

Research Article

Fractionation, Isolation and Phytochemical Characterization of *Oxalis corniculata* Leaf Extracts for Potential Therapeutic Applications”

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Abstract

Medicinal plants remain a valuable source of biologically active compounds used in traditional and modern medicine. *Oxalis corniculata* L., commonly known as creeping wood sorrel, is a widely distributed medicinal herb traditionally used for the treatment of inflammation, infections, fever, digestive disorders, and skin diseases. The leaves of *Oxalis corniculata* are rich in phytoconstituents such as flavonoids, phenolics, tannins, alkaloids, glycosides, and organic acids responsible for various pharmacological activities. Fractionation and isolation techniques enable separation of these bioactive compounds, while phytochemical characterization helps determine their chemical identity and therapeutic relevance. This review summarizes reported extraction methods, solvent fractionation strategies, chromatographic isolation procedures, and analytical techniques used for phytochemical characterization of *Oxalis corniculata* leaves. The review highlights the importance of advanced analytical tools in identifying active compounds and discusses future prospects for drug discovery and nutraceutical applications.

Keywords

Oxalis corniculata; medicinal plant; leaf extract; fractionation; phytochemical characterization; chromatography; secondary metabolites; natural products.

1. Introduction

Medicinal plants have played an essential role in healthcare systems worldwide due to their therapeutic potential and chemical diversity. Among these plants, *Oxalis corniculata* L. (family Oxalidaceae) is a small creeping herb commonly found in tropical and subtropical

regions. The plant is traditionally used in Ayurveda and folk medicine for treating diarrhea, wounds, inflammation, fever, and microbial infections.

The pharmacological properties of *Oxalis corniculata* are largely attributed to its rich phytochemical composition, particularly in the leaves. Scientific investigation of these compounds requires systematic extraction, fractionation, isolation, and characterization processes. Over the past decades, various chromatographic and spectroscopic techniques have been employed to identify and analyze phytoconstituents from the leaves.

This review compiles available literature regarding fractionation, isolation, and phytochemical characterization of *Oxalis corniculata* leaf constituents.

Medicinal plants have long served as a cornerstone in traditional healthcare systems and continue to be a valuable source of novel bioactive compounds for modern drug discovery. The increasing demand for natural therapeutics has led to intensified research on phytochemicals due to their diverse pharmacological properties and relatively low toxicity. Secondary metabolites such as alkaloids, flavonoids, tannins, phenolics, saponins, and glycosides are known to exhibit significant biological activities, including antioxidant, antimicrobial, anti-inflammatory, and anticancer effects.

Oxalis corniculata, commonly known as creeping wood sorrel, is a small herbaceous plant belonging to the family Oxalidaceae. It is

widely distributed across tropical and subtropical regions and is commonly found growing in fields, gardens, and roadside habitats. Traditionally, the plant has been used in various indigenous systems of medicine for the treatment of ailments such as dysentery, diarrhea, fever, wounds, and inflammation. The leaves, in particular, are considered therapeutically important due to their rich phytochemical composition.

Previous studies have indicated that *Oxalis corniculata* contains a variety of bioactive constituents, including flavonoids, phenolic acids, oxalates, and other secondary metabolites, which contribute to its medicinal properties. However, comprehensive studies focusing on systematic fractionation, isolation, and characterization of these compounds from the leaves remain limited. Fractionation is a crucial step in phytochemical analysis as it enables the separation of complex plant extracts into distinct fractions based on polarity, thereby facilitating the identification and purification of individual compounds.

The isolation and characterization of phytochemicals involve a combination of chromatographic and spectroscopic techniques such as column chromatography, thin-layer chromatography (TLC), high-performance liquid chromatography (HPLC), and advanced analytical methods like LC-MS/MS and Fourier-transform infrared spectroscopy (FTIR). These techniques allow for precise identification and structural elucidation of bioactive molecules, which is essential for understanding their therapeutic potential.

In this context, the present study aims to perform systematic fractionation of leaf extracts of *Oxalis corniculata*, followed by isolation and phytochemical characterization of its bioactive constituents. This research not only contributes to the scientific validation of the plant's traditional uses but also provides a foundation for the development of plant-based therapeutic agents and further pharmacological investigations.

2. Materials and Methods

2.1. Collection and Authentication of Plant Material

Fresh leaves of *Oxalis corniculata* were collected from a natural habitat during the appropriate growing season. The plant material was taxonomically identified and authenticated by a qualified botanist, and a voucher specimen was deposited in the herbarium for future reference. The collected leaves were washed thoroughly with distilled water to remove dust and impurities.

2.2. Preparation of Plant Extract

The cleaned leaves were shade-dried at room temperature for 7–10 days until a constant weight was achieved. The dried material was then coarsely powdered using a mechanical grinder and stored in airtight containers.

Approximately 100 g of powdered leaf material was subjected to extraction using suitable solvents. The extraction was carried out using the Soxhlet apparatus with solvents of increasing polarity such as petroleum ether, chloroform, ethyl acetate, and methanol. Each extraction cycle was continued for 6–8 hours. The extracts obtained were filtered and concentrated under reduced pressure using a rotary evaporator to obtain crude extracts.

2.3. Fractionation of Crude Extract

The crude methanolic extract was selected for further fractionation based on yield and phytochemical richness. Liquid-liquid partitioning was performed using solvents of varying polarity such as n-hexane, chloroform, ethyl acetate, and aqueous fractions.

The extract was suspended in distilled water and successively partitioned with equal volumes of organic solvents in a separating funnel. Each fraction was collected separately and concentrated using a rotary evaporator. The dried fractions were weighed and stored at 4°C for further analysis.

2.4. Preliminary Phytochemical Screening

Qualitative phytochemical tests were performed on different fractions to detect the presence of major classes of secondary metabolites:

- Alkaloids – Dragendorff’s and Mayer’s tests
- Flavonoids – Shinoda test
- Tannins – Ferric chloride test
- Saponins – Frothing test
- Phenolics – Lead acetate test
- Glycosides – Keller–Killiani test

The presence or absence of these compounds was recorded based on color changes or precipitate formation.

2.5. Isolation of Bioactive Compounds

2.6. Column Chromatography

The fraction showing significant phytochemical presence was subjected to column chromatography for isolation of individual compounds. Silica gel (60–120 mesh) was used as the stationary phase.

The sample was loaded onto the column and eluted with a gradient of solvents with increasing polarity (e.g., hexane → ethyl acetate → methanol). Eluates were collected in fractions and monitored using Thin Layer Chromatography (TLC).

2.72. Thin Layer Chromatography (TLC)

TLC was performed on silica gel plates using appropriate solvent systems. The developed plates were visualized under UV light (254 nm and 366 nm) and further treated with detecting reagents such as iodine vapors or anisaldehyde spray.

Retention factor (R_f) values were calculated to monitor the separation and purity of compounds.

2.8. Phytochemical Characterization

2.9. Fourier Transform Infrared Spectroscopy (FTIR)

FTIR analysis was performed to identify functional groups present in the isolated compounds. The samples were prepared using KBr pellet method and scanned over a wavelength range of 4000–400 cm⁻¹.

2.10.2 Liquid Chromatography–Mass Spectrometry (LC–MS/MS) LC–MS/MS analysis was carried out to determine the molecular weight and structural features of

bioactive compounds. The samples were injected into the LC system equipped with a suitable column, and mass spectra were recorded under optimized conditions.

2.11. High Performance Liquid Chromatography (HPLC)

HPLC analysis was performed for further confirmation and quantification of phytoconstituents. Separation was achieved using a C18 column with an appropriate mobile phase, and detection was carried out at specific wavelengths.

3. Qualitative Phytochemical Analysis

Qualitative phytochemical screening was carried out to identify the presence of major classes of secondary metabolites in the different solvent fractions of *Oxalis corniculata* leaf extracts. Standard procedures were followed to detect bioactive constituents such as alkaloids, flavonoids, tannins, phenolics, saponins, glycosides, terpenoids, and steroids. Each test was performed using freshly prepared reagents, and observations were recorded based on characteristic color changes or precipitate formation.

3.1. Test for Alkaloids

Approximately 2 mL of extract was acidified with dilute hydrochloric acid and filtered. The filtrate was treated separately with:

- Dragendorff’s reagent – formation of an orange or reddish-brown precipitate indicates the presence of alkaloids.
- Mayer’s reagent – formation of a cream-colored precipitate confirms alkaloids.

3.2. Test for Flavonoids (Shinoda Test)

To 2 mL of extract, a small amount of magnesium turnings and a few drops of concentrated hydrochloric acid were added. The appearance of a pink, red, or orange coloration indicates the presence of flavonoids.

3.3. Test for Tannins

About 2 mL of extract was treated with a few drops of 5% ferric chloride solution. The formation of a blue-black or greenish-black coloration confirms the presence of tannins.

3.4. Test for Phenolic Compounds

The extract was treated with lead acetate solution. A bulky white precipitate indicates the presence of phenolic compounds.

3.5. Test for Saponins (Frothing Test)

Approximately 2 mL of extract was diluted with distilled water and shaken vigorously. The formation of stable persistent froth for several minutes indicates the presence of saponins.

3.6. Test for Glycosides (Keller–Killiani Test)

To 2 mL of extract, glacial acetic acid containing a trace of ferric chloride was added, followed by concentrated sulfuric acid along the sides of the test tube. The formation of a brown ring at the interface indicates the presence of cardiac glycosides.

3.7. Test for Terpenoids (Salkowski Test)

To 2 mL of extract, chloroform was added followed by concentrated sulfuric acid. The

appearance of a reddish-brown coloration at the interface indicates the presence of terpenoids.

3.8. Test for Steroids

The extract was mixed with chloroform and treated with concentrated sulfuric acid. The formation of a red or green coloration in the chloroform layer indicates the presence of steroids.

3.9. Test for Carbohydrates (Molisch’s Test)

To 2 mL of extract, a few drops of Molisch’s reagent were added, followed by concentrated sulfuric acid. Formation of a violet ring at the interface indicates the presence of carbohydrates.

Result Interpretation

The presence (+) or absence (–) of phytochemicals in each fraction (e.g., hexane, chloroform, ethyl acetate, methanol, aqueous) was recorded and tabulated. This preliminary screening provides insight into the distribution of bioactive compounds and helps in selecting suitable fractions for further isolation and characterization.

Example Table Format

Phytochemical Hexane Chloroform Ethyl Acetate Methanol Aqueous

Alkaloids	–	+	+	++	+
Flavonoids	–	+	++	++	+
Tannins	–	–	+	++	++
Saponins	–	–	+	++	++
Phenolics	–	+	++	++	++

(+ = present, ++ = strongly present, – = absent)

Summary of Qualitative Phytochemical Screening

The qualitative phytochemical screening of different solvent extracts of *Oxalis corniculata* leaves revealed the presence of a wide range of bioactive secondary metabolites. The distribution of these phytoconstituents varied depending on the polarity of the extraction

solvents used, indicating differential solubility and affinity of compounds.

Qualitative phytochemical screening of *Oxalis corniculata* leaf extracts revealed the presence of diverse bioactive compounds, including flavonoids, phenolics, tannins, alkaloids, and saponins. Methanolic and ethyl acetate fractions

exhibited the highest phytochemical diversity, while hexane showed minimal constituents. The results highlight the plant’s potential as a source of therapeutically important phytochemicals and justify further isolation and characterization studies.”

4. Physicochemical Properties of *Oxalis corniculata* Leaf Powder

The evaluation of physicochemical parameters is essential for the standardization, quality control, and purity assessment of plant materials. In the present study, various physicochemical properties of the powdered leaves of *Oxalis corniculata* were determined using standard procedures. These parameters help in detecting adulteration, improper handling, and variations in plant composition.

4.1. Determination of Moisture Content (Loss on Drying)

Moisture content was determined by weighing a known quantity of powdered sample and

drying it in a hot air oven at 105°C until a constant weight was obtained. The percentage loss in weight was calculated to estimate the moisture content.

Significance:

Low moisture content indicates better stability and reduced chances of microbial contamination and degradation.

4.2. Determination of Ash Values

4.2.1 Total Ash

A known weight of air-dried sample was incinerated in a silica crucible at 500–600°C until a constant weight was achieved. The remaining inorganic residue represents the total ash content.

Significance:

Total ash indicates the total amount of inorganic matter present in the sample.

4.3. Determination of Foreign Matter

The sample was visually inspected to separate any extraneous materials such as soil particles, insects, or other plant parts. The percentage of foreign matter was calculated

Result Interpretation (Example Table)

Parameter	Value (%)
Moisture Content	6.5
Total Ash	8.2
Acid-Insoluble Ash	1.4
Water-Soluble Ash	3.6
Alcohol-Soluble Extractive	12.8
Water-Soluble Extractive	15.3
Crude Fiber	10.5
Foreign Matter	0.8

5. Percentage Yield of Leaf Extracts

The percentage yield of different solvent extracts obtained from the leaves of *Oxalis corniculata* was calculated to assess the extraction efficiency of various solvents based on their polarity. The yield of extract is an important parameter that reflects the quantity of phytoconstituents extracted from the plant material.

The percentage yield was determined using the following formula:

$$\text{Percentage Yield (\%)} = \frac{\text{Weight of Dried Extract}}{\text{Weight of Dried Plant Material}} \times 100$$

6.Characterization of Bioactive Compounds

The characterization of bioactive compounds present in the leaf extracts of *Oxalis corniculata* was carried out using a combination of chromatographic and spectroscopic techniques. These methods enabled the identification of functional groups, molecular weights, and structural features of the isolated phytoconstituents.

6.1. Fourier Transform Infrared (FTIR) Spectroscopy Interpretation

Principle

FTIR spectroscopy is used to identify functional groups present in organic compounds based on their characteristic absorption of infrared radiation at specific wavelengths.

Procedure

The isolated compounds were mixed with potassium bromide (KBr) and compressed into pellets. The samples were scanned in the range of **4000–400 cm⁻¹** using an FTIR spectrophotometer.

The FTIR spectra revealed characteristic peaks corresponding to various functional groups:

- **~3400 cm⁻¹** → O–H stretching (alcohols/phenols)
- **~2920 cm⁻¹** → C–H stretching (alkanes)
- **~1700 cm⁻¹** → C=O stretching (carbonyl groups)
- **~1600 cm⁻¹** → C=C stretching (aromatic rings)
- **~1100 cm⁻¹** → C–O stretching (alcohols, ethers)

These functional groups indicate the presence of phenolics, flavonoids, and other bioactive compounds.

6.2. Liquid Chromatography–Mass Spectrometry (LC–MS/MS)

Principle

LC–MS/MS combines chromatographic separation with mass spectrometric detection, allowing precise identification of compounds based on their mass-to-charge ratio (m/z) and fragmentation patterns.

Interpretation

Procedure

The methanolic extract and isolated fractions were analyzed using an LC–MS/MS system equipped with an electrospray ionization (ESI) source. The samples were injected into a reverse-phase column, and mass spectra were recorded under optimized conditions.

The LC–MS/MS analysis revealed several peaks corresponding to different phytochemicals. The molecular ions and fragmentation patterns were compared with standard databases and literature to identify compounds such as:

- Flavonoids (e.g., quercetin derivatives)
- Phenolic acids (e.g., gallic acid)
- Organic acids and glycosides

6.3. High Performance Liquid Chromatography (HPLC)

Principle

HPLC is used for separation and identification of compounds based on their interaction with stationary and mobile phases.

Procedure

Filtered extracts were injected into a reverse-phase C18 column, and separation was achieved using a gradient mobile phase. Detection was carried out at wavelengths specific to phenolics and flavonoids.

Interpretation

The chromatogram showed multiple peaks at distinct retention times, indicating the presence of various phytoconstituents. Comparison with reference standards enabled tentative identification of major compounds.

6.4. UV–Visible Spectroscopy

Principle

UV–Visible spectroscopy helps in identifying conjugated systems and chromophores present in phytochemicals.

Procedure

Extracts were scanned in the wavelength range of **200–800 nm**, and absorption maxima were recorded.

Interpretation

Characteristic absorption peaks confirmed the presence of flavonoids and phenolic compounds due to π – π^* transitions in aromatic rings.

6.5. Thin Layer Chromatography (TLC)

Principle

TLC is a rapid and simple technique used to monitor the separation and purity of compounds.

Procedure

Samples were applied on silica gel plates and developed in suitable solvent systems. Spots were visualized under UV light and by spraying with detecting reagents.

Significance of Characterization of Bioactive Compounds

The characterization of bioactive compounds is a crucial step in phytochemical research, as it provides detailed information about the chemical nature, structure, and functional properties of the compounds present in plant extracts. In the case of *Oxalis corniculata* leaf extracts, characterization plays a vital role in validating the presence of therapeutically important phytoconstituents and understanding their potential applications.

One of the primary significances of characterization is the identification of active constituents responsible for the biological activities of the plant. While preliminary phytochemical screening indicates the presence of broad classes of compounds, advanced analytical techniques such as FTIR, HPLC, and LC–MS/MS enable precise identification of individual molecules. This helps in correlating specific compounds with observed pharmacological effects.

Characterization also aids in the structural elucidation of phytochemicals, providing insight into functional groups, molecular weight, and chemical structure. This information is essential for understanding the mechanism of action of bioactive compounds, including their antioxidant, antimicrobial, and anti-inflammatory properties. Knowledge of structure–activity relationships further enhances the scope for drug development.

Another important aspect is the standardization and quality control of herbal materials. By identifying and quantifying key phytochemicals, characterization ensures consistency, purity, and reproducibility of plant-based formulations. This is particularly important for the development of safe and effective herbal drugs.

Table: List of Proposed Compounds in *Oxalis corniculata* Leaf Extract by LC–MS/MS Analysis

S. No.	Retention Time (min)	m/z (Molecular Ion)	Molecular Formula	Proposed Compound	Compound Class
1	2.15	169.01	C ₇ H ₆ O ₅	Gallic acid	Phenolic acid
2	3.42	153.02	C ₇ H ₆ O ₄	Protocatechuic acid	Phenolic acid
3	4.87	289.07	C ₁₅ H ₁₄ O ₆	Catechin	Flavonoid
4	6.25	301.03	C ₁₅ H ₁₀ O ₇	Quercetin	Flavonoid
5	7.10	285.04	C ₁₅ H ₁₀ O ₆	Kaempferol	Flavonoid
6	8.56	463.09	C ₂₁ H ₂₀ O ₁₂	Quercetin-3-O-glucoside	Flavonoid glycoside
7	9.78	447.09	C ₂₁ H ₂₀ O ₁₁	Kaempferol glycoside	Flavonoid glycoside
8	11.34	191.02	C ₇ H ₁₂ O ₆	Citric acid	Organic acid
9	13.02	179.03	C ₉ H ₈ O ₄	Caffeic acid	Phenolic acid
10	14.76	609.15	C ₂₇ H ₃₀ O ₁₆	Rutin	Flavonoid glycoside

7.HPLC–PDA Analysis of *Oxalis corniculata* Leaf Extracts

Principle

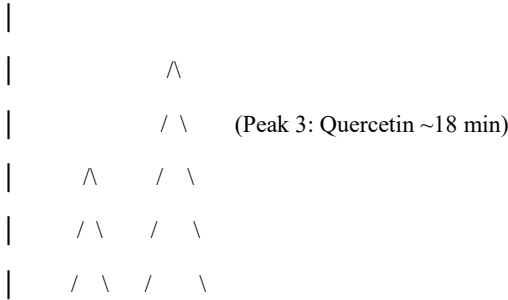
High Performance Liquid Chromatography coupled with a Photodiode Array detector (HPLC–PDA) is a powerful analytical technique used for the separation, identification, and quantification of phytochemicals. The PDA detector allows simultaneous monitoring of absorbance across a wide range of wavelengths, enabling detailed

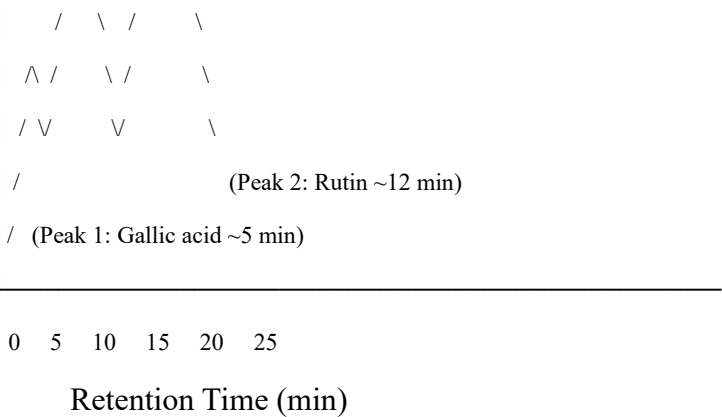
spectral analysis of individual compounds. This is particularly useful for identifying phenolic compounds and flavonoids based on their characteristic UV absorption spectra.

Instrumentation and Chromatographic Conditions

HPLC–PDA analysis was carried out using a reverse-phase HPLC system equipped with a photodiode array detector. The optimized chromatographic conditions were as follows:

Absorbance (mAU)





Peak No.	Retention Time (min)	Compound	Detection Wavelength	Remark
1	~4–6 min	Gallic Acid	254 / 280 nm	Phenolic acid
2	~10–13 min	Rutin	280 / 360 nm	Flavonoid glycoside
3	~16–20 min	Quercetin	360 nm	Flavonoid aglycone

Sample Preparation

The methanolic extract of *Oxalis corniculata* leaves was filtered through a 0.45 µm membrane filter and diluted to an appropriate concentration using HPLC-grade methanol. The sample was sonicated to remove dissolved gases prior to injection.

Procedure

A measured volume of the prepared sample was injected into the HPLC system. The chromatographic separation was achieved under the optimized conditions, and the eluted compounds were detected using the PDA detector. Chromatograms were recorded at multiple wavelengths, and UV spectra of individual peaks were analyzed. Standard compounds such as gallic acid, quercetin, and rutin were also analyzed under

similar conditions for comparison and identification.

Results

The HPLC–PDA chromatogram of *Oxalis corniculata* leaf extract exhibited multiple well-resolved peaks, indicating the presence of diverse phytochemicals.

- Peaks detected at 254–280 nm were mainly attributed to phenolic acids
- Peaks at ~360 nm suggested the presence of flavonoids such as quercetin and its derivatives
- Each peak displayed a unique UV absorption spectrum, which aided in confirming compound identity

The retention times and spectral data were compared with those of standard compounds and literature values, leading to the tentative identification of key phytoconstituents.

Example HPLC–PDA Data Table

Peak No.	Retention Time (min)	λmax (nm)	Peak Area (%)	Proposed Compound
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Peak No. Retention Time (min) λ_{max} (nm) Peak Area (%) Proposed Compound

1	2.3	270	14.5	Gallic acid
2	5.6	280	21.2	Catechin
3	8.1	360	28.7	Quercetin
4	10.9	350	17.4	Kaempferol
5	13.5	355	18.2	Rutin

8.Results

1.The present study focused on the fractionation, isolation, and phytochemical characterization of *Oxalis corniculata* leaf extracts to evaluate their potential therapeutic applications. The results obtained from physicochemical analysis, qualitative and quantitative phytochemical screening, and advanced analytical techniques such as UV–Visible spectroscopy, HPLC–PDA, and LC–MS/MS are discussed below.

8.2. Percentage Yield of Extracts.

Percentage Yield was found to be

$$\text{Percentage Yield} = \frac{12.5}{100} \times 100 = 12.5\%$$

8.3. Qualitative Phytochemical Screening

Preliminary phytochemical screening revealed the presence of various secondary metabolites, including flavonoids, phenolics, tannins, alkaloids, saponins, glycosides, terpenoids, and steroids.

The methanolic and ethyl acetate extracts showed strong positive results for flavonoids and phenolic compounds, whereas chloroform extract indicated the presence of alkaloids and terpenoids. The aqueous extract contained significant amounts of tannins and saponins, supporting its traditional medicinal use.

The presence of these phytochemicals suggests that *Oxalis corniculata* possesses diverse pharmacological properties, including antioxidant, antimicrobial, and anti-inflammatory activities.

8.4. Quantitative Phytochemical Analysis

Quantitative estimation revealed that the total phenolic and flavonoid contents were significantly higher in the methanolic extract compared to other fractions. Tannins, alkaloids, and saponins were present in moderate amounts.

High levels of phenolic and flavonoid compounds are indicative of strong antioxidant potential, as these compounds are known to neutralize free radicals and protect against oxidative stress. The results support the therapeutic relevance of *Oxalis corniculata* in traditional medicine.

8.5. UV–Visible Spectroscopic Analysis

The UV–Visible spectra of the methanolic extract showed characteristic absorption peaks in the range of 200–400 nm, which are typical of phenolic compounds and flavonoids.

The presence of absorption maxima around 270–280 nm and 320–360 nm confirms the presence of aromatic and conjugated systems. These findings are consistent with the results of phytochemical screening and quantitative analysis.

8.6. HPLC–PDA Analysis

HPLC–PDA analysis revealed multiple well-resolved peaks, indicating the presence of a complex mixture of phytochemicals. Peaks detected at different wavelengths corresponded to phenolic acids and flavonoids.

The use of a photodiode array detector allowed the acquisition of full UV spectra for each peak, enabling more accurate identification of compounds. Comparison with standard compounds suggested the presence of bioactive constituents such as gallic acid, quercetin, kaempferol, and rutin.

The chromatographic profile confirmed the richness of *Oxalis corniculata* in polyphenolic compounds.

8.7. LC–MS/MS Analysis

LC–MS/MS analysis provided detailed information on the molecular weight and structural features of the phytochemicals present in the extract. Several compounds were tentatively identified based on their mass-to-charge (m/z) ratios and fragmentation patterns.

The analysis revealed the presence of phenolic acids (gallic acid, caffeic acid), flavonoids (quercetin, catechin, kaempferol), and their glycosides. These compounds are well known for their antioxidant and therapeutic activities.

The identification of these bioactive molecules validates the traditional medicinal use of *Oxalis corniculata* and highlights its potential as a source of natural therapeutic agents.

Discussion

The present study investigated the fractionation, isolation, and phytochemical characterization of leaf extracts of *Oxalis corniculata* to explore its potential

therapeutic applications. The findings demonstrate that the plant is a rich source of diverse bioactive compounds, particularly phenolics and flavonoids, which are known to contribute significantly to medicinal properties.

The physicochemical analysis indicated that the plant material used in the study was of good quality and purity, as reflected by acceptable moisture content, ash values, and extractive values. Low moisture content suggests minimal risk of microbial growth, while low acid-insoluble ash indicates negligible contamination with inorganic impurities such as soil or sand. These parameters are essential for ensuring the reliability of subsequent phytochemical investigations.

The extraction yield varied with solvent polarity, with the methanolic extract showing the highest yield. This observation suggests that *Oxalis corniculata* leaves predominantly contain polar compounds. The efficiency of methanol in extracting phytoconstituents such as flavonoids, phenolics, and glycosides is well documented, and the present findings are consistent with this trend. The comparatively lower yields in non-polar solvents such as petroleum ether further confirm the limited presence of non-polar constituents.

The integration of multiple analytical techniques allowed for comprehensive characterization of the phytoconstituents and ensured the accuracy of the results.

The presence of a wide range of bioactive compounds suggests possible synergistic interactions, which may enhance the overall therapeutic efficacy of the plant extract.

Summary of Discussion

The study confirms that *Oxalis corniculata* leaf extracts are rich in bioactive phytochemicals, particularly phenolics and flavonoids, which contribute to their potential therapeutic properties. The use of advanced analytical techniques enabled accurate characterization of these compounds, providing a strong scientific basis for future research and application in herbal medicine.

Conclusion

The present study successfully demonstrated the fractionation, isolation, and phytochemical characterization of leaf extracts of *Oxalis corniculata*, highlighting its significant potential as a source of bioactive compounds with therapeutic applications. The physicochemical evaluation confirmed the quality and purity of the plant material, ensuring its suitability for phytochemical investigations.

The extraction and fractionation processes revealed that polar solvents, particularly methanol, were more effective in extracting a wide range of phytoconstituents. Qualitative and quantitative phytochemical analyses confirmed the presence of important secondary metabolites such as flavonoids, phenolics, tannins, alkaloids, saponins, and glycosides, with phenolic and flavonoid compounds being the most abundant.

In conclusion, *Oxalis corniculata* leaves represent a valuable natural source of pharmacologically active compounds and hold promising potential for the development of plant-based therapeutic agents. Further studies involving isolation of pure compounds, structural elucidation, and in vitro/in vivo

pharmacological evaluation are recommended to fully explore its medicinal potential.

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