Original Research Article

A COMPREHENSIVE REVIEW OF STINGING NETTLE FOR THE TREATMENT OF ALLERGIC RHINITIS

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Abstract:
Urtica dioica L. (Urticaceae), sometimes known as stinging nettle, is a herbaceous perennial plant that belongs to the phytoalimurgic vegetables group, that includes wild edible plants that were all useful in the past when food was confined. The plant is recognized for producing dermatitis when contacted, which is triggered by biochemical mediators such as histamine and acetylcholine. Because of the plant's antirheumatic, anti-infective, immuno-modulatory, anti-hyperglycemic, and allergy relief characteristics, it has lately been rediscovered as a food and medicine. This publication, which includes a botanical, phytochemical, and pharmacological synopsis of the species, aims to stimulate the scientific community's interest in this promising plant.

Keywords: Allergic Rhinitis, Stinging Nettle, Urtica Dioica.

INTRODUCTION:

Urtica dioica L. (Urticaceae), also known as stinging nettle, is an herbaceous perennial plant. It is found in temperate regions of Europe, Asia, North Africa and North America up to 1800 metres of altitude. Because of its wide use throughout the world, other names are used to define the plant such as nettle leaf or common nettle, but it also has different regional names. Where it flourishes it forms dense thickets, particularly within disturbed ground(1).The plant belongs to the group of phytoalimurgic vegetables. This includes the wild edible species that were used in the past when there was a shortage of food. The term in fact originates from the Greek word utso´m (phyto´n), indicating the plant, and the Latin words alimenta urgentia, indicating any kind of food available in case of necessity(2).The usage of phytoalimurgic plants has grown in recent years due to their distinct chemical makeup and beneficial association with regard to human well-being(3).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 (as a matter of fact, ‘‘nettle’’ derives from an Anglo-Saxon word meaning ‘‘needle’’). Stinging nettle dermatitis is due to both mechanical and biochemical mechanisms within the plant(4). In fact, formic and tartaric acids, alkaloids, enzymes, histamine, acetylcholine, 5-hydroxytryptamine, salts and proteins are likely to be the biochemical mediators of the stinging nettle dermatitis(5).

BOTANICAL DESCRIPTION:

Urtica dioica is a complex taxonomic group in which several infrasubspecific taxa are recognized in several national or local floras and sometimes may be found also as intermediate forms(6).All the subspecies are erect perennials that stand up to two metres tall, they have long stoloniferous rhizomes, opposite ovate-lanceolate leaves, toothed margins with acute tip (the last one usually longer than the others), axillary inflorescence with many small, green and unisexual flowers, and achenes as its fruits(7).The Gynoecium is made up of hairy and sessile pistils covered by two pair of unequal tepals. Pollen is released from the flowers when the sepals on the staminate flowers open: this allows the inward-curved stamens to spring elastically outwards, pitching pollen into the air. After pollination has taken place, mostly by wind, fruits begin to develop; these are small diclesia containing only one seed of which completely fills the fruit, this latter has an elliptic shape and is brown or olive in colour, with lighter spots(8).Nettles were used worldwide for centuries from Roman soldiers to South American tribes, for a common practice called urtication. It consists in deliberately flogging the body with fresh nettles to relieve pain and other ailments(9).Leaves are very nutritious and can be preserved for winter and consumed after drying. In this way they become unharmful, which can also be achieved by boiling them. It is advisable to eat young shoots and leaves, since as the plant flowers and bears fruits, it may contain higher amounts of cystoliths with maturity, which can irritate the kidneys (10).The Leaves' juice or a decoction of the leaves there of can be used as a rennet substitute for curdling(11).The herb can be helpful in cases of rheumatic conditions, lower urinary infections, as a nutritional tonic for its high content in vitamins and minerals, and recently also as an allergy relief medication. In the freeze-dried form; roots, instead, help tackling benign prostatic hyperplasia symptoms, such as difficulty in urination. For both plant parts different studies have enlightened some mechanisms of action, providing support to the traditional uses(12).Besides ''urticae radix'', Commission E also reports a monograph for ''urtica herba'' and ''urtica folium'' given by herbs and leaves of U. dioica and Urticaurens and/or their hybrids, gathered while in bloom: can be used ''as supportive therapy for rheumatic ailments'' and ''as irrigation therapy for inflammatory diseases of the lower urinary tract and treatment of kidney gravel''(13).

PHYTOCHEMICAL ANALYSIS

The first phytochemical studies on the chemical composition of nettle were performed on the root extracts, because they had been traditionally used in the cure of prostatic hyperplasia. Studies on the chemical composition of U. dioica roots were performed by Chaurasia and Wichtl(14).A more comprehensive phytochemical analysis on nettle root extracts by gas chromatography coupled to mass spectrometry after trimethylsilylation allowed the identification of 26 phenolic compounds, including 8 lignans; some of them had never been reported before from nettle extracts(15),In another study, the occurrence of a new flavone 5,20 ,40 trihydroxy-7,8-dimethoxyflavone, was established in the benzenic root extract, and its structure was determined by spectroscopic studies(16).The analysis of terpenes and their glucosides in the methanolic extract of the roots has been performed by GC–MS, after trimethylsilylation reaction, leading to the identification of three new terpene diols and their glucosides(17).The same approach allowed the identification of a new type of phenolic glycerol ether glucosides. Two of these were determined by GC–MS analysis as b-

D-glucopyranoside,3-hydroxy-2[4-(3-hydroxy-1-propen-1-yl)-2,6-dimethylphenoxy] propyl and b-D-glucopyranoside,3-hydroxy-2-[4-(3-hydroxy-1-propen-1-yl)-2-methoxyphenoxy]propyl(18).

WHAT IS ALLERGIC RHINITIS?

Allergic rhinitis is one of the most common chronic disorders, with reported prevalence ranging from 3% to 19% in various countries. Evidence suggests that seasonal allergic rhinitis is found in approximately 10% of the general population and perennial allergic rhinitis in 10% to 20%.1 and the prevalence of the disorder is increasing(19).Persistent allergic rhinitis was an IgE-mediated inflammatory disorder of the nasal mucosa characterized by continuous symptoms presented for more than 4 days a week consecutive weeks) nasal congestion, rhinorrhea, sneezing, itching, purities of the conjunctiva, nasal mucosa and oropharynx, allergic shiners, lacrimation, along with ocular symptoms and fatigue(20).The condition could be caused by environmental agents such as dust mites, mold, pollen, fungus spores, cockroaches, grass, animal dander, feathers, and also food sensitivities, structural abnormalities, metabolic conditions, or drugs(21,22).Allergen avoidance has the essential component of allergy management but was not always practical for all patients(23).On the other hand, various studies have demonstrated that rhinitis patients were tormented by repeated nose blowing, had a disrupted sleep pattern, were fatigued, suffered from a significant decline in concentration, verbal learning, decision-making speed, and psychomotor speed which in turn might lead to considerable reduction in productivity level at work, frequent absenteeism from work and school and also a significant decline in general quality of life(24,25).As the financial costs and the negative impact of allergic rhinitis on life quality were of high importance and it was documented as a major risk factor for developing future asthma(26).

Pharmacological properties of U. dioica L

Hypoglycemic,anti-inflammatory,anti-proliferative, antioxidant, antibacterial, hypolipemic, analgesic, antirheumatic, anticarcinogenic, antiviral, anti-colitis, and anti-Alzheimer activities are all found in the extract from the leaves and roots. Figure 1 shows the health benefits of stinging nettle.

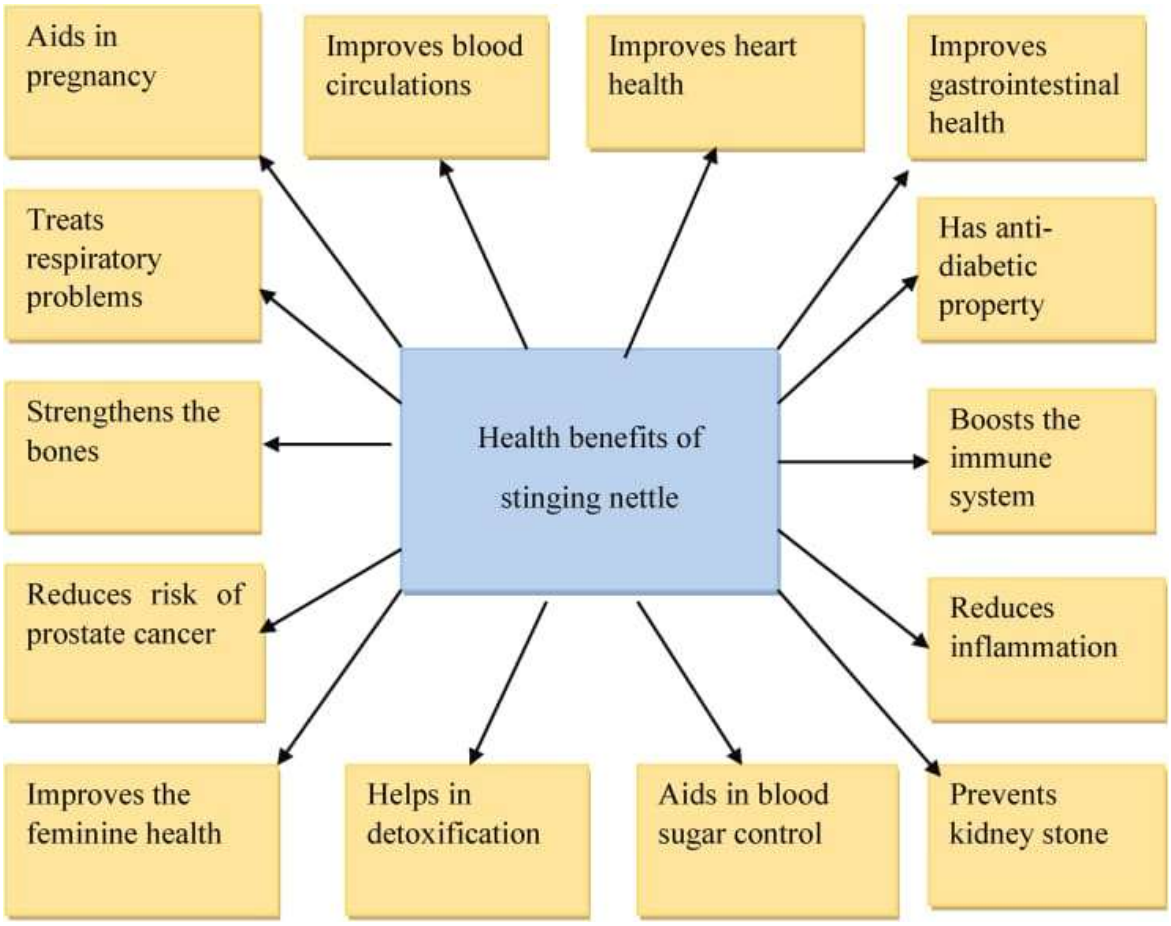

Figure 1 Health benefits of stinging nettle

ANTI-ALLERGIC ACTIVITY

Stinging nettle has been shown to alleviate a variety of seasonal allergies. In trials, certain stinging nettle extract combinations have been shown to significantly reduce allergic reactions. Regular use of its tea has been connected to the cure of asthma in Australia for years. The antiallergenic properties of nettle are mostly due to two processes. In addition to blocking histamine H1 receptors, nettle inhibits tryptase, which lowers mast cell degranulation and the release of proinflammatory cytokines(27).In a randomized double-blind research with allergic patients with allergic rhinitis, symptoms improved after one week of treatment(28).

ANTI-DIABETIC ACTIVITY

According to an in vivo study, aqueous nettle leaf extracts have anti- diabetic effects(29).Diabetic mice were used to test the hypoglycemic effects. The decreased glucose absorption in their intestine is the cause of these results(30).A number of studies have found that nettle stimulates insulin secretion, resulting in a reduction in blood sugar. This conclusion was confirmed by examining a healthy and a diseased rat following intra-peritoneal injection of aqueous extract(31).

ANTI OXIDANT ACTIVITY

Reactive oxygen species are neutralized by nettle extracts (ROS). Antiradical activity was measured by spectrophotometry against su-peroxide anion O2-, hydroxyl radical OH-, and nitric oxide radical NO-. Several studies have shown that methanolic and ethanolic extracts of leaves have antioxidant activity against the 1,1-diphenyl-2-picrylhydrazyl radical (DPPH) (32).Another study showed that nettle reduced lipid peroxidation and enhanced antioxidant defense system activity in rats treated with carbon tetrachloride (CCl4), protecting the liver against hepatotoxicity. The presence of phenolic chemicals is mostly responsible for this antioxidant activity(33).

ANTI-HYPERTENSIVE EFFECT

Regularly drinking stinging nettle tea can help lower systolic blood pressure as well as relieve tension and stress in the cardiovascular system(34).Blood pressure was reduced by 15% and 38%,respectively, after IV injection of an aqueous extract of nettle leaves at two concentrations: 4 and 24 mg/kg h(35).Root extracts had a soothing effect when tested on isolated portions of a vaso-constricted aorta (i.e. aorta with a smaller diameter than usual). The release of nitrogen oxide by endothelial cells, the activation of potassium channels, and a negative inotropic effect are assumed to be responsible for this vasodilator effect(36).

DETOXIFYING EFFECT

It is also said that toxins (typically acids) in the body's system cause chronic inflammations, such as dermal and arthritic disorders, and that nettle, with its alkalinity, neutralizes the acids and excretes toxins through the urine(37).

BIOACTIVE COMPOUNDS

A history stretching back over 2000 years, nettle has been used as a natural remedy for ages(38).Medicinally, all plant components (seeds, leaves, and roots) are used(39).Flavonoids, tannins, volatile compounds, fatty acids, polysaccharides,isolectins, sterols, terpenes, protein, vitamins, and minerals are among the main chemical components of U. dioica L.(40).Because of its balanced protein composition and relatively high mineral and vitamin content, nettle is becoming more well-known. It contains a lot of vitamin C and provitamin A(41).Protein accounts for about 30% of dry mass and contains numerous amino acids necessary by humans. Minerals account about 20% of the dry mass. Zinc, iron, cobalt, potassium, nickel, and molybdenum are all abundant(42).Minerals and trace elements are found in the root of the stinging nettle: calcium, manganese, copper, magne-sium, and zinc(43).Roots include flavonoids such as kaempferol-3-O-rutinoside, myricetin, quercetin, kaempferol-3-Orutinoside (rutin), and isorhamnetin(44). Isolariciresinol, pinoresinol, neoolivil, secoisolariciresinol, dehydrodiconiferyl alcohol, and 3,4-divanillyltetrahydrofuran(45). U. dioica agglutinin (UDA), a single-chain polypeptide having 89 amino acids and rich in glycines, cysteines, and tryptophans, is found in the root of U. dioica(46). Phytosterols are found in the root, including stigmasterol, campesterol,stigmast-4-en-3-on, hecogenin , and sitosterol(47).Calcium, potassium, magnesium, phosphorus, iron, sulphur, zinc,

manganese, copper, and nickel are minerals found in the stinging nettle shoot(48).Flavonoids found in the shoot include kaempferol-3-O-rutinoside and isorhamnetin-3-O-glucoside, as well as quercetin-3-O-rutinoside (rutin)(49).Vitamins contained in shoot parts include ascorbic acid (vitamin C), riboflavin (vitamin B2), pantothenic acid (vitamin B5), folic acid (vitamin B9), vitamin K (phylloquinone), and vitamin A (retinol) (50).

CONCLUSION

Urtica dioica L. (Urticaceae), **commonly** known as stinging nettle, is a herbaceous plant **containing edible** wild plants that were useful in the past when food was **scarce. This** plant is **known to cause contact dermatitis, caused** by biochemical mediators such as histamine and acetylcholine. **The anti-rheumatic, anti-infective, immunomodulatory, anti-hyperglycemic and anti-allergic properties of** the **plant have also** been **discovered** as food and medicine. This publication, which includes a botanical, **phytochemical** and **medicinal overview** of the species, aims to **inspire** the scientific **community's** interest in this **valuable** plant.

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