

UNCONVENTIONAL FOOD PLANTS: RICH NUTRIENTS SOURCES WITH UNTAPPED POTENTIAL - A LITERATURE REVIEW AND A CLOSE EXAMINATION OF THE ROMANIAN LEGISLATION IN THIS REGARD

Silviu Ionuț BEIA, Romeo CREȚU, Iulian ALECU, Violeta Elena BEIA, Silviu Viorel ANDREI

University of Agronomic Sciences and Veterinary Medicine Bucharest of Bucharest, 59 Marasti Boulevard, District 1, 011464, Bucharest, Romania, Emails: silviuionutbeia@gmail.com, beiaionut@yahoo.com, creturomeocatalin@yahoo.com, iulian_alecu_2000@yahoo.com, beia.violeta@ansva.ro, silviuviorelandrei@gmail.com

Corresponding author: silviuionutbeia@gmail.com

Abstract

The difficulty of finding non-animal protein sources has determined scholars to explore the less researched plants in recent decades. Alternative protein sources, such as those derived from multicellular fungus, microalgae, and unconventional vegetables, have become a prominent focus in Western studies, particularly because urbanization and distance from metropolitan centres might limit access to food plant resources. Plant-based proteins are regarded an economical option and can be derived from industrial waste, which is abundant and has significant health benefits. The present article aims at exploring the potential of unconventional food plants, as although not much attention is dedicated to them throughout the public food chains, they have gained much academic interest in the last 10 years. Particularly, their potential in Europe, as well as in Romania is the focus of this paper. In Romania, while the current legislation recognizes their existence, their understanding is limited to that of genetically modified organisms. The implications of this lack of understanding are outlined in the final part of this paper.

Key words: unconventional food plants, importance, characteristics, legislation, Romania

INTRODUCTION

Non conventional food plants are innovative food products containing new ingredients, capable of meeting nutritional needs and new consumption trends.

Firstly, different species of plants, called non-conventional food plants, are studied in the literature and can provide food with a better composition, and can be healthier.

Secondly, more than this, non-conventional food plants are addressed to economically disadvantaged people being an alternative income source in the family.

Thirdly, non-conventional food plants do not need pesticides giving a help to environment avoiding pollution of soil air, and water.

Last but not least, from a biological point of view, these plants are resistant to drought, and could be easily cultivated with very low costs. However, they are not known so much by the majority of the population.

Usually, these plants are closely connected to the traditional agricultural practices and cultures in various countries (Gaban and Borges, 2020) [12].

Several plant-based food products have been identified as innovative, including *Moringa oleifera*, *Pereskia aculeata* Miller, *Jatropha curcas* L., *Bambusa vulgaris*, and *Gramineae bambusoideae*. These plants are recognized for their high nutritional value, particularly in terms of fiber, protein, phenolic compounds, and carotenoids. In addition, there are other unconventional edible plants such as white acacia (Saucedo-Pompa et al., 2018) [24], *Ora-pro-nobis* (Agostini-Costa, 2020; Garcia et al, 2019) [1, 13], *Jatropha* (León-Villanueva et al., 2018) [18], and bamboo (Kong et al., 2020; Nongdam & Tikendra, 2014; Wang & Ng, 2033) [16, 19, 30], which

can be used in food processing and protein extraction.

This group of less studied plants until recently has captured the interest of the academic community by virtue of the debates regarding the identification of new sources of proteins, of non-animal origin (Felix et al, 2016) [11].

In the current scenario, the focus on finding alternative sources of protein has gained prominence in Western research, owing to factors such as urbanization and limited access to food plant resources. To address this concern, unconventional vegetable sources (Akyüz & Ersus, 2021; Cho et al., 2020; Silva et al., 2019; Wang et al., 2020) [2, 8, 26, 31] and protein sources from multicellular fungi (Colosimo et al., 2020) [10] and microalgae (Callejo-López et al., 2020) [6] have been explored. The knowledge and use of these sources may be limited by factors such as urbanization and access to food plant resources, as highlighted by previous studies (Benz et al., 2000) [4]. Plant-based proteins are considered an economic substitute and can be obtained from industrial wastes, which are prolific and with important benefits to human health (Call et al, 2020; Girgih et al, 2013; Sá et al., 2020) [5, 14, 23].

It is estimated that, in 2054, approximately 1/3 of all protein consumed will be of vegetable origin (Henchion et al., 2017) [15].

The generic names used for these are alternative food plants, wild edible plants, unconventional vegetables or 'plants of the future' (Leal et al, 2018) [17]. According to Kinupp and Lorenzi (2014, as cited in Cobus et al., 2023) [8], the terminology used to describe food plants is limited and tends to refer to a narrow category of plants, such as "wild vegetables," which can lead to confusion. To address this issue, they suggest using the term "unconventional food plants," which includes plants that are not commonly used for food, often require unusual preparation methods, and are typically undervalued in the market or traded on a small scale. This broad definition refers to both native and exotic plants, including cultivated and naturally occurring plants (Cobus et al, 2023) [9].

In this context, the purpose of the paper is to present a review on the potential of unconventional food plants existing especially in Europe, as well as in Romania and to stress their importance in human life and health, as well as its economic and environmental benefits.

MATERIALS AND METHODS

In order to investigate the characteristics of unconventional food plants, we look at studies published within the last decades by means of a qualitative content analysis, as well as taking into consideration the Romanian regulations, as well as tradition in regards to unconventional food plants. This study is consistently relevant in the context of the global search for non-animal protein sources, as well as non-chemical medicine alternatives.

RESULTS AND DISCUSSIONS

In general, research in recent years has shown that non-conventional plants have great potential in various fields and that there is an increase in interest in their use. However, there are still many aspects that need to be explored and researched in detail to better understand the impact and potential of these plants in different fields.

Several scholars have observed a decline in plant knowledge among communities residing close to urban centers as compared to those in isolated areas, which they attribute to the process of delocalization. Pelto and Pelto (1983) [20] have defined delocalization as the expanding network of socio-economic and political interdependencies that influence people's diets, leading them to rely more on food and products sourced from distant locations via various commercial channels. Concurrently, recent literature has highlighted another process that underscores the growing significance of urban forests and wild edibles in urban areas in contemporary diets (Poe et al., 2013; Shackleton et al., 2017) [22, 25].

Several studies conducted in different regions have shown that many wild plants have both nutritional and medicinal uses. For instance, Pinela et al. (2017) [21] found that 33 out of

37 wild plant species in Northern Portugal were used for medicinal purposes in addition to food. Yang et al. (2020) [32] reported the use of 19 out of 75 plant species for both medicinal and nutritional purposes.

In Southeastern Angola, Urso et al. (2016) [29] found that about 11% of the known plants in the communities they studied were consumed as both food and medicine. For example, the fruit of *Aframomum alboviolaceum* was used as an anthelmintic and also eaten raw. Such species can be investigated for their potential nutritional and medicinal benefits. The potential therapeutic benefits of underutilized wild edible species, which have been traditionally used for both food and medicinal purposes, is a topic of interest, as highlighted by Towns and Andel (2016) [28]. Localized studies on unconventional food plants are essential to document species that hold traditional use value and to encourage their cultural use and conservation, especially in communities undergoing socio-economic changes resulting from proximity to urban areas. For example, Campos et al. (2016) [7] reported that the species *Hancornia speciosa* Gomes (Apocynaceae) is consumed exclusively as food, while the latex derived from the stem is used for medicinal purposes to treat and prevent gastrointestinal problems. The participants of the study revealed that although green fruits with latex were used as medicine in the past, the higher concentration of latex in the stem led consumers to preferentially use this part for medicinal purposes.

The prevalence of non-conventional food plants in Europe varies by region and country. Some of these herbs have a long history of use in traditional cuisines, while others have been added more recently to the diet of European countries. In general, countries with a stronger culinary tradition tend to have a greater diversity of unconventional food plants available.

Nordic countries such as Sweden, Finland and Norway have a long history of foraging wild foods, including berries, mushrooms and wild herbs. These countries also have a growing interest in more exotic and unconventional

foods, seaweed, insect-based foods and other plant-based alternatives to meat and dairy.

In Mediterranean countries such as Italy, Spain and Greece, there is a rich tradition of using wild greens and herbs in food, such as dandelion greens, wild fennel and butterwort (*Portulaca oleracea*). Other unconventional food plants gaining popularity in Europe are chia seeds, quinoa and amaranth, which are all native to South America but are now grown in several European countries.

Research by Takahashi et al (2020) [27] found that wild food plants are commonly used for food and medicinal purposes in rural areas across Europe. The study identified a total of 377 plant species from 45 families that are used as food and medicine in 26 European countries.

In Romania, there is a long tradition of using wild plants in traditional medicine and traditional cuisine.

Some of the more popular wild plants used in food are nettles, dandelion, wild spinach, sedge, mouse tail, burdock, wild mustard, blueberry, wild raspberry and strawberry. These herbs are used in salads, soups, sauces and other dishes.

Regarding the use of wild plants in medicine, in Romania there is a long tradition of using them to treat ailments such as colds, coughs, flu, headaches, digestion and many others. Some of the most widely used wild plants in Romanian traditional medicine are chamomile, horsetail, St. John's wort, calendula, mint, basil, licorice, lime and sage. However, the use of wild plants should be done with caution, as some plants can be toxic or have side effects. It is also not recommended to collect plants from polluted areas and not to consume plants whose provenance is unknown. In Romania, non-conventional plants fall under the scope of Law no. 321/2009 regarding the cultivation of genetically modified plants and plants intended for industrial use, which was updated by Emergency Ordinance no. 107/2019 on the regulation of certain measures in the field of genetically modified organisms and non-conventional plants.

According to this law, non-conventional plants are defined as plants that are not part of

the traditional species commonly cultivated in the European Union and that are not listed in Annex I of Regulation (EC) no. 1829/2003 on genetically modified food and feeds.

The law states that the cultivation of non-conventional plants is allowed only for experimental purposes and only with the consent of the competent authorities. Cultivation of non-conventional plants is also not allowed in protected areas, as well as in water protection areas.

In addition, the law requires that these plants be registered in a national register of non-conventional plants, which contains information on producers, traders and importers of non-conventional plants. The competent authorities have the responsibility to monitor the cultivation and marketing of these plants.

Regarding the use of non-conventional plants in food, they are regulated by national and European food legislation. Before being marketed, non-conventional plants must be evaluated and approved by the European Food Safety Authority (EFSA) in accordance with standardized risk assessment procedures.

From 2000 to 2006, Romania strictly followed the regulatory framework under the agricultural authority for the registration of crop varieties and hybrids, including biotechnological crops. An important administrative step before the introduction on the market of any cultivar or hybrid consists in fulfilling all the requirements imposed by the International Union for the Protection of New Varieties of Plants, a convention to which Romania has been a party since 1961, renewing this cooperation in 2001 (Antofie & Sand -Sava, 2022) [3].

Thus, the introduction to the market of any crop variety or hybrid in Romania falls under the responsibility of the agricultural authority with the support of the State Institute for Testing and Registration of Plant Varieties. This institute operates at the county level as a network of County Centers for testing and registering varieties and hybrids of crops that require them to be globally recognized by standard procedures. Before entering the European Union, there was no biosecurity

inspection system to ensure traceability, labeling or monitoring in the field.

The first soybean test (RR S2254RR) in the field took place in 1999. At the same time, GEO 49/2000 entered into force 1 year before the adoption of Directive 2001/18/EC and the National Biosecurity Commission was established, a forum scientific body made up of scientists, researchers and other personalities from public institutions with a major role in decision-making. Based on the agreement made by the National Biosafety Commission, the authorizations for testing genetically modified organisms in the field and for commercialization were approved (Antofie & Sand-Sava, 2022) [3].

Starting from 2010, the Romanian Tree Research and Development Station in Bistrita is the first public institution that continuously applied for testing the genetically modified plum for the Plum-Pox virus (plum blight).

However, in traditional Romanian medicine, many wild plants are used for their therapeutic properties. Dandelion (*Taraxacum officinale*) is used to stimulate digestion and diuresis, as well as for detoxification and purification. Horsetail (*Equisetum arvense*) is used to treat kidney problems, soothe inflammation and stimulate wound healing. St. John's wort (*Hypericum perforatum*) is known for its antidepressant, anti-inflammatory and antibacterial properties. Marigolds (*Calendula officinalis*) is used for their anti-inflammatory, healing and antimicrobial properties, especially for skin conditions. Plantains (*Physalis alkekengi*) is used in the treatment of respiratory problems, inflammations and urinary infections. In traditional Romanian cuisine, wild herbs are used to add flavors and additional nutritional benefits to specific dishes. Some examples include: Leurda (*Allium ursinum*), a wild herb similar to garlic, used in salads, soups, stews and other dishes to add flavor and health benefits, Nettles (*Urtica dioica*) - eaten in soups, pies and other dishes, nettles are rich in vitamins, minerals and antioxidants; Horseradish leaves (*Tussilago farfara*), a traditional version of horseradish using horseradish leaves instead of the classic vine leaves; Sorrel (*Rumex*

acetosa) is used to add flavor and nutritional benefits to salads and other dishes.

These plants remain virtually unknown to the academic environment, as well as international practitioners in the field of food supplements, and should be known worldwide. At the same time, the Romanian legislation does not encompass them to the same extent as genetically modified plants, although they are equally less known. This encourages a downplay of local resources, as well as important losses for the Romanian economy, which could monetize them to foreign markets.

CONCLUSIONS

Recent research has demonstrated that non-conventional plants have significant potential in many industries and are becoming more popular.

Local studies on non-conventional food plants are crucial for recording species with traditional use value and encouraging cultural use and conservation, especially in communities facing socio-economic transformation owing to urbanization.

Non-conventional food plants vary across Europe.

Certain herbs are part of traditional cuisines, while others are not commonly used in European diets. Countries with a well-established culinary culture often incorporate unconventional food plants into their cuisines. In Romania, for example, wild herbs are frequently used in traditional medicine and gastronomy. Common wild foods include nettles, dandelion, wild spinach, sedge, mouse tail, burdock, wild mustard, blueberry, wild raspberry, and strawberry. These herbs are often used in salads, soups, and sauces.

In traditional Romanian medicine, numerous wild plants have healing characteristics. Dandelion (*Taraxacum officinale*) aid digestion, diuresis, and detoxification. Horsetail (*Equisetum arvense*) helps kidneys, inflammation, and wound healing. St. John's wort (*Hypericum perforatum*) has antidepressant, anti-inflammatory, and antibacterial properties. Marigolds (*Calendula officinalis*) have anti-inflammatory,

therapeutic, and antibacterial effects, especially for skin disorders. Plantains (*Physalis alkekengi*) treat respiratory, inflammatory, and urinary illnesses. Wild plants give flavor and nutrients to Romanian recipes. Academics and many practitioners are unaware of these plants, which should be known worldwide. To this day, the Romanian legislation does not encompass them in the category of unconventional food plants, although genetically modified plants, for instance, have been recognized as such. This devalues local resources and implies an invisible, but significant cost to the Romanian economy, as they could be sold for many uses and in multiple formulas abroad. Future research should consider their prevalence and use locally, so as to gain more depth into the potential of their commercialization in different areas of Europe, where they are needed.

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