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ANTI-ULCER POTENTIAL OF *GREWIA TILIFOLIA* ETHANOLIC LEAF EXTRACT AGAINST NSAID-INDUCED GASTRIC ULCERS IN RATS

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ABSTRACT

Peptic ulcer disease (PUD) results from an imbalance between gastric mucosal defense and aggressive factors such as NSAIDs, gastric acid, and *Helicobacter pylori* infection. Due to limitations of synthetic anti-ulcer drugs, plant-based therapies are being explored for safer and holistic management. This study evaluates the anti-ulcer properties of ethanolic leaf extract of *Grewia tilifolia* using an aspirin-induced ulcer model in Wistar rats. Phytochemical screening revealed flavonoids, tannins, alkaloids, saponins, phenols, and triterpenoids, indicating strong antioxidant potential. Acute toxicity study (OECD 425) confirmed safety up to 2000 mg/kg. Rats were treated with extract doses of 200 mg/kg and 400 mg/kg, with omeprazole as standard. Ulcer indices showed significant reduction in treated groups: 27.58% protection (200 mg/kg), 39.84% protection (400 mg/kg), compared with 49.78% by omeprazole. Histopathology showed reduced inflammation, edema, and mucosal disruption. These findings suggest that *Grewia tilifolia* possesses dose-dependent gastroprotective effects through antioxidant, anti-inflammatory, mucus-enhancing, and cytoprotective mechanisms. The plant demonstrates strong potential as a natural alternative for NSAID-induced ulcer management.

KEYWORDS: *Grewia tilifolia*, peptic ulcer, NSAIDs, phytochemicals, omeprazole, gastroprotection.

1. INTRODUCTION

Peptic ulcer disease is a global health concern caused by erosion of gastric or duodenal mucosa due to acid-pepsin aggression. Major etiological factors include *H. pylori* infection, NSAID consumption, stress, smoking, and alcohol. NSAIDs are widely recognized for reducing protective prostaglandins through COX inhibition, making the mucosa vulnerable to acid-induced damage.

Although proton pump inhibitors (PPIs) and H2 blockers are effective, chronic use may lead to adverse effects such as nutrient malabsorption, microbial infections, and renal complications. These limitations have renewed interest in medicinal plants known for their multi-targeted therapeutic actions.

Grewia tilifolia, traditionally used for gastrointestinal ailments, contains flavonoids, tannins, and saponins—phytochemicals known for mucosal protection and antioxidant activity. This study investigates the anti-ulcer efficacy of its ethanolic leaf extract against NSAID-induced gastric ulcers.

2. MATERIALS AND METHODS

2.1 Plant Collection and Authentication

Leaves of *Grewia tilifolia* were collected from Chittoor district, Tirupati, Andhra Pradesh, authenticated, shade-dried, and powdered for extraction.

2.2 Preparation of Ethanolic Extract

Powdered material was subjected to extraction using ethanol. The solvent was distilled off, and a semi-solid extract was obtained at 40°C. Preliminary phytochemical analysis was conducted to determine the presence of active compounds.

2.3 Experimental Animals

Healthy Wistar rats (150–200 g) of both sexes were maintained under controlled conditions:

- Temperature: 24 ± 2°C
- Humidity: 60–70%
- 12-hour light–dark cycle
- Standard pellet diet and water ad libitum.

2.4 Acute Toxicity Study (OECD 425)

Rats were administered 2000 mg/kg of extract orally and observed for 24 hours. No toxicity or mortality was observed, confirming safety for further dosing.

2.5 Phytochemical Screening

Screening revealed presence of.

- Alkaloids
- Flavonoids
- Saponins
- Tannins
- Phenols
- Triterpenoids

Carbohydrates were present, while glycosides and phytosterols were absent.

2.6 Anti-Ulcer Study (Aspirin-Induced Ulcers)

Four groups (n=6 each) were used:

- **Group I:** Control (0.5% CMC)
- **Group II:** Omeprazole 20 mg/kg
- **Group III:** Extract 400 mg/kg
- **Group IV:** Extract 200 mg/kg

All groups received aspirin 200 mg/kg orally to induce ulcers. Treatments were administered 1 hour prior. Animals were sacrificed after 2 hours, and stomach tissues were examined macroscopically and histologically.

2.7 Ulcer Index & Percentage Protection

Ulcer scoring was done using standard criteria.

0 = normal, 0.5 = redness, 1 = spot ulcers, 1.5 = hemorrhagic streaks, 2 = deep ulcers, 3 = perforation.

% Protection = (UI_control – UI_treated) / UI_control × 100

2.8 Histopathology

Tissues were fixed in 10% formalin, sectioned, H&E stained, and examined for ulceration, edema, necrosis, and inflammation.

3. RESULTS

3.1 Phytochemical Composition

Extract contained flavonoids, alkaloids, saponins, tannins, phenols, and triterpenoids—bioactive compounds known for anti-ulcer effects.

3.2 Acute Toxicity

Extract was safe up to 2000 mg/kg with no behavioral or physiological abnormalities.

3.3 Ulcer Index and Protection

Group	Ulcer Index	% Protection
Control	9.14 ± 0.04	—
Omeprazole	4.59 ± 0.06	49.78%
Extract 400 mg/kg	5.5 ± 0.06	39.84%
Extract 200 mg/kg	6.62 ± 0.04	27.58%

3.4 Histopathology Findings

- **Control:** Severe mucosal erosion, edema, and inflammatory infiltration.
- **Omeprazole:** Intact mucosa with minimal inflammation.
- **Extract 400 mg/kg:** Markedly reduced lesions, improved mucosal continuity.
- **Extract 200 mg/kg:** Moderate improvement, reduced inflammatory damage.

4. DISCUSSION

Aspirin-induced ulcers occur through inhibition of protective prostaglandins, increased acid secretion, and oxidative stress. The current study demonstrates that *Grewia tilifolia* extract significantly reduces ulcer severity in a dose-dependent manner.

Phytochemicals present in the extract contribute to its gastroprotective action:

- **Flavonoids:** potent antioxidants, reduce oxidative mucosal injury.
- **Tannins:** form protective mucosal layers and promote wound healing.
- **Saponins:** enhance mucus secretion, improving gastric defense.
- **Triterpenoids:** contribute to cytoprotection and prostaglandin stimulation.

The 400 mg/kg dose showed nearly comparable activity to omeprazole, suggesting its potential as an alternative natural therapy. The extract acts via multiple mechanisms—antioxidant, anti-inflammatory, mucoprotective, and acid-suppressing effects.

5. CONCLUSION

The ethanolic leaf extract of *Grewia tilifolia* demonstrates significant anti-ulcer activity against aspirin-induced gastric ulcers, supported by favorable phytochemical profile, safety, and histopathological evidence. The plant offers a promising natural alternative for the management of NSAID-induced ulcers. Further studies on isolation of active constituents and clinical evaluation are recommended.

REFERENCES

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