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Introduction:

India is a land of wild diversity including animals, plants, and insects. The geological features of the nation have offered diversity in specific plant species also. Being rich in its plant diversity, plants with medicinal and other purposes are grown in different parts of the country. Khandesh region, located in northern Maharashtra, is one of the regions of Western India falls by the ranges of Satpura to its northern section. This entire region has flora with its own diversity including wild and ground woods and plants. Among these diverse plants, *Urtica Dioica*, belonging to the family of *Urticaceae* is a wild vegetable known as *Kartule or Katurle* in the Khandesh region, while by boundaries of Madhya Pradesh it is called as *Kantula* vegetable. (Khuma Bhusal et al, 2022). On the other hand, at the global level this plant spacy is known as stinging nettle, an evergreen plant mostly observed in tropical and temperate geological regions. (Aditi Sharma, 2023). Being a multi-purpose common plant, *Urtica Dioica* is found in Africa, Asia, Europe and North America. Having medicinal properties and neutrious values within it, the fruit of this plant has high demand and cost as it grows once in a season. In India, farmers have started farming of *Urtica Dioica* and earning good fiancé from it. Not only the fruit of this plan has high demand, the young leaves of this plant are also for curry and vegetable soup.

The family of *Dioica* covers almost 45 genera and over 1000 species of it are spread all over the world and most common recognition across the world is Stinging Nettle. Having stinging hairs on its leaves and fruits, this plant is mostly either found or cultivated in moist and shady surroundings. Being a medicinal property over the years, this plant is treated to health problems like decreasing pain, swelling and other health related issues. The study of Benitez Cruz et al. 2009 have highlighted on the agricultural significance of *Urtica Dioica* by mentioning that the slurry of stinging nettle is used as fertilizer in organic farming especially in Spain.

Stinging nettle (*Urtica dioica*) is a green leafy plant that grows upright and can reach a height of 1 to 2 meters. It has pointed, dark green leaves with jagged (toothed) edges, and the leaves grow opposite each other on the stem. The stem and leaves are covered with tiny, sharp hairs that can sting when touched. These hairs release chemicals that cause a burning or itching feeling on the skin. The plant produces small, greenish flowers that hang in clusters. It grows mostly in moist soil, along riverbanks, roadsides, and in forests.

Urtica dioica, commonly recognized as stinging nettle across the world, is a perennial herbaceous plant having distinctive sting hair. Due to its own system of quadrangular, it grows to few meters with heart shaped leaves.

Historical and Ethnobotanical Uses of *Urtica dioica*:

The study of Upthon and Dayu (2013) while giving historical perspective dioica by referencing Egyptian use of plant have mentioned that the use of infusion for the relief of arthritis and lumbago shows the deep roots of this plant. This suggests that *Urtica dioica* has its history deeply rooted in ancient times across various cultures and with diverse uses. Some studies have also revealed that this plant has also been used in textile to have long threads for viewing purpose. As mentioned earlier that this plant has its existence over the global regions and its oil is performed for arthritis, removing joint pain allergies as well as skin related issues. In ancient Greco-Roman medicine, nettle was employed as a diuretic and to stimulate circulation. In folk medicine, both the leaves and roots were used to treat wounds, anemia, and urinary tract infections. Ethnobotanically, nettle has also been consumed as a nutrient-rich food, high in iron, calcium, and vitamins A and C. Its fibers were historically used

to make ropes, textiles, and even military uniforms during World War I due to their strength and abundance. These diverse traditional applications highlight the plant's significance in early human health and industry. (Dhakal, N. et al. 2024).

Use of *Urtica dioica* As Vegetable:

Stinging nettle, or *Urtica dioica*, is a natural green plant that has been historically used as a vegetable and medicinal plant in India and other nations. Nettle leaves are gathered in the wild and cooked as a neighborhood particular in India, especially in the Himalayan regions of Uttarakhand, Himachal Pradesh, and parts of Northeast India. They are frequently incorporated into soups and stews, curry dishes, or chutneys, with care taken to remove the itchy strands by soaking or cooking. Locally known to as "Bicchu Buti" or "Sisnu," the species of plant is valued for its high content of zinc, magnesium, calcium, protein molecules, and vitamin C and A. Therefore, it is an important seasonal source of nutrition for mountainside groups of people.

It has been utilized for decades for treating allergies, hemophilia, and pain in the joints as well as to improving immunity. *Urtica dioica* has a long tradition of application in European medical practices and food preparation, particularly in Europe, the United Kingdom, Finland as well, and parts of Eastern Europe. It is frequently employed as a herbal stimulant and made into stews, herbal teas, and pestos. due to its anti-inflammatory in nature and scrubbing characteristics, stinging nettle has grown increasingly popular by consumers with health concerns across the globe over the past few years. As result, it has begun to appear in herbal teas, drinks, pills, and natural food items. As fascination with hunted and nutritious foods develops, *Urtica dioica* has become increasingly recognized as an environmentally friendly, rich in nutrients green vegetable with cooking and medicinal properties as well as being a wild plant, it meets the cultural use in some functions of tribal communities.

Phytochemical Compositions:

Urtica dioica, commonly referred to as stinging nettle, is a plant of considerable nutritional and medicinal importance, abundant in a diverse array of bioactive compounds. These phytochemicals are integral to the plants application in both traditional and contemporary medicine. Among the most notable compound are flavonoids, phenolic acids, sterols, lignans, alkaloids, and terpenoids. Each of these categories significantly contributes to the plant's antioxidant, anti-inflammatory, antimicrobial and immune-modulating properties. A thorough understanding of the chemical composition of *Urtica dioica* not only affirms its historical utilization in folk medicine but also enhances its increasing significance in pharmaceutical and nutraceutical studies.

➤ **Flavonoids:**

Quercetin and its glycosides (e.g., quercetin 3-O-rutinoside, isoquercitrin): Identified in aerial parts; shown to reduce inflammatory markers (IL-6, IL-8) and oxidative stress in benign prostatic hyperplasia cell models. (Boer, A. H. 2024)

Quercetin suppresses P. acnes-induced IL-1 β , IL-6, IL-8 in skin cells, is a well-known antioxidant and a plant polyphenolic of flavonoid group found in many fruits, leaves, and vegetables. (Lim et al. 2021)

Kaempferol 3-O-glucoside and isorhamnetin glycosides (e.g., isorhamnetin 3-O-rutinoside) boost immune cell activity such as neutrophil chemotaxis and intracellular bacterial killing (Jauhiainen et al. 2002, *Journal of Nutrition* 132(3), March)

➤ **Phenolic Acids**

A phenolic acid is used among the most dominant and pharmacologically significant constituents. Notably, compounds such as 5-O-caffeoylquinic acid (commonly known as chlorogenic acid), protocatechuic acid, *p*-hydroxybenzoic acid, vanillic acid, caffeic acid, ferulic acid, and *p*-coumaric acid are primarily localized in the leaves and stems, where they contribute to both the plant's defense and its therapeutic potential. Chlorogenic acid, a major phenolic compound, has demonstrated potent anti-inflammatory activity by modulating immune signaling; as reported by Bucar et al. (2006), it effectively suppresses the expression of pro-inflammatory cytokines such as TNF- α , IL-1 β , IL-6, and IL-8 through the NF- κ B/p38 MAPK signaling pathways, making it a valuable molecule in the

prevention of chronic inflammatory conditions. Similarly, protocatechuic acid—another key phenolic—has shown significant antioxidant, antimicrobial, and neuroprotective effects. According to recent findings by D'Antuono et al. (2000) protocatechuic acid can inhibit inflammatory cytokines (TNF- α , IL-1 β , and IL-6) in experimental models of mouse lung injury, indicating its potential in mitigating respiratory inflammation and oxidative stress. These phenolic acids not only play a protective role for the plant itself but also offer therapeutic possibilities in human health, supporting the traditional and emerging uses of *Urtica dioica* in nutraceuticals and herbal medicine. Though much of the research remains preclinical, the broad spectrum of biological activities—particularly the anti-inflammatory and antioxidant mechanisms—underscores the promise of *Urtica dioica* phenolics as functional components in the prevention and management of inflammatory and degenerative diseases.

➤ Sterols

The underground stems of *Urtica dioica* are the main source of β -sitosterol, a naturally occurring plant lipid. The substance in question is widely recognized for helping in the body's decrease in inflammation. Its benefits for encouraging prostate wellness are the focus of specific studies, particularly among men who struggle with benign prostate hyperplasia (BPH), a prevalent aging illness. The sit sterol can reduce pain while improving the flow of urine. It operates in part by inhibiting certain inflammatory signals and hormone activity related to prostate growth.

➤ Lignans:

Urtica dioica also contains lignans, which are plant compounds known for their antioxidant and hormone-balancing properties. According to Gülçin et al. (2020, *Phytotherapy Research*), lignans in stinging nettle contribute to reducing oxidative stress and may help regulate estrogen activity in the body. These effects make lignans potentially useful for supporting hormonal health, especially in conditions like menopause or hormone-related cancers. They may also add to the plant's anti-inflammatory and immune-boosting benefits.

Secoisolariciresinol, neo-olivil (and acetyl derivatives) were found in roots (Schöttner et al. 1997)

➤ Alkaloids

Urtica dioica contains alkaloids, which are naturally occurring nitrogen compounds known for their strong biological activity. These alkaloids contribute to the plant's anti-inflammatory, pain-relieving, and antihypertensive effects. According to Rutto et al. (2013, *Food Science and Nutrition*), the alkaloids in nettle may help lower blood pressure and reduce joint pain by influencing nerve signals and relaxing blood vessels. Although present in small amounts, these compounds add to the overall medicinal value of stinging nettle.

Conclusion:

Stinging nettle, or *Urtica dioica*, is a beneficial natural plant which thrives in India and other nations as well. It has historically been used as an agricultural product and medicinal and is rich in vitamins. Important bioactive compounds that exist in the plant comprise phenolic acids, flavonoids, sterols, lignans, and alkaloids. These substances offer an array of health benefits like reducing inflammatory processes, boosting immunity, and modulating hormonal. Its increasing uses in organic agriculture, medicinal products, and food prove its wide relevance. *Urtica dioica* distinguishes out as an ecologically sound and health-promoting plant that has conventional and modern application.

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