



**INTERNATIONAL JOURNAL OF
PHARMACEUTICAL SCIENCES**
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: <https://www.ijpsjournal.com>



Research Article

Evaluation Of Antiulcer Activity of Ativisha by Ethanol Induced Model on Experimental Animal

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ARTICLE INFO

Published: 29 Nov. 2024

Keywords:

Antiulcer activity, Aconitum heterophyllum, Ulcer index, Ulcer score, Gastric pH, Free acidity, Total acidity, Ethanol-induced ulcer, Omeprazole, Wistar rats

DOI:

10.5281/zenodo.14243215

ABSTRACT

The present study investigates the antiulcer activity of the ethanolic root extract of Aconitum heterophyllum (ERAH) in ethanol-induced ulcer models in albino Wistar rats. The study aimed to evaluate the ulcer index, ulcer score, and other related parameters such as pH, free acidity, and total acidity following the administration of different doses of ERAH (225 mg/kg, 450 mg/kg, and 900 mg/kg) and comparison with the standard drug Omeprazole (20 mg/kg). The findings revealed that ERAH demonstrated significant protection against ulcer formation, with a dose-dependent reduction in ulcer scores and ulcer indices. The highest dose of 900 mg/kg showed a notable inhibition of ulcer formation (20.48%) compared to the control group. Additionally, ERAH treatment resulted in a significant improvement in gastric pH and a reduction in both free and total acidity levels. These results suggest that Aconitum heterophyllum has promising antiulcer properties and may offer an alternative therapeutic approach for the treatment of gastric ulcers.

INTRODUCTION

Peptic ulcer disease (PUD) is a prevalent and multifactorial gastrointestinal condition characterized by the formation of open sores or erosions in the mucosal lining of the stomach or duodenum. It arises due to an imbalance between the protective factors of the gastric mucosa, such as mucus and bicarbonate secretion, and

aggressive factors like gastric acid, pepsin, and Helicobacter pylori infection. Several external factors, including chronic use of non-steroidal anti-inflammatory drugs (NSAIDs), stress, smoking, alcohol consumption, and dietary habits, further exacerbate this imbalance, contributing to the development and progression of ulcers. If left untreated, peptic ulcers can lead to severe

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



complications such as bleeding, perforation, and obstruction, which significantly impact the quality of life and may require surgical intervention. Despite the availability of various synthetic drugs, including proton pump inhibitors, H₂ receptor antagonists, and antacids, to manage peptic ulcers, these therapies are often associated with adverse effects like headache, diarrhea, drug interactions, and a risk of recurrence. This has prompted a growing interest in exploring natural remedies with minimal side effects and a holistic approach to healing. Traditional medicine, particularly Ayurveda, has long emphasized the use of herbal formulations for the treatment of gastrointestinal disorders, including ulcers. One such herb, *Ativisha* (*Aconitum heterophyllum*), holds a prominent place in Ayurvedic texts for its therapeutic properties. Known for its bitter taste and potent medicinal attributes, *Ativisha* has been traditionally used to treat digestive disorders, inflammation, and infections. It is rich in bioactive compounds such as alkaloids, flavonoids, tannins, and phenolic compounds, which are believed to contribute to its pharmacological effects. The herb is specifically recognized for its ability to enhance digestive health, reduce inflammation, and provide protection to the gastric mucosa, making it a promising candidate for antiulcer therapy. To scientifically validate the traditional claims associated with *Ativisha*, this study focuses on evaluating its antiulcer activity using the ethanol-induced ulcer model in experimental animals. Ethanol-induced gastric ulcers are a widely accepted model for studying ulcerogenesis and gastroprotective agents, as ethanol disrupts the mucosal barrier, induces oxidative stress, and triggers inflammation, closely resembling the pathological mechanisms observed in human ulcers.⁴ The primary objective of this study is to assess the gastroprotective potential of *Ativisha* by investigating its effects on gastric mucosal integrity, oxidative stress markers, and

inflammatory mediators in an ethanol-induced ulcer model. By doing so, the study aims to provide a scientific basis for the therapeutic use of *Ativisha* in ulcer management and explore its potential as a safe and natural alternative to conventional ulcer treatments. Furthermore, the findings may pave the way for the development of novel phytopharmaceutical formulations derived from *Ativisha* for the effective management of peptic ulcer disease.⁵

Plant Profile Of Ativisha (Aconitum Heterophyllum)

Family and Synonym

Ativisha belongs to the family Ranunculaceae, which is renowned for its diverse range of medicinal plants. Its botanical name is *Aconitum heterophyllum*, and it is commonly referred to as Indian Aconite or *Ativisha* in Ayurvedic literature. It is also known by several regional names, including "Atis" in Hindi, "Atividayam" in Tamil, and "Ati Veladi" in Kannada.⁶

Geographical Distribution

Ativisha is primarily found in the temperate regions of the Himalayan range. It grows naturally in countries like India, Nepal, and Bhutan, predominantly at altitudes ranging from 2,500 to 4,000 meters. In India, it is widely distributed in the states of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, and parts of Arunachal Pradesh. The plant thrives in cool climates with well-drained, rocky, and sandy soils, making it well-suited to high-altitude environments.⁷

Habitat

The natural habitat of *Aconitum heterophyllum* includes alpine meadows and subalpine zones of the Himalayas. It thrives in open grasslands, forest edges, and areas with moderate sunlight and cool temperatures. The plant is adapted to grow in soils rich in organic matter, typically derived from decomposed vegetation, which enhances its nutrient content and medicinal properties.⁸

Cultivation and Collection



The cultivation of Ativisha is challenging due to its specific environmental requirements and slow growth rate. Efforts have been made to cultivate the plant in controlled conditions to meet the increasing demand in the pharmaceutical and Ayurvedic industries. Cultivation typically involves seed propagation or root division, with sandy-loam soils being preferred. The plant is collected during the late autumn or early winter when the tuberous roots, the primary source of medicinal compounds, are mature. Sustainable harvesting practices are essential to prevent overexploitation, as the plant is considered threatened in many regions.⁹

Botanical Description

Ativisha is a perennial herb that grows to a height of approximately 30–60 cm. The plant has tuberous roots that are spindle-shaped, light brown on the exterior, and creamy white inside. The stem is erect, slender, and branched, while the leaves are alternate, deeply lobed, and heteromorphic—varying in shape and size. The flowers are pale blue or purplish, arranged in racemes, and bloom during the late summer months. The fruit is a follicle containing numerous seeds, which are small, blackish-brown, and angular in shape.¹⁰

Traditional Uses

In Ayurveda, Ativisha is regarded as one of the most potent herbs for digestive ailments. It is traditionally used to treat conditions like dyspepsia, diarrhea, vomiting, and abdominal pain. It is also valued for its antipyretic, anti-inflammatory, and analgesic properties. Ativisha is a common ingredient in herbal formulations for respiratory conditions such as cough, asthma, and bronchitis. Additionally, it is employed in pediatric care for managing fever, indigestion, and infections. Its bitter and astringent properties make it an effective remedy for expelling intestinal parasites and detoxifying the body.¹¹

Pharmacological Uses

Modern pharmacological studies have validated many traditional claims regarding Ativisha. The plant exhibits significant anti-inflammatory, analgesic, antipyretic, and antimicrobial properties. It has been shown to possess potent gastroprotective activity, making it useful for managing peptic ulcers and gastritis. Furthermore, it demonstrates immunomodulatory effects, enhancing the body's resistance to infections. The alkaloids present in Ativisha contribute to its antioxidant and hepatoprotective actions. It is also being explored for its potential antidiabetic, anticancer, and neuroprotective activities, broadening its scope of therapeutic applications.²² Through its diverse medicinal attributes, Ativisha continues to hold a vital position in traditional and modern healthcare systems, warranting further exploration for its phytochemical and pharmacological potential.

MATERIALS AND METHODS:

Collection and Authentication of Plant Material

The medicinal roots of *Aconitum heterophyllum* were collected from the botanical garden of Radheya Charitable Trust's Dinesh Bembade College of Pharmacy, located in Mahalangra, Tq. Chakur, Latur, Maharashtra. The collected plant material was authenticated and confirmed by a qualified botanist. A voucher specimen was prepared and stored for future reference and documentation purposes, ensuring traceability and verification of the plant material used in the study.

Standard Drug

The standard drug used in this study was Omez 20 Tablet (Omeprazole 20 mg), an allopathic formulation manufactured by Dr. Reddy's Laboratories, Baddi-Solan, Himachal Pradesh. Omeprazole is widely utilized in the treatment of peptic ulcers and acidity due to its potent proton pump inhibitory action, which reduces gastric acid secretion.

Other Chemicals



The chemicals used in this study included ethanol (90%), anesthetic ether, hydrochloric acid (HCl), 0.1N sodium hydroxide (NaOH), phenolphthalein indicator, and formal saline. These were procured from Loba Chemicals Ltd., Mumbai, Maharashtra. All chemicals and reagents were of analytical grade, ensuring the precision and reliability of experimental outcomes. Solutions and preparations involving these chemicals were freshly prepared immediately prior to use to maintain their effectiveness and integrity during the experiments.

METHODS

Extraction Method

The extraction of *Aconitum heterophyllum* roots was carried out using the Soxhlet extraction method with ethanol as the solvent. The collected roots were first air-dried under shade at room temperature to preserve their phytochemical integrity and then milled into a coarse powder. This powdered material was packed into a thimble made from Whatman filter paper and subjected to continuous extraction using 80% ethanol in a Soxhlet apparatus for 40 cycles. The ethanolic extract obtained was concentrated to dryness using a flash evaporator under reduced pressure and controlled temperature to prevent thermal degradation of the bioactive compounds.^{13-14,27} The extraction process yielded 10.73 % of a thick, brown, sticky paste. This residue was stored in a refrigerator to maintain its stability and was reconstituted with gum acacia prior to administration during experimental procedures. This method ensured efficient extraction of the phytoconstituents, providing a reliable preparation for subsequent pharmacological evaluation.

Experimental Animals

The study was conducted using albino Wistar rats weighing 150–200 g, sourced from the animal house of the Department of Pharmacology. Prior to the experiment, all animals were acclimatized to the laboratory environment under controlled

conditions. They were housed in standard cages and maintained on a 12-hour light/dark cycle. The rats were provided with a standard pellet diet and tap water ad libitum to ensure optimal nutrition and hydration.¹⁵⁻¹⁶ The care, handling, and experimental procedures involving the animals adhered to internationally accepted guidelines for the ethical use of laboratory animals, as stipulated by the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA). Ethical clearance and approval for the study were obtained from the Institutional Animal Ethics Committee (IAEC), ensuring that all protocols complied with animal welfare regulations.²⁷

Selection of Animal Species and Housing

Female albino Wistar rats were selected for the acute toxicity study due to their heightened sensitivity compared to male rats, making them more suitable for assessing toxicity. The rats were housed individually in standard laboratory cages at least five days prior to the commencement of the study, allowing acclimatization to the experimental environment. The animals were maintained at a temperature of $22 \pm 3^\circ\text{C}$ under a controlled 12-hour light/dark cycle. They were provided free access to a standard pellet diet and water to ensure proper nutrition and hydration throughout the study.¹⁷⁻²⁰

Acute Oral Toxicity Study

To determine the appropriate dose range for the ethanolic root extract of *Aconitum heterophyllum*, an acute oral toxicity study was conducted following OECD guidelines No. 425. The study was performed in compliance with CPCSEA standards. Doses of 250 mg/kg, 500 mg/kg, 1000 mg/kg, 1500 mg/kg, and 2000 mg/kg of the extract were administered orally. The animals were closely observed for signs of toxicity or mortality for 48 hours and periodically for up to 14 days.²¹⁻²³ No toxic symptoms or mortality were observed at any dose, indicating that the median lethal dose



(LD₅₀) of the extract is greater than 2000 mg/kg. Based on this data, three experimental doses were selected for further study: 225 mg/kg (low dose), 450 mg/kg (medium dose), and 900 mg/kg (high dose).

Preparation of Doses

Fresh aqueous solutions of the root extract were prepared before each study session. The doses were administered in a consistent volume, with the concentration of the extract adjusted to achieve the desired dosage. This ensured uniformity and accuracy in the administration of the test compound.²⁴

Test Procedure

The extract was administered to the animals using oral gavage. Prior to dosing, the rats were fasted overnight, though water was made available. After determining the fasted body weight, the dose was calculated accordingly. Following the administration of the extract, food was withheld for an additional 3–4 hours to standardize absorption. For the limit test, a 2000 mg/kg dose was given to one animal, which was observed for mortality over a 48-hour period. As the animal survived, the test was expanded to include four more animals. In the main test, doses of 250, 500, 1000, and 1500 mg/kg were administered one at a time, with animals observed for toxic symptoms initially for 1 hour, then every 4 hours, and periodically over 14 days.²⁵

Selection of Dose Groups

The acute toxicity data confirmed that the LD₅₀ of the ethanolic root extract of *Aconitum heterophyllum* exceeds 2000 mg/kg. Based on these results, 225 mg/kg was selected as the low dose for evaluation, with medium and high doses set at 450 mg/kg and 900 mg/kg, respectively. The antiulcer efficacy of the low dose was confirmed in preliminary studies, supporting the selection of these dose levels for further investigation.²⁶

Determination of Antiulcer Activity

The antiulcer potential of the ethanolic root extract was evaluated using an ethanol-induced ulcer model in albino Wistar rats (150–250 g, either sex). This model is widely recognized for assessing gastric ulceration caused by ethanol's direct damaging effects on the gastric mucosa.

Ethanol-Induced Ulcer

The animals were divided into five groups (n = 6 per group) and fasted for 24 hours prior to the experiment. Each group received the following treatments orally:

Group 1 (Negative Control): Ethanol (ulcer-inducing agent) + vehicle (10 ml/kg).

Group 2 (Standard Control): Ethanol + Omeprazole (20 mg/kg).

Group 3 (Low Dose): Ethanol + 225 mg/kg ethanolic root extract (ERAH).

Group 4 (Medium Dose): Ethanol + 450 mg/kg ERAH.

Group 5 (High Dose): Ethanol + 900 mg/kg ERAH. After 60 minutes of the respective treatments, all groups received 1 ml of ethanol solution orally to induce gastric ulcers. One hour later, the animals were sacrificed, and their stomachs were excised for evaluation.²⁷⁻³⁰

Gastric Damage Evaluation

Gastric damage was assessed by scoring ulcer severity, providing a quantitative measure of the protective effect of the ethanolic root extract. The results were compared across all groups to determine the extract's efficacy at different dose levels in mitigating ethanol-induced gastric ulcers.³¹⁻³³

Ulcer Scoring

Ulcer severity was assessed using a scoring system based on the observed gastric lesions. Each score corresponded to a specific observation as outlined below:^{34,37}

0: Normal, no ulceration.

0.5: Red coloration of the gastric mucosa.

1: Presence of spot ulcers.

1.5: Hemorrhagic streaks.



2: Deep ulcers.

3: Perforations.

Determination of Ulcer Index

The ulcer index (UI) was calculated to quantify the extent of gastric damage across experimental groups. The mean ulcer score for each group was derived to represent the ulcer index.³⁸

Percentage Inhibition of Ulceration

The percentage inhibition of ulceration, indicating the protective efficacy of treatments, was calculated

Determination of Total Acidity

The stomach contents were collected and centrifuged at 3000 rpm for 10 minutes. Total acidity of the gastric secretions was measured by titration with 0.01 N NaOH using phenolphthalein as an indicator.^{39,27}

Determination of Gastric pH

The pH of the gastric secretions was recorded using a calibrated pH meter. This provided an additional parameter to evaluate the gastric environment and the protective effect of treatments.^{40,41,27}

Statistical Analysis

The data were presented as mean $\pm$ SEM and analyzed using one-way ANOVA followed by Dunnett's post-hoc test. One-way ANOVA was used to compare the means of multiple groups, and Dunnett's test was applied for comparisons with the control group. A p-value of less than 0.05 was considered statistically significant.

RESULT AND DISCUSSIONS:

Physicochemical Analysis

The physicochemical analysis of the ethanolic extract of *Aconitum heterophyllum* provided valuable insights into its properties. The extract appeared as a brown, thick, sticky paste, indicating a concentrated form. The loss on drying was found to be 10.5%, suggesting the extract retained a reasonable amount of moisture after drying, which

could influence its storage and stability. The total ash content was recorded at 2.2%, indicating the inorganic matter present in the sample, which is typical for plant extracts. The water-soluble ash was 1.5%, showing the presence of soluble minerals in the extract. In contrast, the alcohol-soluble extractive was 14.8%, indicating a significant portion of the plant's active compounds were extractable using ethanol. This was higher than the water-soluble extractive, which was 7.4%, reflecting the varying solubility of the phytochemicals in different solvents.

The pH of the extract was found to be 5.6, suggesting a mildly acidic nature, which could affect its formulation for oral or topical applications. The tannin content was determined to be 8.2%, which is significant, as tannins are known for their astringent properties and potential therapeutic effects. The flavonoid content, another important bioactive component, was recorded at 5.1%, suggesting moderate levels of these compounds, which are known for their antioxidant and anti-inflammatory properties. Similarly, the phenolic content was 6.8%, reinforcing the extract's potential as an antioxidant agent. The moisture content of the extract was 5.4%, which is typical for dried plant extracts and indicates a balanced moisture level that should support the extract's stability during storage. The viscosity of the extract was found to be 450 cps, which may be relevant for its formulation into various dosage forms like gels or suspensions. Finally, the solubility tests revealed that the ethanolic extract is soluble in both water and ethanol, which supports its versatility for different pharmaceutical applications. Overall, these results suggest that the ethanolic extract of *Aconitum heterophyllum* has promising physicochemical properties that could be leveraged for its potential therapeutic uses.



Table 1: the physicochemical parameters evaluation of the ethanolic extract of *Aconitum heterophyllum*.

Physicochemical Parameter	Method Used	1. Result
Appearance	Visual inspection	Brown, thick, sticky paste
Loss on Drying	Drying at 105°C	10.5 %w/w
Total Ash Content	Incineration at 600°C	2.2 % w/w
Water Soluble Ash	Water extraction and drying	1.5 % w/w
Alcohol Soluble Extractive	Ethanol extraction	14.8 % w/w
Water Soluble Extractive	Water extraction	7.4 % w/w
pH of the Extract	2. pH meter	5.6
Determination of Tannin Content	Colorimetric method	8.2 % w/w
3. Flavonoid Content	Spectrophotometric	5.1 % w/w
Phenolic Content	Folin-Ciocalteu method	6.8 % w/w
Moisture Content	Loss on drying at 60°C	5.4 % w/w
Viscosity	Viscometer	450 cps
Solubility in Water	Solubility test	Soluble
Solubility in Ethanol	Solubility test	Soluble

Phytochemical Analysis

The phytochemical analysis of the ethanolic extract of *Aconitum heterophyllum* revealed the presence of several bioactive compounds with significant therapeutic potential. Alkaloids, known for their pharmacological effects, were detected in the extract, suggesting a possible contribution to its medicinal properties. Tannins were present at a notable concentration of 8.2%, which is often associated with antioxidant, antimicrobial, and anti-inflammatory activities. Flavonoids, another group of bioactive compounds, were found at 5.1%, indicating their potential role in reducing oxidative stress and supporting overall health benefits. The presence of phenolic compounds (6.8%) further supports the antioxidant potential of the extract. While saponins and steroids were

absent, the extract contained glycosides, which are known for their cardiovascular and anti-inflammatory effects. Terpenoids, which play a role in anti-inflammatory and antimicrobial activities, were also present, contributing to the overall therapeutic profile. Additionally, the extract showed the presence of resins, carbohydrates, proteins, and fatty acids, all of which may have roles in the extract's bioactivity, including wound healing, immune modulation, and cellular repair. These findings suggest that the ethanolic extract of *Aconitum heterophyllum* is rich in various phytochemicals, many of which are known for their pharmacological effects, supporting its use in traditional medicine and potential for further therapeutic applications.

Table 2: phytochemical analysis of the ethanolic extract of *Aconitum heterophyllum*

Phytochemical Compound	Observation/Result
Alkaloids	Present
Tannins	Present
Flavonoids	Present
Phenolic Compounds	Present
Saponins	Absent
Glycosides	Present



Steroids	Absent
Terpenoids	Present
Resins	Present
Carbohydrates	Present
Proteins	Present
Fatty Acids	Present

Pharmacological Study Ethanol Induced Ulcer

The results of the mean ulcer scores in the ethanol-induced ulcer model are summarized in Table 3. The control group, which received a 10 ml/kg dose of the vehicle, exhibited a mean ulcer score of 2.25 ± 0.25 , indicating substantial ulceration. In contrast, the group treated with Omeprazole (20 mg/kg), a standard antiulcer drug, showed a significant reduction in ulcer score, with a mean value of 0.83 ± 0.16 ($p < 0.05$), suggesting its effective antiulcer activity. The groups treated with varying doses of the ethanolic root extract of *Aconitum heterophyllum* (ERAH) showed a dose-dependent improvement in ulcer score. The group receiving 225 mg/kg of ERAH demonstrated a

mean ulcer score of 1.75 ± 0.11 , which was not significantly different (ns) from the control group. Similarly, the 450 mg/kg ERAH group had a mean score of 1.66 ± 0.16 , with no significant difference from the control. However, the group treated with the highest dose of ERAH (900 mg/kg) exhibited a mean ulcer score of 1.25 ± 0.21 ($p < 0.05$), which was significantly lower than the control, indicating that this dose of ERAH has a noteworthy antiulcer effect. Overall, while the ethanolic extract of *Aconitum heterophyllum* demonstrated some efficacy, its effects were less pronounced than Omeprazole, and its activity appeared to be dose-dependent.

Table 3: Mean Ulcer Score in Ethanol-Induced Ulcer Model

Treatment Group	Dose (mg/kg)	Mean Ulcer Score
Control Group	10 ml/kg	2.25 ± 0.25
Omeprazole	20 mg/kg	$0.83 \pm 0.16^{***}$
ERAH (Ethanolic Root Extract of Aconitum Heterophyllum)	225 mg/kg	1.75 ± 0.11 ns
ERAH (Ethanolic Root Extract of Aconitum Heterophyllum)	450 mg/kg	1.66 ± 0.16 ns
ERAH (Ethanolic Root Extract of Aconitum Heterophyllum)	900 mg/kg	$1.25 \pm 0.21^{**}$

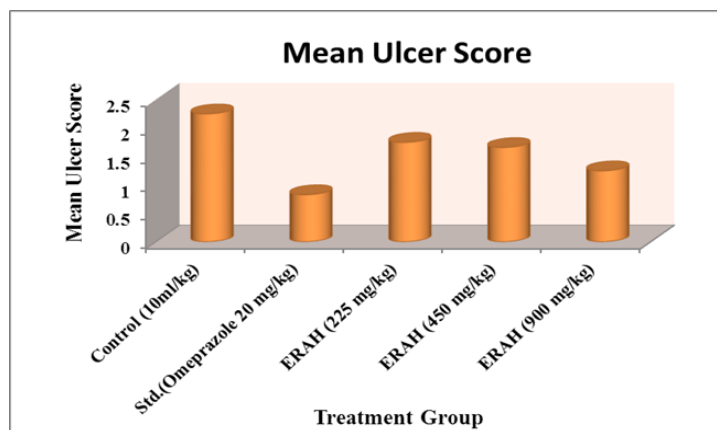


Figure 1: Mean Ulcer Score

Ulcer Index And % Inhibition Of Ulcer

The ulcer index and percentage inhibition of ulceration were assessed in an ethanol-induced ulcer model, with the results presented in Table 4. The control group, which received only the vehicle (10 ml/kg), had the highest ulcer index at 10.74, with a mean ulcer score of 2.25 ± 0.25 and an incidence of ulcers in 100% of the animals. This group showed no inhibition of ulceration. The standard group, treated with Omeprazole (20 mg/kg), demonstrated a significant reduction in both the mean ulcer score (0.83 ± 0.16) and ulcer index (3.46), reflecting an inhibition of 67.78%. The incidence of ulcers was reduced to 33.33%, showing Omeprazole's effectiveness in preventing ulcer formation. The ethanolic root extract of *Aconitum heterophyllum* (ERAH) was evaluated at three different doses: 225 mg/kg, 450 mg/kg, and 900 mg/kg. The group treated with 225 mg/kg ERAH showed a mean ulcer score of 1.75 ± 0.11 ,

and an ulcer index of 10.55, with 100% incidence of ulcers. However, this group demonstrated only a slight reduction in ulceration (1.76% inhibition), which was not statistically significant. In contrast, the 450 mg/kg ERAH group had a significantly lower mean ulcer score of 1.66 ± 0.16 and an ulcer index of 10.29, showing a modest inhibition of ulceration (4.18%). The 900 mg/kg ERAH group showed more pronounced effects, with a mean ulcer score of 1.25 ± 0.21 and a reduction in ulcer index to 8.54, corresponding to a 20.48% inhibition of ulceration. Additionally, this group showed a reduced incidence of ulcers (83.33%) compared to the control group. Overall, while the 900 mg/kg dose of ERAH showed the most significant improvement in both ulcer score and ulcer index, indicating a potential for antiulcer activity, the lower doses of 225 mg/kg and 450 mg/kg were less effective, especially in terms of ulcer inhibition.

Table 4: Observation table for Ulcer Index and % of Inhibition in Ethanol induced ulcer.

Group	Treatment	Ulcer Number	Meanulcer score	Incidence of ulcers (%)	Ulcer Index	% Of Inhibition
Control	Vehicle 10 ml/kg	5.16 $\pm$ 0.477	2.25 $\pm$ 0.25	100 %	10.74	-
Standard	Omeprazole 20mg/kg	0.50 $\pm$ 0.341***	0.83 $\pm$ 0.16***	33.33 %	3.46	67.78
ERAH	225 mg/kg	3.83 $\pm$ 0.401 ns	1.75 $\pm$ 0.11 ns	100 %	10.55	1.76
ERAH	450 mg/kg	1.33 $\pm$ 0.21***	1.66 $\pm$ 0.16 ns	100 %	10.29	4.18
ERAH	900 mg/kg	0.83 $\pm$ 0.166***	1.25 $\pm$ 0.21**	83.33 %	8.54	20.48

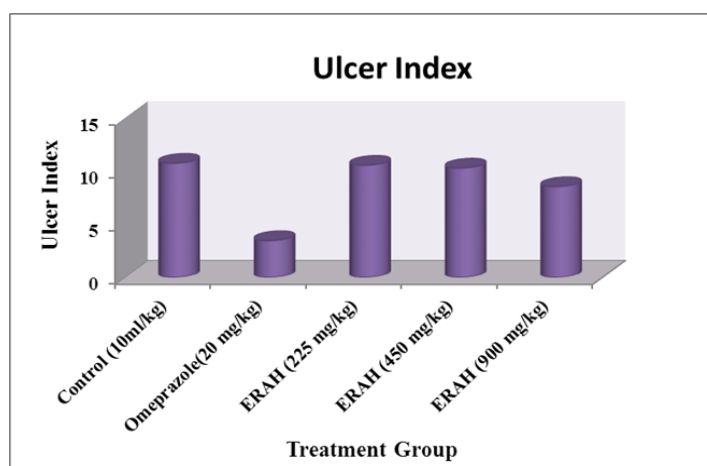


Figure 2: ulcer Index in Ethanol induced ulcer.

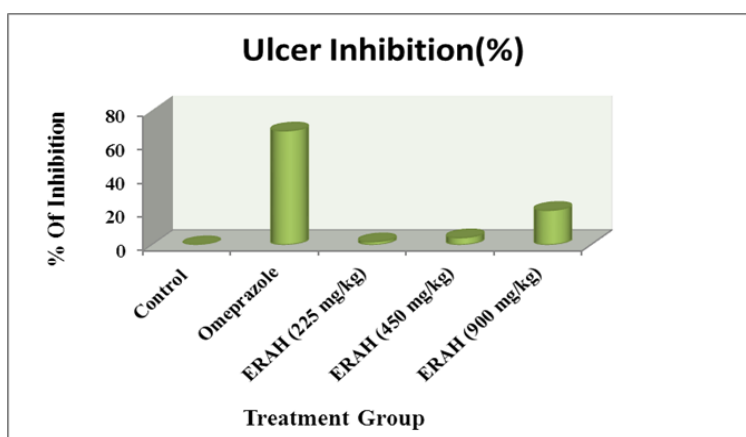


Figure 3: % Inhibition of Ulcer in Ethanol induced ulcer

Determination Of Ph And Total Acidity

The pH, free acidity, and total acidity of gastric contents were evaluated in an ethanol-induced ulcer model, and the results are summarized in Table 5. The control group, which received only the vehicle, exhibited a very low pH of 1.36 ± 0.049 , indicating high acidity in the stomach. Additionally, the free acidity and total acidity in the control group were found to be 33.33 ± 0.66 Meq/L and 84.83 ± 1.19 Meq/L, respectively, suggesting a high gastric acid secretion. In contrast, the Omeprazole-treated group (20 mg/kg), which served as the standard treatment, showed a significant increase in pH (2.85 ± 0.089) and a substantial reduction in both free acidity (19.00 ± 0.68 Meq/L) and total acidity (45.67 ± 0.91 Meq/L). This indicates that Omeprazole effectively reduces gastric acid secretion and increases the pH, which contributes to its ulcer-healing properties. The ethanolic root extract of *Aconitum heterophyllum* (ERAH) at different

doses also influenced gastric acidity, though to varying extents. The 225 mg/kg ERAH group showed a moderate increase in pH (2.36 ± 0.045) and a reduction in both free acidity (26.83 ± 0.60 Meq/L) and total acidity (61.67 ± 0.95 Meq/L), suggesting that the extract has some ability to moderate gastric acid levels. The 450 mg/kg and 900 mg/kg ERAH groups similarly showed increases in pH (2.66 ± 0.072 and 2.75 ± 0.068 , respectively) and reductions in free and total acidity (24.50 ± 0.88 Meq/L and 22.67 ± 0.71 Meq/L for free acidity; 49.00 ± 1.15 Meq/L and 48.67 ± 0.61 Meq/L for total acidity), although these effects were less pronounced than those observed with Omeprazole. Overall, the data suggest that ERAH has a dose-dependent effect on gastric acidity, with higher doses showing more significant reductions in both free and total acidity. These results indicate that ERAH may help reduce gastric acid secretion, which could contribute to its potential antiulcer activity.

Table 5: Observation of pH, Free Acidity, Total Acidity

Treatment group	PH	Free acidity Meq/L	Total acidity Meq/L
Control group	$1.36 \pm 0.049^{**}$	33.33 ± 0.66	84.83 ± 1.19
Omeprazole (20 mg/kg)	$2.85 \pm 0.089^{**}$	$19.00 \pm 0.68^{***}$	$45.67 \pm 0.91^{***}$
ERAH(225mg/kg)	$2.36 \pm 0.045^{**}$	$26.83 \pm 0.60^{***}$	$61.67 \pm 0.95^{***}$
ERAH(450mg/kg)	$2.66 \pm 0.072^{**}$	$24.50 \pm 0.88^{***}$	$49.00 \pm 1.15^{***}$
ERAH(900mg/kg)	$2.75 \pm 0.068^{**}$	$22.67 \pm 0.71^{***}$	$48.67 \pm 0.61^{***}$

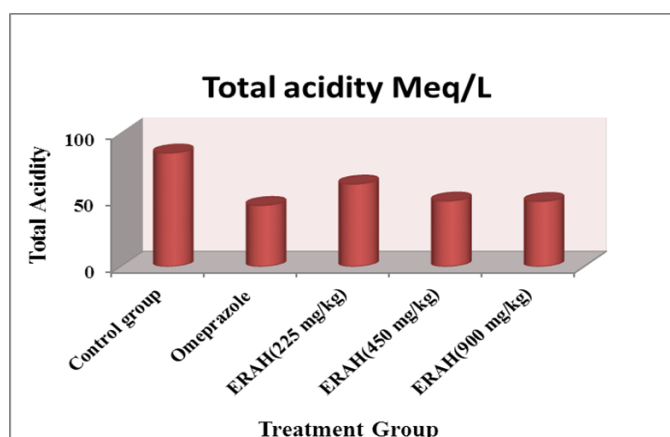


Figure 4: Total Acidity

CONCLUSION:

The ethanolic root extract of *Aconitum heterophyllum* (ERAH) demonstrated promising antiulcer activity in the ethanol-induced ulcer model. The results of the ulcer score, ulcer index, and percentage inhibition of ulceration suggest that ERAH has a significant protective effect against gastric ulcers, particularly at higher doses (450 mg/kg and 900 mg/kg). ERAH exhibited a dose-dependent effect on reducing ulcer severity, with the highest dose showing a notable reduction in both ulcer score and ulcer index. In terms of gastric acidity, ERAH significantly increased the pH and reduced both free and total acidity in the stomach. These effects were comparable to the standard antiulcer drug, Omeprazole, which also effectively increased gastric pH and reduced acidity. Notably, ERAH at higher doses demonstrated a more substantial effect on lowering gastric acidity, supporting its potential as a therapeutic agent for ulcer prevention and treatment. The findings suggest that *Aconitum heterophyllum* contains bioactive compounds that could modulate gastric acid secretion and contribute to ulcer healing, making it a potential candidate for further investigation as a natural remedy for gastric ulcers. However, further studies are needed to explore the underlying mechanisms and to evaluate the long-term safety and efficacy of ERAH in clinical settings.

Conflict Of Interest:

The authors declare that there is no conflict of interest regarding the publication of this research.

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HOW TO CITE: Vishnu Patil*, Mahesh Dhumal, Shantanu Mane, Evaluation Of Antiulcer Activity of *Ativisha* by Ethanol Induced Model on Experimental Animal, Int. J. of Pharm. Sci., 2024, Vol 2, Issue 11, 1603-1615. <https://doi.org/10.5281/zenodo.14243215>

