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Original Article

Exploration of *in vitro* Antioxidant Dynamics and Gastroprotective Potential of *Ficus exasperata* Leaf Extract in Pylorus Ligation-induced Gastric Ulcer Model

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ABSTRACT

Background: Gastric ulcer is a prevalent gastrointestinal disorder, often characterized by oxidative stress and mucosal damage. *Ficus exasperata* is widely used for managing various digestive ailments but still its multimodel efficacy remains unexplored. **Objectives:** This study aims to evaluate the antioxidant activity and antiulcer potential of the Methanolic Leaf extract of *Ficus exasperata* (MEFE). **Materials and Methods:** Authentication followed by collection and identification of plant has been carried out. Antioxidant activity was assessed by using *In vitro* spectroscopic methods and antiulcer potential was evaluated by using pylorus ligation-induced gastric ulcer model. Animals were pretreated with different concentrations of *Ficus exasperata* (50-200 mg/kg) or standard Ranitidine (50 mg/kg). Ulcer index was calculated and results from histopathological findings were also reported. **Results:** *Ficus exasperata* reported significant dose dependent antiulcer activity in the animal model. At the highest dose (200 mg/kg), the extract achieved a maximum of 79.3% inhibition of gastric lesions as compared to the control group. Furthermore, *MEFE* exhibited a robust gastroprotective effect by suppressing oxidative stresses. **Conclusion:** The methanolic extract of *Ficus exasperata* possesses potent antiulcer and gastroprotective potential. This therapeutic effect is mediated by suppression of mucosal oxidative stress thereby validating its traditional use.

Keywords: Antioxidant, *Ficus exasperata*, Gastric ulcer, Gastroprotective, Oxidative stress, Pylorus Ligation.

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INTRODUCTION

Gastric ulcer disease remains a critical global health challenge characterized by mucosal barrier disruption due to an imbalance between aggressive factor accumulations (such as gastric acid and pepsin) and endogenous protective defense elements. The pylorus ligation method serves as a highly robust preclinical experimental design to simulate this pathology. Pyloric ligation induces a rapid accumulation of endogenous gastric juices and corrosive hydrochloric acid, directly triggering structural auto-digestion and tissue injury within the mucosal lining.[1–3]

Ficus exasperata (Moraceae), widely known across West Africa as the sandpaper tree, is a prominent ethnomedicinal plant traditionally utilized to treat broad-spectrum inflammatory conditions, infectious ailments, and gastrointestinal distress. Recent pharmacological screenings have confirmed its multi-target bioactivities, including distinct antimicrobial, wound-healing, and anxiolytic properties. The leaves of *Ficus exasperata* are rich in distinct secondary metabolite clusters, notably polyphenols, flavonoids, tannins, and saponins.[4]

These phytochemical groups act as powerful radical-scavenging agents that mitigate cellular membrane breakdown under extreme physiological stress. Chronic disease and aging have a common denominator: oxidative stress. Oxidative stress is defined as a shifting equilibrium between the creation and removal of free radicals towards the formation.[5,6]

During oxidative phosphorylation, electrons from the electron transport chain leak to molecular oxygen in the mitochondria, producing the superoxide radical, which is regarded as a major endogenous source of ROS.[7,8]

The core hypothesis of this study was developed by evaluating the cross-functional synergy between the established folkloric

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Figure 1: *Ficus Exasperata* leaves.

application of *Ficus exasperata* and its high-density antioxidant profile. Because pylorus ligation directly induces gastric damage via a dual pathway of localized acid hypersecretion and intensive oxidative tissue breakdown, it was hypothesized that a methanolic leaf extract would provide comprehensive dual-action healing. It was anticipated that the extract's chemical compounds would act directly as an anti-secretory barrier agent while simultaneously upregulating systemic cellular enzymes to protect tissue integrity.

This study is deemed important because it bridges the gap between traditional herbal practices and rigorous, evidence-based preclinical pharmacology. While crude extracts of this plant have been broadly noted in ethnobotanical records, there is a critical shortage of precise scientific literature detailing how this plant explicitly alters micro-level enzymatic pathways inside damaged gastric tissue. data regarding the plant's mechanism of action. Ultimately, establishing these parameters validates *Ficus exasperata* as a viable, safe, and cost-effective natural template for future gastroprotective drug formulation.[9,10]

Therefore, the primary aim of this study is to investigate the *In vitro* antioxidant dynamics and preclinical *in vivo* gastroprotective potential of *Ficus exasperata* methanolic leaf extract using a pylorus ligation-induced mucosal injury model, with specific reference to its modulatory effects on critical volume of gastric content, acid neutralizing index (pH) and total acidity of treated stomach.

MATERIALS AND METHODS

Plant collection, Identification and Authentication

Leaves of *Ficus exasperata* were collected from the Konkan region, of Maharashtra. A plant taxonomist at the Sree Narayana College, Kollam (affiliated with the University of Kerala) recognized the species. The aforementioned centre's herbarium received voucher specimen no 5804 (Figure 1).

Plant *Ficus exasperata* leaves morphological studies

Extract Preparation

Leaves of the *Ficus exasperata* were dried under the shade for 2 weeks and mechanically pounded into fine particles using mortar and pestle. 4000 mL of methanol was used to macerate 100 g of plant material for 72 hr at room temperature. After that mixture was filtered and the solvents were evaporated.[11] Extractive Yield was calculated as 13.24% w/w.

Based on the extractive yield solvent methanol was selected for the extraction of plant material.

UV spectrometry of Flavonoids

The total flavonoid content was assessed using the modified UV-spectrophotometric technique for determining flavonoids. *Ficus exasperata* standard plot was created by calculating the absorbance of aqueous solutions containing 0, 0.2, 0.4, 0.6, 0.8, 1, 1.2, and 1.4 µg/mL of the compound. At 340 nm, the absorbance of each solution was measured. The standard equation and regression coefficient were derived from triplicate measurements of the mean absorbance at each concentration during the experimentation. The absorbance values for solutions are shown in Table 1, and the concentration and absorbance value are graphically shown in Figures 2 and 3 the linear graph in figure had a regression coefficient of 0.9934.

Observations of evaluation of Total Flavonoid Content using (TFC) UV spectrometric method

In vitro Antioxidant Assays

DPPH Assay of *Ficus exasperata* Extracts

The DPPH (2,2-diphenyl-1-picrylhydrazyl) assay was used to evaluate the free radical scavenging ability of antioxidants in plant extracts of *Ficus exasperata*. The assay was executed

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Table 1: Absorbance of various concentrations of *Ficus exasperata* (extract).

Concentration (µg/mL)	Absorbance (nm)
0	0.007
0.2	0.015
0.4	0.022
0.6	0.030
0.8	0.037
1	0.045
1.2	0.058
1.4	0.065

Values in the table representing the absorbance values in nm at different concentrations (µg/mL) of *Ficus exasperata* plant extract against the control.

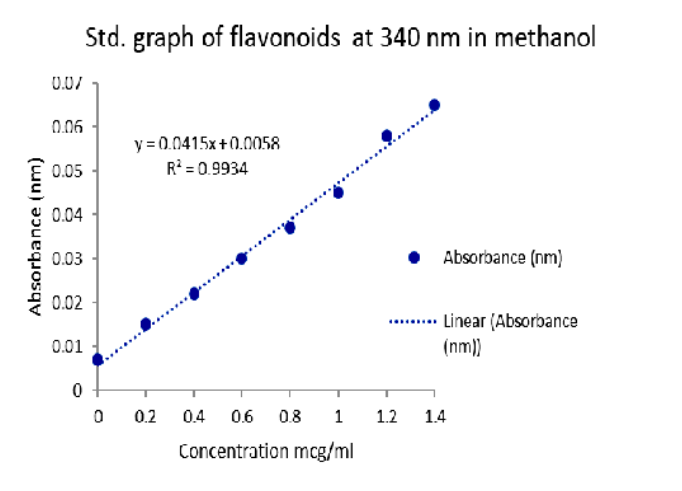


Figure 2: Calibration curve.

in a 96-well microplate format. Briefly, 100 µL of different concentrations of the plant extract solution were dispensed in designated wells. Subsequently 100 µL of freshly prepared 0.1 mM DPPH solution to each well to initiate the radical reactions, Solvent methanol was used as the blank control for calibration in the spectrophotometer. Different dilution (10-50 µg/mL) of plant extract was treated with DPPH Addition. For the control, added 100 µL of methanol instead of the plant extract. Serial dilutions of the standard antioxidant ascorbic acid were processed simultaneously to serve as the positive reference standard. The micro plates were gently agitated to ensure the homogenization and subsequently incubated in the dark place at ambient room temperature (25±2°C) for 40 min. Following incubation the purple color of the solution turned to yellow. Reduced form was quantified by measuring the absorbances at 517 nm using a microplate reader the percentage of radical scavenging activity was calculated relative to control, and the corresponding experimental data are presented in Table 2 and Figure 4.

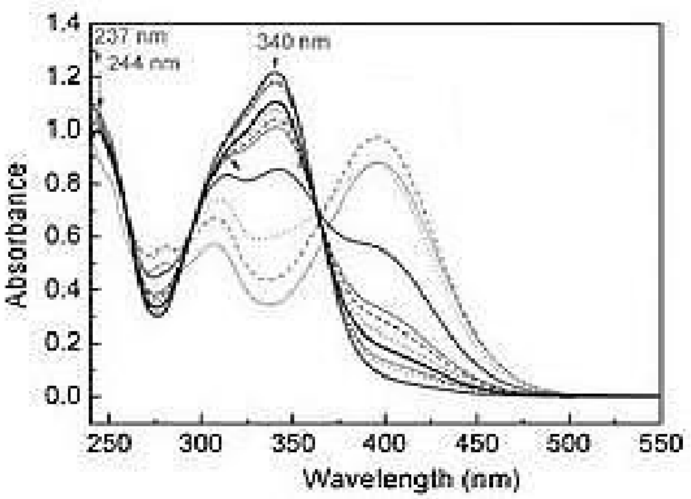


Figure 3: Maximum Absorbance of standard.

DPPH Radical Scavenging Assay

Ferric Reducing Antioxidant Power (FRAP) assay

The ferric reducing capacity of the *Ficus exasperata* extracts was determined using the Ferric Reducing Antioxidant Power (FRAP) assay. The working FRAP reagent was prepared freshly by mixing acetate buffer, 2,4,6-Tri(2-Pyridyl)-S-Triazine (TPTZ), and Ferric Chloride ($FeCl_3$) in a volume ratio of 10:1:1, respectively. The reaction was initiated by adding 100 µL of the plant extract to test tubes containing 3 mL of the prepared working FRAP reagent. Trolox was employed as the reference standard and prepared in serial dilutions to establish a calibration curve. For baseline calibration of the UV-vis spectrophotometer, a reagent blank was prepared by mixing 3 mL of FRAP reagent with 100 µL of the methanol as a solvent vehicle. The reaction mixtures were vortexed thoroughly to ensure homogeneity and subsequently incubated in a water bath at 37°C for 30 min. Following the incubation period, the analytical response driven by the reduction of the Ferric-Tripyridyl Triazine (Fe^{3+}-TPTZ) complex to its intense blue ferrous (Fe^{2+}-TPTZ) form was monitored. The absorbance of each sample was recorded at 593 nm. The antioxidant potential was quantified against the Trolox standard curve, and the quantitative findings are detailed in Tables 3 and 4, and visually represented in Figures 5 and 6.[12,13]

Ferric Reducing Antioxidant Power (FRAP) assay

In vivo pharmacological activity evaluation

Acute oral toxicity Study

No treatment-related mortality was observed at the maximum limit dose of 5000 mg/kg body weight during the 14-day post-administration period. Consequently, the median Lethal Dose (LD_{50}) of *Ficus Exasperata* via oral gavage was determined to be greater than 5000 mg/kg. According to the Globally Harmonized

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Table 2: Calculation of % Radical Scavenging activity and IC_{50} value.

Absorbance measurement data							
Conc. µg/mL	Plant extract	Control	Standard	% RSA of PE	IC_{50} of PE	% RSA of Std	IC_{50} of Std
10	0.710	0.800	0.500	11.25%	40.11 µg/mL	37.5%	15.00 µg/mL
20	0.600	0.800	0.300	25%	40.11 µg/mL	62.5%	15.00 µg/mL
30	0.521	0.800	0.200	34.87%	40.11 µg/mL	75%	15.00 µg/mL
40	0.401	0.800	–	48.75%	40.11 µg/mL	–	15.00 µg/mL
50	0.312	0.800	–	61%	40.11 µg/mL	–	15.00 µg/mL

Values represent absorbance at different concentrations and the calculated percentage of radical scavenging activity (% RSA). IC_{50} indicates the concentration required to inhibit 50% of DPPH radicals. PE: Plant Extract; Std.: Standard; Control: Absorbance of DPPH without sample.

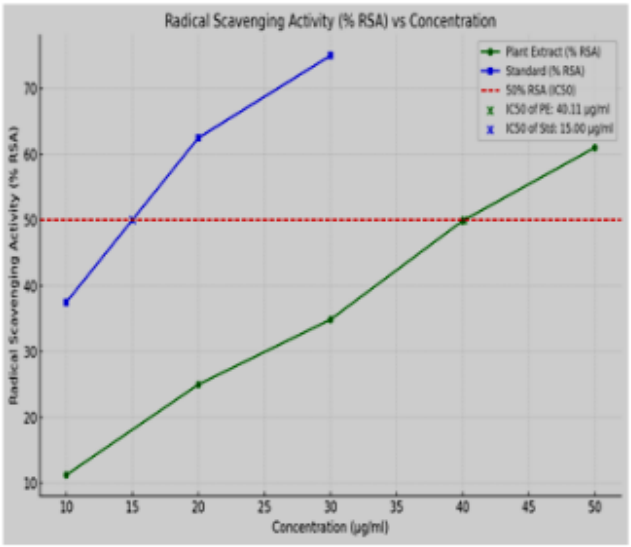


Figure 4: The Radical Scavenging Activity (% RSA) of the Plant Extracts (PE) and standard.

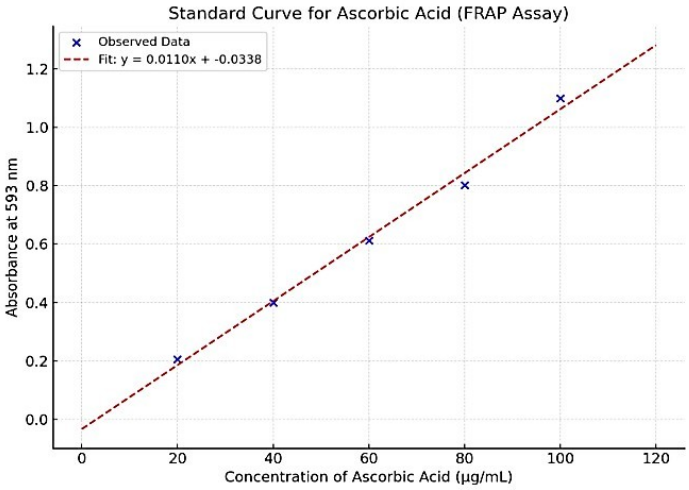


Figure 5: Calibration curve of Ascorbic acid.

Table 3: Absorbance data for different concentrations of ascorbic acid.

Concentration of Ascorbic Acid (µg/mL)	Absorbance (at 593 nm)
20	0.205
40	0.400
60	0.612
80	0.802
100	1.100

Values represent the absorbance measurement at 593 nm for different known concentrations of standard Ascorbic acid this data is used to construct calibration curve of standard for FRAP assay.

System (GHS) for chemical classification, the test substance falls under Unclassified, indicating low acute toxicity.

Pylorus Ligation-induced ulcer model

Healthy male adult Albino Wistar rats weighing 200-250 g were selected for this procedure. All the animals were kept in the standard laboratory environment (temperature: 24±2°C, humidity: 65-70%, and a 12-hr light/dark cycle). Fasted the rats for 24 hr before the experiment to ensure an empty stomach, with access to water *ad libitum*. The study followed ethical guidelines for animal care and use, The study protocol was reviewed and approved by the Institutional animal ethical committee of Karpagam College of Pharmacy, Coimbatore, India. Protocol approval number KU/IAEC/Ph.D./324. All procedures were performed in accordance with the ethical committee.

Animals were divided in to six experimental groups.

- **Normal Control Group:** Vehicle-treated (normal saline).
- **Negative Control Group:** No treatment, pylorus ligation only.
- ***Ficus exasperata* Low Dose:** (50 mg/kg).
- ***Ficus exasperata* Medium Dose:** (100 mg/kg).
- ***Ficus exasperata* High Dose:** (200 mg/kg).
- **Positive Control Group:** Standard drug Ranitidine.

An oral gavage of *Ficus exasperata* extract and standard drug ranitidine was given to the animals 1 hr before to the pylorus

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ligation. (Distilled Water is used to make the dosing, prior to oral gavage.)

Surgical Procedure for pylorus ligation

To minimize intraoperative discomfort, the animals were anesthetized via an intraperitoneal (i.p.) injection of a combination of ketamine (50 mg/kg) and xylazine (10 mg/kg). Once surgical anesthesia was achieved, each rat was secured in a supine position. A minimal midline abdominal incision (approximately 1-2 cm) was executed to expose the stomach. The pylorus was carefully isolated and ligated using a silk suture thread, taking strict precautions to prevent structural injury to the surrounding blood vessels and adjacent mesenteric tissues. Following successful ligation, the stomach was anatomically repositioned within the abdominal cavity, and the abdominal wall was closed sequentially using surgical sutures. The animals were monitored closely during the post-anesthetic recovery phase.

Sample Collection and Ulcer Assessment

During the post-ligation observation period, the animals were maintained in a fasting state without access to food or water for 4 hr to permit the accumulation of gastric secretions. At the conclusion of this period, the rats were humanely euthanized via cervical dislocation. The abdominal cavity was re-opened, and the stomach was excised rapidly. The gastric contents were collected into graduated centrifuge tubes for subsequent biochemical analysis. The stomach was then opened along the greater curvature, rinsed gently with normal saline, and the gastric mucosa was exposed. The degree of mucosal injury was evaluated macroscopically, and the gastric ulcer index was calculated by scoring the total number of lesions and grading their individual severity.

Biochemical Analysis of Gastric Secretions

Gastric Juice Volume and pH Determination

The collected gastric contents were transferred into graduated centrifuge tubes and centrifuged at 3000 rpm for 15 min to separate any solid debris. The total volume of the supernatant, representing the gastric juice volume, was measured and expressed in milliliters (mL). Subsequently, the hydrogen ion concentration (pH) of the clear gastric supernatant was quantified using a digital pH meter calibrated with standard buffer solutions.

Total Acidity Titration

To determine total acidity, a 1 mL aliquot of the centrifuged gastric juice was diluted with 9 mL of distilled water. The mixture was titrated against 0.01 N Sodium Hydroxide (NaOH) using two to three drops of phenolphthalein as an indicator. The titration endpoint was marked by the appearance of a persistent light pink coloration. Acidity was calculated and expressed in Milliequivalents per Liter (mEq/L) per 100 g of body weight.

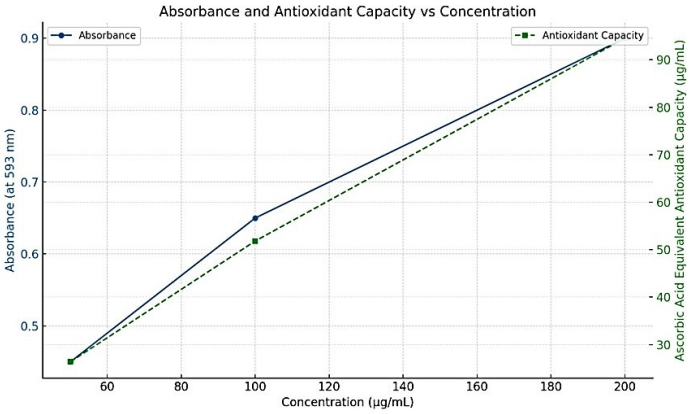


Figure 6: Antioxidant Capacity of *FE* extract.

Histopathological Examination

For microscopic evaluation, tissue samples from the stomach were harvested from both the control and high-dose treatment groups. The excised tissues were immediately fixed in 10% neutral buffered formalin for 24 to 48 hr. Following fixation, the specimens underwent automated dehydration through a graded series of ethanol, clearing in xylene, and embedding in paraffin wax blocks. Serial sections of approximately 4-5 µm thickness were cut using a rotary microtome. The sections were mounted on glass slides, stained with Hematoxylin and Eosin (H&E), and examined under a light microscope to assess structural alterations, inflammatory cell infiltration, and mucosal erosions.

Statistical Analysis

All experimental data were expressed as Mean±Standard Error of the Mean (SEM) for groups of six animals (n=6). Statistical significance and multi-group variations were analyzed using one-way Analysis of Variance (ANOVA), followed by Tukey's post-hoc multiple comparison test using GraphPad Prism software. A value of $p<0.05$ was considered statistically significant.

RESULTS

Observations of evaluation of Total Flavonoid Content using (TFC) UV spectrometric method

Flavonoids are important secondary plant metabolites reported for their radical scavenging activity and capability to stabilize cellular membranes against lipid peroxidation. Spectroscopic analysis revealed a significant presence of flavonoids in the methanolic extract of plant *Ficus exasperata* the total flavonoid content was calculated to be 13.167 mg QE/gm. (Table 4 and Figures 2 and 3).

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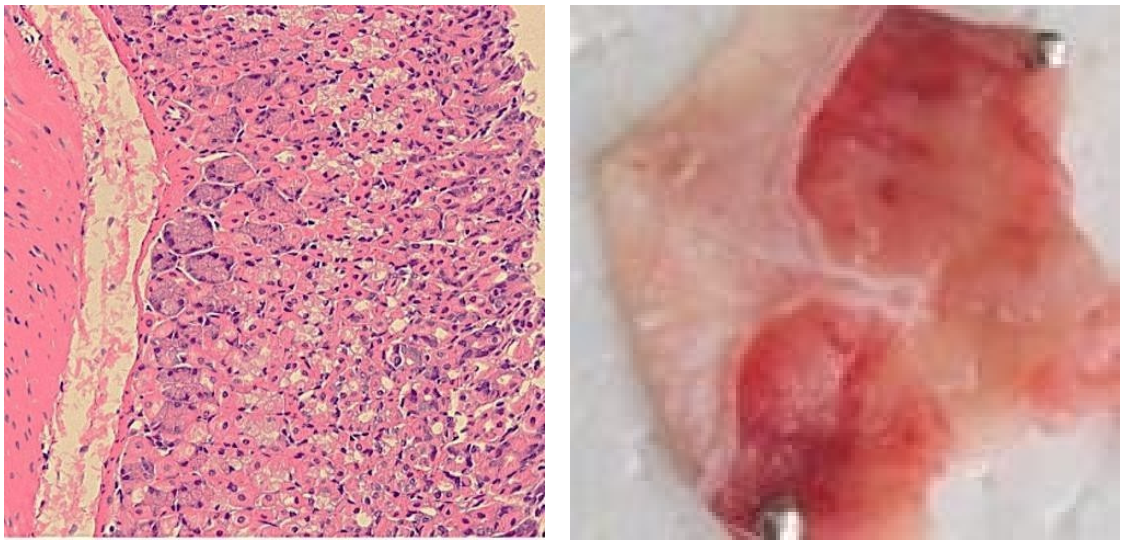


Figure 7: Stomach of Control (Microscopic and real tissue).

Table 4: Absorbance data for different concentrations of Plant Extract (*Ficus exasperata*).

Concentration of *Ficus Exasperata* (µg/mL)	Absorbance (at 593 nm)	Ascorbic acid equivalent antioxidant capacity
50	0.450	26.36 µg/mL
100	0.650	51.82 µg/mL
200	0.900	94.55 µg/mL

Ascorbic acid equivalent antioxidant capacity was calculated using the linear regression equation (Y=0.0111x+0.0338) derived from calibration curve (Figure 5) Values represent mean of independent determinations. *Ficus exasperata*: plant extract.

In vitro antioxidant Activity

DPPH Radical Scavenging Assay

The DPPH assay evaluated the hydrogen-donating capacity of *Ficus exasperata* extracts to neutralize free radicals. The extract demonstrated a concentration-dependent radical scavenging profile (Table 5 and Figure 4). At the lowest tested concentration of 10 µg/mL, the inhibition was 11.25%, which significantly increased to 61% at the maximum concentration of 50 µg/mL. The calculated half-maximal inhibitory concentration (IC_{50}) of the *Ficus exasperata* extract was found to be 40.11µg/mL, whereas the standard ascorbic acid exhibited an IC_{50} value of 15.00 µg/mL.

Pharmacological Screening Antiulcer Activity of Extracts

Pylorus Ligation Induced Peptic Ulcers

The DPPH radical contains an odd electron that exhibits a strong absorption band at 517 nm, giving it a deep purple color in solution. When this electron becomes paired in the presence of a hydrogen-donating antioxidant, the radical is reduced to DPPH-H, resulting in decolorization to a yellow complex. The low IC_{50} value observed for *Ficus exasperata* underscores its potent radical-scavenging properties, which are likely mediated by the high concentration of secondary metabolites, such as polyphenols and flavonoids, present within the extract. Phenolic hydroxyl group's act as excellent hydrogen donors, effectively terminating radical chain reactions before oxidative damage propagates (Table 5 and Figure 4).

Ferric Reducing Antioxidant Power (FRAP) assay

The reducing capacity of *Ficus exasperata* extract was quantified based on its ability to reduce a Ferric (Fe^{3+}-TPTZ) complex to its intensely blue Ferrous (Fe^{2+}-TPTZ) form at low pH. The extract showed a significant, concentration-dependent increase in reducing power (Figures 5 and 6). The FRAP assay serves as a reliable indicator of single-electron transfer capacity. The significant reduction of the Fe^{3+} complex indicates that *Ficus exasperata* extract is rich in antioxidants. The antioxidants act by breaking free radical chains via the donation of a hydrogen atom. This electron-donating ability confirms that the extract possesses strong reductive capacity, supporting its potential to mitigate intracellular oxidative stress in biological systems.

The linear increase suggests a strong correlation between extract concentration and reducing power. These findings highlight *Ficus exasperata* as a promising source of natural antioxidants, warranting further exploration to evaluate pharmacological potential and understand their mechanisms of action (Figures 5 and 6).

Pharmacological Screening Antiulcer Activity of Extracts

Pylorus Ligation Induced Peptic Ulcers

Effect on Gastric Secretion Volume, pH, and Acidity Pylorus ligation in the control and vehicle groups led to accumulation of gastric juice, severe mucosal damage, and hyperacidity. Oral

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Table 5: Gastric Ulcer Parameters, Gastric Juice Volume, pH and Total acidity.

Sl. No.	Group	Ulcer index (Mean ±SD)	Inhibition of Ulcer (%)	Volume mL (Mean ±SD)	pH (Mean ±SD)	Total acidity (mEq/L) (Mean ±SD)
1.	Normal Control	0	0	2.1±0.2	5.8±0.2	39±2.4
2.	Negative Control vehicle treated	15.0±1.2	0	4.2±0.3	2.4±0.1	120±5.2
3.	*Ficus exasperata* (50 mg/kg)	9.8±0.8	34.7	3.6±0.2	3.2±0.1	95±4.8
4.	*Ficus exasperata* (100 mg/kg)	6.4±0.6	57.3	3.1±0.2	4.5±0.2	70±4.2
5.	*Ficus exasperata* (200 mg/kg)	3.1±0.5	79.3	2.8±0.1	5.6±0.3	50±3.6
6.	Ranitidine (50 mg/kg)	2.5±0.3	83.3	2.5±0.1	6.2±0.3	42±3.4

Values are expressed as mean ± Standard Deviation (SD) (n=6 animals per group) percent inhibition of gastric ulcer was calculated in both standard and test groups and reported as % inhibition of ulcer. Ranitidine served as standard drug. Total acidity was determined in standard and test groups and it is expressed as Milliequivalents per Liter (mEq/L). Ranitidine served as standard drug.

pre-treatment with *Ficus exasperata* extract for 1 hr significantly and dose-dependently countered these pathological changes. The negative control group produced a substantial gastric juice volume of 4.2±0.3 mL, with a highly acidic pH of 2.4±0.1. This group also exhibited elevated total acidity 120±5.2mEq/L.

Pre-treatment with the high dose of *Ficus exasperata* extract 200 mg/kg significantly reduced the gastric juice volume to 2.8±0.1mL (p<0.05) and elevated the pH to 5.6±0.3. Concurrently, total acidity was suppressed to 50±3.6 mEq/L. These results were comparable to the standard anti-ulcer drug, ranitidine (50 mg/kg), which maintained a gastric volume of 2.5±0.1mL and a pH of 6.2±0.3.

Macroscopic examination of the stomach mucosa revealed severe hemorrhagic streaks and deep erosions in the control groups. This correlated with a high Ulcer Index score of 15.0±1.2. In contrast, animals treated with 200 mg/kg of *Ficus exasperata* extract showed a strong gastroprotective effect. They achieved an ulcer inhibition rate of 79.3 %, which closely rivaled the 83.3% protection shown by the ranitidine group. This was a significant increase compared to the vehicle group (p<0.05).

Histopathological Findings of stomach control and treated

Histopathological analysis of stomach sections from the control groups showed extensive mucosal erosion, deep ulceration, disrupted epithelial lines, and significant inflammatory cell infiltration. In contrast, stomach sections from the high-dose group (200 mg/kg) revealed a well-preserved mucosal architecture. The epithelial surface remained intact, and there was absence of deep mucosal hemorrhages and minimal inflammatory cell infiltration. This demonstrates that the extract is safe and free from systemic organ toxicity at the tested pharmacological concentrations (Figures 7-11).

Histopathological Findings of stomach control and treated

DISCUSSION

In the present study it is clearly found that the plant *Ficus exasperata* has reported quantity of flavonoids or antioxidants. Which has been evaluated by using *In vitro* antioxidant widely accepted DPPH and FRAP assay methods. Findings of the assay revealed that *Ficus exasperata* shows significant antioxidant activity by the results i.e. at the highest concentration 50 µg/mL in DPPH and 100 µg/mL in FRAP assay.

In the pharmacological *in vivo* antiulcer study there were notable variations between the groups, according to the morphological analysis of the stomach tissues. Compared to pylorus ligated group, animals treated with a low dose of *Ficus exasperata* (50 mg/kg) showed fewer gastrointestinal lesions, while some mucosal damage remained. These findings scientifically validate the traditional medicinal use of *Ficus exasperata* and highlight its strong potential as a natural therapeutic candidate for the management of gastric ulcer and oxidative stress-related ailments.

These results imply that at low dosages, *Ficus exasperata* offers modest efficacy on gastroprotection. While high dosage of *Ficus exasperata* (200 mg/kg) considerably demonstrate high potential and reduces mucosal damage and elicited a strong gastroprotective action. Treatment with ranitidine successfully shielded the stomach, resulting in little ulcers and maintained mucosal integrity. As we compare the activity of plant *Ficus exasperata* with standard ranitidine, the plant complies with the potential of standard.

Some other assessments of gastric parameters were experimented and the results founded as there is significant decrease in the volume of gastric juice, increase in pH and decrease in the total acidity at the highest dosage of *Ficus exasperata* (200mg/kg). it is reported that plant is having significant antioxidant and antiulcer activity.

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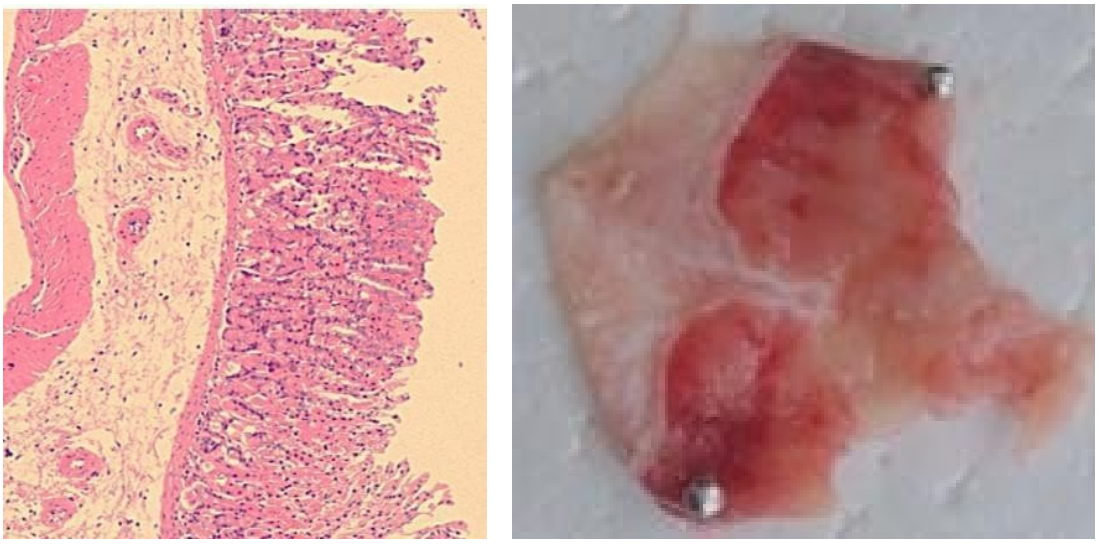


Figure 8: Stomach of pylorus ligated animal (Microscopic and real tissue).

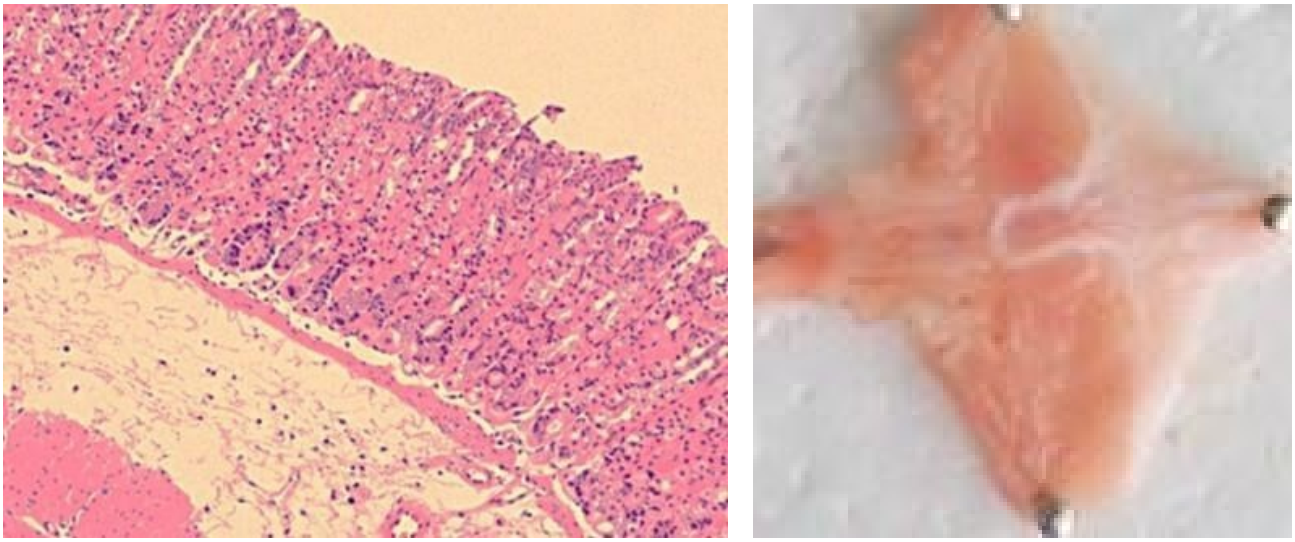


Figure 9: Stomach treated with of *MEFE* 50mg/kg.

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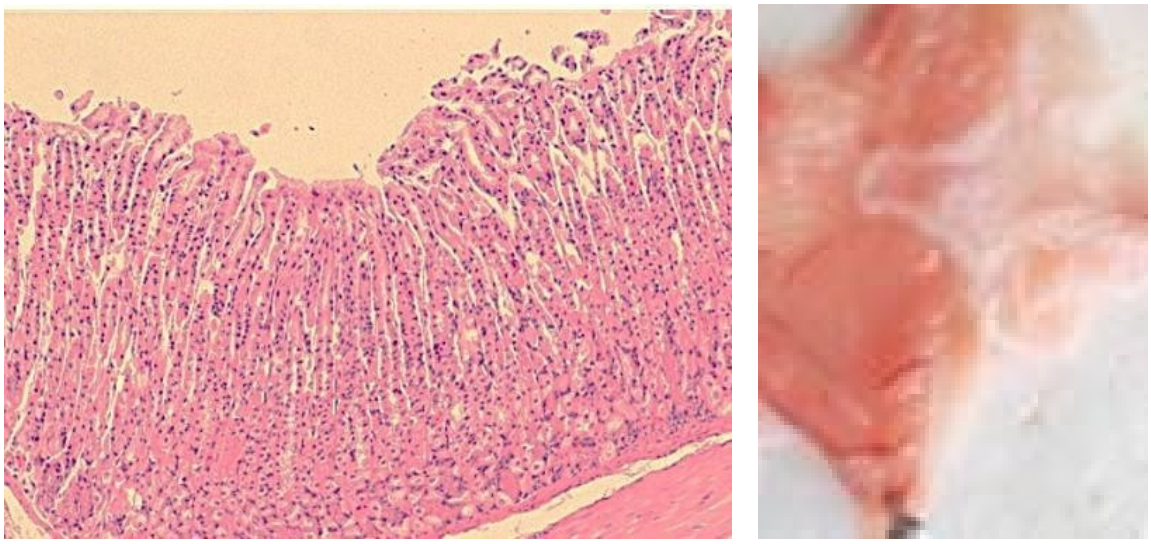


Figure 10: Stomach Treated *MEFE* with 200mg/kg.



Figure 11: Stomach treated with standard drug Ranitidine 50 mg/kg.

CONCLUSION

Ficus exasperata, a medicinal plant widely acknowledged for its traditional therapeutic applications, demonstrates significant antioxidant and antiulcer activities. The findings of the present study reveal that

the pronounced antiulcer activity, evidenced by an impressive 79.3% inhibition, highlights the plant's gastroprotective potential. Flavonoids, well-known for their ability to strengthen gastric mucosa, play a pivotal role in this effect by reducing oxidative damage, suppressing inflammatory mediators, and promoting mucosal defense mechanisms. Tannins and saponins further enhance the antiulcer efficacy by forming a protective layer over the gastric lining and improving tissue repair. Alkaloids and terpenoids complement these effects through their analgesic, anti-inflammatory, and cytoprotective properties.

Further research is recommended to elucidate the specific molecular mechanisms underlying its pharmacological effects and to explore its potential through clinical trials. The integration of *Ficus exasperata* into therapeutic regimens could offer a safe and effective alternative for managing gastric disorders and oxidative stress-related conditions.

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their professional assistance in the botanical identification and authentication of the plant material.

ABBREVIATIONS

ANOVA: Analysis of Variance; **CAT:** Catalase; **CCSEA:** Committee for Control and Supervision of Experimental Animals; **DNA:** Deoxyribonucleic Acid; **DPPH:** 2,2-Diphenyl-1-picrylhydrazyl; **EA:** Ellagic acid; **FE:** *Ficus exasperata*; **FRAP:** Ferric Reducing Antioxidant Power Assay; **IC_{50}:** Half-Maximal Inhibitory Concentration; **MDA:** Malondialdehyde; **MEFE:** Methanolic Extract of *Ficus exasperata*; **NaOH:** Sodium Hydroxide; **OECD:** Organisation for Economic Co-operation and Development; **PE:** Plant Extract; **RNS:** Reactive Nitrogen Species; **ROS:** Reactive Oxygen Species; **%RSA:** Percent Radical Scavenging Activity; **SD:** Standard Deviation; **SOD:** Superoxide Dismutase; **TFC:** Total Flavonoid Content; **TPTZ:** 2,4,6-Tri(2-Pyridyl)-s-Triazine; **UV:** Ultraviolet; **mg QE/g:** Milligram Quercetin Equivalent per Gram.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

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AUTHORS CONTRIBUTION

All authors made significant contribution to this study for designing and implementing the research protocol also assisted with the statistical analysis and critically reviewed the final draft to the manuscript. All authors have read and approved the final version of submission to the journal.

ETHICAL APPROVAL

The study protocol was reviewed and approved by the Institutional animal ethical committee of Karpagam College of Pharmacy, Coimbatore, India. Protocol approval Reference number: KU/IAEC/Ph.D./324. All procedures was performed were in accordance with the ethical committee.

DATA AVAILABILITY STATEMENT

The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

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