



Urtica Spp.: From Underutilized Crop Towards Sustainability



Baraa Munir Al-mansour

Directory of Agriculture and Agrarian Reform: Lattakia, Syria

Associated partner Diversifying cropping systems - Traditional Knowledge and Innovative Approaches Project.

Rostock, Germany

Email: baraaalmansour@yahoo.com



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Abstract

Sustainability of agricultural systems has become an important issue throughout the world. The need to balance environmental quality, human needs and economic stability is often referred to as "the three pillars of sustainability". Nettle is one of the most widely distributed wild plants, found in all regions of the temperate zones, growing in all seasons, and having ethnobotanical importance as a wild plant. Cultivation of this underutilized crop has potential to be valuable food, medicine source, organic fertilizer and carbon sink in addition to its economic advantages. It needs further expanded and assisted by agricultural extensions to be part of management strategies in tackling food and environment insecurity.

Keywords: Sustainability; Underutilized crop; Nettle; Insecurity.

1. Introduction

Agricultural sustainability has become one of the most important issues at the global level, with the progress of knowledge and awareness of global environmental issues, Nettle crop has gained recent interest environmentally, pharmaceutically and commercially, because it is the source of many added-value products by exploiting all the plant parts (stem, leaves, roots and seeds) [1].

Stinging nettle (*Urtica dioica* L.) is a herbaceous perennial flowering plant of the *Urticaceae* family that often grows as a weed in neglected places, such as along roads and river valleys, and near settlements, or can be grown spontaneously in forest [2]. It is one of the most widely distributed wild plants, found in all regions of the temperate zones, growing in all seasons [3], in intensive agriculture, it is presented as weed because of its fast vegetative growth and high densities enable increased spread and soil coverage [4].

Urtica dioica prefers open habitats (floodplains, pastures, meadows) and represents a species typical of moderately shaded woodlands. It occurs on almost all soil types, though absent from waterlogged soils, and produced taller shoots in sunny sites, knowing that shoot/root ratio increased with increasing nitrogen supply [5].

Nettle, growing up to 2m in height. Each stem is formed of a succession of nodes and internodes containing best fibers in the bark [6] the flowers that are formed in the leaf axils on the same plant are female or male. Stems and leaves are covered with baculiform, spherical, wormy and stellar biting villus, which are filled with fluid [7].

It is rich in nutrients, with a high content of minerals and vitamins, especially vitamin A and C., its extract contains ursolic acid and quercetin, having by this many pharmaceutical effects, and significant nutritional value [8].

The aim of this paper is to highlight on Nettle stinging nettle, introduce an updated and comprehensive overview of the studies related to its multipurpose, to support the introduction of this plant into farming system.

2. Nettle in Agroforestry System

Agroforestry can be defined as sustainable way of land management which integrates both agricultural and forestry practices on the same land management base that mimic local-ecosystem processes, and can be developed to provide livelihoods for farmers while protecting and preserving forest reserves and biodiversity [9]. Home-gardens are complex agroforestry systems involving many plant species characterized by different morphology, stature, biological function and utility, practiced mostly in the humid and sub-humid tropics [10]. While, “Weedy” medicinal species could be noted as an important category among home gardens.

Thomas, *et al.* [11] studied Nettles that grew spontaneously and dominated the vegetation cover in poplar short rotation coppices planted for the phytomanagement of lands contaminated by trace element. Results showed that, for the considered soils, the contaminant contents in nettle bast fibers were at low levels, comparable to those collected at unpolluted control areas. This making spontaneous nettles an interesting supplement to traditional European fiber crops for material applications.

Nettle has potential and possible opportunities as food source and usually referred to as “wild foods” or “famine foods”. Taking in consideration, that utilization of wild edible plants as a food source is an integral part of the culture of indigenous people that dwell in the rain forests of Africa and South America [12].

Quantitative analysis of consumers’ perspectives of stinging nettle “Samma” consumption was conducted in Ethiopia. The gathering have been connected with poorness and they call it “poor man crop”, even though stinging nettle plants are preferred by the local people for food, medicinal, livestock feed and environmental services they provide [13].

3. Nettle as Liquide Fertilizer

Sustainable and organic agriculture practices apply management ideals that include a diverse assembly of farming methods, usually with a reduced reliance on purchased inputs [14]. The interest in integrated nutrition has increased through planning to fertilize plants with combinations of organic and biological fertilizers, to achieve environmentally safe agriculture on one hand and reduce the financial burden on farms on the other.

Therefore, using nettle meet the concept of sustainability by getting benefit from neglected resources. Aqueous nettle extract is rich in nitrogen, phosphorus, calcium, magnesium and iron and promotes plant growth, so it could use as fertilizers or pesticides and be integrated into sustainable organic agriculture [15].

Marić, *et al.* [16] demonstrated the efficacy of nettle extract in increasing soil fertility, declared that foliar fertilization with it proved to be efficient on vegetative parameters. Furthermore, aqueous nettle extracts showed a positive effect on the iron accumulation in the leaves.

4. Nettle as a Carbon Sink

Increasing climate related public concern has created a demand for suitability, international efforts have focused on ways in which anthropogenic emissions of greenhouse gases, particularly carbon dioxide (CO₂), can be reduced. David [17] indicated that the potential to enhance the land carbon sink through changes in land management practices is finite in size and duration.

However, Nettle (*Urtica dioica*) has been proven to hold an ecological advantages. In the chosen 4-year setting, Environmentally, after the first year nettle creates an annual 1,3 ton carbon sink despite conventional fertilizer use and machinery work done of field [18].

According to Butkutė, *et al.* [19] C stock in stems of hemp and nettle amounted to an average of 5149 and 3719 kg ha⁻¹, The CO₂ content fixed into the biomass of Nettle crops might contribute towards the reduction of climate warming.

5. Nettle as Medicinal Plant

The past three decades have obviously witnessed a tremendous surge in acceptance and public interest in natural therapies both in developing and developed countries. It is estimated that, up to four billion people (representing 85% of the world’s population) living in the developing world rely on herbal medicinal products as a primary source of traditional medical practice [20]. Moreover, approximately 120 drugs in western medicine are obtained from plants, while many other drugs are obtained either by semi synthesis from plant products, or synthesis based on plant molecules [21].

Nettle is widely used species by traditional societies in temperate and tropical Asia, Europe, northern America and northern Africa. Having ethno-pharmacology, and ethnobotanical uses [22].

Various parts of the plant have been used in ayurvedic preparations, having a long history in herbal remedy since ancient times for curing various ailments. As a useful first-aid remedy it is used in the treatment of ailments such as bites and stings, burns, hives and breast feeding problems, due to its active anti-inflammatory chemical agents formic acid (methanoic acid) and histamine (1H-Imidazole-4-ethanamine; 2-(4Imidazolyl ethylamine; 4-(2-Aminoethyl)-1H-imidazole. Also, according to Riehemann, *et al.* [23] part of the anti-inflammatory effect of *Urtica* extract might be ascribed to its inhibitory effect on NF-kappa B activation.

Jacquet, *et al.* [24] indicated that using of nettle as complementary medicines in the treatment of osteoarthritis (OA) appeared to decrease the need for analgesics and non-steroidal anti-inflammatory drugs (NSAIDs), and improve the symptoms of osteoarthritis.

Nettle's nutritional and immunity modulating benefits with higher nutrient content that is more than cultivated green leafy vegetables, having strong potential for food and therapeutic purposes, as a new plant resource that could meet the growing needs of the human society [25].

The phytochemical profile of nettle leaves can be divided into several categories such as terpenoids, chlorophylls and carotenoids, fatty acids, polyphenolic acids and compounds, essential amino acids, vitamins, tannins, carbohydrates, sterols, polysaccharides, isolectins and minerals [26].

These attributes make nettle leaves a rich source of phytochemicals with confirmed antioxidant, antidiabetic, antimicrobial, antiulcer, and antihypertensive activities thereby justifying its use as a functional food as well as traditional medicine [27].

6. Nettle as Source of Income

Cultivation of medicinal plants today is not only a promising alternative and counterpoint to wild collection, but also represents a powerful economy branch providing raw materials for pharmaceutical, cosmetic and the food industry, and the profitability of its cultivation compete with profit achievable for standard field crop [28].

Nettle has been proven to hold economic advantages and great commercial potential having low inputs with multiple end uses within harvest considering as an attractive crop for farmers [29]. It requires low agronomic inputs so is highly feasible for organic farming, as a perennial crop it reduces soil erosion, and being a nitrophilous species it recovers over-fertilized soils [30].

According to Thomas, *et al.* [11] the biomass from nettle could be used to extend the productivity of the marginal land from short rotation coppice (SRC) alone, whilst still maintaining a functioning phyto-management system of land.

Also, nettle fibers were used for the production of textiles in central Europe before the introduction of cotton (*Gossypium* sp.). However, processing facilities for nettle were destroyed during the Second World War and other cheaper fibers became more readily available [31].

Today, organically produced fibers are in demand by the green textile industry and nettle show potential that is economically promising in this sector. Physical-mechanical characteristics of nettle's fiber have been studied by Bacci, *et al.* [32] he confirmed its potential to be used for textile purposes. That, they were similar to hemp fibers in diameter, lignin content and elongation, and similar to flax or cotton in tensile strength.

7. Conclusion

Agricultural extensions and decisions makers should make strategic policies to encourage farmers for growing nettle as a source of food, medicine, fertilizer and income to fight food insecurity from one side and improve the farmer's livelihood from another, future research are needed on value addition and processing for effective utilization of this wild underutilized crop to concrete its effects on health, soil fertility and environment in the way towards sustainability.

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