Pharmacognostical and Phytochemical Screening of Commelina diffusa: An Emerging Perspective on Its Therapeutic Potential

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Abstract- Medicinal plants have played a pivotal role in traditional healing systems and continue to serve as an abundant source of bioactive compounds used in modern medicine. Among these, *Commelina diffusa* Burm. f., a member of the family Commelinaceae, has been traditionally employed in various ethnomedicinal systems across tropical and subtropical regions. Despite its widespread traditional use, this plant has not been extensively studied in terms of its pharmacognostical properties and phytochemical constituents.

The present study undertakes a detailed pharmacognostical and phytochemical investigation of *Commelina diffusa* to scientifically validate its traditional uses and to explore its therapeutic potential. Macroscopic and microscopic examinations were conducted to identify and describe the distinguishing morphological and anatomical features of the plant. Phytochemical screening was carried out using various solvent extracts such as aqueous, ethanol, and methanol to detect the presence of primary and secondary metabolites.

The study revealed the presence of various phytoconstituents including alkaloids, flavonoids, tannins, saponins, phenolic compounds, terpenoids, and steroids. These bioactive compounds are known to exhibit a range of pharmacological properties such as antioxidant, anti-inflammatory, antimicrobial, and wound healing activities. The pharmacognostical parameters and diagnostic features obtained in this study can serve as valuable tools in the standardization and identification of the plant material. Furthermore, the preliminary phytochemical data provides a scientific basis for the potential therapeutic applications of *Commelina diffusa* in future drug development and pharmacological research.

Keywords: Commelina diffusa, Pharmacognosy, Phytochemical screening, Medicinal plants, Ethnopharmacology, Traditional medicine, Bioactive compounds, Therapeutic potential, Secondary metabolites

INTRODUCTION

1.1 BACKGROUND:

Medicinal plants have historically been used as therapeutic agents for various diseases, especially in countries with strong traditional medicinal systems like Ayurveda, Unani, and Traditional Chinese Medicine. More than 80% of the global population relies on natural products and plant-based formulations for primary healthcare needs, as per the WHO.

One such medicinally important plant is Commelina diffusa, commonly known as the climbing or spreading dayflower. It belongs to the family Commelinaceae and grows in moist and shady areas of tropical and subtropical regions across the world. *C. diffusa* has a wide range of traditional applications — it has been used as an anti-inflammatory agent, in the treatment of fevers, diarrhea, wounds, and even to control bleeding.

Figure 1.1 FiPurple Dayflower

Despite its traditional use, there is insufficient modern scientific data available to validate its pharmacological potential and chemical profile. Therefore, a systematic pharmacognostical and phytochemical study is essential to establish scientific support for its ethnomedicinal uses.

1.2 Aims and Objectives:

The present study was designed with the following objectives:

- To carry out the botanical identification and authentication of *Commelina diffusa*.
- To perform a macroscopic and microscopic examination for pharmacognostic standardization.
- To conduct preliminary phytochemical screening to identify active constituents present in the plant.
- To correlate the presence of phytoconstituents with the traditional uses of the plant.
- To generate baseline data for further pharmacological and analytical research on the species.

1.3 SCOPE OF THE STUDY:

The study focuses on two main scientific aspects:

- Pharmacognostical investigation, which includes detailed analysis of the plant's morphological and anatomical characteristics.
- Phytochemical screening, which aims to detect the presence of key secondary metabolites such as alkaloids, flavonoids, tannins, saponins, and glycosides.

The significance of this study lies in:

- Providing a scientific validation for the traditional medicinal use of *Commelina diffusa*.
- Contributing to the standardization of the plant, which is essential for ensuring quality, purity, and identity in herbal drug formulation.
- Offering a preliminary insight into the plant's chemical constituents that may lead to the discovery of new pharmacologically active molecules.

Furthermore, this study serves as a foundation for future research involving:

- Pharmacological testing to evaluate therapeutic activities (e.g., antimicrobial, anti- inflammatory).
- Isolation and characterization of individual compounds using chromatographic techniques.
- Toxicological assessments to ensure safety for therapeutic use.

LITERATURE REVIEW

2.1 INTRODUCTION:

Literature review is a critical component of any scientific research project. It involves gathering, analyzing, and interpreting previous work conducted on a given subject, thus forming the theoretical foundation of a study. This chapter reviews the available literature on the pharmacognostical characteristics, phytochemical constituents, traditional uses, and pharmacological activities of *Commelina diffusa*, along with a brief overview of related species in the family Commelinaceae.

2.2 BOTANICAL DESCRIPTION OF COMMELINA DIFFUSA:

Commelina diffusa is a herbaceous plant commonly found in moist and shaded habitats throughout tropical and subtropical regions. It is widely distributed across Asia, Africa, North America, and Oceania. The plant is commonly referred to as spreading dayflower, owing to its rapid growth and horizontally spreading habit.

Figure 2.2 Blue Dayflower

- Scientific Name: *Commelina diffusa* Burm.f.
- Family: Commelinaceae
- Common Names: Spreading dayflower, climbing dayflower
- Habitat: Moist soils, riverbanks, roadsides, gardens
- Morphology:
  - Stem: Prostrate to ascending, succulent, and branched
  - Leaves: Alternate, lanceolate, sheathing base
  - Flowers: Blue or purplish, borne in clusters (cymes)
  - Fruit: Capsule, with several seeds

The plant completes its life cycle quickly, which allows it to dominate disturbed habitats. It propagates via seeds and vegetative nodes and is often regarded as a weed in some agricultural areas

2.3 ETHNOMEDICINAL USES OF COMMELINA DIFFUSA:

The use of Commelina diffusa in traditional medicine has been documented in various regions, especially in India, China, Africa, and the Caribbean. It has been employed to treat a wide variety of ailments.

Region	Traditional Use
India	Treatment of wounds, sore throat, fever, and urinary problems
China	Used as a diuretic, antipyretic, and anti-inflammatory agent
Africa	Applied to skin infections, burns, and snake bites
Caribbean	Employed for diarrhea and as a febrifuge

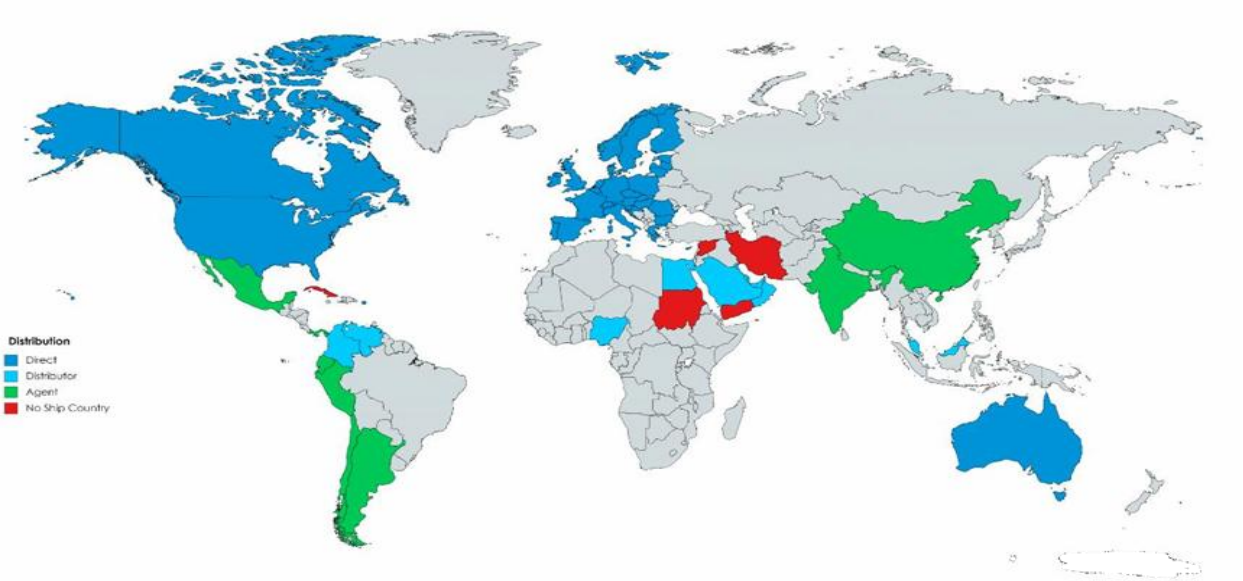

Figure 2.3 Commelina diffusa documented in various regions

In several tribal medicinal practices, the plant is crushed into a paste and applied topically or administered orally as a decoction or infusion. The use of the plant in treating inflammatory conditions, wounds, and infections suggests the presence of bioactive compounds with therapeutic action.

2.4 PREVIOUS PHARMACOGNOSTICAL STUDIES:

Pharmacognostical evaluations are essential for the proper identification and standardization of crude drugs. Though limited, some studies have been conducted on Commelina diffusa:

Figure 2.4 Plant-Powered Pharma: From Roots to Remedies

- Macroscopic studies revealed the presence of soft, succulent stems, sheathing leaf bases, and mucilaginous tissue, which are distinguishing characters.
- Microscopic analysis of the stem and leaves indicated the presence of vascular bundles, stomata, and calcium oxalate crystals.
- Powder microscopy showed the presence of trichomes, starch grains, and epidermal fragments.

These features can be used as diagnostic characters to differentiate Commelina diffusa from other closely related species in the genus.

2.5 PHYTOCHEMICAL CONSTITUENTS:

Several preliminary phytochemical screenings have been reported for *Commelina diffusa*. These studies show the presence of:

- Flavonoids
- Tannins
- Alkaloids
- Saponins
- Phenols
- Glycosides
- Steroids
- Mucilage

The high flavonoid and phenolic content is of particular interest due to their known antioxidant and anti-inflammatory properties. Saponins and tannins are often associated with wound healing and antimicrobial effects, while alkaloids can provide pain relief and other pharmacological actions.

2.6 REPORTED PHARMACOLOGICAL ACTIVITIES:

Though under-researched compared to other medicinal plants, *Commelina diffusa* has shown promising pharmacological properties in preliminary studies:

a. Anti-inflammatory Activity

- Ethanolic and aqueous extracts have shown significant inhibition of inflammation in animal models.
- The anti-inflammatory action is believed to be mediated by flavonoids and phenolic compounds.

b. Antimicrobial Activity

- Some studies have shown antibacterial effects against *Staphylococcus aureus*, *E. coli*, and *Pseudomonas* species.
- The extracts were more effective in polar solvents like ethanol and methanol.

c. Antioxidant Activity

- The plant contains compounds that scavenge free radicals, reducing oxidative stress.
- This supports its traditional use in treating fevers and infections.

d. Diuretic Effect

- Used traditionally as a diuretic, some animal studies have confirmed increased urinary output upon extract administration.

2.7 STUDIES ON RELATED SPECIES:

Other members of the Commelinaceae family also exhibit medicinal properties:

- Commelina benghalensis: Known for anti-inflammatory and hepatoprotective properties.
- Tradescantia zebrina: Exhibits antioxidant and antimicrobial activity.
- Commelina erecta: Used in folk medicine for gastrointestinal issues.

These findings suggest a shared phytochemical base across the genus, increasing the pharmacological relevance of Commelina diffusa.

MATERIALS AND METHODS

3.1 Plant Collection and Authentication:

The whole plant of *Commelina diffusa* was collected during its flowering season from moist and shaded areas of the selected local region. The plant material was carefully uprooted to retain all parts including roots, stems, leaves, and flowers. The collected specimens were authenticated by a recognized taxonomist on the basis of morphological and botanical characteristics. A voucher specimen was prepared and deposited in a herbarium for future reference.

After authentication, the plant parts were washed thoroughly under running tap water to remove soil and debris. The clean plant material was then shade-dried at room temperature for approximately 10–15 days to prevent the degradation of active constituents. Once completely dried, the material was ground into a coarse powder using an electric grinder and stored in an air-tight container for further phytochemical and pharmacognostical investigations.

Figure 3.1 Collected and Authenticated Plant of Commelina diffusa

3.2 Macroscopic and Microscopic Evaluation

Macroscopic Evaluation: The plant was examined visually to note parameters such as color, shape, surface texture, odor, and taste of individual parts (leaf, stem, and root). These organoleptic characteristics were documented and used as primary identification markers for the crude drug.

Microscopic Evaluation: Transverse sections (T.S.) of the fresh stem, root, and leaf were obtained using a sharp razor blade. These sections were stained using phloroglucinol and hydrochloric acid to highlight lignified tissues. The slides were mounted in glycerin and observed under a compound microscope. Key anatomical features observed included:

- Epidermal cells
- Parenchyma and collenchyma tissues
- Vascular bundles (xylem and phloem)
- Stomata (amphistomatic)
- Calcium oxalate crystals
- Unicellular and multicellular trichomes

3.3 Powder Microscopy:

The dried plant powder was subjected to powder microscopy. A small quantity of the powder was treated with chloral hydrate and stained with iodine and phloroglucinol-HCl as required. The treated powder was observed under a compound microscope, and the following diagnostic characters were identified:

- Starch grains (oval to round)
- Xylem fibers
- Epidermal fragments
- Calcium oxalate crystals
- Trichomes (unicellular and multicellular)

These features help in the authentication and standardization of the crude plant drug.

3.4 Extraction Procedure:

About 100 grams of the powdered plant material was subjected to successive solvent extraction using Soxhlet apparatus. The solvents used were in increasing order of polarity:

1. Petroleum ether
2. Chloroform
3. Ethanol
4. Distilled water

Each extraction was carried out for 6–8 hours or until

the solvent ran clear. The obtained extracts were concentrated using a rotary evaporator under reduced pressure. The semi-solid extracts were then weighed, labeled, and stored in sterile containers in a refrigerator at 4°C until further phytochemical screening.

3.5 Preliminary Phytochemical Screening:

The preliminary phytochemical analysis of the petroleum ether, chloroform, ethanol, and aqueous extracts was conducted using standard qualitative methods. The results were based on observable changes in color, frothing, or precipitate formation. The following table summarizes the tests used for each class of phytoconstituents:

S.No.	Phytoconstituent	Test Performed	Positive Indication
1	Alkaloids	Mayer's / Wagner's Test	Creamy or reddish-brown precipitate
2	Flavonoids	Shinoda Test	Pink or red coloration
3	Tannins	Ferric Chloride Test	Blue-black or green color
4	Saponins	Froth (Foam) Test	Persistent foam for at least 10 minutes
5	Phenolic Compounds	Ferric Chloride Test	Deep blue or black coloration
6	Glycosides	Keller-Killiani Test	Reddish-brown ring at junction of two layers
7	Steroids	Salkowski Test	Red or violet ring at chloroform layer
8	Terpenoids	Liebermann-Burchard Test	Brownish-green coloration
9	Mucilage	Ruthenium Red Test	Pink coloration

3.6 Chemicals and Instruments Used:

All reagents and solvents used during the study were of analytical grade, procured from reliable chemical suppliers such as Merck, Sigma-Aldrich, and Loba Chemie.

Instruments used in this study included:

- Compound microscope (10x, 40x magnification)
- Soxhlet extraction apparatus
- Rotary evaporator
- Hot air oven
- Digital analytical balance
- Glassware: test tubes, conical flasks, beakers, pipettes, watch glasses, etc.
- Refrigerator (for extract storage)

RESULTS AND OBSERVATIONS

4.1 Macroscopic Characteristics

The macroscopic examination of *Commelina diffusa* was conducted by observing fresh plant parts—stem, leaf, root, and flower. The observations included shape, color, texture, surface, and other visual properties. These features are useful for primary identification and raw drug authentication.

Table 4.1: Macroscopic Features of *Commelina diffusa*

Plant Part	Observation	Description
Stem	Color, Shape, Surface	Green, cylindrical, branched, soft and succulent
Leaf	Arrangement, Color, Shape	Alternate, green, lanceolate, entire margin, glossy
Root	Type, Appearance	Fibrous, brownish, thin and elongated
Flower	Color, Type	Blue-purple, bilobed, borne in cymes

Figure 4.1 Macroscopic view of *Commelina diffusa* showing root, leaf, and stem

4.2 Microscopic Characteristics:

Microscopic analysis was performed on transverse sections (T.S.) of the stem, leaf, and root using phloroglucinol and hydrochloric acid staining. The microstructures were observed under a compound microscope. Diagnostic features are tabulated below:

Table 4.2: Microscopic Diagnostic Features of Different Parts

Plant Part	Microscopic Features Observed
Stem	Epidermis, collenchymatous cortex, vascular bundles

	arranged in a ring, xylem and phloem elements
Leaf	Upper and lower epidermis, parenchyma, stomata (amphistomatic), chlorenchyma, palisade cells
Root	Outer cortex, central vascular cylinder, radial xylem and phloem, starch granules, endodermis

4.3 Powder Microscopy:

Microscopy of the powdered plant material (leaf, stem, and root) revealed several key structural features that aid in authentication and detection of adulterants.

Observed Elements:

- Starch grains: Round to oval, densely packed in root powder
- Trichomes: Multicellular, uniseriate, present in leaf powder
- Calcium oxalate crystals: Prism and rosette forms
- Xylem vessels: Spiral and reticulate types
- Fibers: Thick-walled and elongated

These features serve as diagnostic markers for crude drug identification under pharmacognostical examination.

4.4 Extractive Values:

The dried plant powder of Commelina diffusa was subjected to successive extraction using different solvents (petroleum ether, chloroform, ethanol, and water). The percentage yield of each extract was calculated using the formula:

Extractive value (%) = (Weight of extract / Weight of crude drug) × 100

Table 4.3: Percentage Yield of Extracts

Solvent Used	Color of Extract	Nature	% Yield (w/w)
Petroleum Ether	Pale yellow	Sticky/semi-solid	1.2%
Chloroform	Brownish	Resinous	2.5%
Ethanol	Dark brown	Thick paste	6.3%
Aqueous (Water)	Brown	Sticky, thick	7.8%

4.5 Phytochemical Screening Results:

Preliminary phytochemical analysis was carried out on all extracts using standard chemical tests. The results are shown below:

Table 4.4: Presence (+) or Absence (–) of Phytoconstituents in Various Extracts

Phytoconstituent	Petroleum Ether	Chloroform	Ethanol	Aqueous
Alkaloids	–	+	+	+
Flavonoids	–	+	+	+
Tannins	–	–	+	+
Saponins	–	–	+	+
Phenols	–	–	+	+
Glycosides	–	+	+	+
Steroids	+	+	–	–
Terpenoids	+	+	+	+
Mucilage	–	–	–	+

DISCUSSION

5.1 Overview:

Medicinal plants have always played an integral role in healthcare systems across the world, particularly in regions with rich ethnomedicinal traditions such as India, China, and Africa. The increasing resistance of pathogens to synthetic drugs and the rising side effects associated with chemical medications have led to a renewed interest in plant-based medicine.

Figure 5.1 Microscopic transverse section of *Commelina diffusa* stem showing vascular bundles and calcium oxalate crystals

The current study explores the pharmacognostical and phytochemical profile of *Commelina diffusa*, a plant widely used in traditional medicine for treating fever, wounds, inflammation, and microbial infections. Despite its frequent use in tribal and folk medicine, scientific validation of its constituents and standardization remains minimal. This study bridges that gap by offering macro- and micro-morphological features, powder microscopy, and preliminary phytochemical screening.

5.2 Pharmacognostical Significance:

The pharmacognostical evaluation of *Commelina diffusa* revealed several distinct morphological and anatomical characteristics that support its correct identification and authentication in herbal preparations.

- Macroscopic Features such as the soft, succulent stem; lanceolate green leaves; and fibrous roots match standard botanical texts, thus confirming correct plant identity.
- Microscopic Analysis provided detailed insight into internal cellular structures like:

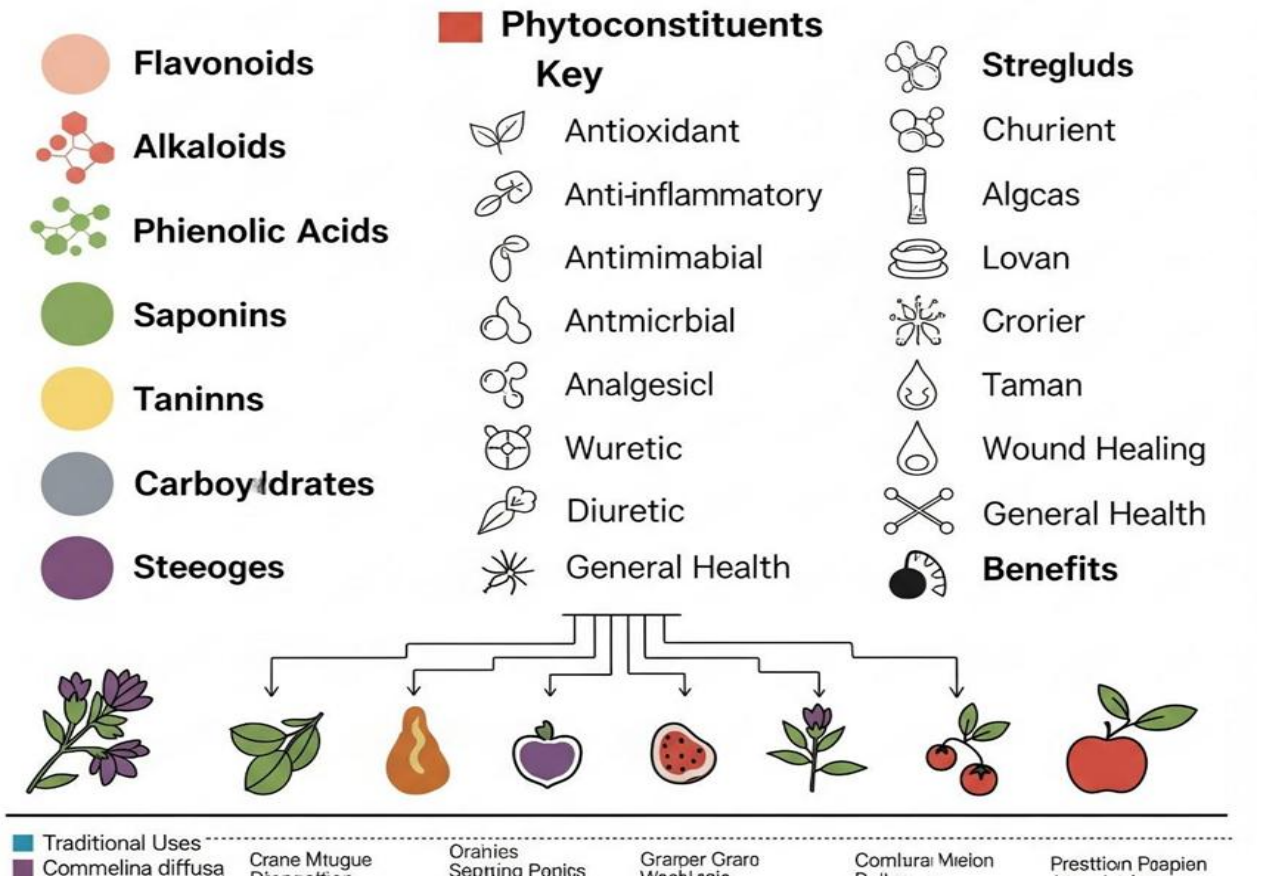

Figure 5.2: Graphical representation of phytoconstituents in *Commelina diffusa* and their traditional uses

These microscopic characters are critical diagnostic markers used in quality control, especially when the plant is used in powdered or crushed form.

Powder microscopy further confirmed the presence of identifying cellular elements, such as starch grains, trichomes, and fibers, which can aid in detecting adulterants or substitutes in raw drug material.

5.3 Phytochemical Relevance and Interpretation:

The preliminary phytochemical screening revealed that *Commelina diffusa* is a rich source of secondary metabolites, which are responsible for its wide range of medicinal applications. The most significant classes identified were:

- Alkaloids – known for analgesic, antimicrobial, and CNS-modulating activities
- Flavonoids and Phenolic Compounds – potent antioxidants and anti-inflammatory agents
- Tannins – astringent, wound healing, and

antimicrobial activities
- Saponins – surfactant-like properties, immune modulation
- Glycosides – cardioprotective and detoxifying functions
- Steroids and Terpenoids – anti-inflammatory, hepatoprotective, and hormonal roles
- Mucilage – soothing agent, used in gastrointestinal and respiratory disorders

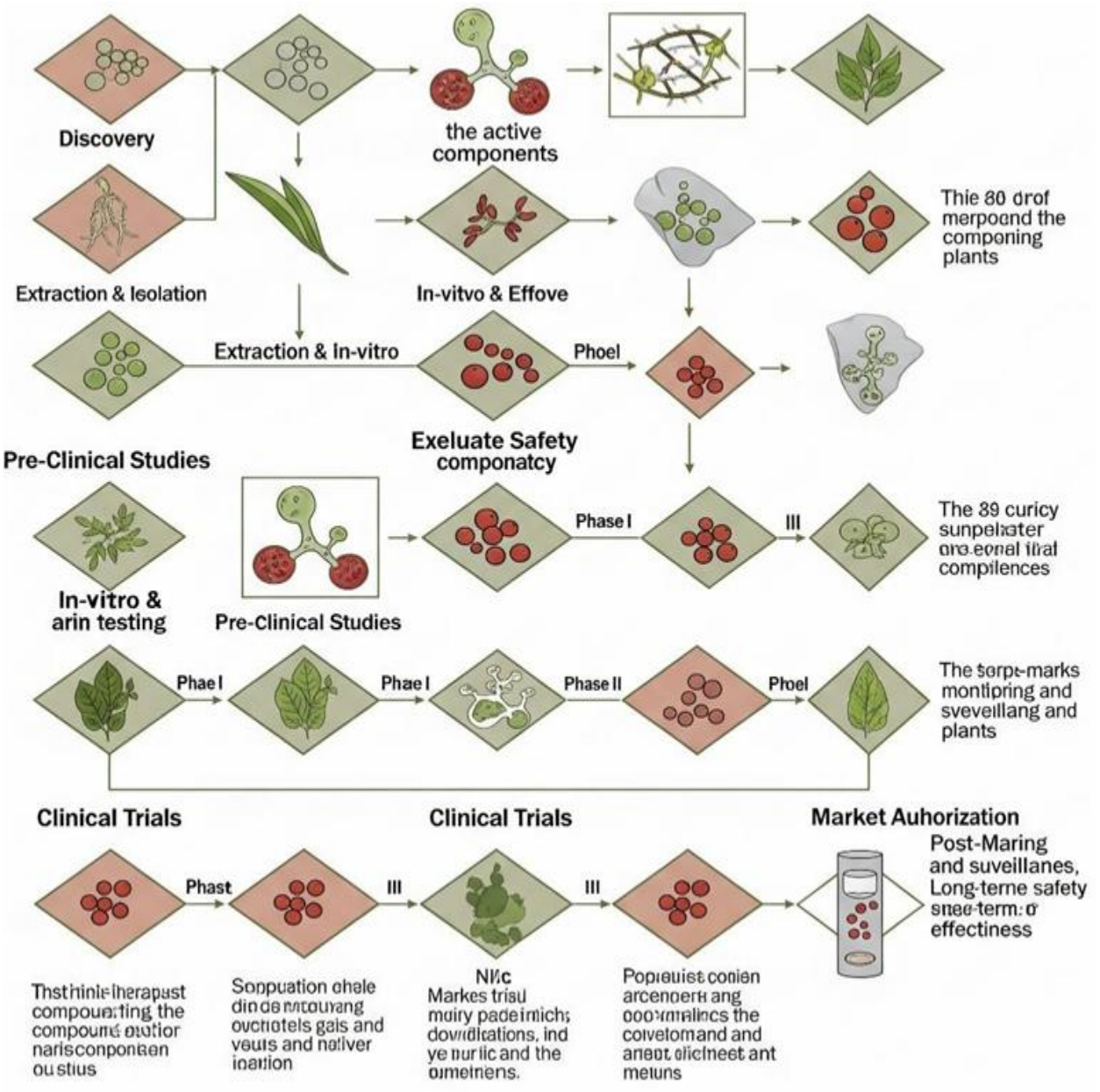

Figure 5.3 - Schematic flow of drug development pathway from medicinal plants

Notably, ethanolic and aqueous extracts demonstrated the widest range of phytochemicals. This is in line with other herbal studies, which indicate that polar solvents (ethanol and water) are more efficient in extracting bioactive compounds than non-polar ones.

This diversity in chemical composition explains the traditional versatility of *Commelina diffusa* and forms the basis for its pharmacological potential.

5.4 Correlation with Traditional Uses:

The phytochemicals found support and validate many of the ethnomedicinal uses of the plant:

Traditional Use	Related Phytochemicals	Scientific Basis
Fever and infections	Flavonoids, phenols	Antioxidant and immune-modulating effects
Wound healing and burns	Tannins, saponins	Antimicrobial and tissue-healing properties
Anti-inflammatory applications	Alkaloids, steroids, flavonoids	Inhibition of inflammatory mediators
Diuretic and urinary infections	Glycosides, flavonoids	Diuretic effect via increased renal output
Skin infections, snakebites	Saponins, terpenoids	Anti-inflammatory, antimicrobial, and analgesic roles

Thus, this phytochemical evidence provides a scientific rationale for the traditional medicinal claims and encourages further research for therapeutic applications.

5.5 Comparison with Previous Studies:

Though limited, earlier studies on *Commelina diffusa* and its relatives within Commelinaceae have reported the presence of certain phytochemicals and antimicrobial activities. This study not only confirms these findings but also provides detailed pharmacognostical and microscopic features, which were lacking in earlier reports.

For instance:

- *Commelina benghalensis* was shown to have anti-inflammatory and hepatoprotective effects.
- *Tradescantia zebrina* exhibited antioxidant and antimicrobial properties.
- However, these species were not subjected to as detailed pharmacognostical profiling as done here for *C. diffusa*.

This positions the current study as a foundational step in the comprehensive understanding of this species.

5.6 Scientific and Pharmaceutical Implications:

The results obtained in this study hold multiple implications:

- Quality Control and Authentication: Pharmacognostical data aids in setting standard parameters to avoid adulteration in herbal products.
- Pre-formulation Studies: Extracts rich in bioactives can be tested for formulation into creams, ointments, or capsules.
- Drug Discovery Pipeline: Flavonoid- and alkaloid-rich extracts from *Commelina diffusa* could be screened for antimicrobial, anti-inflammatory, or antioxidant drug development. This research adds to the growing body of evidence that traditional plants can be a source of future pharmaceuticals if studied rigorously and validated scientifically.

5.7 Limitations and Future Recommendations:

Although the study generated valuable data, certain limitations were noted:

- The study employed qualitative analysis only; no quantification (e.g., total phenolic content, total flavonoid content) was conducted.
- No in vitro or in vivo pharmacological tests (e.g., antimicrobial, anti-inflammatory) were performed to confirm biological activity.
- No chromatographic analysis (e.g., TLC, HPTLC, GC-MS, or LC-MS) was conducted to isolate or identify specific compounds.
- Toxicity or cytotoxicity profiling was not done to assess safety. Future Work Should Include:
- Quantitative estimation using UV-spectrophotometry or HPLC.
- Isolation and structural elucidation of major bioactive compounds.
- Pharmacodynamic studies in animal models.
- Toxicity screening to evaluate the therapeutic safety margin.

CONCLUSION AND FUTURE SCOPE

6.1 Conclusion

The present investigation focused on the pharmacognostical and phytochemical screening of *Commelina diffusa* Burm. f., a tropical herb with wide ethnobotanical significance but limited scientific documentation. The study systematically evaluated both the macroscopic and microscopic features of the plant, in addition to the qualitative phytochemical content using different solvent extracts. The findings reveal that *Commelina diffusa* is a promising source of therapeutic phytoconstituents and supports its potential inclusion in herbal formulations.

Pharmacognostical Observations:

Distinct macroscopic characters such as its green, soft

stem; fibrous roots; and lanceolate leaves help in the proper morphological identification. Microscopic and powder microscopy studies revealed anatomical structures such as collenchymatous cortex, calcium oxalate crystals, starch grains, multicellular trichomes, and vascular bundles, which are important diagnostic markers.

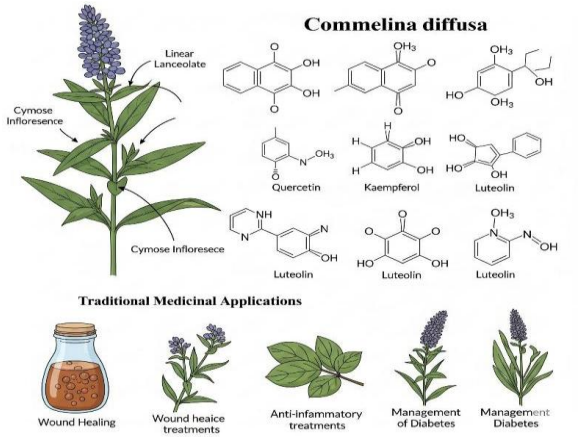

Figure 6.1Summary illustration of pharmacognostical and phytochemical findings of *Commelina diffusa*

Phytochemical Findings:

Preliminary screening revealed the presence of alkaloids, flavonoids, tannins, saponins, phenolic compounds, glycosides, steroids, and mucilage, especially in the ethanolic and aqueous extracts. These metabolites are known to contribute to various pharmacological actions including anti-inflammatory, antimicrobial, antioxidant, wound healing, and diuretic effects.

6.2 Future Scope:

Though the present work provides valuable primary data, it opens up many avenues for deeper scientific exploration. Several critical aspects remain underexplored:

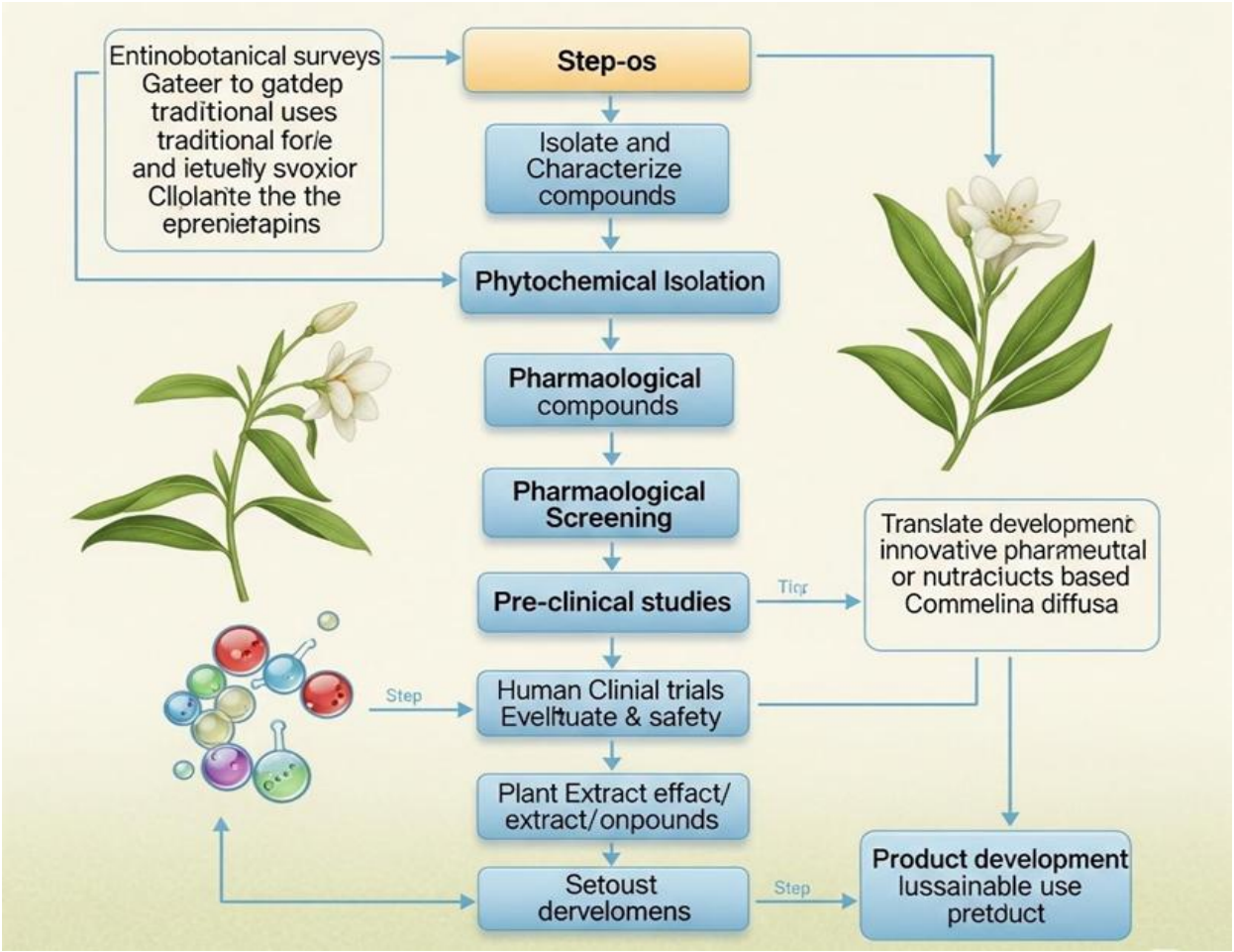

Figure 6.2: Flowchart showing future research and development pathway for *Commelina diffusa*

[1] Quantitative Phytochemical Estimation:
Future studies must focus on quantification of bioactive compounds such as total flavonoid content (TFC), total phenolic content (TPC), and antioxidant potential using UV-visible spectroscopy, HPLC, or LC-MS techniques.

[2] Isolation and Characterization:
The isolation of pure phytoconstituents from extracts using chromatographic techniques (TLC, HPTLC, column chromatography) and identification through spectroscopic tools (GC-MS, NMR, FTIR) is essential for structural elucidation.

[3] Pharmacological Validation:
Though traditional uses suggest therapeutic value, in vivo and in vitro studies must be conducted to validate specific biological actions like anti-inflammatory, antimicrobial, antioxidant, analgesic, and hepatoprotective effects.

[4] Toxicological Assessment:
Safety assessment through acute, sub-acute, and chronic toxicity studies in appropriate animal models is required before the plant can be considered for human use.

[5] Formulation and Standardization:
Extracts of *Commelina diffusa* can be explored in various formulation types such as topical ointments, tablets, decoctions, and capsules. These formulations must undergo stability testing, shelf-life assessment, and bioavailability studies.

[6] Clinical Studies and Regulatory Approval:
Clinical validation and development of pharmacopoeial monographs will enhance the credibility and regulatory acceptance of *Commelina diffusa* in global herbal markets

6.3 Final Remarks:
Commelina diffusa is an underutilized yet biologically rich medicinal herb that holds a well- documented legacy in various traditional healing systems, including Ayurveda, Chinese, African, and folk medicine. The plant's traditional applications in treating ailments such as inflammation, wounds, diarrhea, fever, and infections strongly suggest the presence of potent bioactive constituents.

This study has systematically explored and validated the pharmacognostical and phytochemical properties of Commelina diffusa. The findings confirm the presence of important secondary metabolites such as flavonoids, alkaloids, tannins, phenols, and saponins, which are known for their wide range of pharmacological actions including anti- inflammatory, antimicrobial, antioxidant, and wound healing effects. These results provide a credible scientific basis for many of its traditional medicinal claims and emphasize its potential in modern phytomedicine.
In the current global context, where the demand for safe, natural, and plant-based therapeutics is rapidly growing, Commelina diffusa emerges as a promising and cost-effective source of phytotherapeutics. Its abundant availability in tropical and subtropical regions, coupled with minimal known toxicity, enhances its suitability for herbal product development.
Moreover, this research contributes to the standardization and authentication of C. diffusa, which is crucial for ensuring the quality, safety, and efficacy of herbal drugs. It also sets the groundwork for advanced pharmacological research, including isolation and structural characterization of active compounds, toxicity studies, and clinical evaluation.
Thus, the current study serves not only as a scientific validation of traditional knowledge but also as an academic and pharmaceutical stepping stone toward the development of novel herbal formulations. With further research, Commelina diffusa could potentially become an integral part of therapeutic strategies in both traditional and integrative medicine systems.

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