

*Significance of wild eatables in traditional diet with specific reference to Stinging nettle*

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**Abstract**

Among the cultivated species few are meeting more than 90% of food demand. It is worrisome if something happens to one or two major species under the present crisis of climate change. Obviously, the 'climate change' and 'sustainable livelihood' are the most conversed and debated issues of today's scientific and social forums to formulate guiding lines for the policy makers all over the world. The diet of rural and indigenous communities is still diverse. These still use wild plants for food. One of valuable wild plants, which constituted traditional diet, is stinging nettle (*Urtica dioica*). This much-ignored plant has multiple uses as food, fiber, medicine as well as for enhancing soil fertility. However, once used as an edible plant by many, nettle does not enjoy much importance among the residents of Uttarakhand. Therefore, whole scenario calls for the new strategies in Uttarakhand for involving traditional food habits and local resources.

During the course of human civilisation, human has used as food nearly 3000 plant species and cultivated about 150 species. Only 12 plant species are meeting 75 percent of the world food demand. Only three - rice, maize and wheat - contribute nearly 60 percent of calories and proteins obtained by humans from plants. It is worrisome if something happens to one or two major species under the present crisis of climate change. What would happen to the diet base of people especially the urban ones? Obviously, the 'climate change' and 'sustainable livelihood' are the most conversed and debated issues of today's scientific and social forums to formulate guiding lines for the policy makers all over the world.

The diet of rural and indigenous communities is still diverse as the studies in Himalayan and other regions indicate. These still use wild plants for food, medicines, fermented foods and beverages, dyes, oil, and as the domestic goods. Wild foods have long provided rural

communities an ‘unaccounted harvest’, as they have used cultivated harvest from their fields and other wild biodiversity in and around their farms to supplement their foods and earnings. These wild plants can sustain livelihood of generations of these communities. Significance of the wild food plant increases more with global estimate that 1.02 billion people are undernourished and malnutrition is a major health burden in developing countries. However, the over exploitation of wild plants for commercial purposes is threatening their regeneration in the natural habitats. One of valuable wild plants, which constituted traditional diet in hills of Uttarakhand, is stinging nettle (*Urtica dioica*).

This plant got its name as the ‘stinging nettle’ because its leaves and stems have stinging hair that gives severe sting on touch. However, this much-ignored plant has multiple uses as food, fiber, medicine as well as for enhancing soil fertility. Medicos, textile specialists and culinary experts have found many health benefits and commercial uses of this plant. Nettle’s advocates are of the opinion that it can add to the livelihood of people and provide economic support for the impoverished populace of the hill region. It is a common plant in the rich biodiversity of Himalayan region. However, once used as an edible plant by many, nettle does not enjoy much importance among the residents of Uttarakhand. Therefore, whole scenario calls for the new strategies in Uttarakhand for involving traditional food habits and local resources. With its numerous, nutritional and economic benefits, nettle could earn the respect of younger generation if it is utilised as a source of employment and source of wellness. The review of literature reveals that significant findings have been published internationally on this important plant and its use for medicine, food and agro input. However, it has so far not received the required scientific, agricultural and economical attention in India and, therefore, has been neglected despite its enormous potential as today’s super food and medicine despite the fact that it offers a solution for the depleting and climate-endangered agriculture, besides supplementing for nutritional insufficiency. We need to go back to this plant and encourage its use in the food culture of the locals as well as urban people for their well-being.

**What makes wild food-** During the entire course of human plant interaction the wild plants have continued to be important. History of agriculture origin goes back to hardly 10000 - 12000 years BCE that means for more than 99 percent of his existence human lived as hunter-gatherer and collected all his food from wild, growing in nature without human interference. Though it is still a matter of debate whether agriculture followed sedentism or sedentism came after advent of agriculture, what is accepted by all: surplus agriculture production brought civilization and cultures progressed from hunter – gatherer to agricultural to industrial to information technology age. While cultivation is defined by human activities, domestication is genetic response of plants to human action. Thus wild plants can

be cultivated; however it does not ensure the domestication. For long plant domestication had been a subject of interest to scholars interpreting human plant interaction and archaeologists concerned with the origin and spread of agriculture [1]. In archaeobotanical findings we do find evidences for transition from collection of food grains from wild to the cultivated domesticated for same food grains. In general archaeobotanical finding is interpreted as its use solely as diet. However archaeological reconstructions should not undermine their use as medicine also. Wild and cultivated foods are considered separately by researchers and policy makers, the differences are hardly recognized by local communities. Here wild food means any edible plant part that is growing in nature by itself without human interference. Despite of dependency on food from the market, studies indicate that wild plant species still constitute part of diet in many communities in India (table 1)

**Table 1: The diversity of wild plant species used as food in some areas of India**

Study area	Number of species	References
Countrywide estimate	600	Rathore (2009) [2]
Tribal/non-tribal; cultivation and livestock, deciduous forest	73	Kala (2009) [3]
Tribal and non-tribal, transhumance and rain fed agriculture, temperate forests	21	Misra <i>et al.</i> (2008) [4]
Mornaulla Reserve Forest in western Himalaya	114	Pant & Samant (2006) [5]
Sikkim Himalaya	190	Sundriyal & Sundriyal (2001) [6]
Rain fed agricultural community of Deccan Plateau	79	Mazhar <i>et al.</i> (2007) [7]

Researchers in India often tend to underscore variety of wild food plants. However whenever systematic studies have been done emphasizing their importance in food economy of people of a region they tend to emerge as regular and important element of diet.

**Significance of Wild food plants:** Local food diversity makes an important contribution to nutritious diets, although strong evidence is lacking and the findings were limited to communities living in areas with high biodiversity. Agro diversity as well as biodiversity is linked to nutritional security. Recognition of this fact by policy makers is fundamental for the policy formation for any local community. Being

located in nearby areas the wild plants hold a significant position for human advantage. Its importance lies especially in societies still following the traditional lifestyle where these plants are used for their nutritional, medicinal, ritual, and livelihood generation significance.

In their own capacity these plants are important either for their cultural implications and sometimes a combination thereof. Among populations from the US Southwest to Andes the ritual use of red amaranth pigments was far more common than the use of these plants for grain. Soybean (*Glycine max*) was first cultivated in China for medicinal use and only later acquired their now prominent dietary function. Wild plants which are still collected and used for the food like amaranth, bathua, ugal, lingura (*Diplazium esculentum* (Retz.) Sw.) , stinging nettle, to name some of them are high in nutrition hence offer a potentially critical role for nutritional security in Uttarakhand hills. Some of these are used as seeds, some as greens and some as roots or flowers. Also researchers generally agree that the use of wild food adds diversity and thus improves quality of diet by widening the range of nutrition consumed. Their direct nutritional contribution is often significant but neglected. Despite of having low taste scores wild greens including *Urtica* had high cultural significance and rose petals had ritual significance in the past for bringing good omens. May be that non nutritional factors could have played a central role in the choice of wild vegetal food source and their acceptance and or popularity [8]. Wild greens represent an important diet source of nutraceutical that may be used to balance the traditional carbohydrate rich and relatively poor in minerals, vitamins and phenolics diet. However knowledge of wild greens is declining due to changing social values and non-participation of younger generation. Apart from being nutritionally significant wild food species hold promise as medicine also. In general each plant is a treasure house of Phytochemicals with benefits to human wellbeing still unknown to scientific fraternity. Very little is known about health benefits of regular consumption of small quantities of varied plants. Other than this wild food species also offer a potentially critical role for buffering against seasonal food stress. In current scenario of climate change also these wild food species may play a bigger role because of their innate resilience which is often lacking in exotic and domesticated species. One of the incredible wild edible plant of Himalayan region with multiple significance as food, medicine, fiber, livestock and poultry feed, and soil fertility enhancer.

#### **Description of Stinging nettle**

Stinging Nettle (*Urtica dioica* L.) belongs to the family Urticaceae, the plant is a native to temperate and tropical Asia, Europe, northern America and northern Africa. *Urtica dioica* is a perennial herb that grows commonly in waste lands, gardens, farmers field (as weed), as hedges in terraced fields between 1200 to 3000 m in Himalayan region. It is commonly called as California nettle, slender nettle, *shishnoo*,

*Bichhu Butti* and *Vrishchhiyaa shaaka* at different places. The plant reaches up to 2 m height and comprised opposite and heart shaped finely-toothed leaves (Figure 1). The plant is called Stinging Nettle because its leaves and stems comprised hairs (trichomes) filled with a fluid that give severe sting when it comes in contact of body (Figure 2). The composition of the fluid in trichomes comprised formic acid, histamine, acetylcholine, moroidin, leukotrienes and serotonin, and on touching it enters in human body thus causes irritation [9], which may last more than 12 hours [10]. This property of fluid is dissipated when heated or cooked, thus enable tender shoots and leaves to be eaten as fresh or dry. During July to September small, greenish-white female flowers appear in clusters at leaf axils; male flowers appear on different plants as groups of diagonally upright strands at the top of the plant (Figure 3). The seeds are small enclosed in the dried sepals. In the Himalayan region Stinging Nettle is consumed all over, however considered poor-man's food despite of its high nutritional and medicinal values. The species also provide fiber and extracted for this purpose in some places.

#### **Stinging nettle and ethnobotanical relevance**

Use of stinging nettle as vegetable is dating back to the 1st century AD [11]. The young leaves and tender shoots are cooked as green leafy vegetable after blanching. The plant is reported as a rich source of vitamin C, protein and minerals (iron, calcium, magnesium); also provides vitamin A, B1, B2, E and K along with a rich source of many trace elements (Cu, Zn, Mn and Co) and fibre required for human body [12]. High proteins (26 percent) and calcium (5.09 percent) in leaves, stem and root make it a good source of nourishment [13]. Most importantly as suggested by them that quantities of elements found in the stinging nettle leaves, stem and root do not exceed the limits of health hazards and toxicological limits. When comparing with spinach and parsley, the leaves of stinging nettle comprise as much as double protein [11]. In Himalayan nettle, nutrient content was higher than the cultivated green leafy vegetables spinach and rayi [14]. Nettle has higher concentrations of essential amino acids than Brussels sprouts [15] that mainly comprise threonine, valine, isoleucine, leucine, phenylalanine, and lysine, along with lower concentrations of histidine and methionine [16]. In view of high lysine and protein content, nettle can be considered better than other green vegetables [11]. On dry weight basis, nettle leaf is considered better source of essential amino acids than almond; it is also comparable to common bean (*Phaseolus vulgaris*) and chicken (*Gallus gallus*) [17]. As lysine is a limiting amino acid in wheat, a diet supplement with nettle can provide better nutritional balance in traditional staple diet. Nettle leaf flour in bread, pasta, and noodles can make it a protein-rich supplement. Stinging nettle also provide significant quantities of oleic (18:1), linoleic (18:2) and  $\alpha$ -linoleic (18:3) acids and is a good source of unsaturated fatty acids [17]. High levels of linoleic and  $\alpha$ -linoleic acids are found in young and mature leaves and the presence of relatively high concentrations of the same oils in nettle are found

in the seeds, stem, and root portions. As the yield of edible part of nettle varies over the seasons, the blanching and cooking has a minimal impact on the fatty acid composition of *U. dioica*, implying that it can be a good source of essential fatty acids when eaten as a leafy vegetable [17]. Nine carotenoids are also identified in the leaves [18]. Also, the properties of phenolic compounds in the leaves, stalks, and fibers have been reported [19]. Processed nettle can supply 80–100 percent of Vitamin A (as  $\beta$ -carotene) [17]. Nettle tea made from fresh or dried leaves, sweeten with honey or sugar is considered good in taste that also comprised mineral contents [20] and trace elements [21].

Generally livestock do not consume fresh nettle from field directly. However traditionally in Uttarakhand it is given to milking livestock after crushing and mixing with hay. It is considered nutritious fodder in dried form that can be mixed with other hay and fed to animals; such combination are considered beneficial to increase body weight and meat quality. Use of nettle by broilers during the rearing period at a dose of 1 percent is found as growth promoters, that also enhances histological features of immune structures in caecal tonsils. Enhancement of immune potential of this lymphoid organ may be beneficial in prevention of related diseases and/or reduction of mortality rates. Adding dry powder of nettle in the diets of laying hens significantly increases egg production, and lowers the total cholesterol and triglycerides concentration [22].

#### **Health relevance of nettle**

Use of nettle leaves, roots, inflorescence and seeds are part of traditional folk medicine world over as extracts or powder. Traditionally it has been used for centuries for medicinal purposes to cure diseases in humans as well as in animals. For treatments nettle is used as extract (juice), dried form, tincture, ointment and/or as a supplement. In various folk systems it is used to treat allergies, kidney stones, burns, anemia, rashes, internal bleeding, diabetes, etc. A decoction of the plant is used to treat fever. The fresh leaf extract when applied externally is helpful in treating headaches and swollen joints. Stinging nettle is considered useful to cure rheumatism and arthritis [23] and the traditional practice of flogging the affected body part with nettle shoots is still in use by in Himalayan area [22]. The joint inflammation caused by the excess uric acid in the blood is known as gout; and consuming nettles is reported to increase the excretion of uric acid from the body and is an effective treatment for gout in herbal medicine [24]. Other than the joint ailment it has been found effective in various other diseases, namely allergies, ulcer, bronchitis, pleurisy, asthma, colds, sciatica, stress, anemia, depressions, hypertension and many more [12].

Realizing the side effects of medicines developed using synthetic chemical compounds focus of consumers as well as researchers is shifting towards the medicines of herbal origin. Plethora of interesting research data has been originated to substantiate its use in traditional medicine. It is not a review article where details of researches involved can be given, however some of them are being mentioned here.

Nettle leaves are an interesting source of biologically active compounds that may be applied for the treatment of infectious diseases in both human as well as veterinary animals [25]. The property of nettles to support elimination of chlorides, urea and bacterial toxins as well as metabolites can be an explanation for its application in rheumatic, dermatological and allergic diseases. The free radicals are normally generated during normal body metabolic function and also can be acquired from the environment. Significant correlations were found among phenolic phytochemicals and radical scavenging activity of nettle [26]. Use of nettle supplement is considered to have effective antioxidant role which can be used to reverse the harmful and pathological effect of the free radicals [27, 28]. Vitamin deficiency along with excess production of free radicals, a decreased level of antioxidant defense enzymes and increased lipid peroxidation are considered causal for oxidative stress and linked with various pathological conditions. Scientific researchers have shown nettle to be hepatoprotective, prophylactic, antioxidant as also anthelmintic.

Anthelmintics or antihelminthics are drugs that expel parasitic worms and other internal parasites from the body by either stunning or killing them and without causing significant damage to the host. Consumption of nettle leaves can decrease cholesterol levels as well as enhance the overall liver function [29].

Another important role of Nettle is to cure prostrate problems [30]. Benign Prostatic Hyperplasia (BPH) is found in approximately 50 percent of men aged 51–60 years and in approximately 90 percent of men aged 81–90 years [31]. Healing properties of this plant can be attributed to the presence of certain phytochemicals, namely flavonoids, lignans, fatty acids, sterols, polysaccharides, glycoproteins, carotenoids, plastocyanins, tannins and lectins. The maximum contents of phenolic compounds and ascorbic acid were found in the young nettle leaves [32]. It has also been proven that the stinging nettle extracts have diuretic, and hypotensive effects.

Nettle extract is also found useful as antimicrobial agent that has the potential for pharmaceutical and food industry [26]. In synthetic condition, this extract can has been found effective against viruses causing Aids and Hepatitis [33]. Its extract has exhibited promising anti-mycobacterial activity against multi-drug resistant strain of *Mycobacterium tuberculosis* [34].



Being rich in nutrients and antimicrobial activity consumption of leaf and stem may promote general health and well-being as well as reduce the risk of chronic diseases. The study showed that these highly valuable medicinal compounds are more concentrated in leaves compared to the other parts. The presence of a relatively high concentration of flavonoids and caffeic acid derivatives enriched in the lipophilic fraction of the herb suggest mainly anti-inflammatory, antioxidant and analgesic activities [35].

The clinical trial of Nettle seed (figure 4) extracts showed positive results for treatment of renal dysfunction [36]. Seeds are also recommended as a restorative kidney tonic for severe cases of kidney failure [37]. Nettle has been found effective in both Type1 and Type 2 diabetes [38]. However further studies are necessary to elucidate in detail the mechanism of action of the nettle at the cellular and molecular levels followed by clinical trials to ascertain whether nettle can replace insulin treatment for patients.

Till now focal point of scientific research had been primarily on identification and isolation of phyto chemicals and bioactive compounds present in these plant parts and testing the efficacy of various nettle extracts as used in herbal medicines either invitro or invivo (mainly on rats). Based on the findings the scholars have been providing justification of plant use in folk medicine to treat various diseases. However scientific validation of an effect only can be obtained by clinical experiments but the fact remains that clinical trials are expensive. While reviewing the literature pertaining to nettle use as medicine we rarely encounter research findings on clinical trials. Still whatever we could find shows its positive effect on diabetic patients, BPH patients, allergic sinusitis and joint pain. At this stage of researches involved in the use of this plant as medicine it is difficult to say that the nettle extracts or isolated compounds are an alternative to the registered medicines. However these findings encourage performing clinical trials to verify the potential use of herbal drugs for a given purpose. To get validation from scientific community many more serious clinical trials are required to generate plethora of data showing its positive efficacy on patients with various diseases at least for whom it has shown positive effect in-vitro and in-vivo.

#### **Other relevance of stinging nettle**

The plant produces long and strong fibers similar to that of hemp and flax (Figure 5). It has been used as a textile for at least 2000 years in Europe, and the utility of fibers from stinging nettle to make sail-cloths, ropes and fishing nets has been common world over. As the craze for organic food has grown exponentially during last decade the search for plants that produce quality organic fiber is also rising day-by-day. Hence, nettle fiber that grows abundantly in Himalayan region holds commercial potential for the future (figure 6).





Fig. 1: Nettle plant



Fig. 2: Trichomes



Fig. 3: Fruiting stage



Fig. 4: Seeds



Fig. 5: Fiber



Fig. 6: Fiber Products



Fig. 7: Fiber Products

The development, cultivation and processing of nettle has become a topic of research in Germany, Austria and Finland since the middle of the 1990s. However such efforts are negligible in India. Thus Nettle has the potential to be used as an alternative to cotton which is a pesticide intensive crop. Other than using as fiber Nettle can also be used to prepare an herbal dye (greenish-yellow), which is extracted from the leaves, stems and roots. Mixing of nettle in compost heap not only adds nutrients but also accelerates the breakdown of organic matter into robust humus [43]. Water extract of nettle acts as positive growth stimulating effect on plants as it increase nitrogen content in treated crops, when mixed with compost, it adds to quality of manure as being rich source of nitrogen thus helps to replenish soil [40] and helpful in promoting organic agriculture. Presence of stinging nettles in landscapes seems to enhance the density of aphidophagous insect communities necessary for aphid biocontrol in field crops [41]. Anti-bacterial property of the nettle seed extract has high activity against phytopathogens [42]. These reports clearly indicate that there are diverse environmental benefits of nettle; therefore promoting its cultivation on a commercial basis can prove to be a 'carbon neutral' business with no waste.

#### **Conclusion**

In unison with food security, nutritional security is current buzzword worldwide. As global population surges and the challenge of food and nutritional security threaten to become a crisis, the agriculture sector is desperately in need of alternative nutritive crops. To tackle this problem, the need of the hour is to boost alternative nutritive food crops. And for this the growth and development of wild plant species to bridge the supply-demand gap, needs to be given special impetus. The indigenous wild plants not only have the potential to provide nutritional diet and health security. Presently, humanity is being sustained by a limited number of plant species to meet its daily needs. Therefore, the role of wild species, to fill the supply gap, becomes all the more important to meet whatever shortfall that may arise in the future. Unfortunately, the forces of economic development have ignored the role of the wild food species could play in enhancing food and nutritional security and economic development.

Along with major attention on nutritional quality researchers should also explore other physiological implications of phytochemicals for overall wellbeing with consumption of currently underused wild species. The government policies too need to be integrated to identify such potential wild eatables and enhance productivity. The FAO 2009 report says: 'Nutrition and biodiversity converge to a common path leading to food security and sustainable development... wild species and intraspecies biodiversity have key roles in global nutrition security' [17].



Stinging Nettle widely found in Himalayan areas, is one among many such plants that has huge potential for the future applications. For its wider applicability it is suggested that future research should focus on nutritional potential of the plant and further validate the results and claims on health benefits. Raising awareness among communities who can commonly consume nettle as food regarding its benefits in nutrition and health will attract young population to use this species. Only future multidisciplinary research, incorporating appropriate nutritional assessment methodologies would lead to a better understanding of the dietary contribution of nettle. The chemical, nutritional and medicinal properties of nettle, the bioavailability of macro and micronutrients and their modifications by various processing technique needs to be properly established and documented before its use as an alternative dietary source can be advocated.

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