

# Therapeutic Potential and Biochemical Properties of Nettle grass (*Urtica Dioica*)

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## ABSTRACT:

*Urtica dioica*, commonly known as "Stinging Nettle," is a perennial herbaceous plant in the Urticaceae family, prevalent in temperate regions such as the Himalayan areas of India, Europe, North Africa, North America, and Asia. Rich in phytochemicals like flavonoids, tannins, fatty acids, and vitamins, *Urtica dioica* offers extensive span from alleviating menstrual symptoms, arthritis, and skin conditions to purifying blood and reducing allergies, medicinal, nutritional, and agricultural applications. The plant shows a range of pharmacological properties, including antioxidant, anti-inflammatory, antimicrobial, antidiabetic, antiviral, and anticancer effects.

The stinging nettle also has notable environmental benefits, enhancing soil fertility, preventing erosion, and supporting organic farming. In addition, it serves as a fiber source for textiles and an ingredient in cosmetics and supplements. Research highlights its antibacterial action against pathogens such as *E. coli* and its potential for treating serious conditions like cancer and HIV. Despite these promising applications, further studies are needed to clarify its mechanisms and optimize its use in broader medical and commercial contexts.

**KEYWORDS:** Herbaceous, Weed, Medicinal, Conventional, Phytochemistry, Pharmacological

## INTRODUCTION:

*Urtica dioica* L. is a perennial herbal plant which is known as 'Stinging Nettle', it comes under Urticaceae family. In India it mainly found in Himalayan areas like Kashmir, Kumaon, Garhwal. It is used as a vegetable in Uttarakhand and Nepal. The indigenous names of the plant *Urtica dioica* are Bichubutti in Hindi, Shisun in Kumauni, Kandali in Garhwali, Anjuraa in Unani, Vrishchhiyaa-shaaka in Sanskrit, Lelali sishnu in Nepal [1]. Stinging Nettle have 3-5cm long leaves and the plant bear hairs on leaves and stem. It is multipurpose herbaceous

perennial blooming plant which has medicinal and nutritional values. *Urtica dioica* commonly contain phytochemicals such as tannins, flavonoids, scopoletin, sterol, minerals, fatty acids, isolactins, fibers, vitamins, polyphenols, carotenoids etc. [2]. It is found in all over the world specially in Europe, North Africa, North America and Asia. The slurry of Stinging nettle is used as fertilizer in organic farming and it is also used as natural homemade remedy for healing the wounds over 2000 years. The roots of nettle grass brownish in color which can be widely spreadable in wasteland areas. It is the high source of fiber which is useful in textile companies. *Urtica dioica* is also beneficial for the cosmetic products. Stinging nettle composed of some biologically active compounds which helps to reduce the free radical formation produced by current lifestyle. Nettle tea used for stress, allergic reactions and it is also good for skin. Nettle can relieve menstrual symptoms like cramping and blotting and reduce blood flow during menstruation. Nettle act as restorative agent for woman during menopause [3]. Stinging nettle show pharmacological activities like antifungal, antimicrobial, analgesic, antioxidant, antiproliferative, antidiabetic, antiulcer, anti-inflammatory, antimycotic, hypoglycemic, hypolipemic, anticarcinogenic, antiviral, anti-colitis, antiarthritic, antialzheimer etc. [1,2,3]. Nettle is widely used as a traditional medicine in various countries. It is commonly grown in temperate and topical wasteland areas [4]. Stinging nettle has a long history as a fiber plant and it is cultivated in Europe during second world war in 19<sup>th</sup> century [5].

The fiber from Stinging nettle that is removed from the middle of the stem has superior textile strength. The majority of natural fibers are composed of lignin and cellulose, but they also include additional ingredients such as hemicellulose, pectin, hardwood, ash, oil, wax, silica and other water solutions. Stinging nettle belongs to the shrub family, which includes 30-45 species. The stinging nettle reaches a height of 40 to 120cm and thrives foetid soil. *Urtica dioica* is a naturally occurring biomass, and its uses in fiber, medicines, livestock and cosmetic have been explored [6]. Its heart shaped, serrated leaves and its capacity to sting painfully when touched by its microscopic hairs like structure that contain irritants are what define it. Nettle has been used for very long time in traditional medicine and cuisine. Its leaves are high in protein, vitamins and minerals when they are cooked or dried [7]. The common nettle extract has antibacterial action against *E. choli*, one of the most prevalent bacterial pathogens associated with urinary track infections [8]. The leaves of the plant accommodate ample amount of natural phenolic compounds. The predominant phenolic compound holds anti-inflammatory properties. Nettle leaves also contain five monoterpenoid, terpine diol and terpine diol glucoside p[10]. The crops are indeed very viable for organic farming because they require little in the way of agronomic inputs. Being a perennial, they also help to prevent soil erosion and restore overfertilization soil because they are nitrophilous plant [11]. There is clinical evidence that nettle extracts that have been freeze - dried can lessen allergy symptoms. Although clinical evidence and current research indicate that nettle extract's anti-inflammatory

properties are most likely the source of its advantages, the extract mechanism of nettle extract's usefulness for allergies remain unknown [12]. Luarca was the source of *Urtica dioica* collected in January and February 2022 [17]. Every fungal species culture was kept on potato dextrose agar slants are refrigerated at 4°C [18]. Robert Hook studied stinging nettle hairs as one of the first plant structures through microscopy [25]. Stinging nettle also reduce excitability and has a calming impact on the body. It also benefits the CNS and amplifies the effect of other sleeping pills [27].



***Urtica dioica* plant [Stinging Nettle]**

### **PLANT PROFILE**

*Urtica dioica* is an herbaceous plant which grow in the colder regions all over the world. Stinging nettle belongs to the Urticaceae family from plantae kingdom. It found in the wasteland areas which is rich in Nitrogen. The leaves are green and stems are erect, used as antioxidant, antimicrobial and immunity booster. Nettle grass having the Stinging hairs in stem and leaves. The rhizomes are widely spreadable and they are brownish in color and the flowers of the plants are reddish - brown to greenish – white in color. The plant mainly having the male or female flowers. Stinging Nettle collected from the Himalaya regions in India [4]. *Urtica dioica* used in cleansers, ointments, gargles, suppositories, plasters, drinks etc [13]. Nettle plant fiber used as food and raw material for the formulations of cosmetic, medicine, industries and biodynamic farming [14].

**TAXONOMY [STINGING NETTLE] [1]**

Biological Name	<i>Urtica dioica</i>
Biological Source	Stinging Nettle
Family	Urticaceae
Kingdom	Plantae
Sub kingdom	Tracheobionta
Genus	<i>Urtica</i> L.
Species	<i>Urtica dioica</i>
Super division	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
Sub class	Hamamelidae
Color	Green
Odour	Urticales

**CHEMICAL COMPOSITION [*Urtica dioica*]**

*Urtica dioica* contains some phytochemicals like flavonoids, tannin, volatile compounds and sterol. It also contains acetylcholine, histamine and 5-hydroxytryptamine. Stinging Nettle composed of some pain reducing agents in their Stinging hairs like histamine, serotonin and formic acid. Scopolatin, fatty acid, polysaccharides, sterol, isolactin are some other biological active compounds found in nettle roots. The main components of *Urtica dioica* are carvacrol, carvone, anethol, naphthalene, hexa-hydrofarnesyl acetone and phytol [2].

**VARITIES OF STINGING NETTLE**

- *Urtica dioica*
- *Urtica gansuensis*
- *Urtica afghanica*
- *Urtica galeopsifolia*
- *Urtica gracillis*
- *Urtica urens*
- *Laportea Canadensis*

**VERNACULAR NAMES OF STINGING NETTLE**

- |                         |                      |                                  |
|-------------------------|----------------------|----------------------------------|
| 1. Bichu buti           | 6. California nettle | 11. <i>Urtica galeopsifolida</i> |
| 2. <i>Urtica dioica</i> | 7. European nettle   | 12. <i>Urtica gansuensis</i>     |

- |                 |                      |                             |
|-----------------|----------------------|-----------------------------|
| 3. Ortie        | 8. Big string nettle | 13. <i>Urtica garacilis</i> |
| 4. Buran nettle | 9. Stinger           | 14. <i>Urtica afghanica</i> |
| 5. Nettle leaf  | 10. Stinging nettle  |                             |

### GEOGRAPHICAL ABSTRACT [*Urtica dioica*] [1]



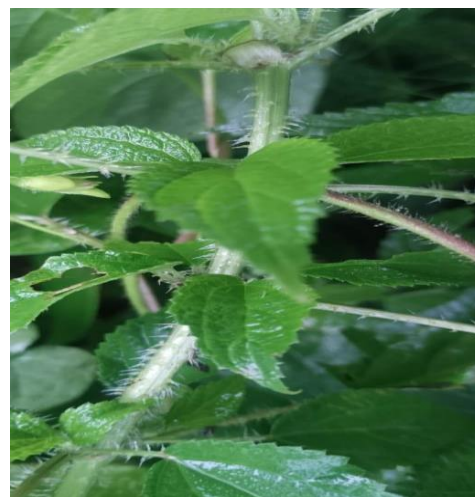
***Urtica dioica* leaves**



***Urtica dioica* roots**



***Urtica dioica* flower**



***Urtica dioica* steam**

### BOTANICAL FEATURES AND GEOGRAPHICAL LOCATION OF STINGING NETTLE

A nitrophilous plant, the *Urtica* species can reach height of 1-2 meters, contingent on edaphic conditions. With its stoloniferous rhizomes, the plant can spread widely even if it grows best

in regions with abundant water. The distribution of *Urtica* species is subcosmopolitan; they are found all over the world. Typically found as weed, the plant prefers damp, shaded areas and is frequently found in ecosystem that have been altered by human [23].

### COLLECTION OF URTICA DIOICA

In addition to the possible benefits to product and users, Stinging nettle cultivation has the potential to yield significant environmental benefits. With organic agriculture methods, stinging nettle is easily propagated and produced with sustainable harvests. A perennial crop that preserves soil fertility and structure, stinging nettle requires less tillage input [21]. Nettles are harvested for their aerial parts either right before or right after they flower. The concentration of active chemicals is highest in the leaves, while other portions of the plant have relatively little of them. Pr. Mohamad Eshaieb, a botanist at the faculty of Science in Sfax, Tunisia, identified the plant after it was gathered in April from the Sidi Bouzol region [28].

### NUTRITIONAL ABSTRACT [*Urtica dioica*] [3]

Vitamins	Minerals	Calories
Vitamin A	Zinc	Fiber
Vitamin B1	Iron	Protein
Vitamin B2	Calcium	Carbohydrates
Vitamin B3	Selenium	
Vitamin B6	Magnesium	
Choline	Manganese	
Vitamin K	Potassium	
	Copper	
	Phosphorus	

### TRADITIONAL USES OF STINGING NETTLE

*Urtica dioica* has long been used in home remedies for families as well as healthy diet. Controlled leaf removal is used as an antihemorrhagic agent to reduce excessive menstrual flow and nasal bleeding. Unfortunately, this plant was used in people's medicine as a diuretic, astringent, and blood producer in addition to treating joint discomfort, iron deficiency, and tea made from *Urtica dioica* leaves has been used as blood purifier and purging tonic [1]. The herb is used to treat gout, sciatica, neuralgia, hair issues and other skin conditions. The roots are applied externally to bruises and have a goof effect on enlarged prostate gland. They are also used to treat nettle rash and chickenpox [4].

## PHARMACOLOGICAL USES OF STINGING NETTLE

**ANTIOXIDANT PROPERTIES** – Research on the antioxidant capacity of *Urtica dioica* revealed a substantial decrease in the rate of NE release in 95% ethanol stimulant. When the storage temperature rises from 4 °C to 40 °C, the rising influence of temperature on the release rate [1]. The primary way that free radicals harm biological membranes is by targeting the infatuated fatty acids inside them. This can lead to lipid peroxidation, a loss in membrane fluidity, decrease in antioxidant defense enzyme activity and damage to membrane protein. Ultimately the cells inactivation or death is brought on by these damaging processes. Therefore, antioxidant can be employed to cleanse the physiological system and counteract the detrimental and pathogenic effect of free radicals [26]. Supplementing *Urtica* extract lowers the potential for oxidative stress at the systemic level and enhances antioxidant ability for decreasing ferric equivalent to Trolox, which was found to be effective at chelating metals [30].

**ANTIMICROBIAL ACTIVITY** – Ten microorganisms were employed in the antimicrobial assessment process [20]. The evaluation of multidrug resistance in common pathogens has made it obvious that new antimicrobial drug and techniques for their application in the treatment of major gram-positive and gram-negative infections are needed now more than ever [24]. The extract of *Urtica dioica* was evaluated in water and ethyl acetate solution [29]. Strongly antibacterial properties of *Urtica dioica* are shown against microorganisms including *Salmonella* spp., *Escherichia coli* and *Proteus* spp., *Bacillus* subunit cause disruption in the stabilization of *Streptococcus aureus* and *Pseudomonas aeruginosa* by either promoting bacterial attachment to the surface or by deactivating certain areas such as bacterial enzyme and receptors [31].

**ANALGESIC EFFECT** – The antioxidant capabilities of nettle WHN were assessed, and the different antioxidant activities were contrasted with antioxidant such as alpha tocopherol, butylated hydroxyanisole and quercetin. It was found that the WEN's total phenolic compounds were equal to pyrocatechol. It reveals antimicrobial properties towards antiulcer properties towards the analgesic effect of ethanol on ulcerogenesis and nine microorganisms on the stretching caused by acetic acid [1].

**ANTIFUNGAL ACTIVITY** – The proteins *Arabidopsis thaliana* chia4 (ATCHIT4) and *Urtica dioica* agglutinin were found to be overexpressed in bacteria and infections between these *P. Francia* surfaces and the protein was examined using immunocytochemistry. It demonstrated how the protein UDSA and ATCHIT4 interact with *P. Francia*'s surface exposed chitin [1]. When it comes to crop output losses and illness, fungi have the biggest influence. Fungicide application is the most crucial defence against fungal infections of plants [15]. It was

discovered that *F. Solani*, a fungal pathogen, exhibited a slight resistance to the extract at the dose utilized with 80.0% fungal mycelial growth suppression [18].

**ANTHELMINTIC ACTIVITY** – The worm flaccid paralysis was produced by the potent anthelmintic effect of piperazine citrate and albendazole, as indicated by the anthelmintic activity. Worms died and become paralysis when albendazole inhibited the polymerization of microtubules causing immobilization [26]. The considerable anthelmintic activity of the methanolic leaf extract was tested on earthworms like *Pheretima posthuma*. The extract from *Urtica dioica* inhibits cutaneous leishmaniasis, eliminates leishmania major casual organisms in sick mice without causing injury to microphage and strengthens the immune system defences against the illness [30].

**RHEUMATOID ARTHRITIS** – An autoimmune condition called rheumatoid arthritis is defined by cartilage degradation and hyperproliferation of synovial lining inflammation over time. Specifically, there is an increase in tumour necrosis factor in synovial fluid, which may be related to inflammatory mediators. For rheumatoid arthritis, stinging nettle leaf extracts are utilized as anti-inflammatory medications. Although the exact mechanism of action of standardized preparations of these extract is unknown, the decrease the generation of cytokines [16].

**ANTI CANCER ACTIVITY** – It was shown to exhibit a dose-dependent suppression of globulin binding to its receptor, directly reduce HeLa cell proliferation, and prevent epidermal growth factor binding to its receptor. Additionally, the prostate tissue of patients with prostate cancer showed a notable suppression of ADA activities in response to the aqueous extract of *Urtica dioica* leaves [2]. Cancer is a class of disease where healthy cells proliferate out of control, invade other body parts unnaturally, and spread to other areas of the body. Prolific human prostate cancer cells (PC3) are inhibited in their proliferation by the dichloromethane extract of *Urtica dioica* leaves [22]. It has been demonstrated that the extract raises antioxidant parameters linked to cancer and that the histological results show a significant reduction in the number and size of adenomas and adenocarcinomas [31]. It has also been shown that *Urtica dioica* processes chemopreventive properties against specific carcinogens. It has been claimed that *Urtica dioica* is a potential candidate for the creation of phytopharmaceuticals or dietary supplements for the cotreatment of many disorders, notably inflammatory bowel disease. It also greatly improved the susceptibility of breast cancer cells to paclitaxel [32].

**ANTIVIRAL ACTIVITY** – Human immunodeficiency virus replication is inhibited by mannose binding proteins produced from several plants which also favour drug resistant viruses that exhibit a significant loss of N-glycosylation sites in the GP120 envelop. The *Urtica dioica* N-acetylglucosamine binding protein inhibited HIV entrance and eventually selected for



viruses that had removed the conserved N-glycosylation sites in GP120 [2]. Lower dose of the plant extract significantly restricts the growth of Syncytia and as the extract, so does the degree of inhibition. Corona, toro and arteriviruses are inhibited by *Urtica dioica*. Anti rota viral qualities are present in plant nutritional extract [30].

## CONCLUSION:

*Urtica dioica*, commonly known as stinging nettle, is a versatile perennial herb belonging to the Urticaceae family. Found globally, particularly in temperate regions like the Himalayas in India, it holds substantial nutritional, medicinal, and agricultural value. Rich in phytochemicals such as tannins, flavonoids, and fatty acids, the plant exhibits various pharmacological properties, including antioxidant, anti-inflammatory, antidiabetic, antimicrobial, and antiviral effects.

Traditionally, stinging nettle has been used for a range of health benefits, such as treating allergies, menstrual symptoms, arthritis, and skin conditions. It is also applied externally for wound healing and as a blood purifier when prepared as tea. Additionally, stinging nettle has environmental benefits in organic farming, improving soil fertility and preventing erosion. Its significance extends beyond medicinal uses; stinging nettle serves as a fiber source for textiles, food, and cosmetics. Extracts from the plant show potential in treating serious conditions like cancer, HIV, and inflammatory diseases. Despite its therapeutic promise, further research is required to understand its mechanisms fully and develop effective treatments for broader application.

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