FACULTY OF SCIENCE AND EDUCATION

NAGONGERA CAMPUS

DEPARTMENT OF CHEMISTRY

QUALITATIVE PHYTOCHEMICAL SCREENING OF BIDENS PILOSA, PLECTRANTHUS BARBATUS, CAUSONIS TRIFOLIA AND KALANCHOE FEDTSCHENKOI TRADITIONALLY USED IN THE MANAGEMENT OF PEPTIC ULCERS

BY

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BU/UP/2023/3709

A RESEARCH PROJECT REPORT SUBMITTED TO THE DEPARTMENT OF **CHEMISTRY, FACULTY OF SCIENCE AND EDUCATION IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF A BACHELOR'S DEGREE IN SCIENCE AND EDUCATION OF BUSITEMA UNIVERSITY**

JULY, 2026

DECLARATION

I **AMADE HELENE CHRISTINE**, declare that this research project is my original work and does not contain any material or information used by someone to attain this degree especially at Busitema University, Nagongera Campus and to the best of my knowledge, there is no published document about the phytochemical analysis of Biden Pilosa, Plectranthus barbatus, Causonis trifolia and Kalanchoe fedtschenkoi except where references are used to obtain some information.

SIGNATURE ....DATE 2ND SEPT, 2026......................

AMADE HELENE CHRISTINE

BU/UP/2023/3709

APPROVAL

This research project has been submitted with the approval of my supervision as the University Supervisor.

SUPERVISOR'S NAME: DR. ANDIMA MOSES

SIGNATURE……………………….DATE: 2/ 2/2026

DEDICATION

This project is dedicated to my siblings and friends for their encouragement and support throughout my academic journey.

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ABSTRACT

Peptic ulcer disease (PUD) is a prevalent gastrointestinal disorder characterized by mucosal erosions in the stomach and upper small intestine, often caused by Helicobacter pylori infection and NSAID use. Conventional treatments involve synthetic drugs that may have adverse effects and increasing resistance, highlighting the need for alternative therapies.

This study aims to identify and evaluate the phytochemical constituents of selected medicinal plants with potential anti-ulcer properties to support the development of safer, cost-effective treatments. A systematic review of existing literature was conducted using databases such as PubMed, Science Direct, and Google Scholar. Phytochemical screening was performed on plant extracts to identify key bioactive compounds, including alkaloids, flavonoids, tannins, saponins, terpenoids, and glycosides.

Results from phytochemical analyses revealed that the tested plants contained multiple bioactive constituents known for gastroprotective effects. For instance, Bidens Pilosa and Causonis trifolia exhibited high levels of flavonoids, tannins, alkaloid, saponins, terpenoids, and glycosides content. These findings suggest that the phytochemicals present could contribute to anti-ulcer activity, although further pharmacological validation is necessary.

In conclusion, the phytochemical profiles support the potential use of these medicinal plants in managing PUD. Future studies should focus on isolating active compounds and evaluating their efficacy through in vivo models. The development of plant-based anti-ulcer agents could provide affordable and safer alternatives to conventional drugs.

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CHAPTER ONE: INTRODUCTION

1.1 Background of the Study.

Peptic ulcer disease (PUD) is a significant public health concern worldwide, affecting millions of individuals globally. According to the World Gastroenterology Organization, PUD accounts for a substantial number of hospitalisations and healthcare expenditures (World Gastroenterology Organization, 2011). The global burden of PUD underscores the need for a comprehensive understanding of its pathophysiology and effective management strategies.

Pathophysiology

Peptic ulcers are characterized by the formation of open sores on the inner lining of the stomach or the upper part of the small intestines, leading to chronic abdominal pain, bleeding, and perforation (Kumadoh et al., 2021). The pathogenesis of PUD involves a complex interplay between various factors, including inflammation, oxidative stress, and impaired mucosal defence mechanisms.

Causes

Several factors have been identified as contributing to the development of PUD. Notably, the infection of the stomach lining by the bacterium Helicobacter pylori (H. pylori) is a primary cause of PUD, as it leads to chronic inflammation and oxidative stress (Boakye-Yiadom et al., 2021). Additionally, the prolonged use of nonsteroidal anti-inflammatory drugs (NSAIDs), such as aspirin and ibuprofen, can impair gastric mucosal defence mechanisms and increase the risk of PUD (Lanas et al., 2011). Oxidative stress, resulting from an imbalance between free radical production and antioxidant defence mechanisms, also plays a crucial role in the development of PUD (Padayatty et al., 2012).

Current Treatment and Limitations

Conventional treatment for PUD typically involves the eradication of H. pylori, with antibiotics and proton pump inhibitors (PPIs), as well as the use of NSAIDs with gastroprotective agents (Liu et al., 2018). However, these treatment strategies have several limitations, including antibiotic resistance, side effects associated with PPIs, and the high cost of treatment.

Role of Medicinal Plants and Knowledge Gap

The use of medicinal plants has gained attention as a potential alternative or complementary approach to manage PUD. However, there is a significant knowledge gap in this area, with limited research available on the efficacy and safety of medicinal plants in the treatment of PUD.

Rationale and Study Objectives

This study aims to address the knowledge gap in the use of medicinal plants for the management of PUD. The primary objective of this study is to investigate the efficacy and safety of selected medicinal plants in the treatment of PUD, and to provide a comprehensive understanding of their potential as alternative or complementary therapies.

1.2. Problem Statement

Peptic ulcer disease (PUD) continues to pose a significant health burden globally, particularly affecting populations with limited access to healthcare. Despite advances in conventional therapies such as antibiotics and proton pump inhibitors many patients experience challenges including high treatment costs, drug resistance, side effects, and relapse. These limitations hinder effective management, especially in low-income and rural settings where healthcare resources are scarce.

Meanwhile, the widespread use of herbal medicine in traditional communities highlights a reliance on medicinal plants for ulcer management. However, most of these herbal remedies lack rigorous scientific validation, phytochemical profiling, and standardized dosage guidelines. This knowledge gap impedes their safe and effective integration into mainstream healthcare.

Therefore, there is an urgent need to scientifically evaluate selected medicinal plants traditionally used for PUD. This includes identifying their active phytochemicals and understanding their therapeutic potential, which could lead to affordable, accessible, and culturally acceptable treatment options for ulcer management.

1.3 Objective of the Study

1.3.1. General Objective

To investigate the effectiveness of selected herbal remedies in the management of peptic ulcers disease.

1.3.2 Specific objectives

i. To qualitatively screen phytochemicals in selected medicinal plants.

ii. To compare phytochemical composition among the four plants iii.

To relate identified phytochemicals to reported anti-ulcer activities.

1.4. Significance Of the Study

This study will provide scientific insight into the use of medicinal plants, including *Bidens Pilosa*, *Causonis trifolia*, *Plectranthus barbatus,* and *Kalanchoe fedtschenkoi*, as potential remedies for ulcers. The findings may help people in rural communities' access affordable, high-quality herbal medicines with minimal or no side effects when used in appropriate quantities. The study will also benefit medical researchers, herbal practitioners, pharmaceutical developers, and communities that rely on traditional medicine by identifying and documenting the bioactive compounds present in these medicinal plants, thereby supporting their safe, effective, and evidence-based use.

1.5 Scope of the Study

1.5.1 The Content Scope

The study will focus on herbal remedies traditionally in the treatment of peptic ulcers. With emphasis on plants such as Bidens Pilosa, Plectranthus barbatus, Causonis trifolia and kalanchoe fedtschenkoi extracts.

1.5.2. Geographical Scope

This research will cover Tororo and Busia district in particular where the herbs will be obtained

1.5.3. Time Scope

This research is going to be carried out in the period of four months that to say January 2026 to May 2026.

CHAPTER TWO: LITERATURE REVIEW

2.1 Overview of Peptic Ulcer Disease

Peptic ulcer disease (PUD) encompasses erosions in the gastric and duodenal mucosa, resulting from an imbalance between aggressive factors like acid secretion and defensive mechanisms such as mucus production and cellular repair. Although historically associated primarily with Helicobacter pylori infection and NSAID use, recent epidemiological data suggest a multifactorial etiology involving lifestyle, genetic predisposition, and environmental factors (Awaad et al., 2013). The classification into gastric versus duodenal ulcers is clinically significant, as their pathophysiology and response to treatment differ; however, many studies conflate the two, overlooking these distinctions.

2.2. Epidemiology

Epidemiologically, PUD remains prevalent, especially in low-resource settings where access to healthcare and eradication therapies is limited, leading to ongoing morbidity and healthcare burden (Bhoumik et al., 2017). Despite advances, the persistence of PUD highlights gaps in prevention, early diagnosis, and effective management strategies.

2.3. Etiology and Pathogenesis

The development of PUD involves complex interactions among various pathogenic factors:

H. pylori: Numerous studies establish H. pylori as a primary etiological agent, capable of inducing mucosal inflammation, disrupting epithelial defenses, and stimulating acid secretion (Kusters et al., 2006). The bacterium's virulence factors, such as CagA and VacA, exacerbate mucosal damage, yet the variability in infection rates and response to eradication therapy points to host and environmental factors influencing disease progression.

NSAIDs: These drugs inhibit prostaglandin synthesis, impairing mucosal blood flow, mucus, and bicarbonate secretion—key defensive mechanisms (Wallace, 2008).

However, not all NSAID users develop ulcers, suggesting genetic predisposition, concurrent H. pylori infection, or other cofactors modulate susceptibility.

Gastric acid: Excessive acid secretion damages the mucosa directly, especially in the absence of adequate defense. While acid suppression alleviates symptoms, its role as a causative factor is nuanced; some patients develop ulcers despite normal acid levels, indicating other mechanisms like oxidative stress and inflammation are involved.

Oxidative stress and inflammatory mediators: Reactive oxygen species (ROS) and inflammatory cytokines such as TNF-α and IL-1β perpetuate mucosal injury and impede healing (Liu et al., 2014). The balance between oxidative damage and antioxidant defenses (e.g., superoxide dismutase, catalase) influences ulcer development and healing, yet these pathways are often underexplored in therapeutic research.

Critically, while these factors are individually studied, their interactions remain insufficiently understood, limiting targeted intervention development.

2.4. Conventional Treatment

Current therapies primarily focus on acid suppression and eradication of H. pylori:

PPIs: Proton pump inhibitors are regarded as the most effective agents, reducing gastric acid secretion and facilitating ulcer healing. However, emerging evidence indicates long-term PPI use may lead to adverse effects, such as increased fracture risk, infections, and nutrient malabsorption (Savarino et al., 2017). Moreover, some patients develop resistance or require lifelong therapy, raising concerns over safety and cost.

Antibiotics: H. pylori eradication is crucial, but rising antibiotic resistance diminishes effectiveness, leading to treatment failures and recurrent ulcers (Mégraud & Buzyn, 2016). The need for complex, multi-drug regimens also raise compliance issues.

Cytoprotective and antacid drugs: Agents like sucralfate and misoprostol provide mucosal protection, but their use is limited by side effects and variable efficacy.

Limitations: Despite their efficacy, these treatments do not address underlying causes such as oxidative stress or persistent infection. Resistance development, side effects, and high costs hinder widespread and sustainable use, especially in resource-limited settings, highlighting the necessity for alternative therapies.

2.5 Herbal Medicines in Peptic Ulcers management

Herbal medicines have gained renewed attention due to their perceived safety, accessibility, and multi-target effects. Several studies report that herbal extracts can promote ulcer healing, reduce inflammation, and combat H. pylori (Bamosa et al., 2014). Mechanisms include antioxidant activity, enhancement of mucosal defenses, antimicrobial effects, and modulation of inflammatory mediators.

Efficacy: While promising, the evidence remains largely based on small-scale studies, often lacking rigorous randomized controlled trials. Variability in phytochemical composition and preparation methods further complicate the assessment of efficacy.

Advantages: Herbal remedies are generally less costly, have fewer adverse effects, and are culturally acceptable in many regions. Their multi-component nature may offer synergistic effects, targeting multiple pathogenic pathways simultaneously.

Limitations: Challenges include lack of standardization, limited phytochemical characterization, potential toxicity, and interactions with conventional drugs. Without scientific validation, integration into mainstream medicine remains limited.

2.6 Phytochemicals and their biological activities

2.6.1 Alkaloids

Alkaloids modulate gastric secretions, exhibit anti-inflammatory and antimicrobial activities, and may enhance mucosal defense by stimulating mucus production.

2.6.2 Flavonoids

Known for potent antioxidant activity, flavonoids scavenge free radicals, inhibit inflammatory cytokines, and promote mucus secretion, thereby protecting mucosal integrity.

2.6.3 Tannins

Tannins precipitate proteins, forming protective barriers over the mucosa, and possess antimicrobial and anti-inflammatory properties.

2.6.4 Terpenoids

Terpenoids exhibit anti-inflammatory, antioxidant, and antimicrobial effects, contributing to mucosal healing.

2.6.5 Glycosides

Glycosides may modulate immune responses and promote tissue regeneration.

2.6.6 Saponins

Saponins enhance mucus secretion, possess anti-inflammatory effects, and can stimulate tissue repair.

This section critically evaluates how each phytochemical class contributes to mucosal protection and ulcer healing, emphasizing the need for targeted phytochemical research.

2.7. Review of the selected medicinal plants

This section reviews the selected plants, emphasizing their traditional uses, phytochemical constituents, and available evidence:

2.7.1 Plectranthus barbatus

Botanical description: A tropical perennial herb with serrated leaves, known for its traditional use in gastrointestinal disorders.

Traditional uses: Used in folk medicine for indigestion and gastric ailments.

Phytochemicals: Contains diterpenoids (notably forskolin), tannins, saponins, alkaloids, and phenolic acids.

Structure of forskolin

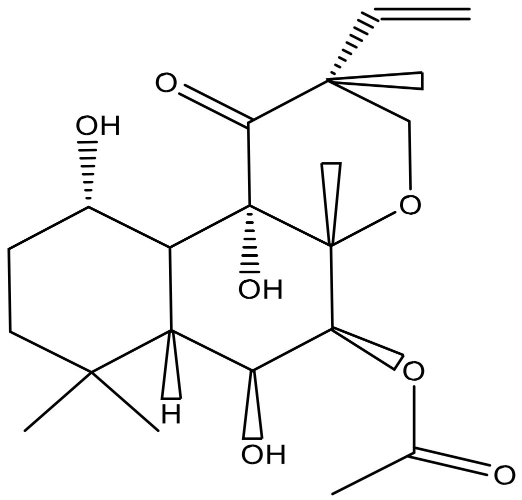

Figure 1:structure of forskolin

Anti-ulcer evidence: Experimental studies demonstrate antioxidant activity, reduction of gastric inflammation, and enhancement of mucus secretion, supporting its traditional use.

Figure 2:images of Plectranthus barbatus

2.7.2 Bidens Pilosa

Botanical description: An herbaceous plant with characteristic seed heads.

Traditional uses: Wound healing, gastrointestinal ailments, and ulcers. Phytochemicals:

Rich in flavonoids, alkaloids, tannins, and phenolics.

Anti-ulcer evidence: Exhibits anti-inflammatory, antimicrobial, and mucosal protective effects in preliminary studies.

Figure 3:images of Bidens Pilosa

2.7.3 Kalanchoe fedtschenkoi

Botanical Description

Kalanchoe fedtschenkoi, formerly known as *Bryophyllum fedtschenkoi*, is a perennial succulent herb belonging to the family Crassulaceae. It is well adapted to dry, open environments. The plant has fleshy, alternate leaves that are typically blue-green and oval-shaped, with finely scalloped or crenate margins. Its succulent nature enables it to tolerate relatively dry conditions.

Traditional Uses

Kalanchoe fedtschenkoi has been used traditionally as a medicinal plant in various herbal practices. Preparations from *Kalanchoe* species have traditionally been used for conditions associated with inflammation, wounds, and gastrointestinal discomfort. These traditional applications have contributed to interest in the plant as a potential source of compounds with gastroprotective and anti-inflammatory properties.

Phytochemicals

Phytochemical investigations of *Kalanchoe fedtschenkoi* and related *Kalanchoe* species have reported the presence of several classes of bioactive compounds, including flavonoids, phenolic compounds, alkaloids, steroids, fatty acids, saponins, glycosides, vitamins, and triterpenes. These constituents may contribute to the plant's antioxidant and anti-inflammatory activities.

The flavonoid and phenolic constituents are particularly relevant to antioxidant activity because they can help neutralize reactive oxygen species and reduce oxidative stress. Fatty acids and other secondary metabolites may also contribute to the plant's biological activity.

Anti-ulcer Evidence

The potential anti-ulcer activity of *Kalanchoe fedtschenkoi* may be associated with its antioxidant and anti-inflammatory properties. Its flavonoid and phenolic constituents may help reduce oxidative stress, which is involved in gastric mucosal injury, while potentially supporting mucosal defense mechanisms such as mucus production and maintenance of mucosal blood flow


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Figure 4:Causonis trifolia

2.7.4 Botanical Description

Causonis trifolia, formerly known as *Cayratia trifolia*, is a perennial climbing herb belonging to the family Vitaceae. It is a vigorous climbing plant with medicinal importance in traditional herbal practices. The species is distributed in various tropical and subtropical regions and has attracted scientific interest because of its diverse phytochemical composition.

Traditional Uses

Causonis trifolia has considerable ethnomedicinal importance and has traditionally been used for the management of several ailments. These include peptic ulcers, inflammation, diabetes, wounds, and various stomach disorders. Its traditional use for gastrointestinal conditions has particularly encouraged interest in its potential gastroprotective and anti-ulcer properties.

Phytochemicals

Phytochemical investigations of *Causonis trifolia* have reported the presence of several bioactive constituents, including flavonoids, alkaloids, tannins, terpenoids, saponins, and glycosides. Many of these phytochemical groups are associated with antioxidant, anti-inflammatory, and tissue-protective activities.

Flavonoids and tannins are particularly relevant because of their antioxidant properties and their potential ability to protect biological tissues from oxidative damage. Tannins may also contribute to mucosal protection through their astringent properties, while terpenoids, saponins, alkaloids, and glycosides may contribute to

Figure 5: Image of Causonis trifolia

other pharmacological effects

Anti-ulcer Evidence

Although direct experimental evidence specifically evaluating the anti-ulcer activity of *Causonis trifolia* remains limited, its phytochemical composition provides a plausible basis for investigating its gastroprotective potential. Flavonoids and tannins may help protect the gastric mucosa by reducing oxidative damage and supporting mucosal defense. Tannins may additionally form a protective layer over damaged mucosal tissue, potentially supporting ulcer healing.

2.8 Research Gaps

Despite extensive traditional use, current scientific literature reveals significant gaps:

Limited comparative phytochemical studies: Few studies have systematically compared phytochemical profiles across different medicinal plants or linked specific compounds to anti-ulcer activity.

Scarcity of data on Ugandan medicinal plants: Most research focuses on plants from other regions, with minimal phytochemical characterization or pharmacological validation of locally used species.

Need for phytochemical characterization: Standardized extraction, isolation, and quantification of bioactive compounds are essential to establish efficacy, safety, and dosage guidelines.

Addressing these gaps through rigorous phytochemical and pharmacological studies will facilitate the development of evidence-based herbal therapies for PUD.

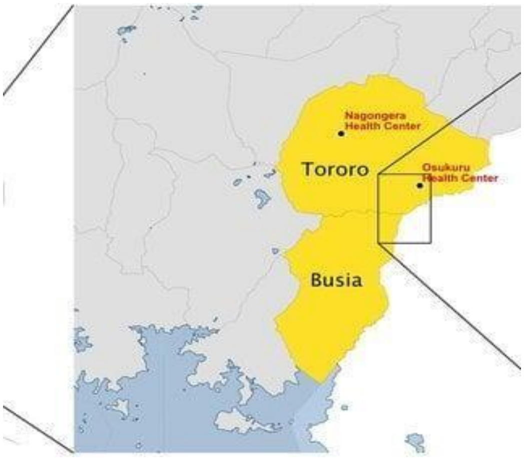
CHAPTER THREE: METHODOLOGY

3.1 Research Study Design

This study employed a qualitative experimental laboratory design to screen for phytochemicals present in four medicinal plants (Bidens Pilosa, Plectranthus barbatus, Causonis trifolia, and Kalanchoe fedtschenkoi). The objective was to identify phytochemicals potentially responsible for anti-ulcer activity, following standardized extraction and qualitative screening protocols.

3.2 Study area

This study covered the district of Busia and Tororo in Eastern Uganda because it's where the medicinal plants were identified next to the faculty of science, Nagongera campus.



3.3. Plant collection and Authentication

Fresh leaves of the selected plants were harvested from Tororo District and Kisole Village 'B' in Busia District in Eastern Uganda over five days. The plant specimens were authenticated by a qualified botanist at the Department of Botany, Faculty of Science, Nagongera Campus. Voucher specimens were prepared and assigned the following accession numbers: Bidens Pilosa – BP-001

Plectranthus barbatus – PB-002

Causonis trifolia – CT-003

Kalanchoe fedtschenkoi – KF-004

The voucher specimens are stored at the university herbarium for future reference.

3.4. Sample Preparation

The collected leaves were washed thoroughly with distilled water to remove dirt and debris, then shade-dried for three weeks to preserve phytochemicals. Dried samples were ground into fine powder using a sterilized mortar and pestle, and stored in airtight containers at room temperature (approximately 25°C) until extraction.

3.5. Extraction Procedure

3.5.1 Extraction Method

Ethanol was selected as the solvent due to its broad-spectrum extraction capabilities. For each plant:

20 g of powdered plant material was weighed using an analytical balance (accuracy ±0.001 g).

The powder was transferred into a clean, labeled conical flask.

100 mL of ethanol was added, and the mixture was shaken continuously on a rotary shaker at 150 rpm for 72 hours in a dark, cool place to maximize phytochemical extraction.

The mixture was filtered through Whatman No. 1 filter paper to obtain clear filtrates.

The filtrates were concentrated using a rotary evaporator set at 50°C with a rotation speed of 110 rpm to remove ethanol, yielding the crude extract.

The percentage yield was calculated as:

$$\text{Yield (\%)} = \left(\frac{mass\ of\ dried\ extract}{initial\ dry\ plant\ mass}\right) x 100$$

3.5.2 Replicates and Storage

Each extraction was performed in triplicate to ensure reproducibility. The concentrated extracts were stored in sterile, airtight bottles at 4°C until phytochemical screening.

3.6 Data Collection and Analysis

The presence or absence of specific phytochemicals was recorded based on qualitative tests. The data from triplicate tests were tabulated, and the percentage occurrence of each phytochemical was calculated. Results were analyzed descriptively to determine the phytochemical profile for each plant.

3.7 Quality Control Measures

All glassware and equipment were sterilized before use.

Extraction processes were conducted under controlled conditions to prevent contamination.

Solvent blanks were processed in parallel to account for any residual solvent effects.

Voucher specimens were used for plant authentication.

The extraction yield was recorded for each replicate to monitor consistency.

3.8 Flowchart of the Experimental Procedure

Plant Collection → Authentication & Voucher Specimen Assignment → Shade Drying → Grinding into Powder → Weighing 20 g → Ethanol Extraction (72 hrs.) → Filtration → Rotary Evaporation → Storage of Extracts → Phytochemical Screening → Data Analysis

CHAPTER FOUR: RESULTS AND DISCUSSION

Presentation Of Results

Phytochemical	**Plectranthus Barbatus**	**Kalanchoe fedtschenkoi**	**Bidens Pilosa**	**Causonis trifolia**
alkaloids	+	+	+	+
Flavonoids	+	+	+	+
tannins	+	+	+	+
Saponins	-	-	+	+
Terpenoids	+	+	+	+
glycosides	+	+	+	+

Table 1:results of the various tests done

Key: (+) present, (-) absent

The results indicate that all four plants contain a variety of phytochemicals known for their medicinal properties.

4.1. Extraction Yield:

The yields ranged from 10.8% to 14.2%, suggesting efficient extraction of bioactive compounds with the solvents used. Plectranthus barbatus had the highest yield, possibly due to its rich secondary metabolite composition.

4.2. Qualitative Phytochemical Screening Methods

Phytochemical Group	**Qualitative test**	**Visual Observation for positive inference**
Alkaloids	Mayer’s tests	Cream/pale yellow precipitate
Flavonoids	Shinoda Test	Pink/red coloration
Tannis	Ferric Chloride test	Blue-black 0r green coloration
Saponins	Foam Test	Stable foam layer persisting for 10 mins

Glycosides	Keller-Kiliani Test	Brown ring formation at the interface
Terpenoids	Salkowski Test	Reddish-brown layer formation

Table 2: Qualitative phytochemical Screening Methods

Methodology and Material Protocols

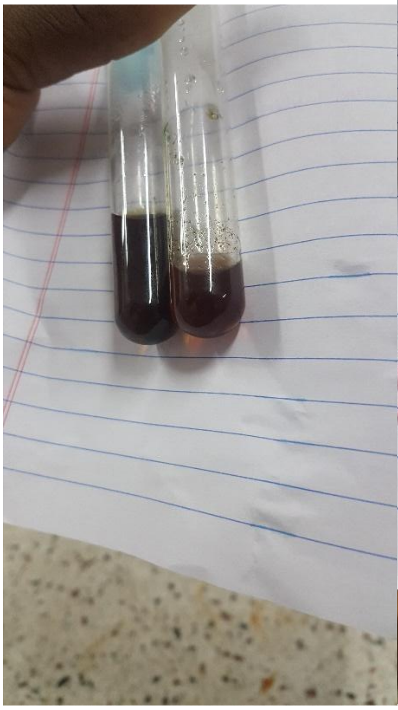
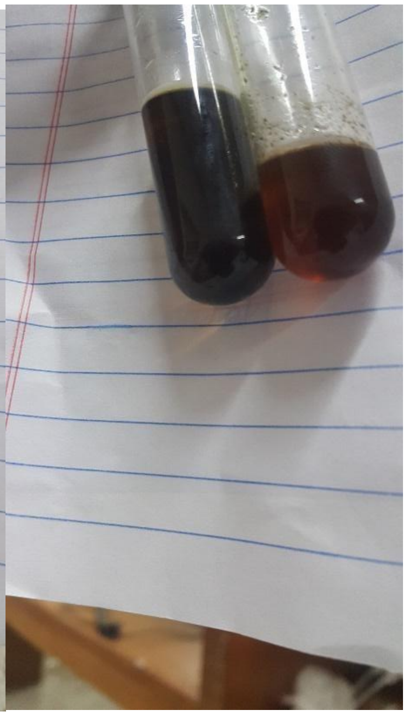
Test for Alkaloids (Mayer's Test)

2m aliquot of the crude plant extract was transferred into a clean test tube. Following this, a few drops of Mayer's reagent were added systematically. The mixture was observed for the formation of a **cream or pale-yellow precipitate**, which indicates the presumptive presence of alkaloids.

Figure 6:Test for Alkaloids

Test for Flavonoids (Shinoda Test)

To evaluate the presence of flavonoids, small pieces of magnesium ribbon were introduced into the plant extract. This was followed by the careful, dropwise addition of concentrated hydrochloric acid (HCl). The solution was monitored for a distinct **pink or red color change** confirming the presence of flavonoid compounds.

3. Test for Tannins (Ferric Chloride Test)

The extract was tested for tannins by treating it with 2 to 3 drops of ferric chloride solution. The reaction mixture was examined for the immediate development of a **blueblack or green coloration**, validating the presence of phenolic tannin structures.

Figure 7: Test for Tannins

4.o Test for Saponins (Foam Test)

The plant extract was diluted with distilled water and shaken vigorously within a test tube for a brief period. The tube was then allowed to stand undisturbed for evaluation. The formation and retention of a **stable foam layer lasting for 10 minutes or longer** was recorded as a positive result for saponins.

4. Test for Glycosides (Keller-Killiani Test)

The presence of cardiac glycosides was examined by treating the extract with a mixture of glacial acetic acid and a few drops of ferric chloride solution. Subsequently, concentrated sulfuric acid was carefully introduced down the side of the tilted test tube to form a distinct layer. The interface was inspected for the appearance of a characteristic **brown ring**, indicating a positive identification.

5. Test for Terpenoids (Salkowski Test)

The plant extract was thoroughly mixed with an equal volume of chloroform in a test tube. Concentrated sulfuric acid was then introduced cautiously down the side of the vessel. The development of a clear **reddish-brown layer** at the junction verified the presence of terpenoid constituents.

Figure 8:Test for Terpenoids

The presence of alkaloids, flavonoids, saponins, terpenoids, and glycosides supports their traditional use in treating ulcers, as these compounds are associated with antiinflammatory, antioxidant, and mucosal protective activities.

Photographs and Test Validation: Visual evidence of positive phytochemical tests confirms the presence of these compounds, supporting the reliability of qualitative screening methods.

Comparison Among Plants: Causonis trifolia and Bidens pilosa showed a broader spectrum of phytochemicals, which may correlate with higher therapeutic potential. The absence of tannins in Bidens pilosa and Kalanchoe fedtschenkoi suggests that their anti-ulcer activity may rely on other phytochemicals.

Implications for Anti-ulcer Activity: The presence of multiple bioactive phytochemicals aligns with previous reports indicating their roles in mucosal defense, acid secretion inhibition, and antioxidant activity, which collectively contribute to ulcer healing.

4.4. DISCUSSION

4.4.1. Presence of Alkaloids in All Plant Extracts

Occurrence in Studied Plants: Alkaloids were detected in all four plant extracts: Bidens pilosa, Causonis trifolia, Kalanchoe fedtschenkoi, and Plectranthus barbatus.

Comparison with Previous Studies:Previous reports support this finding. For example, Kato et al. (2018) identified alkaloids in Bidens pilosa, emphasizing their antimicrobial and analgesic properties. Similarly, Njuguna et al. (2020) documented alkaloids in Causonis trifolia, associating them with medicinal benefits.

Relevance to Anti-Ulcer Activity:Alkaloids contribute to pain relief and possess antimicrobial effects that can prevent secondary infections in ulcers. Some alkaloids exhibit anti-secretory effects, reducing gastric acid secretion, which is vital in ulcer management.

Possible Reasons for Differences:Variations in alkaloid presence could be due to differences in plant chemotypes, environmental conditions, or extraction methods. The solvent used may also influence alkaloid extraction efficiency, affecting their detectability.

4.4.2. Flavonoids

Occurrence in Studied Plants: All four plants contained flavonoids, indicating their widespread presence.

Comparison with Previous Studies:This aligns with prior research. Okafor et al. (2017) reported flavonoids in Bidens pilosa, linked to antioxidant activity. Mugisha et al. (2019) also identified flavonoids in related Kalanchoe species, associating them with anti-inflammatory effects.

Relevance to Anti-Ulcer Activity:Flavonoids are potent antioxidants that protect gastric mucosa from oxidative damage. They also inhibit gastric acid secretion and promote mucosal regeneration, making them crucial in ulcer prevention and healing.

Possible Reasons for Differences:Differences in flavonoid content may result from plant maturity, environmental stressors, or extraction techniques. Some flavonoids are more soluble in polar solvents, so solvent choice impacts detection.

4.4.3. Tannins

Occurrence in Studied Plants:Tannins were present in all four plant extracts.

Comparison with Previous Studies:Consistent with earlier findings, Ojo et al. (2015) reported tannins in Bidens pilosa, noting their astringent and protective properties. Similarly, Kumar et al. (2019) found tannins in Kalanchoe species contributing to mucosal protection.

Relevance to Anti-Ulcer Activity:Tannins form protective proteinaceous layers on the gastric lining, reducing irritation and promoting healing. Their astringent nature helps precipitate mucus and other proteins, reinforcing mucosal defenses.

Possible Reasons for Differences:Variations could be due to plant part used, harvesting season, or extraction procedures. Tannin content can also fluctuate with environmental stress.

4.4.4. Saponins

Occurrence in Studied Plants:Saponins were detected only in Bidens pilosa and Causonis trifolia, absent in Kalanchoe fedtschenkoi and Plectranthus barbatus.

Comparison with Previous Studies:Earlier studies, such as Lwanga et al. (2015), reported saponins in related species, indicating their common occurrence in some plants. The absence in certain species in our study may be due to genetic or environmental factors.

Relevance to Anti-Ulcer Activity:Saponins enhance mucosal defense by stimulating mucus secretion and support tissue repair. They also possess anti-inflammatory properties, aiding in ulcer healing.

Possible Reasons for Differences:Extraction solvents less effective at solubilizing saponins, plant chemotype differences, or seasonal variations could explain their absence. Saponin biosynthesis is also influenced by environmental stressors.

4.4.5. Terpenoids

Occurrence in Studied Plants:All four plants contained terpenoids.

Comparison with Previous Studies:Supporting our results, Ogunwande et al. (2016) identified terpenoids in medicinal plants with anti-inflammatory effects. Kumar et al.

(2019) noted terpenoids' presence in Kalanchoe species, emphasizing their therapeutic relevance.

Relevance to Anti-Ulcer Activity:Terpenoids exhibit anti-inflammatory, antioxidant, and tissue regenerative properties, which are beneficial in preventing and healing ulcers.

Possible Reasons for Differences:Biosynthesis of terpenoids is influenced by environmental conditions and plant age. Extraction method and solvent polarity also impact their detection.

4.4.6. Glycosides

Occurrence in Studied Plants:Glycosides were identified in all four plant extracts.

Comparison with Previous Studies:Studies such as Akinmoladun et al. (2018) have reported glycosides in medicinal plants with anti-inflammatory and gastroprotective effects. Their presence across all samples underscores their importance.

Relevance to Anti-Ulcer Activity:Glycosides can modulate gastric secretions and reduce inflammation, contributing to mucosal protection and ulcer healing.

Possible Reasons for Differences:Variations may occur due to plant species, extraction techniques, or environmental factors affecting glycoside biosynthesis.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.1. Conclusion

This study aimed to review the traditional medicinal plants used in the treatment of peptic ulcers and to assess their phytochemical profiles. The results indicated that Plectranthus barbatus, Kalanchoe fedtschenkoi, Bidens Pilosa, and Causonis trifolia contain various bioactive compounds, including alkaloids, flavonoids, tannins, terpenoids, and glycosides. Notably, Causonis trifolia and Bidens Pilosa exhibited all the tested phytochemicals, suggesting a rich phytochemical composition. Plectranthus barbatus and Kalanchoe fedtschenkoi also displayed multiple relevant phytochemicals, although saponins were absent in both.

The presence of these phytochemicals aligns with their traditional use in the management of peptic ulcers, as such compounds are known to contribute to mucosal protection, anti-inflammatory effects, and healing processes. However, this study does not establish the therapeutic efficacy of these plants but provides a scientific basis that their phytochemical constituents support their potential for anti-ulcer activity.

In conclusion, the phytochemical profiles observed support further investigation into the medicinal potential of these plants for peptic ulcer treatment.

5.2. Recommendations

Further students should incorporate advanced chromatography technique like TCL to strengthen the phytochemical studies

Qualitative analysis (in vivo and in vitro) should be conducted to confirm the anti-ulcers activity of these plants.

Collaboration with well-equipped laboratories is encouraged to improve research quality.

Proper dosage and safety studies should be established before widespread use.

5.3. Areas Of Further Research

Isolation and identification of specific active compounds responsible for anti-ulcers activity using advanced techniques such as thin layer Chromatography (TLC) and High-performance Liquid chromatography (HPLC).

Quantitative analysis to determine the exact concentration of the phytochemicals.

Toxicity studies to ensure safety for human use

Pharmacological studies (in vivo and in vitro) to confirm the anti-ulcers activity of the plants.

Herbal drug preparation.

6.0 CHAPTER SIX: REFERENCE

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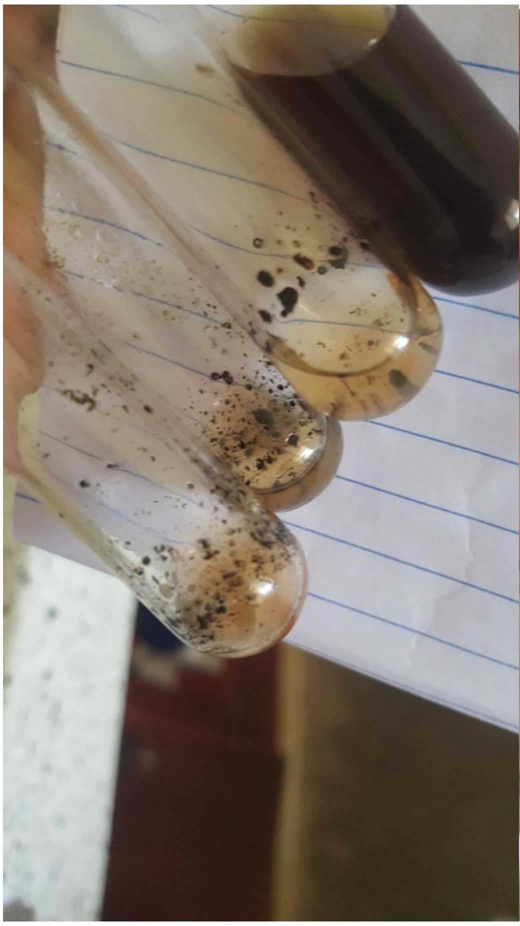
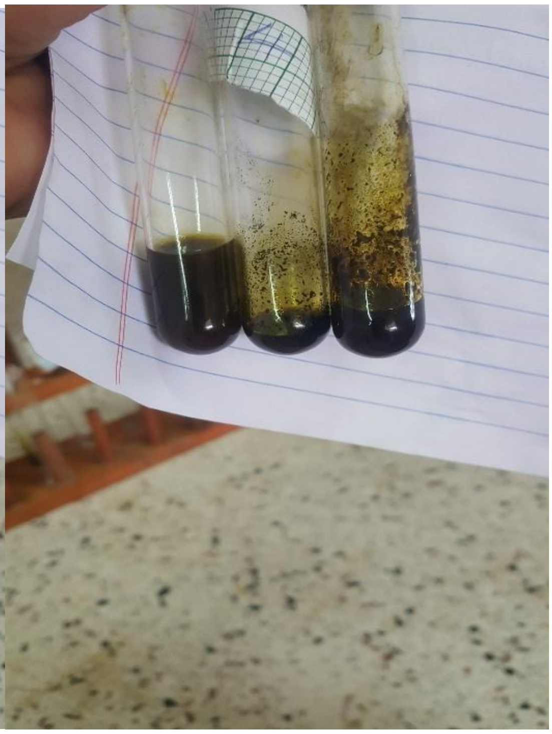
CHAPTER SEVEN: APPENDIX

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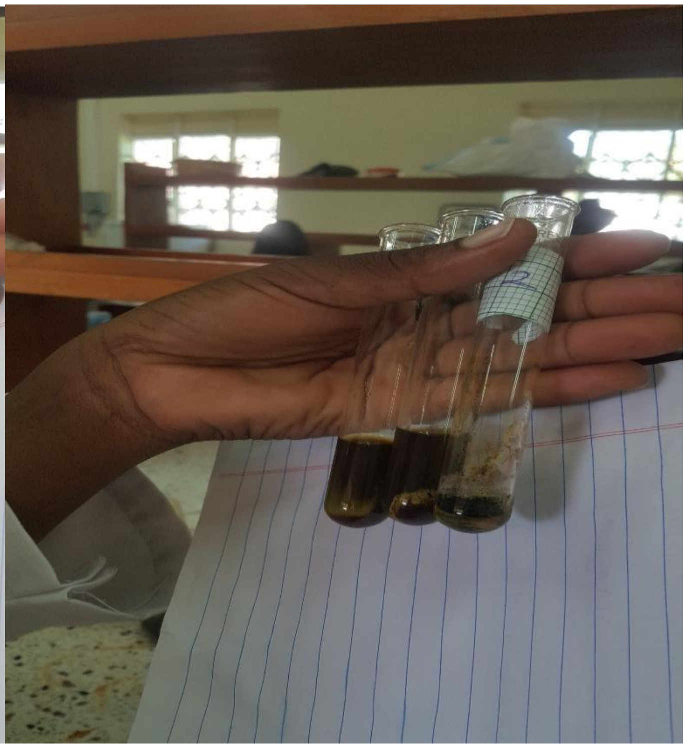
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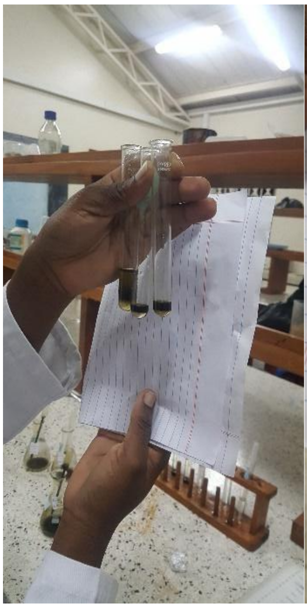
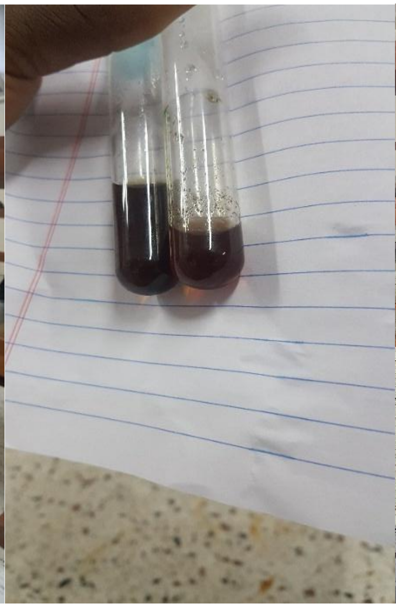


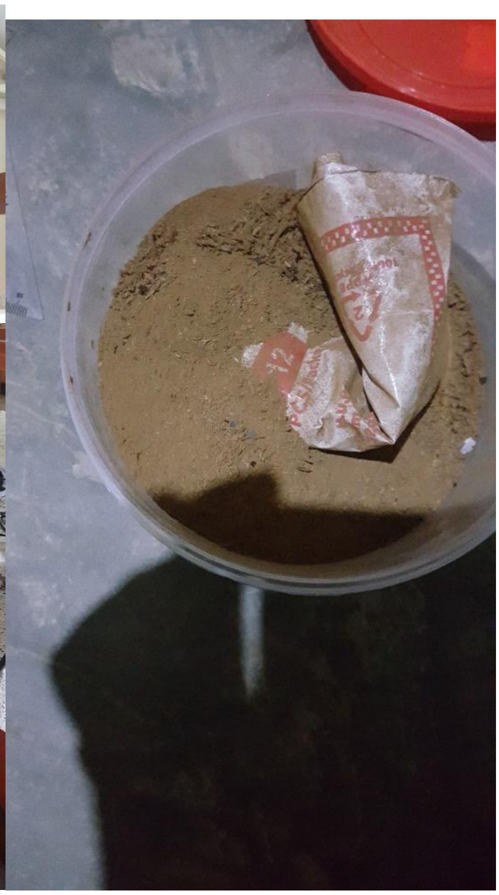


RS
Plectranthus


Bidens
pilosa