

Urtica dioica (stinging nettle)– Properties, uses and applications

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ABSTRACT

Urticaceae is a family of herbs and shrubs that can be found in a variety of habitats around the world. A lot of research has been carried out till date targeted for close understanding of this medicinal plant. The botanical distribution, Ethnomedicinal applications, Traditional uses as well as Pharmacological properties of the Urtica genus, are discussed in this study. The composition such as flavonoids and array of phenolic compounds which includes alcohols, Diocanol, Diol glucosides, Terpenes diols, and sugars as well are an inclusion in the genus Urtica. A wide range of research reports have been published representing its biological and pharmacological potential against cancer, tumors, bacterial, viral or fungal infections significantly. The information about the Urtica genus has been extracted using electronic database search such as Google Scholar and Pubmed as well as a library search for peer-reviewed journal publications.

Keywords: Urtica dioica, Stinging nettle, Medicinal plants, Traditional plants.

Introduction

Urtica dioica (stinging nettle) is a common herb that can be found in many parts of the world. The Urticaceae family includes stinging nettle, which is a herbaceous plant (perennial). It is a well-known and widespread species that can be found in tropical and temperate areas of Asia, Europe, and America, with wide range of climatic adaptations. For more than a century, *Urtica dioica* (*U. dioica*) has been used to cure anything from allergic rhinitis to hypertension (Virgilio *et al.*, 2015; Legssyer *et al.*, 2002). It can be consumed as a vegetable, tea, or juice to treat rhinitis and as a blood tonic. The entire of nettle can be used for a variety of purposes, including fruit, medicine, cosmetics, biodynamic agriculture, fodder, and textile production (Hartl and Vogl, 2002; 2003). Young leaves are used in soups as a potherb and can also be dried for winter use (Facciola and Cornucopia, 1998). The use of *U. dioica* in conventional medicine has been validated by modern science, which has shown that its extracts contains contents which possess nutraceutical

31 potential in conditions like diuretic and hypertension (Tahri *et al.*, 2000). Apart from
32 its culinary and medical benefits, chlorophyll is also collected from commercially
33 developed cultivated plants for use as a colouring ingredient in foods and
34 pharmaceuticals. Also it is established that chlorophyll possess anti-carcinogenic and
35 anti-mutagenic properties, as well as the ability to defend against toxins and reduce
36 drug side effects (Guil-Guerrero *et al.*, 2003).

37 *Urtica* is a shade tolerant plant that thrives in a wide range of wet, humid, acidic, and
38 rich soils. Due to the presence of potential toxins in its stem and leaves rarely it is
39 consumed by cattle and other animals (Taylor, 2009). As the dense hair coating with
40 toxins is present and also known as tenacious weed because of its ability to thrive in
41 the harshest environments and for causing pain. The extracts from fresh tissues has
42 been useful in conditions like arthritic or paralytic limbs as it enhance blood flow
43 and provide warmth to extremities as well as joints a procedure called "urtication"
44 since ancient times (Green, 1820). It's high fatty acid, carotenoid, phenolic contents
45 have been shown to help brined vegetables maintain their oxidative stability (Rutto
46 *et al.*, 2013). Farag *et al.*, (2013) studied regional, taxonomic, and morphological
47 diversity, genetics, and other variables under controlled settings. *U. dioica* is the
48 single species that has been commercialized for the medicinal purposes, as well as
49 for the extraction of chlorophyll and stem fibers. *U. dioica* was also found to be a
50 strong source of caffeic acid analogues, phenylpropanoids and flavonoids and Nettle
51 extract has also been studied for rheumatism, rhinitis, eczema, and arthritis
52 (Harrison, 1966; Upton, 2013).

53 Because of its sting, stinging nettle is rarely domesticated, but in countries like Nepal
54 it is still used in form of medicine and food (Uprety *et al.*, 2012). The Nepal's
55 Himalayas have been naturally flourished stinging nettle in the wild conditions since
56 centuries in the foothill areas. Himalayan Wild Fibers' creator is currently working
57 with the local community to grow the nettle fiber industry. It is expected to aid in the
58 production of strong fibers and many Nepalese will get employment or money as a
59 result of this project, which will also bring a long-lasting and sustainable cloth to
60 market (Tree hugger). A sour soup made with fermented wheat bran vegetables and
61 young nettle leaves is popular in Romania (Costa *et al.*, 2013).

62 Stinging nettle is a common wild edible plant (WEP) that can be used as a staple or
63 supplement food. These WEPs are often the primary source of cash income for local
64 communities, contributing to regional food security. In Nepal, however, there is very
65 little research related to structural and stinging nettle's nutritional properties has been
66 carried out. As a consequence, Adhikari *et al.*, 2015 examined the nutritive and
67 medicinal characteristics of dried stinging nettle powder and compared them to
68 wheat and barley flour.

69

70 **Botanical description**

71 The nettle plant, which originated in Eurasia, was widely spread in the world's
72 temperate zones. The distribution extends in Europe, Africa, Asia, and north and
73 South American regions (Ghedira *et al.*, 2009). *Urtica* is a genus of plants that

74 includes both annual and perennial species. *U. dioica* comes under perennial group
75 of herb reaching up to 12 m in height and reproduction occurs both by seed and
76 rhizomes structures (Whitney and Gibbs, 2006). From June to October, the plant
77 blooms and bears fruit. Its prolific growth can be seen in areas with high annual
78 rainfall. The plant body is covered in stinging hair like structures. These trichomes
79 cause blistering when they reach the skin (Bisht *et al.*, 2012). It includes histamine
80 and serotonin, which downstream stimulate nerve growth factor levels, which
81 enhances nociceptive pain activation neurons (McMahon, 1996).

82 Prior to consumption, stinging hairs may be killed by steaming or cooking. The
83 irritants present in trichomes are formic acid, 5-hydroxytryptamine, histamine, acetic
84 acid, leukotrienes, acetylcholine, and many others (Wagner *et al.*, 1994; Emmelin
85 and Feldberg, 1949). Seeds are physiologically inactive and require a long time of
86 stratification to soften the tough seed coverings and break the dormancy (Baskin and
87 Baskin, 1998). The plant is normally found inhabiting roadsides, waste areas, stream
88 banks, and ditches, in which are usually nitrogen-rich areas suitable for growth. The
89 plant is usually invasive in nature, but dormant rhizomes can be pulled out to
90 monitor it (Jan *et al.*, 2017).

91

92 **Traditional Uses**

93 In Moroccan traditional medicine, every component of the plant is used. The parts of
94 the full plant are utilized as a therapeutic option in antispasmodic, diuretic, anti-
95 asthenia, anti-hypertensive, hemostatic, antianemic, antirheumatic, anti-diabetic,
96 headaches and chills treatment (Bnouham *et al.*, 2002). Spleen, renal, and dermal
97 disorders are also treated with nettle (Daoudi *et al.*, 2008). The seeds are taken
98 through oralroute for their galactagogue and aphrodisiac properties, as well as other
99 common uses for tuberculosis and kidney stones. Aphthae, haemorrhoids, scabies,
100 and pruritus are some of the external uses (Said *et al.*, 2015).

101

102 **Ethnomedicinal applications**

103 In Turkish folk medicine, stinging nettle is traditionally used to cure stomachaches
104 (Sezik *et al.*, 2001). The Balkan countries make use in the diarrhea, menstrual
105 discharge, internal and external bleeding may all be treated with the leaves as an
106 injection (Tucakov, 1997). The ancient Egyptians also used nettle infusions to treat
107 arthritis and lumbago, according to legend (Harrison, 1966). Because of the leaves'
108 high nutritional content, they may be used as a tonic to strengthen the body, as well
109 as in soups and other meals (Wetherilt, 2003).

110 In Europe, the flowers, leaves and seeds are used as a tonic, astringent and diuretic.
111 Feverish gout, as well as sporadic gout, may be treated with nettle tea and tincture.
112 Fever and ague are two symptoms of ague. Fresh nettle juice, used in doses of one or
113 two table spoon, is an excellent therapy for different forms of bleeding, whether it
114 comes from the lungs, nose or any internal organ. Sciatica, incipient wasting,
115 breathing difficulties, and some heart problems (where such stimulation is required)

116 are all treated with this plant. For certain coughs, menstrual flow repression in
117 women, rheumatism and loss of muscle capacity, along with the backbone provides
118 more immediate and full relief than any other remedy (Kirtikar and Basu, 2008).

119

120 **Pharmacological Properties**

121 The antioxidant role of *U. dioica* is the most significant and well-studied functional
122 element. The reason behind its high antioxidant activity, is because of polyphenols
123 and phytochemicals (quercetin, rutin, and ascorbic acid) composition. Different
124 antioxidant tests were used to assess its antioxidant properties, including hydrogen
125 peroxide scavenging, reducing strength, superoxide anion radical scavenging, free
126 radical scavenging, and metal chelating activities. The existence of phenolic
127 compounds in the plants suggests that they may have antimicrobial properties
128 (Ofokansi *et al.*, 2005).

129 As compared to standard antimicrobials, water extract of nettle (WEN) has been
130 recorded for antimicrobial activity against *Proteus mirabilis*, *Staphylococcus aureus*,
131 *Pseudomonas aeruginosa*, *Streptococcus pneumoniae*, *Citrobacter koseri*,
132 *Staphylococcus epidermidis*, *Escherichia coli*, *Enterobacter aerogenes*, *Micrococcus*
133 *luteus* and *Candida albicans* (Gülçin *et al.*, 2004).

134 Extract of nettle was tested in vitro for the anti-inflammatory action, and it was
135 found to inhibit multiple primary inflammatory events that trigger seasonal allergy
136 symptoms. The presence of quercetin in *U. dioica* can contribute to its anti-
137 inflammatory properties. This seems to be caused because of quercetin's inhibitory
138 and antioxidant effects on inflammatory enzymes such as cyclooxygenase and
139 lipoxygenase, as well as blocking inflammatory mediators such as prostaglandins
140 and leukotrienes (Koch *et al.*, 1995). Stinging nettle's leaf extract is beneficial for
141 the treatment for rheumatoid arthritis as an anti-inflammatory agent. The
142 transcription factor NF-kB is effectively inhibited by extract treatment (Riehemann
143 *et al.*, 1999).

144 Antinociceptive and analgesic function, In addition to its anti-inflammatory
145 properties, *U. dioica* has been shown to have an analgesic property in mice and rats.
146 In the hot plate test at 55 °C, the aqueous extract of the leaves, administered at a dose
147 of 1200 mg/kg, decreases heat stimulation and enhances pain tolerance (Tita *et al.*,
148 1993). The antinociceptive activity of the hydroalcoholic extract of nettle leaves was
149 evaluated using the acetic acid writhing test and formalin-induced paw licking test.
150 The findings demonstrate that the hydroalcoholic extract greatly decreases the
151 nociceptive reaction in mice and rats in a dose-dependent manner. These analgesic
152 effects might be attributed to flavonoids, caffeic acid and caffeoyl malic acid
153 (Farahpour and Khoshgozaran, 2015).

154 Platelet aggregation is affected. Several experiments have shown that nettle extracts
155 significantly reduce platelet aggregation. The aqueous extract of the leaves had a
156 strong inhibitory effect on platelet aggregation caused by thrombin. The major
157 compounds involved in this activity are flavonoids (El Houari *et al.*, 2006; Daher and
158 Baroody, 2006). Hyperlipidemia and atherosclerosis are addressed. The
159 administration of 150 mg/kg of *U. dioica* aqueous extract daily for 30 days, either as

160 part of a regular or high fat diet, resulted in a drop in lipoproteins and serum lipids.
161 Significant reductions in cholesterol and the LDL/HDL (Low Density/High Density
162 Lipoproteins) ratio recorded (Daher and Baroody, 2006).
163 Flavonoids have been shown in several studies to have the ability to boost the
164 functions of immune system. An ethanolic extract was administered orally to mice at
165 two different dosages (50 and 100 mg/kg) for 14 days to examine the modulatory
166 impact of nettle aerial parts. The activity of enzymes such as lactate dehydrogenase
167 (LDH), cytochrome P450 & NADPH-cytochrome P450 reductase reduced
168 significantly, but antioxidant enzymes elevate significantly. Furthermore, the plant
169 has been found to have a stimulatory effect on glutathione-S-transferase, catalase
170 enzymes, and superoxide dismutase in the kidneys, lungs, and stomach. (Ozen and
171 Korkmaz, 2003).

172

173 **Conclusion**

174 For a long time, the leaf paste and extract have been used in herbal medicine. Recent
175 experiments have shown that some of them have different biological activity,
176 proving that they can be used for ethno pharmacological purposes. Rheumatism and
177 sciatica, coughs, dandruff, diabetes, diarrhea, eczema, fever, gout, haemorrhoids,
178 scurvy, nose bleeds, snakebites, and other tuberculosis-related diseases have all been
179 treated using *Urtica* species in the past. Experiments also revealed that the *Urtica*
180 genus has anti-inflammatory, immunomodulatory, and antioxidant properties, both of
181 which lead to joint safety. Main purpose of this review is to highlight the important
182 properties of *U. dioica* in various aspects.

183

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