

Therapeutic Effects of Nettle Leaf: An Indigenous Vegetable

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Abstract:

Stinging Nettle (*Urtica dioica* L.; family Urticaceae) is extensively used species by traditional societies of Temperate and Tropical Asia, Europe, Northern America and Northern Africa. As food, the species shows nutritional as well as immunity modulating benefits. It has shown positive benefits for treating various diseases, such as BPH, diabetes, anemia, asthma, hypertension, kidney problem, cancer, etc.; although these claims are based on different doses, followed by type and duration of intervention. There is a need to take-up more coordinated researches and validation studies in future so that applicability of nettle could be established properly against various diseases as well as proper quality control and toxicological investigations is required to assure the stability and safety of the clinical uses. The study highlights on the considerable qualities of stinging nettle and has strong potential for food and therapeutic purposes.

Keywords: Nutrients, minerals, vitamins, food and nutritional supplement, health benefit, vegetables, leaves

INTRODUCTION:

Recently, research and development of new drugs from natural resources has become the global trend in a systematic and strategic manner. Today, Medicines derived from natural products are widely used today and accounts for more than 30% of therapeutic agents presently prescribed in clinics (Yang et al. 2008). These naturally derived medicines have been selected due to their great medicinal relevance. Within these years, recently infections have increased extensively and resistance against antibiotics has become an ever-increasing therapeutic problem.

Urticadioica L. is one of the widespread commonest plants on roadsides and wastelands from Urticaceae family. The genus name 'Urtica' comes from the Latin verb 'urere', which means 'to burn,' because of these stinging hairs whereas the species name 'dioica' means 'two houses' since the plant contains either male or female flowers. This is the main reason why Nettle has a well-known reputation for giving a savage sting when the skin touches the hairs and bristles on the leaves and stems. Since ancient times, people have been taking advantage of this sting to stimulate circulation and bring warmth to joints and extremities via a treatment known as "urtication". Early, Egyptians reported the use of infusion for the relief of arthritis and lumbago. This practice of urtication or rubefaction later became a standard in folk medicine as a remedy for arthritis, rheumatism and muscular paralysis.

Recently in few years, *Urticadioica* L. is accepted as a healing plant due to its considerable effects on human health in almost all over the world. This plant is used as traditional medicine in Morocco,

Turkey, Brazil, Jordan and Northern Iran. The herbs of *U. dioica* are used to treat stomach ache in Turkish and Iranian folk medicine (Gulçin et al. 2004)(Pourmorad et al. 2006).

Besides, this herb is used to treat colds and cough (Sezik et al. 1997). Infusions and decocts made from Nettle are used for the treatment of anemia and convalescence occasionally as it increases the iron binding capacity as well as the level of red cell folate and vitamin B12 in blood on administration (Upton, 2013).

In addition to this, stinging nettle is used as a leaf vegetable, primarily in soups, vegetable pies, and salads (Kavalali, 2003). The medicinal properties present in stinging nettle have been a talk in the modern research playing a major role in the treatment of benign prostatic hyperplasia (Chrubasik et al. 2007) and rheumatoid arthritis (Upton, 2013). However, there is a great need for detailed characterization and exploration of its chemical composition for therapeutic purposes.

Plant Description

The leaves of the stinging nettle contain a wide variety of chemical constituents. Though only few compounds which belong to various natural classes have been identified. The compounds responsible for the stinging/burning sensation on the skin are mainly on the leaves and these are acetylcholine, histamine, 5- hydroxytryptamine (serotonin), and to small amounts of leukotrienes (Czarnetzki et al. 1990). Apart from these, phenylpropanes, caffeic acid, and various esters of shikimpic acid namely chlorogenic acid and caffeoylmalic and coumarin scopoletin are also present (Schomakers et al. 1995). The distinctive components of this plant are the stinging constituents found in leaves (acetylcholine, histamine, serotonin) and caffeoylmalic acid. *Urtica Dioica* Agglutinin (UDA) and ceramides are mainly available in the root.

Therapeutics of stinging nettle

The herb and the root of stinging nettle are used therapeutically in different capacities. The herb is recommended as an adjuvant treatment of rheumatic disorders, lower urinary tract infections, preparation of nutritional tonic, and recently for the treatment of allergies (in the form of freeze-dried leaves). On the other hand, the root is used to reduce symptoms associated with benign prostate hyperplasia. In vitro studies have shed some light into the mechanism of action and provide evidence to use in traditional medicine. Since then stinging nettle herb has been area of interest to pharmacological as well as clinical research. (Ahmed S, 2012)

Antiproliferative activity

Various research studies shown that the components of nettle roots interfere with several mechanisms involved in the pathogenesis of benign prostatic hyperplasia. The in vivo and vitro studies shown antiproliferative effect on prostate cancer cells from the methanolic alcoholic root extracts. Lignans extracted from root not just inhibits the androgen binding to the transporter proteins SHBG (Sex Hormone Binding Globulin), but also the bind these proteins to the membrane receptors of the prostate inhibiting their proliferative activity on prostate tissues. The extract derived from root also reduces the production of estrogen by inhibiting aromatase which decreases the conversion of androgens to estrogens. These extracts however inhibit the enzymatic activity and growth of the membrane of prostate cells. Clinical studies on root extracts showed significant response of the symptoms of benign prostatic hypertrophy. (Wei Y. 2001)

Anti-inflammatory activity

Scientific research highlights the nettle's ability to decrease the inflammatory response via multiple mechanisms and consequences by reducing the synthesis of lipid mediators and proinflammatory cytokines. The extracts from the leaf inhibits the biosynthesis of arachidonic acid cascade enzymes particular to the cyclo oxygenases COX-1 and COX-2 that blocks the biosynthesis of prostaglandins and thromboxanes. NF-kappa B (nuclear factor kappa-light-chain-enhancer of activated B cells) system shows inhibitory effects involved in immune, inflammatory and antiapoptotic responses and the PAF (Platelet Activating Factor). The extract of the leaves helps to reduce the release of Interleukins IL-2 and IL-1 β , Interferon γ (IFN γ) as well as Tumour Necrosis Factors TNF- α and TNF- κ . Nettle leaves are found to be useful in acute inflammatory diseases and chronic diseases, like rheumatoid arthritis by inhibiting cyclo oxygenases and lipoxygenases, and to cytokines.

Antioxidant activity

Nettle extracts have neutralizing action on the superoxide anion O₂^{°-}, the hydroxyl radical OH[°] and nitric oxide radical NO[°]. The methanolic and ethanolic extracts present in leaves have a remarkable antioxidant effect specially on the 1,1-diphenyl-2-picrylhydrazyl radical (DPPH). These extracts have the capability to decrease lipid peroxidation and increase the activity of the antioxidant defense system thus playing a protective role against hepatotoxicity. (Isasa M.T., 2009)

Immunomodulatory effect

As per research studies, flavonoids present in nettle leaf are found to modulate the immune system. The enzymes embedded in this plant such as cytochrome P450, lactate dehydrogenase (LDH) and NADPH-cytochrome P450 reductase showed a significant decrease while the antioxidant enzymes showed a significant increase which in a way shows a modulatory effect on enzymes of the kidney, lung and stomach, such as glutathione-S-transferase, superoxide dismutase and catalase. (Antolak H., 2019)

Analgesic properties

The analgesic and anti-inflammatory effect of the extracts in the plant may be due to the presence of flavonoids, tannins, alkaloid or saponins. Flavonoids are widely shown to target prostaglandins which are involved in the pain perception through moderating opioidergic mechanism that strongly shows peripheral analgesic activity mediated through inhibition of local peritoneal receptors via cyclooxygenase inhibition potential thereby releasing pain mediators which helps to recover tissue damage and injury. (Bolle P., 1993)

Antiulcer properties

The protective effect of the nettle against gastric ulcers is dose dependent. This scorpion herb is helpful in making the digestive process work properly. This nettle leaves are also helpful in removing the acidity problem caused frequently by wrong eating which sometimes takes a serious form. The anti-ulcer properties present in this herb help in the problem of ulcers. Not only this, the herb is a boon for relieving gastro related problems. (Martino E., 2002)

Anti-infective properties

The experimental results from our study of nettles+vinegar, nettles+oil and nettles+butter preparations

showed that these treatments did not extract anything antibacterial from the nettles. However, the nettles acted as a highly effective sponge and delivery agent for vinegar, which is very well established as a bactericidal agent. The presence of bioactive molecules, or their concentration, in nettles varies depending on season, local climate, soil type or other environmental factors, and that studies may only capture activity if nettles are harvested in a particular time and/or place. Second, it is possible that additional biological activity is achieved when *Urtica* spp. are combined with other natural products, due to additive or synergistic interactions between molecules from different plants, a number of known antimicrobial medicinal plants and products are combined with nettles in our dataset of medieval remedies. Finally, plant extracts which are not significantly bactericidal might still be of some medicinal use if they can prevent the expression of highly virulent or persistent bacterial phenotypes. (Maharjan R, 2022)

Anti-diabetic

Furthermore, studies performed on the islets of Langerhans have demonstrated the stimulatory action of nettle on insulin secretion, accompanied by a decrease in blood sugar (Dabaghian FH, 2013). Tests performed on normal and diabetic rats after intra peritoneal injection of aqueous extracts confirmed this result. A study conducted to evaluate the anti-diabetic activity in vivo showed the hypoglycemic effect of aqueous extracts of leaves of nettle on diabetic rats. These results are explained by the inhibition of the intestinal absorption of glucose. (McAuley D 2008)

Antihypertensive action

Intravenous injections of an aqueous extract of the aerial parts of the nettle, using two concentrations: 4 and 24 mg/kg/h resulted in a blood pressure drop of 15% and 38% proportionally to the administered dose. This decrease was correlated with an increase in diuresis and natriuresis. However, the hypotensive effect was reversible after one hour if a low concentration (4 mg/kg/h) had been used, while it persisted when using a high concentration (24 mg/kg/h). Moreover, root extracts tested on isolated pieces of vaso constricted aorta showed a relaxant activity. This vasodilator effect is due to the release of the endothelial nitrogen oxide, potassium channel opening and a negative inotropic action. (Pieroni A, 2012)

Effect on platelet aggregation

Several studies indicate that excerpts of nettle inhibit platelet aggregation. The inhibitory effect of the waterless excerpt of the leaves on platelet aggregation convinced by thrombin was easily demonstrated. Flavonoids are the main composites involved in this exertion. Action on hyperlipidemia and atherosclerosis diurnal administration of waterless excerpt of *Urtica dioica* at 150 mg/ kg for 30 d, either as part of a normal or high fat diet, caused a reduction in serum lipids and lipoproteins. Significant diminishments in cholesterol and LDL/ HDL rate were observed. Also, administration of an ethanolic excerpt to hypercholesterolemic rats, using boluses of 100 mg/ kg and 300 mg/ kg, was responsible for the dropped of cholesterol and LDL situations. Whereas the LD50 of hydro- alcoholic excerpts administered intraperitoneally is 600 mg/ Kg. (Saha S, 2013)

Anti allergic activity

The anti-allergenic exertion of the nettle is substantially due to two mechanisms. In addition to its

inhibition of histamine H1 receptors, nettle inhibits tryptase accordingly reducing mast cell degranulation and the release of pro-inflammatory cytokines. In a randomized double-blind study with antipathetic cases having antipathetic rhinitis, an enhancement in symptoms was observed after one week of treatment. Toxicological studies have shown that the LD50 (standard) of the waterless excerpt of the leaves administered intraperitoneally in mice is 3.5 g/ Kg. While the LD50 of the hydro-alcoholic excerpt of the leaves administered orally is 5.77 g/ Kg. The studies also shown that the LD50 values attained after intravenous injection of a waterless excerpt and an infusion of the roots to rats is independently 1.721 g/ kg and 1.929 g/ kg. (Bielory L, 2004)

MODES OF USE AND USE PRECAUTIONS

Nettle is used both by orally and local routes. The most frequently used preparations in medicine are - total dry powder, dry extracts, infusions, decoctions as well as the fresh nettle juice. For the treatment of arthritis, rheumatism and gout, this plant is given orally using different forms. At times, Nettle teas are also used to treat rhinitis and seasonal allergies.

Nettle is also effective against oral infections such as aphtha, gingivitis and tonsillitis used as mouthwash. Preparations like fresh nettle poultices are used in cases of acne and alleviate arthritic and rheumatic pain and can be applied externally.

Nettle preparations are also used best in hair care against dandruff and oily hair. Furthermore, the nettle roots, if used alone or combined with saw palmetto (*Serenoa repens*) are used as teas or extracts in mictional disorders one of the root causes for benign prostatic hyperplasia. The adherence to dosage recommendations is essential. The recommended dosage of the dried aerial parts for adults is 1.2 to 18g per day. The recommended dose is 15 to 45 ml per day for fresh fruit juice whereas dosages for the dried root preparations are 0.3 to 24g per day

CONCLUSION

Known for its notorious and bit of unpleasant irritant effects, stinging nettle is actually rich in nutrients such as vitamins and minerals and definitely possesses many medicinal properties. Several studies especially in the last decade have focused more on the pharmacological properties as well as the chemical composition and analysis of Nettle plant. Though its potential benefits are defined by many studies which strengthened its claimed indications from traditional medicine. Not only this, the vitro and in vivo animal studies have indeed approved many pharmacological effects such as antiproliferative, anti-inflammatory, anti-oxidant, analgesic, anti-ulcer, immunostimulating, anti-infectious, anti-hypertensive and also as protective against cardiovascular diseases. In addition, being rich in protein, minerals and vitamins, this plant also provides a proven great nutritional value. Many toxicological studies proved that nettle can be considered safe using significant doses if administered orally in humans and shows no side effects.

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