Medicinal importance of Urtica dioica (Stinging nettle)

Abstract

Urtica (Utricaceae) 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 includesalcohols, Diocanol,Diolglucosides, 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 andPubmedas 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. (Virgilio *et al.,* 2015) For more than a century, U. dioica has been used to cure anything from allergic rhinitis to hypertension (Legssyer*et al.,* 2002). It can be consumedas 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 contentswhich possess nutraceutical potential in conditions like diuretic and hypertension(Tahri*et al.,* 2000). Apart from its culinary and medical benefits, chlorophyll is also collected from commercially developed cultivated plants for use as a colouring ingredient in foods and pharmaceuticals.Also it is established that chlorophyll possess anti-

carcinogenic and anti-mutagenic properties, as well as the ability to defend against toxins and reduce drug side effects (Guil-Guerrero *et al.*, 2003).

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

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

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

Botanical description

The nettle plant, which originated in Eurasia, was widely spread in the world's temperate zones. The distribution extends in Europe, Africa, Asia, and north and south American regions(Ghedira*et al.,* 2009). Urtica is a genus of plants that includes both annual and perennial species. U.dioica comes under perennial group of herb reaching up to 12 m in height and reproduction occurs bothby seed and rhizomes structures(Whitney and Gibbs, 2006). From June to October, the plant blooms and bears fruit. Its prolific growth can be seen in areas with high annual rainfall. The plant body is covered in stinging hair like structures. These trichomes cause blistering when they reach the skin (Bisht *et al.,* 2012). It includes histamine and serotonin , which downstream stimulatenerve growth factor levels, which enhances nociceptive pain activation neurons (McMahon, 1996).

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

Traditional Uses

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

Ethnomedicinal applications

In Turkish folk medicine, stinging nettle is traditionally used to cure stomachaches (Sezik*et al.,* 2001) The Balkan countries make use of the diarrhoea, menstrual discharge, internal and external bleeding may all be treated with the leaves as an injection (Tucakov, 1997) The

ancient Egyptians also used nettle infusions to treat arthritis and lumbago, according to legend(Harrison 1966).Because of the leaves' high nutritional content, they may be used as a tonic to strengthen the body, as well as in soups and other meals(Wetherilt 2003).

In Europe, the flowers, leaves and seeds are used as a tonic, astringent and diuretic. Feverish gout, as well as sporadic gout, may be treated with nettle tea and tincture. Fever and ague are two symptoms of ague. Fresh nettle juice, used in doses of one or two tablespoonfuls, is an excellent therapy for different forms of bleeding, whether it comes from the lungs,noseor any internal organ. Sciatica, incipient wasting, breathing difficulties, and some heart problems (where such stimulation is required) are all treated with this plant. For certain coughs, menstrual flow repression in women, rheumatism and loss of muscle capacity, alongwith the backbone provides more immediate and full relief than any other remedy (Kirtikar and Basu, 2008).

Pharmacological Properties

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

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

Extract of nettle was tested in vitro for the anti-inflammatory action, and it was found to inhibit multiple primary inflammatory events that trigger seasonal allergy symptoms. The presence of quercetin in U. dioica can contribute to its anti-inflammatory properties. This seems to be caused because of quercetin's inhibitory and antioxidant effects on inflammatory enzymes such as cyclooxygenaseandlipoxygenase, as well as blocking inflammatory mediators such as prostaglandins and leukotrienes (Koch *et al.,* 1995). Stinging nettle’s leaf extract is beneficial forthe treatment for rheumatoid arthritisas an anti-inflammatoryagent.

The transcription factor NF-kB is effectively inhibited by extract treatment. (Riehemann*et al.*, 1999).

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

Platelet aggregation is affected. Several experiments have shown that nettle extracts significantly reduce platelet aggregation. The aqueous extract of the leaves had a strong inhibitory effect on platelet aggregation caused by thrombin. The major compounds involved in this activity are flavonoids (El Houari*et al.*, 2006; Daher and Baroody, 2006). Hyperlipidemia and atherosclerosis are addressed. The administration of 150 mg/kg of Urtica dioica aqueous extract daily for 30 days, either as part of a regular or high fat diet, resulted in a drop in lipoproteins and serum lipids. Significant reductions in cholesterol and the LDL/HDL (Low Density/High Density Lipoproteins) ratio recorded (Daher and Baroody, 2006).

Flavonoids have been shown in several studies to have the ability to boost the functions of immune system. An ethanolic extract was administered orally to mice at two different dosages (50 and 100 mg/kg) for 14 days to examine the modulatory impact of nettle aerial parts.The activity of enzymes such as lactate dehydrogenase (LDH), cytochrome P450& NADPH-cytochrome P450 reductase reduced significantly, but antioxidant enzymes elevate significantly. Furthermore, the plant has been found to have a stimulatory effect on glutathione-S-transferase, catalase enzymes, and superoxide dismutase in the kidneys, lungs, and stomach. (Ozen and Korkmaz, 2003).

Conclusion

For a long time, the leaf paste and extract have been used in herbal medicine. Recent experiments have shown that some of them have different biological activity, proving that they can be used for ethnopharmacological purposes. Rheumatism and sciatica, coughs,

dandruff, diabetes, diarrhoea, eczema, fever, gout, haemorrhoids, scurvy, nose bleeds, snakebites, and other tuberculosis-related diseases have all been treated using Urtica species in the past. Experiments also revealed that the Urtica genus has antiinflammatory, immunomodulatory, and antioxidant properties, both of which lead to joint safety. Main purpose of this review is to highlight the important properties of U. dioica in various aspects.

References

Baskin C.C., Baskin J.M. Seeds: ecology, biogeography, and evolution of dormancy and germination. (Academic Press, San Diego, 1998), pp. 666

Bhaskar M A, Bajracharya A &Shrestha A K. Comparison of nutritional properties of Stinging nettle (*Urtica dioica*) flour with wheat and barley flours. Food Science & Nutrition (2016); 4(1): 119–124

Bisht S., Bhandari S., Bisht N.S., Agric. Sci. Res. J. 2, 250–252 (2012)

Bnouham M, Mekhfi H, Legssyer A, Ziyyat A. Medicinal plants used in the treatment of diabetes in morocco. Int J Diabetes Metab (2002);10:33-50.

Costa, H. S., T. G. Albuquerque, S. S. Silve, and P. Finglas.New nutritional composition data on selected traditional foods consumed in Black Sea Area countries. *Journal of the Science of Food and Agriculture* (2013).93:3524–3534.

Daher CF, Baroody KG, Baroody GM. Effect of *Urtica dioica* extract intake upon blood lipid profile in the rats. Fitoterapia (2006);77:183-8.

Daoudi A, Benboubker H, Bousta D, Aarab L. Screening of fourteen moroccan medicinal plants for immunomodulating activities. Moroccan J Biol (2008);4-5:24-30. doi: 10.1155/2013/857120.

El Houari M, Bnouham M, Bendahou M, Aziz M, Ziyyat A, Legssyer A. Inhibition of Rat Platelet Aggeration by *Urticadioica*leaves extracts. Phytother Res (2006);20:568-72.

Facciola S., Cornucopia A. *Source book of edible plants*. (Kampong Publications, Vista, 1998)

Farag, M. A., S. H. El-Ahmady, F. S. Elian, and L. A. Wessjohann. Metabolomics driven analysis of artichoke leaf and its commercial products via UHPLC-q-TOF-MS. Phytochemistry (2013). 95:177–187.

Farahpour MR, Khoshgozaran L. Antinociceptive and anti-inflammatory activities of hydroethanolic extract of *Urtica dioica*. Int J Biol Pharm Allied Sci (2015); 1:160-70.

Ghedira K, Goetz P, Jeune L. *Urtica dioica L*., *Urticauren*set ouhybrides (Urticaceae). Phytothérapie (2009); 7:279-85

Green, T. 1820. The universal herbal or botanical, medical, and agricultural dictionary containing an account all the known plants in the world. Vol. 2, Henry Fisher (Caxton

Guil-Guerrero J. Rebolloso-Fuentes M.M, Isasa M.E.T. J. Food Compost. Anal. 16, 111–119 (2003)

Harrison RK. Healing Herbs of the Bible. Leiden: EJ Brill Publishers; (1966). p. 58

Harrison, R. K. 1966. Healing herbs of the Bible. Publisher Leiden, B., 58 p

Hartl A, Vogl C. Am. J. Altern. Agric. 17, 195–200 (2002)

Gülçin I., KüfrevioğluÖİ M.E., Oktay M., Büyükokuroğlu. J. Ethnopharmacol. 90, 205–215 (2004)

Khan Nadiya Jan · Khan zarafshan· Sukhcharn Singh. Stinging nettle (*Urtica dioica* L.): a reservoir of nutrition and bioactive components with great functional potential. Food Measure. (2017) 11:423–433

Kirtikar KR, Basu BD. Indian Medicinal Plants. 2nd ed. Dehradun: International book distributors; (2008). p. 2340.

Koch E., Jaggy H.E.W., Chatterjee S.S., Arch N S. Pharmacol. 351, R57 abstract 225 (1995)

Legssyer A., Ziyyat A., Mekhfi H., Bnouham M., Tahri A., Serhrouchni M., Hoerter J., Fischmeister R. Phytother. Res. 16, 503–507 (2002)

McMahon S.B. Biol. Sci. 351, 431–440 (1996)

Emmelin N., Feldberg W. New Phytol. 48, 143–148 (1949)

Ofokansi K.C., Esimone C.O., Anele C.K. Plant Prod. Res. J. 9, 23–27 (2005)

Ozen T, Korkmaz H. Modulatory effect of *Urtica dioica L*. (Urticaceae) leaf extract on biotransformation enzyme systems, antioxidant enzymes, lactate dehydrogenase and lipid peroxidation in mice. Phytomedicine. 2003. 10:405-15. Press.), Liverpool.

Riehemann K., Behnke B., Schulze-Osthoff K. FEBS Lett. 442, 89–94 (1999)

Rutto, L. K., Y. Xu, E. Ramirez, and M. Brandt. Mineral properties and dietary values raw and processed Stinging nettle (*Urtica dioica* L.). Int. J. Food Sc. (2013).

Said A A H, El Otmani I S, Derfoufi S, Benmoussa A. Highlights on nutritional and therapeutic value of stinging nettle (*Urtica dioica*). International journal of pharmacy and pharmaceutical sciences. (2015) H6T67Y8IGF; 7 (0975-1491)

Sezik E, Yesilada E, Honda G, Takaishi Y, Takeda Y, Tanaka T. Traditional Medicine in Turkey X. Folk Medicine in Central Anatolia. J Ethnopharmacol (2001). 75:95-115

Tahri A., Yamani S., Legssyer A., Aziz M., Mekhfi H., Bnouham A.M., Ziyyat. J. Ethnopharmacol. 73, 95–100 (2000)

Taylor and Francis; Wetherilt H. Nutritional Evaluation of *Urtica* Species. In: Kavalali G, editor. *Urtica*. London and New York; (2003). 84-92.

Taylor, K. 2009. Biological flora of the British Isles: *Urticadioca*L. J. Ecol. (2009) 97:1436–1458.

Tita B, Faccendini P, Bello U, Martinoli L, Bolle P. *Urtica dioica L*.: pharmacological effect of ethanol extract. Pharmacol Res 1993;27:21-2.

Tucakov J. Lecenjebiljem-fitoterpija. Beograd: Rad; (1997). p. 405.

Uprety, Y., R. C. Poudel, K. K. Shrestha, S. Rajbhandary, N. N. Tiwari, U. B. Shrestha, et al.(2012). Diversity of use and local knowledge of wild edible plant resources in Nepal. J. Ethnobiol. Ethnomed. 8:16.

Upton, R. Stinging nettles leaf (*Urticadioca*L.): extraordinary vegetable medicine. Journal of HerbalMedicine.(2013). 3:9–38.

Vogl C.R., Hartl A., Am. J. Altern. Agric. 18, 119–128 (2003)

Wagner H., Willer F., Samtleben R., Boos G. Phytomedicine 1, 213–224 (1994)

Whitney P.J., Gibbs G., Biologist (London) 53, 178–182 (2006)