Pharmaceutical Properties and Medicinal Uses of Stinging Nettle Plant - A Review

Joshi Neha[1*], Joshi Amit Kumar[2], Joshi Priyanka[1], Pawar Shikha[1]

1. *College of Pharmacy, Graphic Era Hill University, Bhimtal Campus, Nainital, Uttarakhand, India – 263136*
joshi.neha379@gmail.com, 8130919389
2. *Department of Pharmacy, Himalayan Institute of Pharmacy and Research, affiliated to Veer Madho Singh Bhandari Uttarakhand Technical University, Dehradun, Uttarakhand, India – 248007*
amit.joshi.pharmacognosist@gmail.com, 9897363394
1. *College of Pharmacy, Graphic Era Hill University, Bhimtal Campus, Nainital, Uttarakhand, India – 263136*
priyankajoshi5595@gmail.com, 8476907804
1. *College of Pharmacy, Graphic Era Hill University, Bhimtal Campus, Nainital, Uttarakhand, India – 263136*
shikhgehu@gmail.com, 9458940232

Abstract:

The stinging nettle plant is spread worldwide but is commonly found in Europe, North America, North Africa, and parts of Asia. In India, it is found in the Himalayan region as a wild plant. In many areas of the Himalayan region, the stinging nettle plant is used as a traditional food, which is very useful to treat painful muscles and joints, eczema, arthritis, gout, and anaemia. Nowadays its leaves are also consumed as juice, tea, and freeze-dried products. The stinging nettle plant has found a good source of fibre which is used for the textiles industry and in manufacturing cosmetic products.

Other than these the major benefit of stinging nettle plants is in the pharmaceutical field. Its leaf, stem, and root have unique merits. The research has proven that the plant is enriched with vitamins and have a very high content of mineral and protein. The root of the stinging nettle also has many minerals and flavonoids. The seeds of stinging nettle contain saturated and unsaturated fatty acids, carotenoids, and β-carotene.

The study reviews the nutritional and pharmacological properties of stinging nettle. The plant is enriched with many biochemical compounds which makes it widely used in the pharmaceutical industry and continuously an attraction point for new researchers.

Keywords: *Stinging Nettle, Root, Leaf, Seed, Stalk, Biochemical compounds, Pharmaceutical properties.*

Introduction

The stinging nettle plant is spread worldwide but is commonly found in Europe, North America, North Africa, and parts of Asia.[1] In India it is found in the Himalayan region as a wild plant. It is also addressed by some other common names like common nettle, burn nettle, or just a nettle or stinger. The scientific name of the stinging nettle plant is Urtica dioica, it comes under the Urticaceae family.[2] It looks like normal wild plants having 3 to 5 feet in length and has different varieties in terms of their leaf shapes. Its main characteristic which makes it unique from all other wild plants is its stinging nature. It got the name stinging nettle because it has a number of fine hair-like needles on both sides of its leaves as well as on its stem which sting when came in contact and give a painful burning and itching sensation. Nature has given stings to this plant for its safety on the other side nature also blessed it with many merits. This plant has many useful characteristics which make it important in many fields from a wild plant.

Stinging Nettle Plant

Stinging Nettle roots

Stinging Nettle leaf

Stinging Nettle seeds

Stinging Nettle stalk

(Asgarpanah, Jinous & R, Mohajerani. (2012). Phytochemistry and pharmacologic properties of Urtica dioica L. Journal of Medicinal Plants Research. 6)

Scientific classification

Kingdom-	Plantae - Plants
Subkingdom-	Tracheobionta - Vascular plants
Superdivision-	Spermatophyta - Seed plants
Division-	Magnoliophyta - Flowering plants
Class-	Magnoliopsida - Dicotyledons
Subclass-	Hamamelidae
Order-	Urticales
Family-	*Urticaceae* - Nettle family
Genus-	*Urtica* L.
Species-	*Urtica dioica* L., - stinging nettle P

(Moal L, Truffa-Bachi MA. Urtica dioica agglutinin, a new mitogen for murine T lymphocytes: unaltered interleukin-1 production but late interleukin 2-mediated proliferation. Cell Immunol. 1988;115(1):24–35)

Traditional and general uses of stinging nettle

In many areas of the Himalayan region, the stinging nettle plant is used as a traditional food. They burn its hairy needles and then use green leaves as a vegetable which is very useful to

treat painful muscles and joints, eczema, arthritis, gout, and anemia.[3] The scientist have explored many other useful characteristics of the stinging nettle plants as food like blood nourishment and the ability to fight against seasonal rhinitis nowadays its leaves are also consumed as juice, tea, and freeze-dried products.[4] Other than food products the stinging nettle plant has found a good source of fibre which is used for the textiles industry and in manufacturing cosmetic products.[1]

Biochemical compounds in stinging nettle

On the basis of their leaf shape and sizes the stinging nettle plant has six different subspecies. The stinging nettle leaves have nettles on both sides their hollow hairs are called trichomes. The top portion of hairs is sealed by a very weak cover which can remove just by a gentle rub and the open hair then act like fine needles. The needles release a mixture of some chemicals (Neurotransmitters – histamine, acetylcholine, serotonin, and Acids – formic, tartaric, oxalic) which cause itching, burning and pain sensation on that part of the skin.[5]

The leaf of stinging nettle is highly rich in vitamins B, C, and K and minerals such as calcium, iron, magnesium, phosphorus, potassium, and sodium.[6,7] Around 20% of dry mass is made of minerals.[8] Almost 30% of dry mass is made of protein and the amino acid demand is taken care of by the protein on leaves.[8,9]

The seeds and leaves of stinging nettle are enriched with vitamins, minerals, and amino acids.[10] The researchers have explored that the stinging nettle plant has very high moisture content i.e. around 70%. Its stalk has the highest moisture content followed by its roots and leaves.[11,12] Past researchers have found that the nettle plant has phenolic components. The amount of phenolic content in leaves is found in higher amounts as compared to root and stalk. The phenolic component mainly contains p-coumaric, kaempferol, and quercetin in roots, syringic, myricetin, quercetin, kaempferol, and rutin in the stalk, and p-coumaric, isorhamnetin and quercetin in leaves.[12] The stinging nettle plant has very good antioxidant properties. Past research shows that the nettle leaves have high antioxidant properties followed by their stalk and roots.[11]

Pharmaceutical properties and medicinal uses of stinging nettle

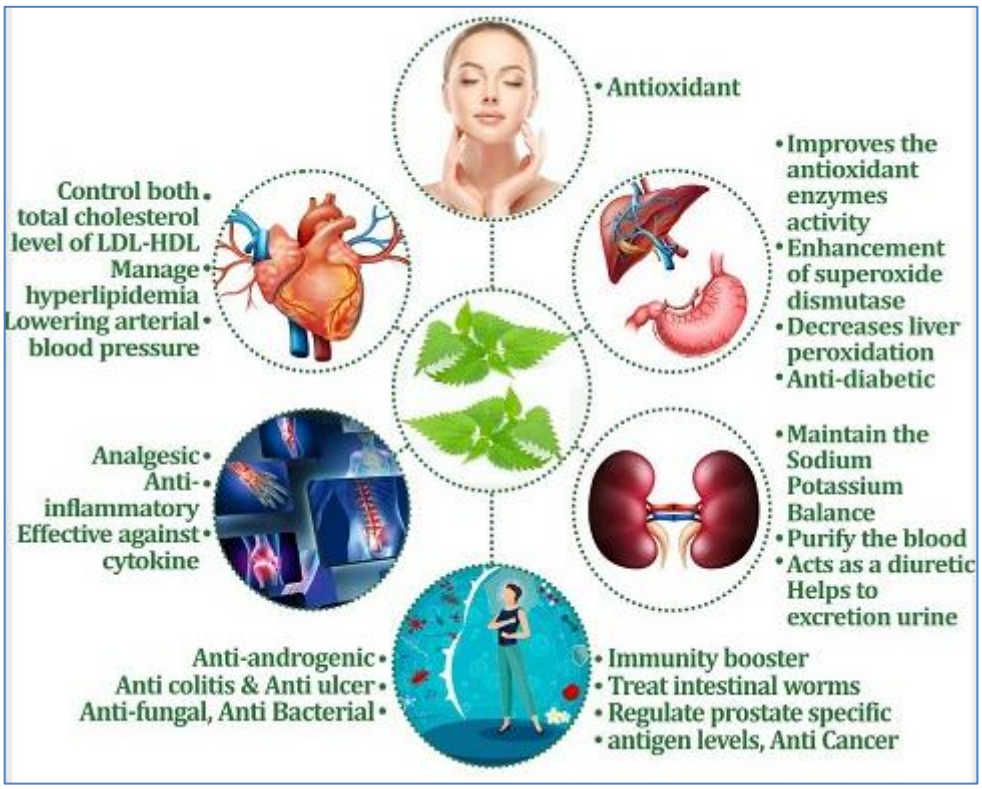
Although the stinging nettle plant has been utilized in a number of traditional as well as general ways, researchers have proven in recent research that the stinging nettle plant has many extraordinary properties. These researches have opened a door to a new dimension in its scope. Due to enriched biochemical components and having a number of pharmaceutical properties, the stinging nettle plant has a wide scope in the medicinal field.

Nowadays research has explored a number of qualities in stinging nettle plants so that they can be very helpful in treating different diseases. Each part of this plant like leaves, stems, roots, and seeds has some unique merits, useful for the treatment of different ailments. The research has proven that the stinging nettle plant has anti-proliferative, anti-inflammatory, antioxidant, analgesic, anti-infectious, hypotensive, and antiulcer properties along with the ability to prevent cardiovascular disease.[13]

The stinging nettle plant has a wide range of pharmaceutical properties which makes it very useful in this industry,

- The stinging nettle has a natural antioxidant property due to the presence of phenolic components and flavonoids.[14] The tea of nettle leaves is consumed as a cleansing tonic for blood purification and for weight loss.[15,16]
- The extract of stinging nettle has the hypoglycemic property to effectively control the serum glucose and fasting insulin resistance index.[17]
- Studies have proven that the nettle plant has more anti-inflammatory results as compared to traditional anti-inflammatories prepared using aqueous solvents and alcohols. The extract of the nettle obtained by squeezing it has anti-inflammatory properties and can target cyclooxygenase COX-1 and COX-2 which cause inflammation.[18,19] Nettle root extract also helps to treat rheumatic gout, chickenpox as well as rashes by its own leaves.[20]
- The studies show that the stinging nettle can inhibit the over-release of acids which is helpful in controlling acidity in the GI tract. Moreover, it also has good antiulcer properties.[21,22]
- The root of the nettle plant is beneficial in the treatment of prostate gland problems.[20]

- The diuretic and laxative properties of the nettle plant make it useful in the treatment of asthma and other pulmonary diseases.[16]
- The stinging nettle plant is helpful to regulate renal function as it helps to extract sodium from the body in urine through the kidney.[23]
- The solvent fraction of nettle extract with ethyl acetate shows a remarkable property in hypertension management.[24]
- A study also shows its promising effect in treating Parkinson's disease due to its antioxidant-rich extract.[25]
- The stinging nettle contains chlorogenic acid, rosmarinic acid, and caffeic acid as hydroxycinnamic acids and quercetin as flavonoid which combinedly represents its antibacterial properties.[26]
- The powder of nettle leaves acts as an antihemorrhagic agent to manage bleeding issues like nose bleeding and excessive bleeding during menstruation.[27,28]



Medicinal Uses of Stinging Nettle Plant

(Healthsoul - https://healthsoul.com/blog/health-benefits-of-stinging-nettle/)

Conclusion and future scope

Due to such a high content of protein and minerals and enriched vitamins, the stinging nettle plant is continuously becoming an attraction point for new researchers. For a long time, the nettle plant has been used as a food ingredient as well as in traditional medicine. The nettle plant is rich in various biochemical compounds like antioxidants, phenolic components, etc. On the basis of different phenolic components, the researchers have explored the individual usefulness of different parts of nettle plants such as leaves, seeds, stalks, and roots. The plant contains a number of pharmaceutical properties like antihyperglycemic, anti-bacterial, anti-ulcer, antioxidative, anti-inflammatory, cardiovascular, etc. It has a rich medicinal value and different parts of the plant are used to treat a number of diseases. This is just the beginning of research on this plant. This plant is used as a traditional medicinal plant which gives researchers a vision to explore the bioactive compounds present in different parts of the nettle plants and their mechanism of action. These require detailed chemical studies as well as streamlined formulation strategies. One more aspect to explore is the nature of the stinging nettle plant and its biochemical compositions on the basis of different climatic conditions where it can grow.

References:

1. Petruzzello M. stinging nettle. In: Encyclopedia Britannica [Internet]. 2023. Available from: https://www.britannica.com/plant/stinging-nettle

2. Plants of the World Online. Royal Botanic Gardens, Kew. Royal Botanic Gardens, Kew Retrieved. 2018;

3. Schlatter C, Ramsier K. Stinging Nettle [Internet]. Ideas Into Books Westview; 2014 [cited 2023 Jan 20]. Available from: https://www.mountsinai.org/health-library/herb/stinging-nettle

4. Upton R. Stinging nettles leaf (Urtica dioica L.): Extraordinary vegetable medicine. J Herb Med [Internet]. 2013;3(1):9–38. Available from: http://dx.doi.org/10.1016/j.hermed.2012.11.001

5. Compound Interest. The chemistry of stinging nettles [Internet]. Compound Interest. 2015 [cited 2023 Jan 9]. Available from: https://www.compoundchem.com/2015/06/04/nettles/

6. Fu HY, Chen SJ, Chen RF, Ding WH, Huang K, Huang LL. Identification of oxalic acid and tartaric acid as major persistent pain inducing toxins in the stinging hairs of the nettle, Urtica thunbergiana. Ann Bot. 2006;98:57–65.

7. Czarnetzki BM, Thiele T, Rosenbach T. Immunoreactive leukotrienes in nettle plants (Urtica urens). Int Arch Allergy Appl Immunol [Internet]. 1990;91(1):43–6. Available from: http://dx.doi.org/10.1159/000235087

8. Pradhan S, Manivannan S, Tamang JP. Proximate, mineral composition and antioxidant properties of some wild leafy vegetables. J Sci Ind Res. 2015;74:155–9.

9. Wetherilt H. Evaluation of URTICA species as potential sources of important nutrients. In: Developments in Food Science. Elsevier; 1992. p. 15–25.

10. Akgul A. Spies Science and Technology. Association Food Technology. Ankara, Turkey; 1993.

11. Hudec J, Burdová M, Kobida L, Komora L, Macho V, Kogan G, et al. Antioxidant capacity changes and phenolic profile of Echinacea purpurea, nettle (Urtica dioica L.), and dandelion (Taraxacum officinale) after application of polyamine and phenolic biosynthesis regulators. J Agric Food Chem [Internet]. 2007;55(14):5689–96. Available from: http://dx.doi.org/10.1021/jf070777c

12. Otles S, Yalcin B. Phenolic compounds analysis of root, stalk, and leaves of nettle. ScientificWorldJournal [Internet]. 2012;2012:1–12. Available from: http://dx.doi.org/10.1100/2012/564367

13. Bhusal KK, Magar SK, Thapa R, Lamsal A, Bhandari S, Maharjan R, et al. Nutritional and pharmacological importance of stinging nettle (Urtica dioica L.): A review. Heliyon [Internet]. 2022;8(6):e09717. Available from: http://dx.doi.org/10.1016/j.heliyon.2022.e09717

14. Komes D, Belščak-Cvitanović A, Horžić D, Rusak G, Likić S, Berendika M. Phenolic composition and antioxidant properties of some traditionally used medicinal plants affected by the extraction time and hydrolysis: Phenolic Composition and Antioxidant Properties of Some Traditionally Used Medicinal Plants Affected. Phytochem Anal [Internet]. 2011;22(2):172–80. Available from: http://dx.doi.org/10.1002/pca.1264

15. Montana Plant Life [Internet]. Plant-life.org. [cited 2023 Jan 12]. Available from: http://montana.plant-life.org/species/urtica_dioica.htm

16. Ji H-F, Li X-J, Zhang H-Y. Natural products and drug discovery. Can thousands of years of ancient medical knowledge lead us to new and powerful drug combinations in the fight against cancer and dementia? EMBO Rep [Internet]. 2009;10(3):194–200. Available from: http://dx.doi.org/10.1038/embor.2009.12

17. Ahangarpour A, Mohammadian M, Dianat M. Antidiabetic effect of hydroalcholic Urtica dioica leaf extract in male rats with fructose-induced insulin resistance. Iranian journal of medical sciences. 2012;37.

18. Roschek B Jr, Fink RC, McMichael M, Alberte RS. Nettle extract (Urtica dioica) affects key receptors and enzymes associated with allergic rhinitis. Phytother Res [Internet]. 2009;23(7):920–6. Available from: http://dx.doi.org/10.1002/ptr.2763

19. 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 [Internet]. 2013;20(2):143–7. Available from: http://dx.doi.org/10.1016/j.phymed.2012.09.016

20. Urtica dioica [Internet]. Find Me A Cure | Alternative Medicine. Find Me A Cure; 2015 [cited 2023 Jan 17]. Available from: http://findmeacure.com/2015/06/06/urtica-dioica/

21. Burkova VN, Boev SG, Vengerovskiĭ AI, Iudina NV, Arbuzov AG. Gastroprotective action of the nettle extract in experimental peptic ulcer. Eksp Klin Farmakol. 2011;74(1):24–7.

22. Gülçin I, Küfrevioglu OI, Oktay M, Büyükokuroglu ME. Antioxidant, antimicrobial, antiulcer and analgesic activities of nettle (Urtica dioica L.). J Ethnopharmacol [Internet]. 2004;90(2–3):205–15. Available from: http://dx.doi.org/10.1016/j.jep.2003.09.028

23. Tahri A, Yamani S, Legssyer A, Aziz M, Mekhfi H, Bnouham M, et al. Acute diuretic, natriuretic and hypotensive effects of a continuous perfusion of aqueous extract of Urtica dioica in the rat. J Ethnopharmacol [Internet]. 2000;73(1–2):95–100. Available from: http://dx.doi.org/10.1016/s0378-8741(00)00270-1

24. Qayyum R, Qamar HM-U-D, Khan S, Salma U, Khan T, Shah AJ. Mechanisms underlying the antihypertensive properties of Urtica dioica. J Transl Med [Internet]. 2016;14(1). Available from: http://dx.doi.org/10.1186/s12967-016-1017-3

25. Bisht R, Joshi BC, Kalia AN, Prakash A. Antioxidant-rich fraction of Urtica dioica mediated rescue of striatal Mito-oxidative damage in MPTP-induced behavioral, cellular, and neurochemical alterations in rats. Mol Neurobiol [Internet]. 2017;54(7):5632–45. Available from: http://dx.doi.org/10.1007/s12035-016-0084-z

26. Zenão S, Aires A, Dias C, Saavedra MJ, Fernandes C. Antibacterial potential of Urtica dioica and Lavandula angustifolia extracts against methicillin resistant Staphylococcus aureus isolated from diabetic foot ulcers. J Herb Med [Internet]. 2017;10:53–8. Available from: http://dx.doi.org/10.1016/j.hermed.2017.05.003

27. USDA plants database [Internet]. Usda.gov. [cited 2023 Jan 22]. Available from: http://plants.usda.gov/classification/output_report.cgi?URDI

28. Greenwoodherbals.com. [cited 2023 Jan 24]. Available from: http://www.greenwoodherbals.com/documents/newsletters/2005/July05Newsletter.pdf