RESEARCH PAPER

Exploring the Phytochemical Basis of *Urtica dioica*: A Qualitative and Quantitative study

Himanshi Rathaur[1], Dr. Divya Juyal[*1], Dr. Sayantan Mukhopadhyay[2]

[1]*School of Pharmaceutical Sciences, Shri Guru Ram Rai University, Dehradun, 248001*
[2]*College of Pharmacy, Shivalik Campus, Sihniwala, Shimla bypass road, Dehradun, 248197*

Received: 10th Nov, 2025; Revised: 29th Nov 2025; Accepted: 23rd Jan 2026; Available Online: 2nd March 2026

ABSTRACT

Introduction: *Urtica dioica*, commonly referred to as stinging nettle, is a perennial herb belonging to the family Urticaceae and is widely distributed across both temperate and tropical regions. It is traditionally recognized for its medicinal properties and has long been used in managing arthritis, rheumatism, anemia, skin diseases, and urinary tract disorders. The plant contains diverse phytoconstituents, including flavonoids, phenolic acids, alkaloids, sterols, saponins, and Triterpenoids, which contribute to its pharmacological effects such as anti-inflammatory, anti-arthritic, antioxidant, analgesic, antimicrobial, and anticancer activities. Considering its traditional applications and growing scientific interest, the present study aimed to qualitatively and quantitatively evaluate the phytochemical composition of *Urtica dioica* to establish its therapeutic potential.

Materials and Methods: Leaves of *Urtica dioica* were collected from the Garhwal region (Dehradun) of Uttarakhand and authenticated at the Botanical Survey of India, Dehradun. After defatting the dried and powdered *Urtica dioica* with petroleum ether, the sample was transferred to a soxhlet thimble, where extraction was performed using a hydro-alcoholic solvent system. The extracts were assessed for yield, subjected to qualitative phytochemical screening, and evaluated quantitatively for total phenolic content (TPC) using the Folin-Ciocalteu method and total flavonoid content (TFC) using the aluminium chloride assay.

Result and Discussion: The percentage yield of petroleum ether extract was found to be 0.10%, while the hydro alcoholic extract showed a significantly higher yield of 6.00%. Qualitative phytochemical analysis of the hydro alcoholic extract confirmed the presence of sterols, triterpenoids, flavonoids, alkaloids, tannins, phenols, saponins, glycosides, proteins, and amino acids, indicating a rich phytochemical profile. Quantitative evaluation revealed that the hydro alcoholic extract contained a total phenolic content of 33.56 mg GAE/g and a total flavonoid content of 29.30 mg RE/g, indicating significant antioxidant potential. These findings support the traditional and medicinal uses of *Urtica dioica* and suggest that its polyphenolic compounds significantly contribute to its therapeutic activities, particularly anti -inflammatory and anti- arthritic effects.

Conclusion: The present study validates the *Urtica dioica* as a phytochemical rich plant. Its pharmacological potential in managing inflammation, arthritis, microbial infections, and oxidative stress-related disorders. The high content of phenolic and flavonoids supports its traditional use and demonstrates its value as a source of natural bioactive compounds. With further scientific validation and clinical studies, *Urtica dioica* could be developed into novel therapeutic agents or herbal formulations, aligning with the vision of promoting indigenous medicinal plants for health benefits and commercialization under the "Vocal for Local" initiative.

Keywords: *Anti-inflammatory, anti-arthritis, analgesic, antioxidant, antimicrobial, Urtica dioica*

How to cite this article: Rathaur H, Juyal D, Mukhopadhyay S, Exploring the Phytochemical Basis of *Urtica dioica*: A Qualitative and Quantitative study. Int J Drug Deliv Technol. 2026;16(2s): 531-541. DOI: 10.25258/ijddt.16. 531-541

Source of support: Nil.

Conflict of interest: None

INTRODUCTION

Consumption of plants and their products has significantly increased over the last several decades due to the expense of synthetic products, their undesired effects on human, health, and the constantly growing awareness of the advantages of plant consumption. Studies showed that plants contain many compounds responsible for their beneficial and nutritional values **Đurović et al. (2024)**. Those compounds have numerous biological activities such as antioxidant, antimicrobial, cytotoxic, anti-inflammatory, antiviral and many other beneficial effects for human health.

Moreover, the consumption of plants as food is connected to reduced risks of different diseases and disorders **Johnson et al. (2013).** *Urtica dioica* L., a member of the family Urticaceae, is a perennial herb commonly known as stinging nettle. It is widely distributed across both temperate and tropical regions of the world and is abundantly found in the Himalayan range, extending from Kashmir to Kumaon. In Uttarakhand, it grows naturally as undergrowth in almost all districts. The Plant is known by various Vernacular name *Bichu, Butti* in Hindi and Punjabi, *Vrishchhiyaa-shaaka*

**Author for Correspondence: divya.juyal@rediffmail.com, himanshiritarathaur@gmail.com*

in Sanskrit, *Anjuraa* in Unani and *Shisuun* in (Kumaon) folk language. Historically, people have utilized its stinging property for therapeutic purposes, particularly by striking arthritic or paralytic limbs with the fresh plant to enhance blood circulation and generate warmth in the joints and extremities, a traditional practice known as urtication **Joshi et al. (2014).** Traditionally, the leaves and roots of plant of this plant have been employed internally as a blood purifier and diuretic and for the management of conditions such as rheumatism, eczema, anemia, nephritis, hematuria, jaundice, menorrhagia and diarrhea **Wetherilt (1992).** The plant grows up to a height of about 2 m and bears opposite, heart shaped leaves with finely serrated margins. It is commonly referred to as Stinging Nettle due to the presence of fine hairs or trichomes, on its leaves and stems, which contain an irritant fluid that causes a painful sting upon contact with the skin. Each trichomes is an elongated cell, approximately 1 to 8 mm in length, supported by a multicellular pedestal. The fluid within these trichomes contains compounds such as formic acid, histamine, acetylcholine, leukotrienes and serotonin. When the plant comes into contact with the skin, these substances penetrate the surface and induce irritation that can persist for more than 12 hours. Interestingly, this stinging property is neutralized upon heating or cooking, allowing the young shoots and leaves to be safely consumed either fresh or dried The Plant produces small, greenish- white female flowers in clusters at the leaf axils from July to September, while, male flowers occur separately as clusters of diagonally upright strands near the top of the plant **Pant and Sundriyal (2016).** Nettle has been used as a natural remedy for its healing properties for over 2000 years. However, it was not until the turn of the century that its medicinal potential was fully appreciated, beginning with the identification of the chemical structure and pharmacological qualities of the principal chemically active compounds **Bhusal et al. (2022).**

Urtica dioica is well known for the nuisance it provokes when touched. It causes skin irritation, red bumps and welts by injecting a stinging liquid in a similar way a hypodermic needle would do. Stinging nettle dermatitis is due to both mechanical and biochemical mechanisms within the plant **Grauso et al. (2020).** Formic acid, acetyl choline, serotonin, and histamine are thought to be present in the trichomes of the nettle. Some of its qualities include anti-proliferative, anti-inflammatory, antioxidant, analgesic, immunological stimulatory, anti-infectious, hypotensive, anti-ulcer, and cardiovascular disease prevention **Bhusal et al. (2022).**

Stinging nettle is rich in essential nutrients such as amino acids, fatty acids, chlorophylls, carotenoids, vitamins (including A and C), and minerals like iron and calcium. It also contains high levels of polyphenolic compounds, particularly flavonoids (quercetin, kaempferol, rutin) and phenolic acids (caffeic, chlorogenic, Ferulic acid and gallic acid), contributing significantly to its nutritional properties and as anti-inflammatory and antioxidant properties. Toxicological evaluations indicate that while high doses can cause adverse effects, moderate consumption of aqueous and ethanolic extracts are generally safe, although more studies areneeded to ensure long-term safety **Devkota *et al.* (2022).** Polyphenolic compounds, naturally present in various parts of the plant including roots, stems, and leaves exhibit a broad spectrum of biological activities such as antioxidant, anti-inflammatory, antimicrobial, and anticancer properties**. Đurović *et al*. (2024)** identifies various extraction techniques like Soxhlet, ultrasound-assisted, microwave-assisted, and supercritical fluid extraction that influence the yield and profile of bioactive compounds. These methods, coupled with green solvents like ethanol and water, are crucial in isolating chlorophylls, carotenoids, fatty acids, and polyphenols.

Pharmacologically, the plant demonstrates Anti-inflammatory, Analgesic, Anti-arthritic, Antioxidant, Anti-proliferative, Antimicrobial, Anti-diabetic activities. Notably, the root extracts are effective in managing benign prostatic hyperplasia by modulating hormonal pathways. Leaf extracts have shown promise in controlling blood glucose levels and reducing inflammation through the inhibition of key enzymes and cytokines. Antioxidant actions are attributed to the presence of polyphenols and flavonoids, which scavenge reactive oxygen species and protect against cellular damage. **Bhusal *et al.* (2022)** One of the most studied aspects of *Urtica dioica* is its potent anti-inflammatory activity, attributed to inhibition of pro- inflammatory cytokines like TNF-α, IL-1β, and enzymes like cyclooxygenase and lipoxygenase. Additionally, it shows immune-modulatory effects, influencing the balance between Th1 and Th2 cytokines, which is particularly relevant in autoimmune disorders like rheumatoid arthritis. **Dhouibi *et al*. (2020)**

Traditional and Medicinal Uses

Historically used in practices like "urtication" (flogging with nettles for pain relief), nettle has multiple applications: as a source of food, fiber, cosmetics, and remedies. Leaves are edible after boiling or drying and are rich in vitamins and minerals. Nettle is utilized in various forms dry powder, infusion, decoction, juice, and tincture for both internal and external applications. Medicinal uses include treatment of rheumatic pain, allergic, urinary tract inflammation, and symptoms of benign prostatic hyperplasia (BPH). **Said *et al*. (2015)**

It is a traditional Ayurvedic herb (known as Vrishchhiyaa-shaaka) commonly found in Himalayas and induces edema and inflammation (due to capability of producing allergenic substances). In folk medicine, it has been used to treat a wide variety of diseases like rheumatoid arthritis, osteoarthritis, urinary tract infections, cardiovascular diseases and diabetes.

It has also been used as diuretic, blood circulation stimulating agent, anti-atherosclerotic, anti-asthmatic, antidandruff, hemostatic and hypoglycemic. It contains a wide variety of pharmacologically active components like minerals, flavones scopoletin, sitosterol, fatty acids, vitamins *etc*. It is a good immunostimulant, antioxidant, anti-inflammatory, antiviral, antimicrobial and antiulcer herb **Semalty et al. (2017).**

Urtica species have long been used traditionally as diuretics and for treating arthritis, gout and anemia with studies confirming their medicinal use among local communities **Mutke et al. (2014)**

Urtica dioica shows notable anti-arthritic, anti-gout, anti-inflammatory, immune-modulatory and antioxidant effects, contributing to joints protection **Weigend et al. (2015).** Additionally, this plant has demonstrated therapeutic potential against microbial and parasitic infections, jaundice, gastrointestinal disorders, snakebites, diabetes, liver and kidney dysfunctions, wounds, pulmonary aliments, hypotension, urticaria, allergic rhinitis, arthritis, prostate disorders, hemorrhoids, and as a depurative. Beyond these uses, *Urtica* species have also been employed in traditional practices for exorcism, post calving care, sprains, bones fracture, hematuria, neck sore, and yolk sore **Yeşil and Inal (2019).**

Despite advances in understanding the bioactive molecules responsible for these effects, it is increasingly recognized that sustainable use of these plants is influenced by the rising living standards of rural communities **Yesil et al. (2019) and Varga et al. (2019).** Therefore, this review aims to provide a comprehensive overview of the botanical characteristics, chemical constituents and biological activities of *Urtica dioica*, emphasizing its relevance in promoting health and preventing disease **Samaha et al. (2019).**

MATERIAL AND METHOD

Plant material

Leaves of *Urtica dioica* were collected from the Garhwal region of Dehradun, Uttarakhand during September 2021.The Plant material was authenticated by S.K Singh, Scientist E & Head of Office, Botanical Survey of India, Dehradun, Uttarakhand. A Plant specimen (Ref no BSI/NRC/tech/Herb2021-22/108) has been deposited herbarium of Botanical Survey of India, Dehradun, Uttarakhand, for future reference

Method

The dried and powdered material of *Urtica dioica* was successively defatted with petroleum ether and then transferred in a Soxhlet thimble for extraction **Chaure et al. (2014).** The extraction was carried out using Hydro-alcoholic solvent system at 40-60^{o}C temperature of the heating mantle for 8-10 hours. After the extraction process, the extract of sample was filtered and concentrated to dryness. Extracts were collected in air tight container **Alara et al. (2019).** Extraction yield of all extracts were calculated using the following equation below: Evans (2019)

Formula of Percentage yield:

Actual yield/Theoretical Yield X 100

Figure1: Extraction by Soxhlet Method

PHYTOCHEMICAL ESTIMATION

Qualitative Phytochemical Estimation

Detailed phytochemical analysis was carried out to determine the presence or absence of various phytoconstituents in the extracts of *Urtica dioica* using following standard procedures **Kokate (2016)**

The extracts were subjected to following tests:

Tests for carbohydrates:

Molisch test: To 1ml of extract, 2-3 drops of alcoholic α-naphthol solution were added. Concentrated sulphuric acid was carefully added along the side of the test tube. The formation of purple ring at the junction of two liquids was observed, which confirms the presence of carbohydrates in the test samples **Elzagheid (2018**).

Fehling's test: To 1 ml of extract, similar quantity of Fehling's solution Aand B was added and heated on a water bath for few minutes. The development of brick red precipitate was observed. **Maheshwaran et al. (2024)**

Benedict's test: Equal volume of Benedict's reagent and extract were mixed in a test tube and heated in the water bath for 5-10 minutes. Solution appears green, yellow or red depending on the amount of reducing sugar present in the test solution which indicated the presence of reducing sugar.

Barfoed's test: 1 ml of extract was mixed with Barfoed's reagent in a test tube and heated in a water bath for 2 minutes. The appearance of a red colour due to formation of cupric oxide, confirmed the presence of monosaccharide **Soleimani et al. (2025)**

Test for alkaloids:

All the test extracts were first treated with dilute hydrochloric acid and then filtered. The filtrates were subjected to the following tests:

Mayer's test: To 2-3 ml of filtrate, few drops of Mayer's reagent were added along sides of test tube. Formation of white or creamy precipitate indicated the presence of alkaloids **Gracelin et al. (2013).**

Hager's test: To 1-2 ml of filtrate was treated with a few drops of Hager's reagent. The appearance of a yellow precipitate confirmed the presence of alkaloids.
Wagner's test: To 1-2 ml of filtrate was mixed with a few drops of Wagner's reagent. The formation of a reddish-brown precipitate indicated the presence of alkaloids. **Mohammad et al. (2019)**

Test for flavonoids:

Lead acetate test: The extract was treated with few drops of lead acetate solution. The formation of a yellow precipitate indicated the presence of flavonoids.
Alkaline reagent test: A few drops of sodium hydroxide were added to the extract in a test tube. The development of an intense yellow color, which becomes color less upon addition of dilute acid, confirmed presence of flavonoids. **Jaradat et al. (2015)**
Shinoda test: To the extract, 5 ml of 95% ethanol was added, followed by the few fragments of magnesium turningand dropwise addition of concentrated hydrochloric acid. The appearance of a pink color indicated presence of flavonoids. **Roghini and Vijayalakshmi (2018), Alamgir (2018)**

Test for glycosides:

Borntrager's test: To 3 ml of extract, dilute sulphuric acid was added, and the mixture was boiled for 5 minutes and filtered. The cold filtrate was mixed with an equal volume of benzene or chloroform and shaken well. The organic solvent layer was separated and ammonia was added. The appearance of a pink to red coloration in the ammonical layer indicated the presence of anthraquinone glycosides **Ezeonu and Ejikeme (2016), Rajesh et al.(2014)**
Legal's test: About 1 ml of the extract was dissolved in pyridine, followed by the addition of 1 ml of sodium nitropruside solution. The mixture was made alkaline with 10% sodium hydroxide. The development of a pink to blood red color confirmed the presence of cardiac glycosides.
Keller-Killiani test: To 2 ml of extract, 3 ml of glacial acetic acid and 1 drop of 5% ferric chloride were added. Carefully 0.5 ml of concentrated sulphuric acid was introduced along the side of the test tube. The formation of blue color in the acetic acid layer indicated the presence of cardiac glycosides **Yadav et al. (2017), Kenneth and Babayemi (2017).**

Test for protein and amino acids:

Biuret's test: The extract was treated with 1 ml of 10% sodium hydroxide solution and gently heated. A drop of 0.7% copper sulphate solution was then added. The appearance of violet or pink colour indicated the presence of proteins. **Kozhamzharova et al. (2017)**
Ninhydrin test: 3 ml of the extract were heated with 3 drops of 5% Ninhydrin solution in a water bath for 10 minutes. The appearance of blue colour confirmed the presence of amino acids **Lanjwani et al. (2015).**

Test for saponins:

Foam test*:* 1 ml of extract was dissolved in 20 ml of distilled water and shacked for 15min in a graduated cylinder. Formation of persistent foam around 1cm layer was observed **Gupta et al. (2013), Tamilselvi et al. (2012)**

Test for triterpenoids and steroids:
Salkowski's test: The extract was treated with chloroform and filtered. A few drops of concentrated sulphuric acid were added, the mixture was shaken and allowed to stand. A red color in the lower layers indicated the presence of sterol whereas a golden yellow layer at the bottom confirmed the presence of triterpenes **Malik et al. (2017).**

Libermann-Burchard's test: The extract was dissolved in chloroform followed by the addition of a few drops of acetic anhydride. The mixture was boiled, cooled and concentrated sulphuric acid was added along the sides of the test tube. Formation of brown ring at the junction of two layers with the upper layer turning green, indicated the presence of steroids, while the development of a deep red color confirmed triterpenoids **Patel et al. (2017).**

Test for tannin and phenolic compounds:

Ferric chloride test: The extract was dissolved in distilled water and 2 ml of 5% ferric chloride solution was added. A blue, green or violet color indicated the presence of phenolic compounds. **Deyab et al. (2016)**
Lead acetate test: A few drops of lead acetate solution was added to the extract dissolved in distilled water. The formation of a white precipitate confirmed the presence of phenolic compounds**. ISMAIL (2019)**
Gelatin Test: The extract was dissolved in distilled water and 2 ml of 1% gelatin solution containing 10% sodium chloride was added. The development of a white precipitate indicated the presence of phenolic compounds. **Shaikhand Patil (2020).**

Quantitative Phytochemical Estimation

Spectrophotometric Quantification of Total Phenolic Content
The total phenolic content of plant extract was measured using the Folin-Ciocalteu Assay **Sankhalkar and Vernekar (2016).** 1ml of *Urtica dioica* Extract (from stock solution) was mixed with 1 ml of Folin-Ciocalteu's phenol reagent. After 5 minutes, 10 ml of 7% Na_2CO_3 solution was added, followed by 13 ml of deionized distilled water, and the mixture was thoroughly mixed **Csepregi et al. (2013).** The solution was kept in the dark at 23°C for 90 minutes, and the absorbance was recorded at 750 nm. The TPC was calculated using a calibration curve prepared with gallic acid (20 to 100µg/ml). All measurements were performed in triplicate, and the total phenolic content was expressed as milligrams of gallic acid equivalents (GAE) per gram of dried sample **Saeed et al. (2012) and Michiu et al. (2022).**

Spectrophotometric Quantification of Total Flavonoid Content

The total flavonoid content of *Urtica dioica* extract was measured using the Aluminium chloride method **Ohadoma et al. (2020).** In a 10 ml test tube, 0.3 ml of the extracts was mixed with 3.4 ml of 30% methanol, 0.15 ml of 0.5M $NaNO_2$ and 0.15 ml of 0.3M $AlCl_3.6H_2O$. After 5 minutes, 1 ml of 1M NaOH was added **Samatha et al. (2012).** The solution was mixed thoroughly, and the absorbance was recorded at 506nm against a reagent blank. A standard Calibration curve was prepared using rutin (20 to 100µg/ml) following the same procedure. Total flavonoids content was expressed as milligrams of rutin equivalents per gram of dried extract **Chang et al. (2002) and Senguttuvan et al. (2014)**

RESULTS

Table 1: Plant collection

S. No.	Plant name	Plant part used	Weight
1.	*Urtica Dioica*	Leaves	100 gm

Percentage yield

The solvent used, color of the extract, theoretical weight, actual yield and percentage yield of *Urtica dioica* are summarized in Table 2.

Table 2: Percentage yield of extracts

S. No.	Plant name	Solvent	Color of extract	Theoretical weight (gm)	Yield (gm)	% Yield
1.	*Urtica dioica*	Petroleum Ether	Dark Yellow to Brown	92 gm	0.100	0.10
2.	*Urtica dioica*	Hydro alcoholic	Dark Greenish	90 gm	5.400	6.00

Table 3: Qualitative Estimation of Hydro alcoholic *Urtica dioica* Extract

Hydro alcoholic *Urtica dioica* Extract		
Test for Carbohydrates		
1.	Molisch's Test	-
2.	Fehling's Test	+
3.	Benedict's Test	+
Test for Alkaloids		
1.	Mayer's Test	+
2.	Hager's Test	+
3.	Wagner's Test	+
Test for Triterpenoids & Steroids		
1.	Salkowski Test	+
2.	Libermann-Burchard's Test	+
Test for Flavonoids		
1.	Lead Acetate Test	+
2.	Alkaline Reagent Test	-
Test for Tannins and Phenolic Compounds		
1.	$FeCl_3$ Test	+
2.	Lead Acetate Test	+
3.	Gelatin Test	+
Test for Saponins		
1.	Foam Test	+
Test for Protein and Amino acids		
1.	Ninhydrin Test	+
2.	Biuret's Test	+
Test for Glycosides		

1.	Legal's Test	+
2.	Keller Killani Test	+
3.	Borntrager's Test	+

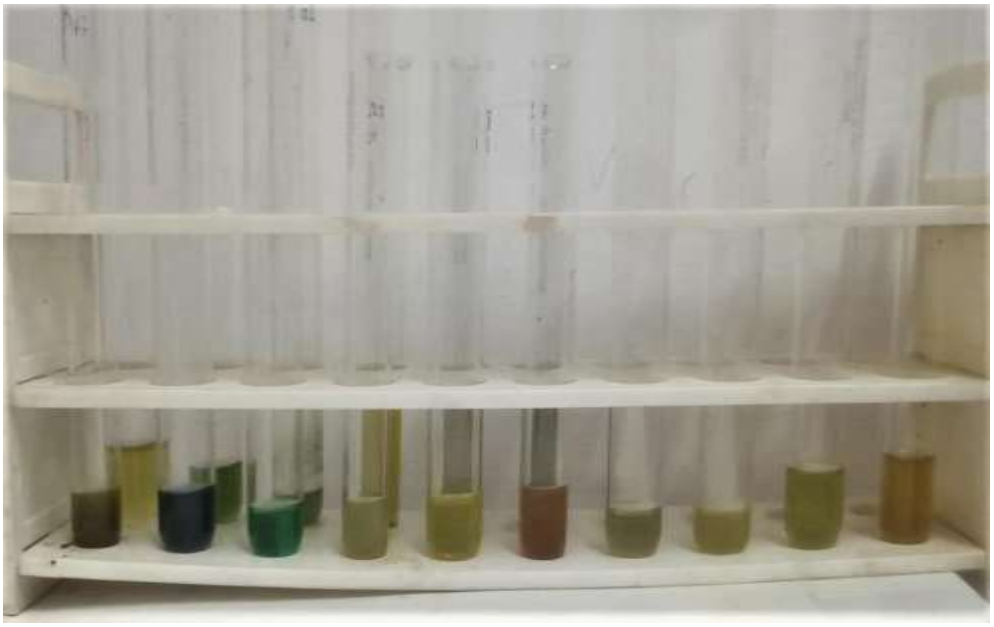

Figure 2: Qualitative Estimation of Hydro alcoholic *Urtica dioica* Extract

Quantitative Estimation of Hydro alcoholic *Urtica dioica* extract

Total Phenolic Content (TPC) Estimation

Table 4: Standard table for Gallic acid

S.No.	Concentration (µg/ml)	Absorbance (nm)
1.	20	0.114
2.	40	0.231
3.	60	0.356
4.	80	0.467
5.	100	0.573

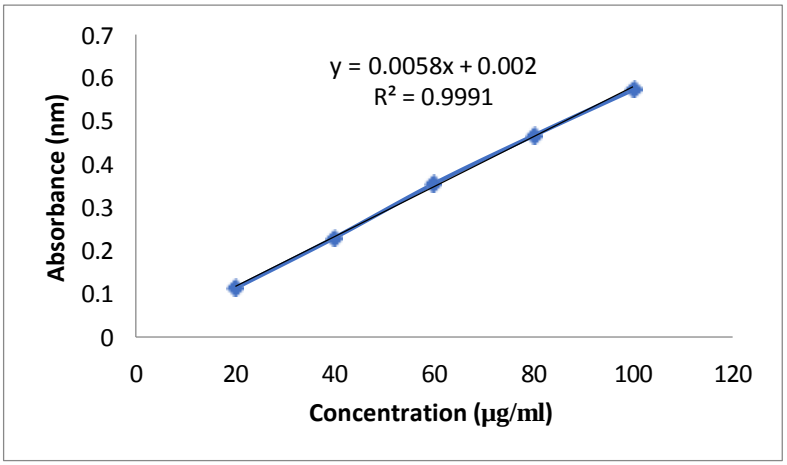

Figure 3: Standard curve of Gallic acid

Table 5: Total Phenolic Content in *Urtica dioica* Hydro alcoholic extract

Total Phenolic content (mg/gm equivalent to Gallic acid)	
Extracts	Hydro alcoholic *Urtica dioica* extract
Absorbance Mean±SD	0.1698±0.004
TPC	33.56

Total Flavonoid Content (TFC) Estimation

Table 6: Standard table for Rutin

S. No.	**Concentration (µg/ml)**	**Absorbance (nm)**
1.	20	0.087
2.	40	0.163
3.	60	0.236
4.	80	0.309
5.	100	0.404

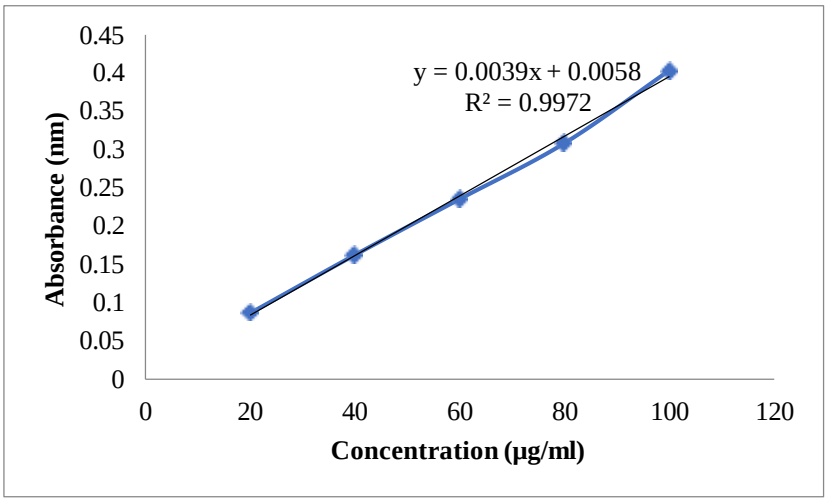

Figure 4: standard curve of Rutin

Table 7: Total Flavonoid Content in Hydro alcoholic *Urtica dioica* extract

Total Flavonoid content (mg/gm equivalent to Rutin)	
Extracts	*Urtica dioica* Hydro alcoholic extract
Absorbance Mean±SD	0.0929±0.002
TFC	29.30

DISCUSSION

The present study aimed to evaluate the qualitative and quantitative phytochemical composition of *Urtica dioica* leaf extract to correlate these findings with its reported pharmacological activities. The extraction yield varied according to the solvent used, with the hydro alcoholic extract showing a considerably higher yield (6.00%) than the petroleum ether extract (0.10%). This difference can be attributed to the higher polarity of the hydro alcoholic solvent, which facilitates the extraction of diverse phytoconstituents such as Phenols, flavonoids and glycosides. The qualitative phytochemical screening revealed that the hydro alcoholic extract of *Urtica dioica* contains a broad spectrum of secondary metabolites including alkaloids, flavonoids, triterpenoids, tannins, saponins, phenolic compounds, proteins and amino acids. The presence of these bioactive constituents supports the traditional use of this plant in treating inflammatory and metabolic disorders. Specifically, the positive results obtained in Liebermann-burchard and salkowski's tests confirmed the presence of sterols and triterpenoids, which are known to exhibit anti-inflammatory and antioxidant properties. Quantitative analysis further strengthened these findings. The total Phenolic Content of the hydro alcoholic extract was determined to be 33.56 mg GAE/g, while the total flavonoid content was 29.30 mg RE/g. These values indicate that *Urtica dioica* is rich in polyphenolic and flavonoids which are primarily responsible for its antioxidant potential. Phenolic compounds are known for their ability to scavenge free radicals andprotectsbiological systems from oxidative stress, while flavonoids contribute to anti-inflammatory, cardio protective and antimicrobials effects. The high content of these compounds in *Urtica dioica* aligns with previous reports that attribute its pharmacological activities such as anti-inflammatory, anti-arthritic, analgesics, anti-microbial and antioxidant effects to its polyphenolic profile. These findings also support its ethno medicinal applications in the treatment of aliments such as arthritis, rheumatism and skin disorders.

Overall, the phytochemical composition observed in this study validates the traditional therapeutic use of *Urtica dioica* and highlights its potential as a natural source of pharmacologically active compounds. The presence of

Phenolic, flavonoids and other secondary metabolites suggests that this plant can be further explored for the development of novel herbal formulations. Future studies focusing on isolation, characterization and *in-vivo* evaluation of these compounds could provide deeper insights into their mechanism of action and therapeutic potential.

CONCLUSION

Ethno-pharmacological evidence highlights *Urtica dioica* as one of the most widely studiedandutilizedspecies within the *Urtica* genus, serving as a valuable source of bioactive compounds for developing novel therapeutic approaches, particularly in the management of arthritis. Despite its ancient use by people from different cultures and in different regions for the treatment of various ailments. *Urtica dioica* exhibits a wide range of pharmacological potentialities, including anti-inflammatory, anti-arthritic, antioxidant, anti-cancer, anti-diabetic, analgesic, anti-microbial effects, which are consistent with its traditional applications. These Pharmacological actions are primarily attributed to its rich content of bioactive phytochemicals, especially Polyphenolic compounds, that may be effectively applied for preventive and therapeutic use for the treatment of inflammation, arthritis, allergy, cancer, diabetes and benign prostatic hyperplasia. Among various herbs, *Urtica dioica* (stinging nettle) stands out for its scientifically validated anti-inflammatory, anti-arthritic, antioxidant, antimicrobial and anti-cancer properties. If we are able to prove our hypothesis then the door for commercialization of this local medicinal plant of Uttarakhand may open. Thus in a way we are able to play our part in full filling honourable Prime Minister Mission i.e. “Vocal for Local”.

REFERENCES

1. Đurović S, Kojić I, Radić D, Smyatskaya YA, Bazarnova JG, Filip S, Tosti T. Chemical constituents of stinging nettle (Urtica dioica L.): A comprehensive review on phenolic and polyphenolic compounds and their bioactivity. International Journal of Molecular Sciences. 2024 Mar 18;25(6):3430.
2. Johnson TA, Sohn J, Inman WD, Bjeldanes LF, Rayburn K. Lipophilic stinging nettle extracts possess potent anti-inflammatory activity, are not cytotoxic and may be superior to traditional tinctures for treating inflammatory disorders. Phytomedicine. 2013 Jan 15;20(2):143-7.
3. Joshi BC, Mukhija M, Kalia AN. Pharmacognostical review of Urtica dioica L. International Journal of Green Pharmacy (IJGP). 2014;8(4).
4. Wetherilt H. Evaluation of Urtica species as potential sources of important nutrients. InDevelopments in food science 1992 Jan 1 (Vol. 29, pp. 15-25). Elsevier.
5. Pant V, Sundriyal RC. Nutritional and therapeutic efficacy of stinging nettle—a review. The Journal of Ethnobiology and Traditional Medicine. 2016 Jan;126:1240-54.
6. Bhusal KK, Magar SK, Thapa R, Lamsal A, Bhandari S, Maharjan R, Shrestha S, Shrestha J. Nutritional and pharmacological importance of stinging nettle (Urtica dioica L.): A review. Heliyon. 2022 Jun 1;8(6).
7. Grauso L, De Falco B, Lanzotti V, Motti R. Stinging nettle, Urtica dioica L.: Botanical, phytochemical and pharmacological overview. Phytochemistry Reviews. 2020 Dec;19(6):1341-77.
8. Devkota HP, Paudel KR, Khanal S, Baral A, Panth N, Adhikari-Devkota A, Jha NK, Das N, Singh SK, Chellappan DK, Dua K. Stinging nettle (Urtica dioica L.): Nutritional composition, bioactive compounds, and food functional properties. Molecules. 2022 Aug 16;27(16):5219.
9. Dhouibi R, Affes H, Salem MB, Hammami S, Sahnoun Z, Zeghal KM, Ksouda K. Screening of pharmacological uses of Urtica dioica and others benefits. Progress in biophysics and molecular biology. 2020 Jan 1;150:67-77.
10. Said AA, Otmani IS, Derfoufi S, Benmoussa A. Highlights on nutritional and therapeutic value of stinging nettle (Urtica dioica). International Journal of Pharmacy and Pharmaceutical Sciences. 2015;7(10):8-14.
11. Semalty M, Adhikari L, Semwal D, Chauhan A, Mishra A, Kotiyal R, Semalty A. A comprehensive review on phytochemistry and pharmacological effects of stinging nettle (Urtica dioica). Current Traditional Medicine. 2017 Dec 1;3(3):156-67.
12. Mutke J, Jacobs R, Meyers K, Henning T, Weigend M. Diversity patterns of selected Andean plant groups correspond to topography and habitat dynamics, not orogeny. Frontiers in genetics. 2014 Oct 10;5:351.
13. Weigend M., Monro A. K. Flora Mesoamericana . St. Louis, MO, USA: Missouri Botanical Garden Press; 2015. Urtica L. (Urticaceae) pp. 171–174.
14. Yeşil Y., İnal İ. Traditional knowledge of wild edible plants in hasankeyf (Batman Province, Turkey) Acta Societatis Botanicorum Poloniae . 2019;88(3)
15. Yesil Y., Celik M., Yilmaz B. Wild edible plants in yesilli (Mardin-Turkey), a multicultural area. Journal of Ethnobiology and Ethnomedicine . 2019;15(1):p. 52.
16. Varga F., Šolić I., Dujaković M. J., Łuczaj Ł., Grdiša M. The first contribution to the ethnobotany of inland dalmatia: medicinal and wild food plants of the Knin area, Croatia. Acta Societatis Botanicorum Poloniae . 2019;88(2) doi: 10.5586/asbp.3622.
17. Samaha A. A., Fawaz M., Salami A., Baydoun S., Eid A. H. Antihypertensive indigenous lebanese plants: ethnopharmacology and a clinical trial. Biomolecules. 2019;9(7):p. 292. doi: 10.3390/biom9070292.

18. Chaure A, Garg B, Jain S. Evaluation of Anti-Inflammatory Activity of Hydro~ Alcoholic Extract of Canscora decussata Roxib. Leaves. Global J. Pharmacol. 2014;8(1):36-8.
19. Alara OR, Abdurahman NH, Ukaegbu CI, Kabbashi NA. Extraction and characterization of bioactive compounds in Vernonia amygdalina leaf ethanolic extract comparing Soxhlet and microwave-assisted extraction techniques. Journal of Taibah University for Science. 2019 Dec 11;13(1):414-22.
20. Evans WC. Trease and Evans' pharmacognosy. Elsevier Health Sciences; 2009 May 27.
21. Kokate C. K. Preliminary phytochemical analysis. Practical Pharmacognosy. 1st ed. New Delhi: Vallabh Prakashan, 2016, p-111.
22. Elzagheid MI. Laboratory activities to introduce carbohydrates qualitative analysis to college students. World Journal of Chemical Education. 2018;6(2):82 -6.
23. Maheshwaran L, Nadarajah L, Senadeera SP, Ranaweera CB, Chandana AK, Pathirana RN. Phytochemical testing methodologies and principles for preliminary screening/qualitative testing. Asian Plant Research Journal. 2024 Aug 19;12(5):11-38.
24. Soleimani A, Hamad DS, Ismael SK, Said KM. Identification and Quantification of Carbohydrates, Amino Acids, and Protein in Gazo (Oak Manna). Jundishapur Journal of Natural Pharmaceutical Products. 2025;20(20):e166248.
25. Gracelin DH, Britto A, Kumar BJ. Qualitative and quantitative analysis of phytochemicals in five Pteris species. Int J Pharm Pharm Sci. 2013;5(1):105-7.
26. Mohammad MH, Abdulghany ZS, Al-mzaien AK. Qualitative and quantitative analysis of alkaloid component in seeds from Peganum harmala L. extracts. Iraqi Journal of Cancer and Medical Genetics. 2019 Jun 1;12(1):45 -52.
27. Jaradat N, Hussen F, Al Ali A. Preliminary phytochemical screening, quantitative estimation of total flavonoids, total phenols and antioxidant activity of Ephedra alata Decne. J. Mater. Environ. Sci. 2015;6(6):1771-8.
28. Roghini R, Vijayalakshmi K. Phytochemical screening, quantitative analysis of flavonoids and minerals in ethanolic extract of Citrus paradisi. International Journal of Pharmaceutical Sciences and Research. 2018 Nov 1;9(11):4859-64.
29. Alamgir AN. Methods of Qualitative and Quantitative Analysis of Plant Constituents. InTherapeutic Use of Medicinal Plants and their Extracts: Volume 2: Phytochemistry and Bioactive Compounds 2018 Jun 24 (pp. 721-804). Cham: Springer International Publishing.
30. Ezeonu CS, Ejikeme CM. Qualitative and quantitative determination of phytochemical contents of indigenous Nigerian softwoods. New journal of Science. 2016;2016(1):5601327.
31. Rajesh KD, Vasantha S, Rajesh NV, Panneerselvam A. Qualitative and quantitative phytochemical analysis in four pteridophytes. International Journal of Pharmaceutical Sciences Review and Research. 2014;27(2):408-12.
32. Yadav R, Khare RK, Singhal A. Qualitative phytochemical screening of some selected medicinal plants of shivpuri district (mp). Int. J. Life. Sci. Scienti. Res. 2017 Jan;3(1):844-7.
33. Kenneth-Obosi O, Babayemi OJ. Qualitative and quantitative evaluation of phytochemical constituents of selected horticultural and medicinal plants in Nigeria. Int J Homeopath Nat Med. 2017;3(1):1.
34. Kozhamzharova AS, Kozhamzharova LS, Ordabekov SO, Yesimseiitova ZB. The qualitative and quantitative identification of amino acids, polypeptides and proteins through biochemical methods. Вестник Казахского Национального медицинского университета. 2017(3):288-91.
35. Lanjwani AH, Ghanghro IH, Ghanghro AB, Khuhawar TM, Channa MJ. Qualitative examination of phytochemicals from some indiginous medicinal plants. Sindh University Research Journal-SURJ (Science Series). 2015 Jun 18;47(2).
36. Gupta M, Thakur S, Sharma A, Gupta S. Qualitative and quantitative analysis of phytochemicals and pharmacological value of some dye yielding medicinal plants. Orient J Chem. 2013;29(2):475-81.
37. Tamilselvi N, Krishnamoorthy P, Dhamotharan R, Arumugam P, Sagadevan E. Analysis of total phenols, total tannins and screening of phytocomponents in Indigofera aspalathoides (Shivanar Vembu) Vahl EX DC. Journal of chemical and pharmaceutical research. 2012 Aug 29;4(6):3259-62.
38. Malik SK. Qualtitative and quantitative estimation of terpenoid contents in some important plants of Punjab, Pakistan. Pakistan Journal of Science. 2017;69(2).
39. Patel MR, Panchal HS, Saluja AK. Identification of terpenoids and steroidal compounds in Caryota urens leaves by column chromatography and various spectroscopic techniques. World J Pharm Pharm Sci. 2016 Mar 21;5(5):1610-22.
40. Deyab M, Elkatony T, Ward F. Qualitative and quantitative analysis of phytochemical studies on brown seaweed, Dictyota dichotoma. International Journal of Engineering Development and Research. 2016 May;4(2):674-8.
41. ISMAIL N. A preliminary study of phytochemical contents in commercial Malaysian black tea extract using quantitative and qualitative tests. Malaysian Applied

Biology. 2019 Mar 20;48(1):123-9.
42. Shaikh JR, Patil M. Qualitative tests for preliminary phytochemical screening: An overview. International journal of chemical studies. 2020 Mar 1;8(2):603-8.
43. Sankhalkar S, Vernekar V. Quantitative and qualitative analysis of phenolic and flavonoid content in Moringa oleifera Lam and Ocimum tenuiflorum L. Pharmacognosy research. 2016 Jan;8(1):16.
44. Csepregi K, Kocsis M, Hideg É. On the spectrophotometric determination of total phenolic and flavonoid contents. Acta Biologica Hungarica. 2013 Dec 1;64(4):500-9.
45. Saeed N, Khan MR, Shabbir M. Antioxidant activity, total phenolic andtotal flavonoidcontents of whole plant extracts Torilis leptophylla L. BMC complementary and alternative medicine. 2012 Nov 16;12(1):221.
46. Michiu D, Socaciu MI, Fogarasi M, Jimborean AM, Ranga F, Mureșan V, Semeniuc CA. Implementation of an analytical method for spectrophotometric evaluatio.n of total phenolic content in essential oils. Molecules. 2022 Feb 16;27(4):1345.
47. Ohadoma SC, Akuodor GC, Amazu LU, Michael HU. Quantitative estimation of total phenolic and total flavonoidcontents of ethylacetate fractionof Chikadoma as a bactericidal agent. Asian J. Sci. Technol. 2020;11:11012-4.
48. Samatha T, Shyamsundarachary R, Srinivas P, Swamy NR. Quantification of total phenolic and total flavonoid contents in extracts of Oroxylum indicum L. Kurz. Asian Journal of Pharmaceutical and Clinical Research. 2012 Nov 1;5(4):177-9.
49. Chang CC, Yang MH, Wen HM, Chern JC. Estimation of total flavonoid content in propolis by two complementary colorimetric methods. Journal of food and drug analysis. 2002 Jul 1;10(3).
50. Senguttuvan J, Paulsamy S, Karthika K. Phytochemical analysis and evaluation of leaf and root parts of the medicinal herb, Hypochaeris radicata L. for in vitro antioxidant activities. Asian Pacific journal of tropical biomedicine. 2014 May 1;4:S359-67.