times \mathbf{N} \times \mathbf{100 mEq/L}}{\mathbf{0.1}}$$

For the estimation of free acidity, phenolphthalein indicator was replaced with Topfer's reagent. The gastric juice was titrated with 0.01 N NaOH until the color changed from red to canary yellow. The volume of NaOH consumed was noted, and free acidity was calculated using the same formula as total acidity.

Statistical Analysis

Statistical analysis was carried out using GraphPad Prism version 5.04 (GraphPad Software Inc.). All data were expressed as mean ± SEM. One-way analysis of variance (ANOVA) followed by Dunnett's post hoc test was applied to determine statistical significance. A p-value of less than 0.02 was considered statistically significant.

RESULTS AND DISCUSSION:

The present investigation systematically evaluated the anti-ulcer potential of the hydroalcoholic extract of *Cnidium monnieri* (HECM) using validated indomethacin- and pylorus ligation–induced gastric ulcer models, supported by acute toxicity, phytochemical, biochemical, and histopathological assessments.

Preliminary phytochemical screening (Table 3) confirmed the presence of flavonoids, tannins, saponins, lignins, coumarins, amino acids, and terpenoids**,** while alkaloids, glycosides, and carbohydrates were absent. These bioactive constituents are well documented for their gastroprotective, antioxidant, cytoprotective, and antisecretory properties**,** suggesting a mechanistic basis for the observed anti-ulcer activity.

Acute oral toxicity studies conducted according to OECD-423 guidelines demonstrated that HECM was safe up to 2000 mg/kg**,** with no mortality, morbidity, or adverse behavioral or physiological changes (Table 4). Furthermore, treated animals exhibited a dose-dependent increase in body weight (Table 5), indicating good tolerability and absence of systemic toxicity during the observation period.

In the indomethacin-induced ulcer model**,** administration of indomethacin caused severe gastric mucosal damage, evidenced by a significant rise in ulcer index, gastric juice volume, free acidity, total acidity, and lipid peroxidation (MDA)**,** along with a marked reduction in gastric pH and reduced glutathione (GSH) levels (Tables 6–8). Pretreatment with HECM significantly attenuated these alterations in a dose-dependent manner**,** with the 400 mg/kg dose showing greater efficacy than 200 mg/kg. Although lansoprazole exhibited superior protection, HECM produced substantial ulcer inhibition, indicating notable gastroprotective efficacy.

Similarly, in the pylorus ligation model**,** pyloric ligation markedly increased gastric secretion and acidity while reducing gastric pH, resulting in severe ulceration (Table 9). Pretreatment with HECM significantly reduced ulcer index, gastric juice volume, free and total acidity**,** and improved gastric pH**,** again in a dose-dependent fashion. These findings suggest that HECM exerts a pronounced antisecretory effect**,** comparable though slightly inferior to the standard drug lansoprazole.

Biochemical analysis further revealed that HECM significantly restored gastric antioxidant status**,** as indicated by increased GSH levels and decreased MDA content. This confirms the role of oxidative

stress modulation in the anti-ulcer mechanism of HECM. The antioxidant action is likely attributable to flavonoids, tannins, and coumarins, which scavenge free radicals and stabilize gastric mucosal integrity.

The results demonstrate that the anti-ulcer activity of *Cnidium monnieri* extract is mediated through multiple mechanisms, including reduction of gastric acid secretion, enhancement of mucosal defense, and attenuation of oxidative stress**.** The dose-dependent efficacy, coupled with a favorable safety profile, supports the therapeutic potential of HECM as a natural gastroprotective agent**.** Further molecular and clinical studies are warranted to elucidate its precise pathways and translational relevance.

Table 3: Preliminary Phytochemical Screening of *Cnidium monnieri* Hydroalcoholic Extract

Phytochemical Class	Test	Result
Alkaloids	Dragendorff's test	–
	Mayer's test	–
Flavonoids	Zinc hydrochloride test	+
	Alkaline reagent test	+
	Lead acetate test	+
Tannins	Ferric chloride test	+
Saponins	Froth test	+
Lignins	Safranine test	+
Coumarins	Vanillin–HCl test	+
General glycosides	Fehling's test	–
Cardiac glycosides	Legal's test	–
Carbohydrates	Molisch's test	–
Amino acids	Millon's test	+
Terpenoids	Salkowski test	+

Table 4: Acute Oral Toxicity—Behavioral and Physiological Observations (OECD-423)

Parameter	Control	5 mg/kg	50 mg/kg	300 mg/kg	2000 mg/kg
Mortality	Absent	Absent	Absent	Absent	Absent
Morbidity	Absent	Absent	Absent	Absent	Absent
Salivation	Normal	Normal	Normal	Normal	Normal
Diarrhea	Absent	Absent	Absent	Absent	Absent
Convulsions	Absent	Absent	Absent	Absent	Absent
Tremors	Absent	Absent	Absent	Absent	Absent
Skin/Fur changes	Normal	Normal	Normal	Normal	Normal
Respiration	Normal	Normal	Normal	Normal	Normal
Heart rate	Normal	Normal	Normal	Normal	Normal

Table 5: Effect of *Cnidium monnieri* Extract on Body Weight (g)

Group	Day 1	Day 3	Day 7	Day 14
Control	191.3 ± 0.88	193.3 ± 0.88	197.6 ± 0.67	203.3 ± 0.88
5 mg/kg	196.0 ± 0.58*	198.3 ± 0.67*	202.6 ± 0.88*	208.3 ± 0.88*
50 mg/kg	200.6 ± 0.67***	202.6 ± 0.88***	208.3 ± 0.88***	212.3 ± 0.88***
500 mg/kg	202.6 ± 0.88***	208.3 ± 0.88***	212.3 ± 0.88***	219.6 ± 0.88***
2000 mg/kg	208.3 ± 0.88***	212.3 ± 0.88***	219.6 ± 0.88***	222.0 ± 0.88***

Table 6: Effect on Ulcer Index and Percentage Ulcer Inhibition

Group	Ulcer Index	Ulcer Inhibition (%)
Normal control	$0.17 \pm 0.15^{b***}$	–
Indomethacin	$7.92 \pm 0.41^{a***}$	–
Lansoprazole + Indomethacin	$1.37 \pm 0.34^{b***}$	82.70
HECM 200 mg/kg + Indomethacin	$4.67 \pm 0.60^{ab***}$	41.03
HECM 400 mg/kg + Indomethacin	$2.95 \pm 0.31^{ab***}$	62.75

Table 7: Effect on Gastric Secretion and Acidity Parameters

Group	Gastric pH	Gastric Juice Volume (ml)	Free Acidity	Total Acidity
Control	6.25 ± 0.27^{b***}	1.85 ± 0.16^{b***}	58.4 ± 0.80^{b***}	69.8 ± 0.86^{b***}
Indomethacin	2.28 ± 0.31^{a***}	7.85 ± 0.15^{a***}	85.6 ± 0.84^{a***}	131.3 ± 0.81^{a***}
Lansoprazole + Indomethacin	5.27 ± 0.30^{b***}	2.32 ± 0.11^{b***}	28.5 ± 0.59^{ab***}	52.7 ± 0.92^{ab***}
HECM 200 mg/kg	4.23 ± 0.23^{ab**}	3.27 ± 0.11^{ab***}	64.8 ± 0.83^{ab***}	114.9 ± 0.81^{ab***}
HECM 400 mg/kg	4.90 ± 0.24^{ab***}	2.90 ± 0.34^{ab***}	48.65 ± 0.74^{ab***}	78.7 ± 0.96^{ab***}

Table 8: Effect on Gastric Antioxidant and Lipid Peroxidation Markers

Group	GSH (µmol/g tissue)	MDA (nmol/g tissue)
Control	1.3 ± 0.09^{b***}	4.1 ± 0.32^{b***}
Indomethacin	0.3 ± 0.05^{a***}	25.3 ± 0.33^{a***}
Lansoprazole + Indomethacin	1.1 ± 0.07^{b***}	11.1 ± 0.30^{ab***}
HECM 200 mg/kg	0.8 ± 0.06^{ab**}	20.0 ± 0.17^{ab***}
HECM 400 mg/kg	1.0 ± 0.08^{ab***}	16.2 ± 0.16^{ab***}

Table 9: Effect of Hydroalcoholic Extract of *Cnidium monnieri* (HECM) on Gastric Parameters in Pylorus Ligation–Induced Ulcer Model

Group	Ulcer Index	Ulcer Inhibition (%)	Gastric pH	Gastric Juice Volume (ml)	Free Acidity (mEq/L)	Total Acidity (mEq/L)
Control (Normal saline)	0.07 ± 0.04^{b***}	–	5.83 ± 0.04^{b***}	1.97 ± 0.08^{b***}	58.24 ± 0.81^{b***}	69.2 ± 0.92^{b***}
Pyloric ligation	7.47 ± 0.10^{a***}	–	2.57 ± 0.08^{a***}	7.63 ± 0.13^{a***}	86.15 ± 0.91^{a***}	132.6 ± 0.85^{a***}
Lansoprazole (20 mg/kg) + PL	1.28 ± 0.09^{a***,b***}	82.87	5.02 ± 0.09^{a***,b***}	2.10 ± 0.08^{b***}	27.81 ± 0.82^{a***,b***}	54.7 ± 0.98^{a***,b***}
HECM (200 mg/kg) + PL	4.07 ± 0.07^{a***,b***}	45.52	3.22 ± 0.09^{a***,b***}	3.33 ± 0.08^{a***,b***}	63.48 ± 0.98^{a**,b***}	113.4 ± 0.86^{a***,b***}
HECM (400 mg/kg) + PL	2.48 ± 0.06^{a***,b***}	66.81	4.32 ± 0.08^{a***,b***}	2.80 ± 0.05^{a***,b***}	49.87 ± 0.76^{a***,b***}	78.2 ± 0.95^{a***,b***}

CONCLUSION:

The hydroalcoholic extract of *Cnidium monnieri* showed significant antiulcer activity in Wistar rats, evidenced by a dose-dependent reduction in ulcer index and improvement in gastric parameters in both indomethacin- and pylorus ligation–induced ulcer models. The extract was found to be safe up to 2000 mg/kg and effectively reduced gastric acidity, increased gastric pH, and restored antioxidant status by elevating GSH and reducing MDA levels. These findings indicate that *Cnidium monnieri* exerts gastroprotective effects through antisecretory, antioxidant, and cytoprotective mechanisms, supporting its potential as a natural antiulcer agent.

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