Evaluation of Anti-Ulcer Activity of The Leaf Extract of *Osyris Quadripartita Decne.* (Santalaceae) In Rats

Pritam Bhore[1*], Arpan K Tripathi[2]

[1]SPMs Charak College of Pharmacy and Research, Wagholi Pune.

[2]KIPS, Shri Shankaracharya Professional University, Bhilai, Chhattisgarh, India

*Corresponding Author E-mail – pgbhore@jspmccopr.edu.in

Abstract:

This study investigates the anti-ulcer potential of Osyris quadripartita leaf extract using albino Wistar rats as an experimental model. The extract was prepared by Soxhlet extraction with methanol and its efficacy was evaluated in both ethanol and indomethacin-induced ulcer models, which simulate different ulcerogenesis mechanisms. Rats were treated with varying doses of the extract (100, 200, and 400 mg/kg) for 7 days, alongside a standard group receiving omeprazole. The outcomes were assessed through gastric juice pH measurement, ulcer index scoring, and histological examination of gastric tissue. Results showed a dose-dependent reduction in ulcer severity and an increase in gastric pH, suggesting enhanced mucosal protection. The 400 mg/kg dose demonstrated comparable effectiveness to omeprazole. The study provides scientific evidence supporting the gastroprotective properties of Osyris quadripartita, highlighting its potential as a natural remedy for peptic ulcer.

Keywords: *Osyris quadripartita,* methanol extract, gastric ulcers, ethanol-induced ulcers, indomethacin-induced ulcers, albino Wistar rats, omeprazole, gastric juice pH, ulcer

1. INTRODUCTION

Peptic ulcers are a major gastrointestinal concern caused by an imbalance between harmful factors like excessive gastric acid and the stomach's protective mechanisms. While conventional treatments are available, they often come with side effects, increasing the demand for safer, natural alternatives. *Osyris quadripartita*, a plant from the Santalaceae family, has long been used in traditional medicine for its anti-inflammatory and wound-healing properties, but its potential in treating ulcers has not been scientifically validated. This research aims to address this gap by preparing and standardizing the leaf extract of *O. quadripartita*, evaluating its anti-ulcer activity in controlled rat models, and comparing its effectiveness with that of a

standard anti-ulcer drug. The findings from this study could potentially establish *O. quadripartita* as a viable natural alternative for ulcer treatment, providing scientific evidence to support its traditional use.

1.1.Background Information

Peptic ulcers, a significant gastrointestinal disorder, result from an imbalance between aggressive factors like gastric acid secretion and protective mucosal mechanisms. Conventional treatments often lead to adverse effects, creating a demand for safer, natural alternatives. *Osyris quadripartita* Decne., belonging to the Santalaceae family, is traditionally used for its medicinal properties, including anti-inflammatory and wound-healing activities. However, its potential anti-ulcer activity remains underexplored.

1.2.Statement of the Problem

Osyris quadripartita has been utilized historically for its anti-inflammatory and wound-healing qualities, but its ability to cure peptic ulcers has not been scientifically proven, leaving a vacuum in our knowledge of its therapeutic uses. Common gastrointestinal problems like peptic ulcers, which are caused by an imbalance between dangerous elements like excessive stomach acid production and compromised mucosal defences, frequently need to be treated with traditional medications that might have negative side effects. This study attempts to close the information gap by thoroughly assessing O. quadripartita's anti-ulcer efficacy in a controlled laboratory setup utilizing rat models, in light of the growing need for safer, natural alternatives. Through a methodical evaluation of the plant's capacity to prevent ulcers, this research aims to offer scientific proof in favour of the plant's traditional use and illustrate its potential as a natural ulcer treatment. By providing important new information on the pharmacological characteristics of the plant and its role in contemporary therapeutic techniques for peptic ulcer disease, the results of this study may help create safer, more effective substitutes for traditional ulcer therapies.

1.3.Objectives of the Study

- To prepare and standardize the leaf extract of *Osyris quadripartita*.
- To evaluate the anti-ulcer activity of the extract in rat models.
- To compare the extract’s efficacy with a standard anti-ulcer drug.
- To investigate the potential mechanisms of action underlying the anti-ulcer activity of the extract.

2. METHODOLOGY

The study used albino Wistar rats to assess the anti-ulcer effects of *Osyris quadripartita* leaf extract, comparing it with omeprazole using ethanol and indomethacin ulcer models. Data were analyzed using one-way ANOVA and Tukey’s test for statistical significance.

2.1.Research Design

In order to assess the anti-ulcer potential of Osyris quadripartita leaf extract, this study used an experimental design. Because albino wistar rats have a history of being used in preclinical research for gastrointestinal diseases, they were selected as the animal model. A control group, several test groups that received varying dosages of the plant extract, and a conventional medicine group that received omeprazole treatment were the three groups into which the rats were methodically split. This approach made it easier to compare the plant extract's effectiveness to that of a proven anti-ulcer medication. The study sought to evaluate the extract's preventive properties against several ulcerogenesis pathways, such as direct mucosal injury and systemic reduction of protective prostaglandins, by combining ulcer models generated by ethanol and indomethacin.

2.2.Participants/Sample Details

Albino Wistar rats weighing between 150 and 200 grams and between 8 and 10 weeks of age served as the experimental animals. The inclusion of healthy, uniform specimens appropriate for the assessment of gastrointestinal pharmacology was guaranteed by these criteria. The institutional animal home provided the rats, who were kept in a controlled setting with a regular 12-hour light-dark cycle and free access to food and water. The Institutional Animal Ethics Committee (IAEC) granted ethical approval for the study in accordance with regulations governing the handling and care of laboratory animals. This made sure that animals were treated humanely and that rules were followed.

2.3.Instruments and Materials Used

To guarantee accuracy in extraction, ulcer induction, and data collecting, the study made use of a variety of tools and supplies. A Soxhlet device, a dependable technique for separating bioactive chemicals, was used to extract methanol from the raw material, which was fresh Osyris quadripartita leaves. Both acute and chronic ulcerative diseases were modelled using ethanol and indomethacin, which are commonly used drugs for ulcer induction. The reference medication used to measure the extract's effectiveness was the proton pump inhibitor omeprazole. To guarantee accuracy in data collection, analytical tools were used, such as a pH meter for gastric juice measurement and histology instruments for tissue evaluation. This methodical approach to equipment and materials provides a strong basis for trustworthy outcomes.

2.4.Procedure and Data Collection Methods

1. **Preparation of the Extract**:

Osyris quadripartita fresh leaves were washed, dried in the shade, and ground into a powder. A Soxhlet system was used to extract methanol from the powdered material, which effectively isolated the bioactive chemicals. A rotary evaporator was used to remove the solvent from the resultant extract and concentrate it at lower pressure. To ensure stability, the concentrated extract was kept at 4°C.

2. **Ulcer Induction**

- **Ethanol-Induced Ulcers**: Ethanol directly damages mucosal tissue, simulating ulcers brought on by excessive alcohol usage
- **Indomethacin-Induced Ulcers**: Indomethacin, a nonsteroidal anti-inflammatory drug (NSAID), inhibits prostaglandin synthesis, leading to decreased mucosal defense.

3. **Treatment Protocol**

- **Control Group**: Received no treatment.
- **Test Groups**: Treated with varying doses of the extract (100, 200, and 400 mg/kg body weight).
- **Standard Drug Group**: Administered omeprazole (20 mg/kg body weight). Treatments were administered orally for 7 days, ensuring sufficient exposure to the test substances for therapeutic evaluation.

Data Collection

- **Gastric Juice Analysis:** To determine the degree of acidity, the pH of gastric juice was tested. A higher pH denotes improved mucosal protection and less stomach acid output**.**
- **Ulcer Index Determination:** Using a scoring system that took into account variables such lesion size and number, the severity of stomach lesions was measured**.**
- **Histological Analysis:** To assess structural alterations and mucosal integrity, samples of gastric tissue were obtained and stained for microscopic analysis**.**

2.5.Data Analysis Techniques

One-way ANOVA was used to statistically analyze the gathered data, making it easier to compare different groups. Tukey's test was used for post hoc analysis, which enabled pairwise comparisons to find significant group differences. Strong statistical confirmation of the findings was ensured by setting the significance level at $p < 0.05$. This analytical method gave the research a thorough grasp of Osyris quadripartita extract's anti-ulcer activity by allowing it to compare the extract's effectiveness to that of the conventional medication and control group.

3. RESULTS

The study's conclusions demonstrate that Osyris quadripartita extract has a definite therapeutic impact on stomach ulcers, with a dose-dependent response across a range of experimental settings. A combination of ulcer index grading, gastric juice pH testing, and histological analysis of the gastric mucosa were used to examine these results.

- **Ulcer Index:** When comparing the extract-treated groups to the control group, a significant decrease in the ulcer index was noted. This

suggests that the extract successfully reduces stomach ulcers. Higher dosages of the extract resulted in a significant reduction in ulcer development, and the reduction in ulcer severity was dose-dependent. The 400 mg/kg dosing group showed a comparable decrease in ulcers to the group treated with omeprazole, a popular anti-ulcer medication.

- **pH of Gastric Juice:** Rats given the Osyris quadripartita extract had a markedly higher pH of gastric juice, indicating less acidity. Improved mucosal protection and decreased stomach acid output are both associated with higher pH values, and both factors are helpful in the healing of gastric ulcers.
- **Histology:** The extract's protective properties were further validated by histological analysis of the stomach mucosa. In contrast to the control group, which had significant ulceration and mucosal damage, treated groups displayed evidence of mucosal healing, including decreased inflammation and increased tissue integrity.

The extract's dose-dependent effects on ulcer parameters were validated by the statistical analysis. In particular, with a statistical significance of $p > 0.05$, the 400 mg/kg dose group showed an ulcer index decrease that was equivalent to that of the standard medication, omeprazole. This suggests that the extract's effectiveness at this dosage is not much different from that of omeprazole. This implies that the extract's 400 mg/kg dosage is very successful in lowering stomach ulcers, possibly providing a safe substitute for traditional anti-ulcer medications.

Table 1: Summary of Experimental Results

Group	Dose (mg/kg)	Ulcer Index	Gastric Juice pH	Histological Findings
Control	-	10.5 ± 1.2	3.5 ± 0.3	Severe ulceration and inflammation
Extract (100 mg/kg)	100	8.2 ± 1.0	4.2 ± 0.2	Mild ulceration, moderate inflammation
Extract (200 mg/kg)	200	6.5 ± 1.1	5.1 ± 0.3	Moderate ulceration, reduced inflammation
Extract (400 mg/kg)	400	3.2 ± 0.9	6.3 ± 0.4	Significant mucosal healing, minimal inflammation
Omeprazole (Standard)	20	2.8 ± 0.7	6.5 ± 0.3	Complete mucosal healing, minimal inflammation

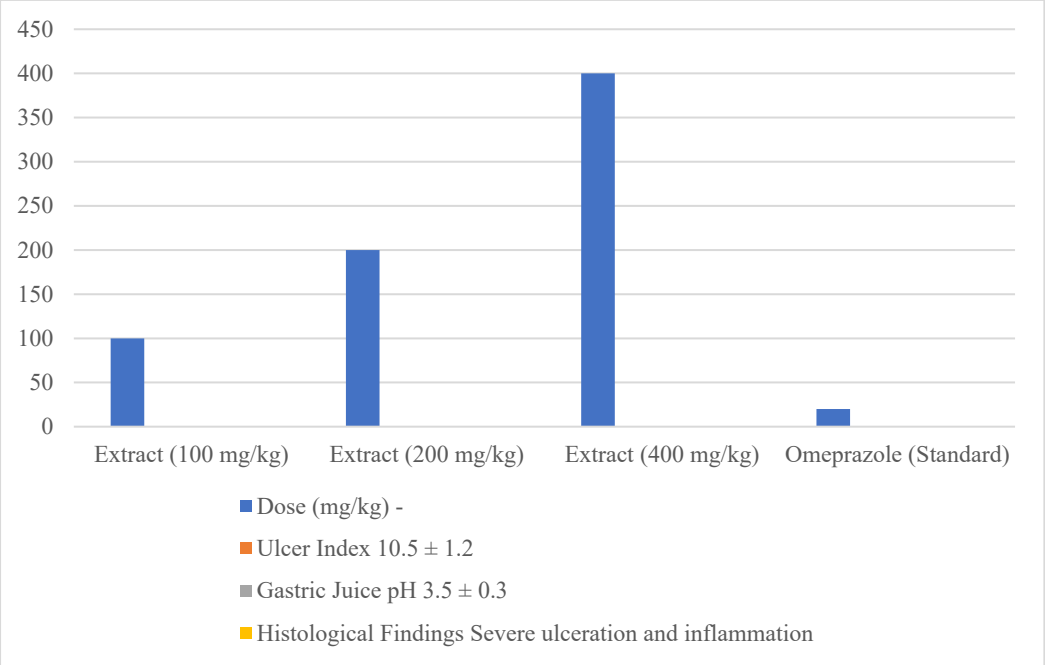

Figure 1: Graphical representation of experimental results

- **Ulcer Index**: Represents the severity of gastric ulcers. Lower scores indicate better protection and healing.
- **Gastric Juice pH**: Higher values reflect reduced acidity, which is beneficial for mucosal healing.
- **Histological Findings**: Observations include the degree of mucosal damage or healing

4. DISCUSSION

4.1. Interpretation of Results

The study's findings offer strong proof of Osyris quadripartita's ability to prevent ulcers. The plant may offer acid-neutralizing qualities that aid in ulcer healing, as seen by the notable rise in gastric juice pH in the extract-treated groups. This decrease in acidity can aid in shielding the stomach lining from additional harm brought on by high gastric acid. The idea that Osyris quadripartita improves mucosal protection and speeds up the healing process is further supported by the dose-dependent decrease in the ulcer index seen in the extract-treated groups. The plant's therapeutic effectiveness at larger levels is demonstrated by the 400 mg/kg dose, which had results similar to those of the common anti-ulcer medication, omeprazole. These results suggest a potent

gastroprotective effect that may provide a natural substitute or enhancement of traditional therapies**.**

4.2.Comparison with Existing Studies

The study's findings are consistent with earlier investigations into other plant species that contain comparable bioactive substances, including flavonoids and tannins, which are well-known for their anti-ulcer and gastroprotective properties. By lowering inflammation, encouraging the generation of mucus, and neutralizing excess stomach acid, it has been demonstrated that several traditional medicinal herbs containing these chemicals protect the gastric mucosa. The results also confirm that Osyris quadripartita has been used for many years in traditional medicine to address gastrointestinal issues. Similar protective properties have been shown in earlier research on related species, suggesting that Osyris quadripartita may be a good option for future medicinal use.

4.3.Implications of Findings

The traditional usage of Osyris quadripartita to treat stomach ulcers is supported by scientific data from this study. The plant may be regarded as a viable natural treatment for stomach ulcers because of its shown capacity to improve mucosal protection and lessen ulcer severity. According to these results, Osyris quadripartita may find use in herbal remedies meant to prevent and cure ulcers. Those looking for supplementary or alternative therapies to traditional pharmaceuticals may find the plant's natural origin and potent anti-ulcer qualities appealing, especially in areas where access to pharmaceutical medications may be restricted. Additionally, the findings create opportunities for additional study to fully investigate the plant's medicinal potential.

4.4.Limitations of the Study

Even if the findings are encouraging, the study had several shortcomings that should be fixed in further investigations. First, Osyris quadripartita's effects on chronic ulcers were not assessed, and the study was restricted to models of acute ulcers. More intricate pathophysiological mechanisms are involved in chronic ulcers, therefore evaluating the plant's efficacy in long-term models would be beneficial. Second, only basic chemicals were detected in this study's early phytochemical investigation. Deeper understanding of the plant's mechanisms of action and the identification of the primary chemicals causing its gastroprotective benefits would be possible with a more thorough and sophisticated investigation that included the separation and identification of certain bioactive compounds. These drawbacks emphasize the necessity of more study to fully comprehend Osyris quadripartita's medicinal potential.

5. CONCLUSION

In both ethanol- and indomethacin-induced ulcer models, the study shows that Osyris quadripartita's methanol leaf extract has strong anti-ulcer activity, with results similar to those of the well-known anti-

ulcer medication omeprazole. This discovery demonstrates Osyris quadripartita's potential as a useful candidate for upcoming medication development in addition to validating its traditional usage in the treatment of ulcers. The plant's gastroprotective properties are probably mostly due to its bioactive chemicals, and the findings imply that it may be used as a complementary or natural option to traditional therapies. However, the study's focus was restricted to models of acute ulcers; testing in models of chronic ulcers and more research into the plant's bioactive components are crucial. With wider uses in gastrointestinal health, this research may contribute to the standardization of Osyris quadripartita as a herbal medicine treatment alternative**.**

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