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## PHYTOCHEMICAL AND PHARMACOLOGICAL IMPORTANCE OF GENUS URTICA - A REVIEW

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**ABSTRACT:** Genus *Urtica* belongs to family Urticaceae and commonly known by name of nettles. The plant *Urtica* has been used as a folk medicine and as a food source from a long time. It has been used frequently for its medicinal properties since the Bronze age (3000 - 2000 B.C.) as a traditional herbal remedy in treatment of variety of diseases as rheumatism, gout, nephritis, haematuria, jaundice, menorrhagia, anemia, eczema, arthritis. It has been used for a long time as first-aid remedy in treatment of infirmities in case of bites and stings, burns, hives and breast feeding problems. Phytochemicals evaluation of the plant revealed presence of various chemical compounds like phytosterols, saponins, flavonoids, phenolic acids, tannins, proteins and amino-acids that showed beneficial potential of the plant to get commercially cultivated and get used for the natural drugs and medicine. The plant has been reported to have various pharmacological activities as antioxidants, analgesic, anti-inflammatory, anti-ulcer, anti-viral, immuno-modulatory, hepatoprotective, anti-diabetic, anti-colitis and anti-cancer effect.

**INTRODUCTION:** Environment has provided us with a great source of medicinally active plants and plant products from ages. Thousands of modern drugs were been isolated from these vast natural sources. Many of these isolations have been developed on the basis of traditional knowledge about the usage of plants as medicines<sup>1</sup>. People now-a-days are getting more and more interested in the use of herbal medicines because they are safer and cause less damage to human body and also they are available at low-cost compared to synthetic drugs. Therefore, scientists are engaged in screening off plants for active biological compounds making them potential to be used as medicines<sup>2</sup>.

Several medicinal plants have long been traditionally used as remedies against different diseases. Use of herbal medicines has increased in recent years. There is present an enormous amount of information and knowledge about the benefits of herbal drugs in our ancient literature of Ayurveda, Charak samhita, Unani medicines. These literature mentions the use of herbs for medicinal purposes<sup>3</sup>.

The Genus *Urtica* belongs to family Urticaceae with about 80 species throughout the world. The plant is commonly known by name of stinging nettle. As the name indicates the plant is known for its potential of inducing persistent pain and burning sensation by releasing an irritant on coming in contact with human skin.

The main varieties identified under the *Urtica* species are *U. dioica* L., *U. urens* L., *U. pilulifera* L., *U. cannabina* L., *U. membranacea* Poir., *U. bausskennchtii* Boiss, *U. atrovirens* Req., *U. rupestris* Guss., *U. chamaedryoides* Pursh, *U. ferox* Forst.<sup>4</sup>

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The genus *Urtica* is derived from word 'uro' to burn or 'urere' denotation to sting<sup>5</sup>. Since old era, public have taken advantage of this sting by flailing arthritic or paralytic limbs with fresh plant to stimulate circulation and bring warmth to joints and extremities in a management known as urtication<sup>6</sup>. This plant has a great potential medicinal uses but is undervalued till now<sup>7</sup>.

Traditionally, in herbal medicine stinging nettle is used as diuretic agent for treatment of rheumatism and arthritis. Stinging nettle is used as supportive therapy to relieve seasonal allergy symptoms, in reducing difficulties in urination associated with early stages of benign prostatic hyperplasia in control of sugar level in diabetes<sup>8,9</sup>. The seeds and leaves of *U. dioica* has been used from a long time in middle east, as traditional medicines for a variety of complaints such as eczema, abscess, wound pile, liver insufficiency, rheumatic pain, dermatophytic infections and cancer<sup>10,11</sup>.

#### Vernacular and Local Names:

**Common name:** Stinging Nettle

**Assamese:** Chorat

**Hindi:** Bichchhu kali, Kandadli

**Sanskrit:** Vrscikali, Vrishchhiyaa - shaaka

**Unani:** Anjuraa, (Kumaon)

**Folk language:** Shisuun

**Local Name:** Bichchhu buti

**Distribution:** *Urtica* is found ubiquitously in the world as a weed plant chiefly in barren wastelands with characteristics attribute of unpleasant stinging hair on stems and leaves<sup>5,12</sup>. *Urtica* was originally found in the cooler regions of northern Europe, Asia and the western United States. Now stinging nettles can be found in many areas of the United States, Canada, Europe, Asia, Africa and South America<sup>13</sup>. In India, It is found in the Himalayas from Kashmir to Kumaon at altitudes of 2,100 - 3,200 m. The plant has reported its presence in Kashmir, Srinagar, Shimla, Rajasthan, and Kerala<sup>14</sup>. The stinging nettle flourishes in temperate climates where it can receive plentiful sunlight. The plants are commonly found along rivers, lakes and streams.

#### Botanical Description:<sup>15</sup>



**FIG. 1: A COMPLETE NETTLE PLANT IN ITS HABITAT AT DAL LAKE, PALAMPUR**

**Roots:** extensive underground network of hard winter rhizomes, fibrous roots produced along with rhizomes.

**Stem:** Unbranched, and grow from 60 - 150 cm high covered with bristly stinging hairs slender and approximately square in cross section.

**Leaves:** Opposite, toothed, pointed stipules (small leaf-like appendages) occur at the base of the leaf, but senesce early. Leaf stalks are 1/4 to 2/3 the length of the leaf,

**Flowers:** Tiny, greenish-white flowers monoecious or dioecious in axillary cymose clusters, hanging panicles.

**Dioecious:** perigone has 4 tepals, 4 stamens and 1 ovary with brush like stigma.

**Monoecious:** Male flower consist of only stamens, perianth of 4 segments. Stamens curve inward in bud stage and grow back at end of flowering for anthers to fling out the pollen.

**Fruit:** Stinging nettle produces a small, dry, oval-shaped, 1 seeded fruit (achene) that is yellow to grayish-tan. Fruits are clustered along drooping flower spikes,

**Seeds:** Erect, Albumen scanty, Cotyledons rounded.

**II. Phytochemistry:** The major chemical constituents of *Urtica dioica* are flavonoids, tannins, volatile compounds and fatty acids, polysaccharides, isolectins, sterols, terpenes, protein, Vitamins and minerals<sup>16, 17, 18</sup>.

GC-MS analysis shows the presence of 43 compounds. Fatty-acid esters (C14:0, C16:0, C18:1, C18:2, C18:3, C19:2, etc.), 9-oxononanoic, hydroxycinnamic, and vanillic acids, free fatty acids, and vanillin, eugenol, apiol, squalene, etc. made up most of the 36 identified compounds. In addition to the aforementioned compounds, pyrazine and pyrazole derivatives were detected for the first time in studied samples of HMT. These included 4-ethyl-4,5-dihydro-5-propyl-1H-pyrazol-1-carboxaldehyde isomers (I) and derivatives of hexahydropyrrolo-[1,2-a]pyrazin-1,4-dione (II) with -3-alkyl and -3-phenylmethyl substituents in addition to 5,10-diethoxy-2,3,7,8-tetrahydro-1H,6H-dipyrrolo[1,2-a;1',2'-d]pyrazine (III)<sup>19</sup>.

Amino acid analysis shows dominating presence of aspartic acid, asparagines, glutamic acid, alanine, and threonine in homeopathic matrix tincture of *Urtica dioica*. Histidine was also identified in the tincture, indicating that the amino acid is in bound form<sup>19</sup>. Arginine, isoleucine and leucine dominated among the free amino acids<sup>20</sup>.

An unusual lectin has been isolated from *Urtica dioica* L. rhizomes. It is a small (8.5 kDa) monomeric protein with high contents of glycine, cysteine and tryptophan<sup>21</sup>. Aspartic acid and Alanine amino acids were isolated from the root extract<sup>19</sup>. Polar extracts of the stinging nettle (*Urtica dioica* L.) roots were screened to have lignans (+)-neoolivil, (-)-secoisolariciresinol, dehydrodiconiferyl alcohol, isolariciresinol, pinoresinol, and 3,4-divanillyltetrahydrofuran. These compounds were isolated from *Urtica* roots<sup>22</sup>. Root extract of *Urtica fissa* isolated 8 known steroidal compounds  $\beta$ -siloesterol, daucosterol, palamitic acid, stigmasterol,  $\alpha$ -spinasterol, potassium nitrate, cholestrine-5, 22-enyl-3 $\beta$ -alcohol, stigmasterol-3- $\beta$ -D-glucopyranoside and phenols found in small traces only<sup>23</sup>.

About nine types of carotenoids were isolated from the phytochemical analysis of leaves of *U. dioica* at

different maturity stages which are, lutein, lutein isomers,  $\beta$ -carotene and  $\beta$ -carotene isomers were the major carotenoids found at every level of maturity<sup>24</sup>. Neoxanthin, violaxanthin and lycopene were also found as important contributors in specific leaf maturity stages. Leaves were analysed to have Chlorophyll A and Chlorophyll B<sup>25</sup>. *Urtica dioica* leaves have revealed the presence of free (1.238%) and bound (4.87%) amino acids<sup>26</sup>. The presence of c- and o-glycosides and proteins, ceramides, Vitamins, minerals, lignans, caffeic acid derivative compounds, and high content of phenolic acids including benzoic acids, cinnamic acids, flavonoid, coumarins, phytosterols<sup>27, 28</sup>. The leaves are rich in Vitamins B, C, K and minerals such as calcium, iron, magnesium, phosphorus, potassium and sodium<sup>29</sup>. The carotenoid such as  $\beta$ -carotene, hydroxy- $\beta$ -carotene, lutoxanthin, lutein epoxide and violaxanthin are reported<sup>30</sup>.

Other important constituents found are essential amino acids, glucokinnins and a very high content of chlorophyll<sup>31, 32</sup>. The derivatives of shikimic acid like phenylpropanes, caffeic acid and various esters of this acid such as chlorogenic acid and caffeoyl malic acid have been identified<sup>30, 15, 33</sup>. *U. dioica* leaves revealed the presence of scopoletin, gentisic acid, proto-catechuic acid, quinic acid, esculetin, quercetin and rutin. The presence of phenolics, 5-O-caffeoyl-quinic acid (chlorogenic acid), quercetin 3-O-rhamnosylglucoside (rutin) 3-O-glucoside (isoquercitrin) and diacanol (new phenol derivative) in the aqueous methanolic extract of inflorescence of the *Urtica dioica* species had been reported<sup>27, 34</sup>.

Young leaves of *Urtica cannabina* were screened to have essential micro elements and fatty acids<sup>35</sup>. Amino acid been screened in *Urtica urens* were Aspartic acid, Threonine, Serine and Alanine<sup>19</sup>. Ethanol extract of leaves of *Urtica augustifolia* had screened phytochemically for presence of steroidal saponins<sup>37</sup>.

The compounds responsible for the burning sensation properties of leaf trichomes are acetylcholine, histamine, 5-hydroxytryptamine (serotonin), leukotrienes and formic acid<sup>29, 38, 39</sup>. The main components of essential oil of *U. dioica* seeds are carvacrol (38.2%), carvone (9.0%), naphthalene (8.9%), (E)-anethol (4.7%),

hexahydrofarnesyl acetone (3.0%), (E)- geranyl acetone (2.9%), (E)-  $\beta$ - ionone (2.8%) and phytol (2.7%)<sup>17</sup>. The flavonoids are mainly kaempferol, isorhamnetin, quercetin, isoquercitrin, astragalol, rutin and their 3- rutinosides and 3- glycosides<sup>40, 42</sup>.

Lignans from the roots of *U. dioica* and their metabolites which bind to human sex hormone binding globulin (SHBG) has been worked by Franciskovic et al., 2017<sup>22</sup>. Telo et al., 2017<sup>43</sup> have observed crystal structure of *U. dioica* agglutinin (UDA), a superantigen presented by MHC molecules of class I and class II.

The stem extract of *Urtica cannabina* had screened to have essential micro elements and fatty acids (palmitic acid, stearic acid, oleic acid, lenoleic acid, linolenic acid) and other unsaturated fatty acids<sup>35, 36</sup>. Phytochemical analysis of inflorescence extracts of *Urtica dioica* has screened with highest amount of phenolics which as in root extracts are found to be in small traces only<sup>27</sup>.

Fruits of *Urtica cannabina* has isolated to mega stigmanes that is + blumenol and (+)-dehydrovomifoliol and five flavonoid glycosides that are isoquercitrin, astragalol, afzelil, quercitril, isovitexin<sup>44</sup>.

Fatty acid analysis had screened presence of Linoleic acid (44.29%) and Oleic acid (34.93%) in the seed oil of *Urtica dioica* and from the seed oils of *Urtica pilulifera* screened the presence of Linoleic acid (62.99%), Oleic acid (21.99%), Linolenic acid (0.55%), Stearic acid (4.79%), Palmitic acid (9.74%). Amino acid analysis had screened Aspartic acid, threonine and serine from the seed oil of *Urtica dioica*<sup>19, 26, 45</sup>.

Asparagine, Isoleucine, Leucine, Arginine are the dominant amino acids which are screened from whole plant of *Urtica dioica*. Steroidal analysis of *Urtica cannabina* isolated three compounds identified as  $\beta$ -siloesterol, scutellarein-7-o-a-L-rhamnoside and bicenin-2<sup>19, 26</sup>.

### III. Pharmacology:

**Anti-diabetic:** The hydroalcoholic extract of *U. dioica* leaves prevents from severity of diabetes by preventing severe increase in blood glucose concentration and also regenerates  $\beta$ -cells, if used

before induction of hyperglycemia<sup>46</sup>. *U. dioica* leaves results in reduction in the level of blood glucose and glycated haemoglobin during streptozotocin (STZ)-induced diabetes<sup>47</sup>. Hydro-alcoholic extract of *U. dioica* leaves shows reduction in dexamethasone induced diabetes and its associated complications such as depressive like behavior and cognitive dysfunction, hyperglycemia, plasma corticosterone and oxidative stress<sup>48</sup>.

The aqueous extract of plant 250 mg/kg has shown a significant glucose lowering effect against alloxan induced diabetes in rats<sup>32</sup>. The fructose induced insulin resistance in male rats has been shown to decrease serum glucose level on administration of hydro- alcoholic leaf extract<sup>49</sup>. *Urtica dioica* has been tested for the alpha amylase inhibition activity and 60% inhibition is seen in 2 mg/ml aqueous extract of plant<sup>50</sup>. Farzami et al., 2003<sup>51</sup> have reported the enhancement in the induction of insulin secretion by a component of *U. dioica* leaves extract in perfused Islets of Langerhans and its *in vivo* effects in normal and streptozotocin diabetic rats.

The cold methanolic extract of leaves of *Urtica dioica* and *Urtica pilulifera* (250 mg/kg) has also shown significant antihyperglycemic effect in alloxan induced diabetes<sup>52, 53, 54</sup>.

**Anti-inflammatory:** *U. dioica* has been reported to increase total antioxidant capacity and reduce inflammatory stress<sup>47</sup>. The two most prevalent active chemical agents found in the Stinging Nettle are formic acid (methanoic acid) and histamine (1H-Imidazole-4-ethanamine; 2- (4- Imidazolyl ethylamine; 4- (2- Aminoethyl)- 1H- imidazole) which function as an anti-inflammatory agent<sup>7</sup>.

Seed oil extract of *U. dioica* had a weak anti-inflammatory effect in rats, had no analgesic effects in mice and is non-toxic<sup>54</sup>. At the dosage concentration of 200 and 400 mg/kg, the Methanolic extract of plant has been shown to inhibit the abdominal twitches induced by acetic acid and paw edema induced by carrageenan<sup>55</sup>.

On infusion of *Urtica dioica* leaf supplements N- Methyl- D- aspartate (NMDA) injection has been reported to show brain lesion and subsequent inflammation in wistar rats significantly reducing the nuclear factor kappa B (NF- kB) binding

activity to DNA showing a significant anti-inflammatory effect<sup>56</sup> and this activity is also found prevalent in the ethanolic extract of *Urtica fissa*. The extract of *Urtica dioica* have been screened to have anti-inflammatory activity due to inhibition of pro-inflammatory transcription factor NF- $\kappa$ B due to presence of high phenolic contents and this activity is found in ethanolic extract of *U. urens* due to presence of Chlorogenic acid<sup>57</sup>.

**Anticancerous:** Aqueous extract of *U. dioica* leaves were evaluated with anti-cancer activity in LNCaP treated prostrate carcinoma cell line<sup>58</sup>. The extract shows significant reduction in LNCaP cell viability in a dose dependent manner, thus shows cytotoxic effect using MTT Assay<sup>57</sup>. The extract has been used as complementary and alternative therapies during and after the chemotherapeutic treatment of cancer patients<sup>59</sup>.

Leaf extract of *U. pilulifera* has been analyzed for its use in cancer treatment as it increase protein concentration and reduces the lipids in lipidemic liver and remodels the phospholipids compositions showing its potential to be used in treatment of cancer diseases. Aerial part of *Urtica pilulifera* extract shows highest cytotoxicity against breast infection, about 85% of the cells were found dead at the concentration of 500  $\mu$ g/ml due to presence of phenolic compounds (phenolic compounds are known to inhibit mutagenesis in humans)<sup>60</sup>.

The aqueous extract of plant has been investigated for cytotoxic activity against MCF- 7, MDA- 231 breast cancer cell lines by using the XTT cell cytotoxicity assay. On MCF- 7 cells; IC<sub>50</sub> value at 48th hr was 34  $\mu$ g/ml increasing the concentration of aqueous extract to 29.2  $\mu$ g/ml has been observed to decrease MDA- 231 cell viability to 43%<sup>61</sup>.

The aqueous extract of the *Urtica dioica* roots has been analyzed *in vitro* for the cytotoxic effect and its anticancerous activity against acute myelogenous leukemia cell line<sup>62</sup>.

Methanolic extract of root of *U. pilulifera* has been screened to have antitumor activity due to presence of flavanoids and phenolic acids<sup>53</sup>.

**Antioxidant:** The hydro-alcoholic extract of *U. dioica* showed positive *in-vitro* antioxidant activity. Ferulic acid is detected as a potential antioxidant

present in the species using HPTLC<sup>20</sup>. It has antioxidant, antimicrobial, antiulcer and analgesic properties<sup>63</sup>. Its extract shows *in vitro* inhibition of several key inflammatory events that cause the symptoms of seasonal allergies<sup>64</sup>.

**Antiarthritic Activity:** Methanolic extract of the root of *Urtica dioica* has been used as a remedy for rheumatoid arthritis due to suppression of cytokine production<sup>65</sup>.

Methanolic leaf extract of *U. pilulifera* had analyzed for antiarthritic activity as it inhabits the CFA induced paw swelling, skin lesions and articular deformity by suppressing inflammatory nuclear factor NF- $\kappa$ B in rats<sup>52, 53, 60</sup>.

**Hepatoprotective Activity:** Hepatoprotection or anti-hepatotoxicity is the ability to prevent damage to the liver, prevent the liver affections prophylactically and maintains balance in liver enzymes<sup>66</sup>. The leaves extract of plant shows maximum hepatoprotective activity at dose of 400 mg/kg concluded by the decreased level of serum alanine transaminase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), total bilirubin level and malonyldehyde (MDA) and also by the increase in level of superoxide dismutase (SOD) level<sup>67, 68</sup>. The seed extract of *Urtica dioica* has also shown hepatoatoprotective protective activity against ischemia-reperfusion induced hepatotoxicity and it exhibited hepatoprotective effect by increasing the activity of paraoxonase, aryl-esterase and liver tissue catalase activity<sup>69</sup>. The plant extract has shown significant hepatoprotective effect in isolated rat hepatocytes (*in vitro*) and in rabbits (*in vivo*) reduces the chances of hepatocellular degeneration and necrotic changes in CCl<sub>4</sub> induced hepatotoxicity<sup>70, 71, 72</sup>.

**Anti- hyperlipidemic Activity:** The plant exhibit potential antihyperlipidemic activity as it lowers the concentrations of lipids and lipoproteins in blood. The dose of 150 mg/kg of the aqueous extract when supplemented for 30 days to rats feeding on normal or high fat diet, improved the blood lipid profile. The extract resulted to decrease in total cholesterol, and decreases the ratios of low density/high density cholesterol (LDL/HDL) ratios by lowering the content of LDL and plasma total apo- protein B<sup>73</sup>.

The dose of 100 and 300 mg/kg of the ethanolic extract of the plant has shown significant reduction in the level of total cholesterol and LDL level in hypercholesterolemic rats <sup>74, 75</sup>.

**Diuretic Activity:** The aqueous extract of whole plant has been reported with the diuretic and natriuretic effects in rabbits <sup>76</sup>. The aqueous extract of aerial part of the plant was administered at low dose (4 mg/kg/h) and high dose (24 mg/kg/h) which shows diuresis effect by increase diuresis (11 and 84% respectively) and natriuresis (28 and 143% respectively). Hence, the plant has shown to have potential diuretic effect <sup>77</sup>. The diuretic effect is also found in *U. circularis* was approximately 101% and 65% respectively with 100 mg/kg <sup>78</sup>.

**Antimicrobial Activity:** Hexane extract of *U. dioica* is analyzed to have antimicrobial activity against a multi drug resistant bacteria - *Mycobacterium semegmatis*. It is also assessed for having potential anti-microbial activity against all the tested bacterial strains and its minimum inhibitory concentration (MIC) value was 125, 15.62, 31.25, 250, 31.25, 125 and 7.81 µg/ml against *Enterococcus faecalis*, *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Shigella flexneri* and *Salmonella typhi*, respectively <sup>79, 80</sup>. Aqueous extract from the leaves of *U. dioica* showed antibacterial activity against bacterias like *Bacillus cereus*, *Staphylococcus aureus*, *Staphylococcus epidermis*, *E. coli* and various other gram positive and gram negative bacteria <sup>63, 45, 81</sup>.

The seed oil extract of *Urtica pilulifera* also screened to have anti-bacterial property against *E. coli*, *Pseudomonas aeruginosa*, *Proteus mirabilis*, *Staphylococcus aureus*, *Bacillus subtilis* and *Enterococcus faecalis* <sup>45</sup> and the same extract from

*Urtica cannabina* showed effective antibacterial property against *E. coli* and *Staphylococcus aureus* <sup>82</sup>.

**Antifungal Activity:** Extract of nettle leaves at different concentrations showed antifungal activity against *R. solani*, *Fusarium oxysporium*, *F. solani*, *Alternaria alternata*. The antifungal activity against is such that the growth of *A. alternata* was completely inhibited at 0.9% concentration. The extract produced great reduction in mycelial growth with this fungus at (0.3, 0.5 and 0.7) % with (30.5, 39.4 and 58.1) % percentage reduction <sup>83</sup>. Seed oil extract of *U. pilulifera* shows anti-fungal activity against *Candida albicans* and *Candida parapsilosis*. The reason of this activity is presence of Ketaconazole and Fluconazole <sup>45</sup>.

**Antiviral Activity:** Antiviral activity is exhibited by the root of *U. dioica* against HIV-1, HIV-2, CMV, RSV, and flu virus <sup>84</sup>.

N-acetyl glucosamine specific lectin from *U. dioica* is screened for having a strong anti- HIV activity, as it have high binding affinity towards HUT-8 cells, CD4+ and Molt/4 cells, the cells which are the binding sites for HIV-1 and HIV-2 virus <sup>66, 85</sup>.

**Nematicidal Activity:** The root exudates of *U. dioica*, when interplanted with tomato and bean shows reduction in the population of plant nematodes. The chemical compound produced by root in surrounding soil includes formic acid, that is highly toxic for nematodes and cause Nematicidal activity against *Pratylenchus*, *Aphelenchoides* and *Helicotylenchus* <sup>86</sup>.

**Anthelmintic Activity:** The methanolic extract of leaves of *U. dioica* exhibited anthelmintic activity against earth worms (*Pheretima posthuma*) with a dose dependent increase in anthelmintic activity of the extract at dose 25, 50, and 100 mg/ml <sup>67</sup>.

**TABLE 1: PHYTOCHEMICALS AND PHARMACOLOGICAL ACTIVITY FOUND IN DIFFERENT SPECIES OF GENUS URTICA**

Name of species	Plant Part	Phytochemicals constituents	Pharmacological activity
<i>Urtica pilulifera</i>	Seeds	Fatty acids- Palmitic, Stearic, Oleic, Linoleic acid <sup>45</sup>	Hypoglycemic, Antioxidant <sup>12</sup>
	Leaf		Anti-arthritis <sup>52</sup>
	Herb		Anti-tumor <sup>53</sup>
	Root		Antioxidant <sup>53</sup>
<i>Urtica parviflora</i>	Leaf	Histamine, Serotonine, Acetyl-choline, Protein-Aspartic acid, serine, threonine, tryptophan, tyrosine <sup>87</sup>	Hepatoprotective, Wound healing, Hypoglycemic, Antioxidant, Cardioprotective, Nephroprotective <sup>87</sup>
<i>Urtica artichocaulis</i>	Aerial parts	Phenols- Chlorogenic phaselic Salicylic caffeic	Antirheumatoid arthritis, Anti-

		acids, Proto-catecheuic aldehyde Flavonoids-rutin, Quercitin, Luteolin <sup>88</sup>	inflammatory, Analgesic <sup>88</sup>
<i>Urtica fissa</i>	Aerial parts		Anti-hyperplasic <sup>89</sup>
	Roots	Steroidal compounds- $\beta$ -sitosterol, daucosterol, palamitic acid, stigmasterol, $\alpha$ -spinasterol, potassium nitrate, cholestrine-5, 22-enyl-3 $\beta$ -alcohol, stigmasterol-3-o- $\beta$ -D-glucopyranoside <sup>89</sup>	
<i>Urtica laetivirens</i>	Herb		Anti-proliferative, Anti-apoptotic, Anti-arthritis <sup>90</sup>
<i>Urtica urens</i>	Aerial part	Amino acid-Aspartic acid, Threonine, Serine and Alanine <sup>19</sup> Chlorogenic acid <sup>57</sup>	Anti-inflammatory <sup>57</sup> , Anxiolytic <sup>91</sup>
<i>Urtica cannabina</i>	Dried fruit	Megastigm-anes-(+)-blumenol A,(+)-Dehydrovoifolial, Flavonoid glycosides-Isovitexin, Astragalin, Afzelin, Quercitin, Iso-Quercitin <sup>44</sup>	
<i>Urtica dioica</i>	Herbs	Phenols- Caffeoyl-malic acid, caffeic acid, Chlorogenic acid, tannins, amines, steroids <sup>92</sup> Amino acid- Aspartic acid, Threonine, Serine, Alanine <sup>92</sup> Phenols-Pinoresinol, Neolivil <sup>92</sup> Unusual lectins.	Hepato-protective, Antioxidant <sup>63</sup> Antirheumatoid arthritis <sup>65</sup>
	Root	lignans - (+)-neoolivil, (-)-secoisolaricresinol, dehydrodiconiferyl alcohol, isolaricresinol, pinoresinol, and 3, 4-divanillyl-tetrahydro-furan <sup>22</sup>	Antiprostatic hyperplasic <sup>54</sup>
	Leaf	Carotenoids - lutein, lutein isomers, $\beta$ -carotene and $\beta$ -carotene isomers, Amino acid- Valine, Threonine, Methionine, Isoleucine, leucine, Lysine, Phenylala-nine, Histidine and arginine <sup>54</sup> c- and o-glycosides and proteins, ceramides, Vitamins, minerals, lignans, caffeic acid derivative, phenolic acids benzoic acids, cinnamic acids, flavonoid, coumarins, phytosterols <sup>27, 28</sup> . Vitamins B, C, K minerals such as calcium, iron, magnesium, phosphorus, potassium and sodium <sup>29</sup> . carotenoid such as $\beta$ -carotene, hydroxyl- $\beta$ -carotene, lucoxanthin, lutein- epoxide and violaxanthin <sup>30</sup>	Anti-diabetic, Anti-inflammatory, Anti-apoptotic, Cytotoxic, Anti-cancerous <sup>57</sup>
	Seed	Fatty acid-Palmitic, stearic, Oleic, Linoleic and Eicosenoic acid, Amino acid Aspartic acid, threonine, serine Essential oils- Carvacrol, carvone, naphthelene, Phytol <sup>19</sup>	Anti-diabetic, Anti-inflammatory <sup>47</sup>
	Stinging hairs	formic acid, histamine, serotonin <sup>93</sup> , Acetylcholine, Leukotriene <sup>39</sup>	
	Inflorescence		Analgesic, Antiviral <sup>84, 85</sup>

**CONCLUSION:** The bioactive compounds isolated from the *Urtica* plant have been reported to show various medicinal, antiproliferative, and antimicrobial activities. So, the bioactive compounds isolated from the plant will help in designing new drugs and other pharmaceutical compounds to fight against widespread diseases like cancer, arthritis, Skin diseases, etc. Phytochemical studies on the plant revealed presence of various chemical compounds like phytosterols, saponins, flavonoids, tannins, proteins and amino-acids that showed beneficial potential of the plant to get commercially cultivated and get used for the natural drugs and medicine. Presence

of Vitamins, phenolic compounds, macro and micro-elements, tannin, flavonoids, sterols, fatty acids, carotenoids, chlorophylls, accorded the plant to get utilized in different ways. The bioactive compounds isolated from the plant will help in designing new drugs and other pharmaceutical compounds to fight against widespread diseases like cancer, arthritis, Skin diseases, etc.

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