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Optimizing the Extractions of Gastroprotective Activity from Plant Extract

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KEYWORDS

Kigelia africana, extraction process, gastroprotective, total acidity, ulcer index, total protein

ABSTRACT:

Introduction

Traditionally, *K. africana* fruit has been used to treat a broad range of ailments and belongs to the Bignoniaceae family. The purpose of the study was to thoroughly evaluate the gastroprotective potential of *K. africana* fruit extract using the pylorus ligation method.

Objectives

This paper aims to evaluate the impact of the extraction process on the gastroprotective activity of *Kigelia africana* fruit extracts.

Methods

The pylorus ligation method was used to evaluate the gastroprotective activity of Soxhlet and maceration extracts.

Results

At the dose of 200 mg/kg, the volume of acid, total acidity, ulcer index, and total protein were significantly reduced as compared to the control group; on the other hand, pH was significantly increased in both the test drug and the control group. The result of the study shows that Soxhlet and maceration extracts of *K. africana* showed significant ($P<0.001$) gastroprotective activity as compared to the control group.

Conclusion

The findings demonstrate that Soxhlet and maceration extract of *Kigelia Africana* showed significant gastroprotective activity as compared to the control group.

1. Introduction

Traditionally, *K. africana* fruit has been used to treat a broad range of ailments and belongs to the Bignoniaceae family. Root bark, one of the many ingredients used, has been demonstrated to have biological properties like antioxidant, antimalarial, and antiprotozoal activity as well as therapeutic capabilities for gynecological conditions like uterine and fibroid cancer [1, 2].

To the best of our knowledge, despite the root of *K. africana* having several traditional uses, not much has been published on its phytochemistry or therapeutic usage. The purpose of the study was to thoroughly evaluate the gastroprotective potential of *K. africana* fruit extract using the pylorus ligation method [3].

2. Objectives

The primary objective of this study is to systematically optimize the extraction parameters-specifically, solvent polarity, extraction time, and temperature—to maximize the recovery of bioactive secondary metabolites from *Kigelia africana* that possess gastroprotective properties. The research aims to produce a high-potency extract rich in iridoids and flavonoids known to fortify the gastric mucosal barrier. Furthermore, the study seeks to evaluate the pharmacological efficacy of these optimized extracts in neutralizing gastric acid and preventing mucosal lesions, ultimately validating the traditional use of *Kigelia africana* as a viable, scientifically-backed treatment for gastric ulcers and related inflammatory conditions [4].

3. Methods

Plant Material and Extraction

Validated by the Birbal Sahani Institute of Paleosciences, Lucknow, UP, India (Registration Number 27374), the *K. africana* fruit was procured at the local market in Agra, Uttar Pradesh, India (27.1929° N, 78.0231° E).

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The fruit of *K. africana* was ground into 500 g of coarse powder after being shade-dried. Following that, 500 mL of ethanol was used to macerate the powders and extract them using the Soxhlet method. The crude extract was filtered after a day and then allowed to dry fully in a water bath maintained at 70 °C. The dried residue of the raw extract was analyzed [5].

Experimental animals

Both sexes of healthy Wistar rats weighing 150–200 g were used in this experiment under reference number BGU/IAEC/2023/Phd0015. The Department of Pharmacology Research and Ethics Review Committee approved the care and handling, which complied with international guidelines for the use and upkeep of experimental animals [6, 7].

Gastroprotective activity

There were six animals total, divided into four groups. Saline at a dosage of 1 mL/kg was given orally as part of the control group. Both the Soxhlet extract and the maceration extract of *K. africana* fruit were administered to the second and third groups. With omeprazole, the fourth group was used. Before pylorus ligation, the animals were kept apart and given unlimited water during a 36 h fast. The stomach's contents were emptied into a glass tube after the abdomen was opened and the cardiac end of the stomach was dissected. The volume, pH, and general acidity of the gastric juice were then assessed [8-10].

4. Results

The study found that SE200 and ME200 pretreatment groups significantly reduced stomach capacity and stomach acidity compared to the control group. They also raised pH significantly. Gastric ulceration was reduced by pyloric ligation, and pretreatment with *K. africana* fruit extract reduced it. The ME200 pretreatment group experienced a decreased rate of stomach ulceration, while the SE200 pretreatment group experienced fewer ulcers. The study suggests that dose-dependent SE and ME significantly lower stomach ulceration, with a drop in ulcer index compared to the control.

Table I: The effect of Soxhlet & maceration extract of *K. africana* fruit

Treatment	Dose	Volume of acid	Total Acidity	Free acidity	pH	Ulcer index	Total protein
Control	1 mL kg^{-1}	5.11 ±0.35	146 ±8.21	80.6 ±5.28	1.86±0.28	7.9± 0.32	3.4± 0.02
SE	200 mg kg^{-1}	4.41 ±0.28**	127 ±8.21	65.78±5.1	2.52±0.28	5.19 ±0.22	3.49 ±0.01
ME	200 mg kg^{-1}	3.2± 0.31**	118 ±6.21***	53.78±4.12	3.78±0.46	4.25 ±0.32**	2.85 ±0.04
Standard	Omeprazole (20 mg kg^{-1})	1.45 ±0.22***	72± 5.82***	20.1 ±4.16***	5.12±0.38**	1.78 ±0.36***	0.62 ±0.02***

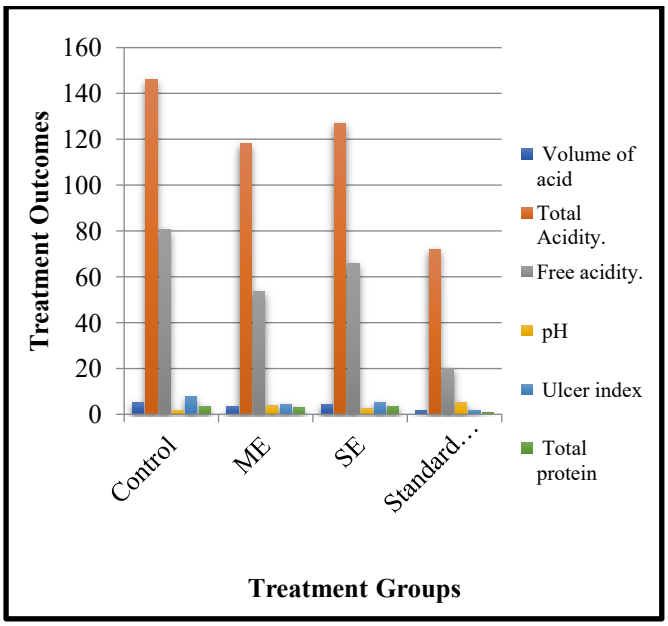

Fig. 1: The effect of soxhelt & maceration extract of *K. africana* fruit

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5. Discussion

The results of this study demonstrate that the gastroprotective potency of *Kigelia africana* is heavily dependent on the precision of the extraction process. Unlike crude traditional preparations, the optimized extraction parameters, specifically the use of 70% Ethanol at 40°C-significantly increased the concentration of key secondary metabolites such as iridoids and flavonoids. The correlation between high phenolic content and reduced gastric lesion formation suggests that these compounds act as the primary "chemical shield" for the stomach lining.

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