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**Ethnobotanical review of wild edible plants used in
Czechia with special reference to non-native
species**

Bc. Thesis

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ABSTRACT

This paper is an ethnobotanical review of wild food plants used in human consumption within the present borders of Czechia. Thirty-seven freely available publications documenting the culinary use of wild plants were analysed. The use of 175 vascular plant species (approximately 5% of native and naturalized flora of the Czech Republic), 3 lichens and 1 bryophyte has been reported. A list of species, plant parts used, use category and mode of consumption is presented in Appendix. Most reported families were Rosaceae, Asteraceae, Ericaceae, Adoxaceae and Apiaceae. The most frequent categories used plants comprise e.g. *Urtica dioica*, *Glechoma hederacea*, *Rumex* spp., *Taraxacum* sect. *Ruderalia* and *Atriplex* spp. from category green vegetable; *Juniperus communis*, *Viola* spp. and *Fragaria vesca* from seasoning; *Rubus idaeus*, *Rosa canina*, *Vaccinium vitis-idaea* from category of fruits and *Cornus mas* and *Sambucus nigra* from beverages. The most commonly used wild food taxa are very identical to those used in Poland, Slovakia or Hungary. Many wild edible plants have also been used for medicinal purposes and some of them are considered to be poisonous. This review highlights the traditional knowledge of edible plants which were used in the Czech Republic with attempt to enhance Czech gastronomy mentioning the forgotten plants. Furthermore, this list of species could be potential source for the breeding of new crops.

Keywords:

Wild plants, ethnobotany, food, species origin, edible weeds

ABSTRAKT

Tato práce se zabývá etnobotanickou revizí divokých jedlých rostlin pro lidskou výživu na území stávajících hranic Česka. Celkem bylo použito třicet sedm volně dostupných publikací dokumentujících kulinářské využití planě rostoucích rostlin. Popsáno bylo 175 druhů cévnatých rostlin (přibližně 5% původní a naturalizovaný flóry České republiky), 3 lišejníky a 1 mechorost. V příloze je uveden seznam druhů, používaná rostlinná část, kategorie použití a způsoby přípravy. Většina rostlin byla z čeledí růžovité, hvězdicovité, vřesovcovité, pižmovkovité a miříkovité. Nejčastěji používané kategorie zahrnují například tyto druhy: *Urtica dioica*, *Glechoma hederacea*, *Rumex* spp., *Taraxacum* sect. *Ruderalia* a *Atriplex* spp. z kategorie zelenin; koření bylo zastoupeno druhy *Juniperus communis*, *Viola* spp., *Fragaria vesca*; z kategorie ovoce to byl *Rubus idaeus*, *Rosa canina*, *Vaccinium vitis idaea* a nápoje představoval *Cornus mas* a *Sambucus nigra*. Podobné běžně používané divoké jedlé druhy najdeme v Polsku, na Slovensku nebo v Maďarsku. Mnoho těchto divokých jedlých rostlin také bývá použito pro léčebné účely a některé z nich jsou považovány za jedovaté. Tento přehled upozorňuje na tradiční znalosti jedlých rostlin, které byly používány v České republice se snahou zvýšit různorodost české gastronomie připomenutím zapomenutých rostlin. Kromě toho by tyto druhy mohly být potenciálním zdrojem pro šlechtění nových plodin.

Klíčová slova:

Plané rostliny, etnobotanika, potraviny, původ druhů, jedlé plevele

DECLARATION

I, Kateřina Šimková, declare that this thesis, submitted in partial fulfilment of requirements for the Bc. degree at the Faculty of Tropical AgriSciences of the Czech University of Life Sciences Prague, is wholly my own work unless otherwise referenced or acknowledged.

May 2 2013

Kateřina Šimková

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PREFACE

The increasing interest in the use of wild edible plants resources in our postmodern society originate from efforts to find alternatives to common dietary habits. Articles about eating wild products appear even in popular magazines, whose main theme is not food or herbalism. Not so many years ago many wild plants were used in everyday cuisine, instead of being eliminated from agriculture systems. Some of them were consumed particularly during the times of famine and these days are very often identified as famine plants. On the other hand, many wild plants are common till today as they are used in traditional dishes. It is a challenge for ethnobotanists who try to gather and record this knowledge. The collected data are important from a cultural perspective as they conserve traditional wisdom. Furthermore, they could be the basis for the breeding of new crops. Modern science repeatedly emphasize that wild plants are rich in vitamins and minerals. Therefore, future research should be focused on growing these wild plants with the same amount of bioactive compounds.

This study presents first comprehensive review of usage wild edible plants in the Czech Republic. It should complement studies of other European countries.

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1 INTRODUCTION

The Czech Republic is small landlocked country in Central Europe with area 78,866 km² and some 1.3 million inhabitants. Its boundaries 2,290 km in length surround very heterogeneous landscape. Bohemia, the western part, consists of a basin drained by the Labe (Elbe) and the Vltava (Moldau) rivers. Moravia, the eastern part of the country, is drained mainly by the Morava and Odra (Oder) Rivers. Both parts are largely surrounded by low mountains. Sixty-seven per cent of the territory lies at an altitude below 500 m, 32% between 500 to 1000 m and only around 1% above 1000m. The climate in the Czech Republic is mild and transient between oceanic and continental with continental character of the climate increasing to the east, due to prevailing western air flow and position towards the Atlantic Ocean. However, given the relatively small size of the territory, differences between east and west and between north and south are small. Local weather patterns and climate are mainly influenced by topography and altitude. A characteristic feature of the climate is distinctly marked by regular alternation of four seasons. Phytogeographically, Czechia belongs to the Central European area of the Circumboreal Region, within the Boreal Kingdom. According to the World Wide Fund for Nature, the territory of the Czech Republic can be subdivided into four ecoregions: the Central European mixed forests, Pannonian mixed forests, Western European broadleaf forests and Carpathian montane conifer forests. Czech territory belongs to the Central European region, the intersection of currents spread of plant species, which implies a great diversity of nature. Because of the rugged topography, Czechia covers a variety of biotopes with relatively small size.

Wild plant species have been always collected by people for different purposes such as food, medicine and spiritual. This knowledge is somewhat a part of a culture (Tardío and Pardo de Santayana, 2008). The increasing popularity in the use of wild food plant resource nowadays stems from efforts to find alternatives to the industrialization and globalization of agriculture and to provide food security in times of agronomic crisis (Turner et al., 2011). The staple food is now based on crop and livestock production. Until now, vast majority of the population of developed countries use wild plants as secondary source of foods, and hence as an important source of vitamins and minerals. We must bear in mind that wild plants are very important as vegetal substitutes in early spring before we

can begin to harvest garden vegetable (Branca, 2002; Nebel et al., 2006; Tardío et al., 2006). On the other hand, with the great development of marketing techniques, it is more comfortable buy fruits and vegetable (i.e. source of vitamins and other nutritional elements) in the grocery stores, available throughout the year (Tardío et al., 2005). Moreover, people do not know (or cannot recognized) wild edible plants as in the past (Kalle and Sõukand, 2012). The topic of more varied diet is relevant at this moment when only three crops provide around 50% of human energy intake (CBD, 2005). It must be stressed that wild plants under normal conditions play an important role in complementing staple foods to provide a balanced diet as they contain trace elements, vitamins, and minerals. Their future as a source of “nutraceuticals” has been shown in recent studies (Heinrich et al., 2006; The Local Food-Nutraceutical Consortium, 2005).

Łuczaj and Szymański (2007) pointed out that the cross-cultural and geographical analysis of the patterns of wild plant use in Europe is dispersed, mostly by the fact that most publications are published in national languages. Therefore, English-language ethnobotanical reviews can represent basis for further international analyses. Within the last two decades, growing interest in wild edible plants has led to many local ethnobotanical studies carried out in European countries to preserve the traditions of wild food use. Such studies were performed for example in Poland (Łuczaj, 2008; Łuczaj, 2010; Łuczaj and Szymański, 2007), in Slovakia (Łuczaj, 2012), on the Iberian Peninsula (Tardío et al., 2006; Bonet and Vallès, 2002; Tardío et al., 2005; Pardo-de-Santayana et al., 2005; Tardío and Pardo-De-Santayana, 2008), in Italy (Guarrera et al., 2006; Nebel et al., 2006; Leonti et al., 2006; Pieroni et al., 2006), Estonia (Kalle and Sõukand, 2012), Bosnia and Herzegovina (Redzic, 2006), Hungary (Dénes et al., 2012), Sweden (Svanberg, 2009) and Cyprus (Della et al., 2006). These studies have shown that the continent has a rich and varied culture related with the gastronomic use of wild plants. In the Czech Republic, even though it is not poorer in traditions of wild plant use than other parts of Europe, no such comprehensive review has been undertaken in this respect, yet. Information on the human consumption of wild plant species is written mostly in Czech language, some older sources in German. Several publications focused on traditional recipes, food history, healthy nutrition, medicinal use and ethnography mention wild food plants. However, a review summarizing information on these species was still missing. Hence a review of Czech publications concerning the ethnobotanical topic about wild edible plants became the aim of this study. The author hopes that this review will be a building block in a monograph of

wild food plants of Europe, summarizing the traditions of all European nations. This work is focused on food, including soups, jams and all kind of beverages, except herbal infusions or decoctions, difficult to handle with as they are mostly drunk for medicinal purposes.

2 OBJECTIVES

The main objective of the thesis is to summarize and evaluate the data on traditional use of wild edible plants in Czechia with special attention to exotic species. To date, most of this information has been published in Czech or a Slovak language (with a few exceptions) being dispersed and therefore difficult to access by the international scientific community. The obtained data were assessed of the wild edible usages and ways of meal's preparation. In addition author tried to classify Czech lands in categories herbophobic/herbophylic countries according to Luczaj's categories (2008).

3 MATERIALS AND METHODS

Thirty-seven publications focused on Czech food history, culinary use of wild plants, ethnography and botany were analyzed. All information summarized in this review refers to wild edible plants used in the Czech Republic during the last 420 years. According to the methodology previously used by Tardío et al. (2006), Table 1 shows the list of sources, each with a reference number (RN) which was also used in the Appendix 1. For each publication main topic, study area, and number of species reported are given. Most of the sources cover the whole country, except for ten publications with regional focus, e.g. Central Bohemia [the RN 8 (Hajný, 1912), 9 (Jakoubčová, 2000), and 10 (Jakoubčová, 2009)], East Bohemia [14 (Kaizl, 1944), 18 (Marhold, 2008)], South Bohemia [19 (Novotná et al., 2005), 33 (Vrabec, 1982), 37 (Zuntová, 2005)], west Bohemia [23 (Roubal, 1902)], and east Moravia [26 (Štika, 1980)]. One book with RN 7 (Gumowska, 1944) includes the whole Europe.

All records of using any parts of plant species as food or drink were considered excluding species used for preparation of herbal teas as they were used more as a medicine.

All data were grouped into alphabetically sorted botanical families in the Appendix, where Latin name, standard Czech name, folk name(s), plant part(s) used, use category, number of reports, mode of use and reference number(s) are provided. Contrary to Tardío et al. (2006) information on collecting season were not included as it was rarely referred in the sources studied and the information obtained usually falls into 3 categories, i.e. green plant parts collected in spring (March – June), fruits collected in their ripening time (July – October), and subterranean/underground parts collected mostly in both seasons mentioned (Łuczaj and Szymański, 2007).

For this study one report was considered one mention of a species use in particular food category and literature source.

3.1 Definition of “wild species” being considered in this study

In compliance with similar studies (Tardío et al., 2006; Łuczaj and Szymański 2007; Kalle and Sõukand, 2012) the term “wild food plants” in this thesis refers to non-

cultivated species gathered in the field without intended cultivation, including alien spontaneously occurring plants. Mostly it covers native plants as well as some distributed species that are now naturalized (e.g. *Acorus calamus* L., *Anthemis arvensis* L.), and some alien species usually cultivated in gardens gathered from the wild as casual or invasive such as *Bunium bulbocastanum* L. and *Levisticum officinale* W. D. J. Koch., categorized according to Pyšek et al. (2012).

Also species, which parts mentioned in the sources are usually not eaten (*Humulus lupulus* L.) or species, which are cultivated, even though for non-food purposes (e.g. *Aesculus hippocastanum* L.), were considered. Sometimes, wild forms are cultivated, such as *Corylus avellana* L. and *Rubus idaeus* L. but they were taken into account because it is known to be feral and they could be gathered from the wild.

3.2 Use categories

Twelve categories and subcategories of food uses were created to classify wild edible plants. Aerial parts like leaves and shoots eaten raw, boiled or fried were placed in the category green vegetable and edible weeds (VEG). Fruits eaten raw or used for making jams and jellies were categorized as wild fruits (FRU). Species which rhizomes, roots, bulbs and tubers were consumed raw as a snack or added to boiled dishes were put in the category subterranean parts (SUB). Plants which are added in small amounts to dishes were placed in the category seasoning (SEA). In cases of using flowers and their nectar as a snack or added to dishes in larger quantities, such species were placed in category flowers (FLO). Plants used for making non-alcoholic beverages (BEV), home-made liqueurs, beers and other alcoholic beverages (BEVliq) and uses such as coffee and cacao substitutes (BEVoth). Plants with use as preserve or rennet substitutes were included in category (PRE). Finally, there were categories for other uses like oils (OTHoil), flours (OTHflo) and non-specified use (OTH) considering making vinegar or honey.

3.3 Plant species identification

In the literature sources containing data on wild edible plants, mostly folk names of plant species were given. A list of taxa was created using a special code for credibility of identification according to Łuczaj (2010).

In case of plant records which were impossible to identify taxonomically on the species level but comprise 2 or more very common species, a taxon was identified on the genus level. Species potentially be used are mention in results.

When the plant identification credibility was very low or the taxon was impossible to identify, the record was left aside and it was not mentioned in plant list in Appendix (Kalle and Sõukand, 2012).

No herbarium specimens in the cited works were available to verify the proper identification. Nevertheless, according to Łuczaj and Szymański (2007), I tried to validate the identification using generally available floras and plant guides (Polívka 1900-1904; Kubát 2002; Skalická et al., 2012).

Latin plant names and authority were given according to “Flora Europaea” and web pages of the Missouri Botanical Gardens’ VAST (VAScular Tropicos). Czech standard names are given through current checklist of Czech vascular plants (Kubát, 2002; Danihelka et al., 2012).

Table 1 Reference consulted, with their reference number (RN), main topic, and number of species from each source included in the database

RN	Reference cited	Main topic	Research area	No. of species used
1	Beranová (1997)	food history	Whole country	9
2	Beranová (2001)	cookbook	Whole country	24
3	Beranová (2005)	food history	Whole country	77
4	Fialová (1958)	food history	Whole country	5
5	Fialová (1989)	cookbook	Whole country	9
6	Fialová, Styblíková (1983)	cookbook	Whole country	14
7	Gumowska (1994)	cookbook	Europe	2
8	Hajný (1912)	ethnographic (food)	Nymburk	2
9	Jakoubčová (2000)	cookbook	Central Bohemia	10
10	Jakoubčová (2009)	ethnographic (folklore)	Central Bohemia	24
11	Janalík, Marhold (2003)	cookbook	Whole country	7
12	Janča, Zentrich (1994-1999)	herbarium (medical)	Whole country	11
13	Janků-Sandtnerová, Janků (2007)	cookbook	Whole country	10
14	Kaizl (1944)	ethnographic (food)	East Bohemia	19
15	Karlík (2007)	cookbook	Whole country	13
16	Kubátová (2003)	ethnographic (food)	Whole country	1
17	Lánská (1990)	edible plant guide	Whole country	35
18	Marhold (2008)	cookbook	East Bohemia	28
19	Novotná et al. (2005)	ethnographic (food)	South Bohemia	5
20	Polívka (1900-1904)	plant encyclopaedia	Whole country	59
21	Rettigová, (2005)	cookbook	Whole country	8
22	Rodovský z Hustiřan (1975)	cookbook	Whole country	10
23	Roubal (1902)	ethnographic (plants)	West Bohemia	2
24	Rozmarová (1938)	cookbook	Whole country	18
25	Skopová (2009)	cookbook	Whole country	12
26	Štika (1980)	ethnographic (food)	East Moravia	18
27	Trachtová (1902)	cookbook	Whole country	14
28	Triwaldová (1909)	cookbook	Whole country	8
29	Úlehlová-Tilschová (1937)	healthy nutrition	Whole country	18
30	Úlehlová-Tilschová (1970)	ethnographic (food)	Whole country	14
31	Úlehlová-Tilschová (2011)	ethnographic (food)	Whole country	66
32	Úlehlová-Tilschová (2000)	cookbook	Whole country	17
33	Vrabec (1982)	cookbook	South Bohemia	5
34	Winter (1892)	food history	Whole country	79
35	Zíbrt (2000)	food history	Whole country	24
36	Zíbrt (2012)	food history	Whole country	26
37	Zuntová (2005)	ethnographic (food)	South Bohemia	2

4 RESULTS

4.1 Overall results

The Appendix 1 shows all wild plant species reported to be used for food purposes in the Czech Republic, 5 centuries rewards from freely available literature sources, listed in alphabetical order according to botanical families. The information includes botanical names, standard Czech names, folk names, credibility of taxonomic identification, plant parts used, use category, specific mode of use and the reference numbers of literature sources. The reference numbers were given in Table 1. In total 179 wild edible plants including 175 vascular plant species (approximately 5% of native and naturalized flora of the Czech Republic), 3 lichens, and 1 bryophyte were reported. All plants investigated belong to 57 botanical families, most represented by Asteraceae (19 species), Rosaceae (14) and Brassicaceae (11).

Only in 3 reference sources Latin names of plants were given. One hundred and fifty plant species were taxonomically documented. Twenty-nine plants could only be identified down to genus level, because of insufficient specification of the plants in reference sources. Taxonomic classification of the genus *Taraxacum* is still not resolved in the Czech Republic. According to Kubát (2002) *pampeliška* formerly considered *Taraxacum officinale* Wigg, has been recently classified as *Taraxacum* sect. *Ruderalia* Kirschner, H. Ollgaard et Štěpánek.

The edible species are consumed in a variety of ways (eaten raw, cooked or fried, ground into flour or pressed into oils). Of the twelve different categories and subcategories considered, green vegetables formed the largest group (26% of species), followed by plants used for making beverages (23%). This category covers 3 subcategories, alcoholic beverages (13%), non alcoholic (8%) and others (2%). Other food uses (14%) covers 3 subcategories, flours (9%), other uses (3%) and oils (2%). Seasonings and plants with edible underground parts each represented 11%, followed closely by fruit species (9%). Finally, category of flowers represents 4% and preservatives 2%. Some species were included in more than one category. Therefore, the total number of plants and their related uses was 284, higher than the number of species (179). It must be stressed that 7% of uses are considered as famine food so they were not commonly consumed.

Most species (62%) were very rarely mentioned (less than 3 reports), 20% were rarely represented (3-7 reports), 11% were well represented (7-15 reports), and only 7% of all species could be considered as very well represented (more than 15 reports).

Considering all food categories, the most important species according to the number of reports were: *Rubus idaeus* (52), *Sambucus nigra* L. (44), *Rosa canina* L. (38), *Junniperus communis* L. (33), *Vaccinium myrtillus* L. (30), *Viola* spp. (29), *Vaccinium vitis-idaea* L. (26), *Urtica dioica* L. (25), *Fragaria vesca* L. and *Rumex* spp. (22 each). Most species were included in different food categories such as *Sambucus nigra*, *Fragaria vesca* and *Viola* spp. which were classified in 5 categories.

Thirty-eight per cent of the investigated species were appreciated for their leaves, 17% for underground parts (bulbs, rhizomes, tubers and roots) and 14 % were important for their fruits.

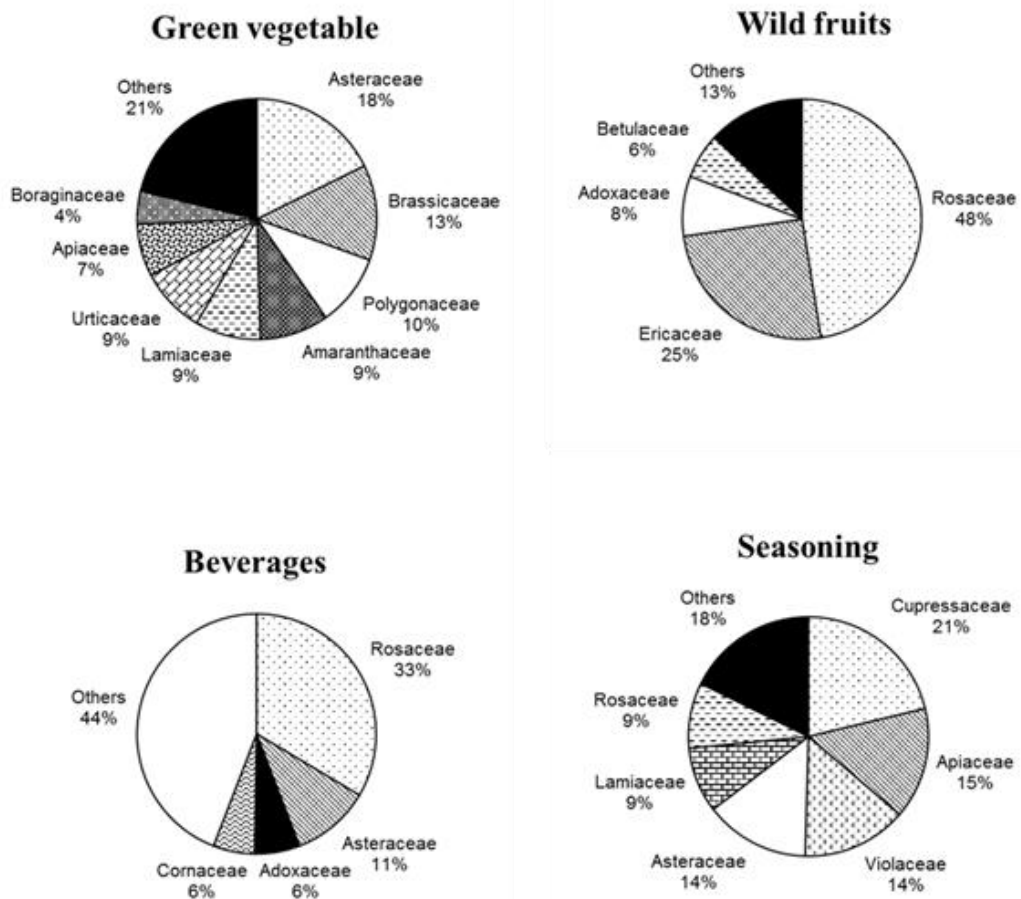


Figure 1 Botanical families with the greater number of species cited for the major categories

4.2 Species original status

Eighty-three per cent of the plants reported in this study were classified according to Danihelka et al. (2012) as autochthonous and seventeen per cent as allochthonous species. The allochthonous species were further distributed into 3 categories according to Pyšek et al. (2012). Casual species represent *Borago officinalis* L., *Campanula rapunculus* L., *Silybum marianum* (L.) Gaertner and *Levisticum officinale* W. D. J. Koch originating in Mediterranean basin, *Lepidium didymus* L. introduced from North America and *Bunias* spp. including *Bunium bulbocastanum* with the origin in other parts of Europe. Naturalized species covers Mediterranean species *Aesculus hippocastanum*, *Anthemis arvensis*, *Capsella bursa-pastoris* (L.) Med., *Physalis alkekengi* L., *Raphanus raphanistrum* L. and *Sinapis arvensis* L. and species from the other parts of Europe *Bryonia dioica* Jacq., *Centaurea* spp., *Gentiana lutea* L., *Matricaria chanomilla* L. and *Sempervivum tectorum* L. Also it covers *Acorus calamus* and *Medicago sativa* L. from Asia. The last category, invasive species, which is a subset of naturalized species, includes originally North American species *Amaranthus retroflexus* L. and *Robinia pseudoacacia* L.

4.3 Green vegetable and edible weeds

Green vegetables constitute the largest category with 74 species recorded. It includes plants whose green parts such as leaves, stalks and stolons are eaten raw or after special preparation (cooking, stewing and frying) excluding seasonings. Among species in this category *Urtica dioica* (Urticaceae) shows the highest number of reports, even though the most represented families were Asteraceae (12 species), Brassicaceae (10) and Polygonaceae (5). Most of recorded plants in this category were consumed during spring, when young shoots and opening leaf buds were eaten raw as salads. Beside *Urtica dioica*, also *Glechoma hederacea* L. (19 reports), *Rumex* spp. (16), *Taraxacum* sect. *Ruderalia* (10) and *Atriplex* spp. (10) were frequently reported species. *Glechoma hederacea*, known under the folk name *kundrlátek* was used for making soups, vegetable dishes or added to scrambled eggs. Plants of the genus *Rumex*, almost certainly *Rumex acetosa* L. or *Rumex acetosella* L., were consumed raw or used as potherb or they were chewed frequently by children and shepherds against thirst. *Atriplex* species were mostly used steamed in vegetable dishes. Probably the species used most commonly were *A. hortensis* L. and *A. patula* L. Other species of *Atriplex* genus grow very rarely in the Czech Republic or are not

mentioned as edible in PFAF database (2013). Another important species are *Bellis perennis* L., *Valerianella locusta* (L.) Betcke, *Achillea ptarmica* L., *Portulaca oleracea* L. and *Aegopodium podagraria* L., which all were used in boiled vegetable dishes. *Lepidium* spp. leaves were sometimes used as filling traditional Czech doughnuts.

4.4 Wild fruits

Excluding species used only as a seasoning, twenty-six species were recorded in this category. More than one third of these species belongs to the Rosaceae (10) species and Ericaceae (4) families. Most wild fruits of these families and species *Sambucus nigra* (16 reports), *Rubus caesius* L. (14) were consumed as a snack or made into preserves (jams, jellies, compotes). These products which consumed especially during the winter months. Some of the species such as *Rubus idaeus* (27 reports), *Rosa canina* (25), *Vaccinium vitis-idaea* (24) and *Vaccinium myrtillus* (22) were occasionally used for making fruit soups. Fruits of *Corylus avellana* were added to pastry and confectionary. Sweet sauce called “žahúr” consist of *Vaccinium myrtillus* fruits mixed with milk and honey (Stoličná, 1997) was used as topping with yeast dumplings or crumpets. *Prunus spinosa* L. and *Cornus sanguinea* L., whose fruits are astringent where collected after frozen, when it loses some of its astringency.

Other occasionally collected plants were *Sorbus* spp., *Berberis vulgaris* L., *Trapa natans* L., *Malva neglecta* Wallr., *Cornus mas* L., *Vaccinium oxycoccos* L., *Vaccinium uliginosum* L., *Fagus sylvatica* L., *Fragaria vesca*, *Rubus nemorosus* Hayne et Willd., *Physalis alkekengi*, *Rubus chamaemorus* L., *Solanum dulcamara* L., *Aronia melanocarpa* (Michx.) Elliot, *Ribes uva-crispa* L., *Crataegus* spp. and *Tilia* spp. Possibly *Sorbus aucuparia* L., *S. domestica* L., *S. aria* (L.) Crantz, *S. intermedia* (Ehrh.) Pers. or *S. torminalis* (L.) Crantz fruits were used raw or in the form of jams. Both species of the genus *Crataegus* growing naturally in the Czech Republic (*C. laevigata* (Poir.) DC. and *C. monogyna* Jacq.), including their hybrids, and could be considered.

4.5 Beverages

This category covers species used for making alcoholic and non-alcoholic beverages as well as plants used as coffee or cocoa substitutes. Most plants in this category are fruit species. The most remarkable species for making beverages are *Rubus idaeus* (16

reports), *Fragaria vesca* (10), *Cornus mas* (9) and *Rosa canina* (9), largely prepared as juices or alcoholic beverages. Making these kind of beverages was popular mainly in 20th century, because of high price of sugar in earlier times (Łuczaj, 2012).

Other plants used for making beverages were *Sambucus nigra*, *Sorbus* spp. and *Vaccinium myrtillus* (juices, wines and spirits), *Prunus spinosa* (wines and spirits), *Rubus caesius* (juices and wines), *Vaccinium vitis-idaea* (juices and spirits), *Berberis vulgaris*, *Sempervivum tectorum* (juices), *Taraxacum* sect. *Ruderalia* (wines), *Artemisia vulgaris* L., *Levisticum officinale*, *Matricaria chamomilla*, *Papaver rhoeas* L., *Quercus robur* L., *Urtica dioica* and *Veronica beccabunga* L. (spirits). Flowers of *Taraxacum* sect. *Ruderalia* and *Bellis perennis* flowers and leaves of *Acorus calamus* were used for making syrups.

Distillate *jalovcová* made from *Juniperus communis* berries is similar to Slovak *borovička* which is well known all over the world. In the Czech Republic brewing has been very popular since ancient times. For cooking homemade beers, people occasionally used hop substitutes from wild plants, rhizomes of *Acorus calamus* and *Geum urbanum* L., leaves of *Salvia pratensis* L. and *Tanacetum vulgare* L. and flowers of *Origanum vulgare* L.

Coffee or cocoa substitutes were used mostly in times of increasing prices of these exotic commodities. One of the most popular plant used for this purpose was *Cichorium intybus* L., whose roasted and ground roots were used as coffee substitute. Roots of *Scorzonera hispanica* L. were used in the same way as well as seeds of *Rosa canina* and *Astragalus glycyphyllos* L., fruits of *Quercus robur* and unspecified parts of *Vicia sativa* L. (probably seeds).

4.6 Seasoning

Out of 31 wild plants used as seasoning *Juniperus communis* (24 reports) and species of the genus *Viola* (16 reports) identified as *V. odorata*, were the most frequently reported species. Berries of *Juniperus* spp. were mostly used for seasoning game. Other plants were *Angelica archangelica* L., *Portulaca oleracea*, *Anthemis arvensis* (leaves), *Capsella bursa-pastoris*, *Allium schoenoprasum* L. (stems), *Geum urbanum* (rhizomes) and *Silybum marianum* (flowers). Very popular were seasoning spring soups made of the leaves of *Viola* spp., *Fragaria vesca*, *Achillea ptarmica* and *Vaccinium myrtillus*.

4.7 Flowers

This category was recorded for 11 species. *Sambucus nigra* (16 reports) was particularly widely used. Dough coated flowers was typical rural spring dish called *kosmatice*. Interestingly, flowers of *Robinia pseudoacacia* and *Trifolium* spp. were used in the same way but they were not as popular as *Sambucus nigra*. *Viola* and *Centaurea* genera were used for colouring foodstuffs in blue. A candied flowers, usually of *Viola* and *Centaurea* species along with *Bellis perennis*, were preserved by a coating of crystallised sugar. Flower receptacles or flower buds from *Carlina acaulis* L., *Fagus sylvatica*, *Betula pendula*, *Tilia* spp., and *Populus* spp. (probably *P. alba* L. or *P. tremula* L.) were eaten raw or boiled in vegetable dishes.

4.8 Underground parts

The use of underground plant parts (roots, rhizomes, bulbs and tubers) was recorded for 30 species. However, the frequency of citation for individual species did not exceed 4 reports. *Acorus calamus* rhizomes were preserved with sugar. Roots of *Campanula rapunculoides* L., *Phyteuma spicatum* L. were eaten raw in fresh salads. Eating boiled rhizomes of *Arum maculatum* L. and tubers of *Chaerophyllum bulbosum* were mentioned either. Bulbs of *Galanthus nivalis* L. and *Leucojum vernum* L. were usually dried and ground into porridges. *Scorzonera hispanica*, *Cyperus esculentus* L., *Onopordum acanthium* L., *Chenopodium bonus-henricus* L., *Sagittaria sagittifolia* L. and several species of the genus *Arctium* (*A. tomentosum* Mill., *A. lappa* L. and *A. minus* Bernh.) were used for preparation of salads and other vegetable dishes

4.9 Preservatives

A few species were identified to be used in this category. Fruiting branches of *Juniperus communis* were used to preserve game. Except for *J. communis*, all species were used as rennet substitutes: leaves of *Fragaria vesca*, *Galium verum*, *Rumex* spp. and *Urtica dioica* and fruits of *Corylus avellana* and *Quercus robur*. It is worth mentioning that *Urtica dioica* was also utilized for short time (2-3 days) preservation of alive crayfish.

4.10 Other uses

This category includes oils, flours, vinegars or “honey”. The term “honey” in this study is related to the product, which is similar to syrup, but the usage was like classic honey.

The oil was extracted from fruits of *Corylus avellana*, *Fagus sylvatica* and *Quercus robur* and from the seeds of *Alliaria petiolata* (M. Bieb.) Cavara et Grande, *Prunus spinosa* and *Sambucus nigra*.

A large variety of vascular plants including 3 lichens (*Cladonia rangiferina* (L.) Weber ex F. H. Wigg., *Cetraria islandica* (L.) Ach. and *Evernia prunastri* (L.) Ach.) and one bryophyte *Sphagnum palustre* L. was used for filling bread. *Cladonia rangiferina* had to be free of bitterness.

Poaceae was the most frequent botanical family represented by 6 species. Seeds of *Digitaria sanguinalis* (L.) Scop., *Glyceria fluitans* (L.) R. Br., *Echinochloa crus-galli* (L.) P. B., *Setaria viridis* (L.) P. B. subsp. *viridis* and *Milium effusum* L., as well as rhizomes of *Elymus repens* (L.) Gould were ground into flour. Other species, whose many different parts as rhizomes (*Pteridium aquilinum* (L.) Kuhn, *Arum maculatum*, *Calla palustris* L.), bulbs (*Leucojum vernum*, *Galanthus nivalis*), leaves (*Urtica dioica*), inflorescence (narrow spikes of *Typha latifolia* L.) flowers (flower buds of *Quercus robur*, *Trifolium* spp.), fruits (*Quercus robur*, *Aesculus hippocastanum*, *Trapa natans*), seeds (*Amaranthus retroflexus*, *Persicaria* spp., *Fallopia convolvulus* (L.) Á. Löve) and even inner bark of *Betula pendula*, were mainly used in times of famine. They were added to cereal flour to make bread dough or in extreme situations used to make dough solely composed of wild plants flour.

Six species (*Artemisia vulgaris*, *Betula pendula*, *Prunus spinosa*, *Rubus idaeus*, *Viola* spp. and *Salix* spp.) were used for making vinegar. Fruits of *Hypericum* spp. (probably *Hypericum perforatum* L.) and flowers of *Taraxacum* sect. *Ruderalia* were used to boil with sugar to make honey.

4.11 Children's snacks

Seven per cent of all plants across all food categories were reported as children's snacks, including mostly species already mentioned in category of fruits, e.g. immature fruits of *Malva neglecta* or species from family Rosaceae. Leaves of *Oxalis acetosella* L., stalks of *Carex* spp., and flower receptacles of *Carlina acaulis* are other examples of this

category. Furthermore, rhizomes of *Tragopogon pratensis* L. and *Polypodium vulgare* L., tubers of *Lathyrus tuberosus* L. and *Lathyrus vernus* (L.) Bernh., first year root of *Oenothera biennis* L. were used by children as well. In spring fresh tree sap of *Betula pendula* and *Acer* spp. (*Acer platanoides* L., *A. pseudoplatanus* L., *A. negundo* L., *A. saccharinum* L., *A. tataricum* L., *A. palmatum* Thunb. and *A. campestre* L.) was drunk mostly by children.

The use of some wild plants as children's snack food could be a relic of general use of these plants by adults when they were young.

5 DISCUSSION

5.1 Comparison with other countries

The presented list of wild edible plants covers 175 vascular species (5% of the Czech flora). It is difficult to classify Czech lands in Luczaj's categories (2008) herbophobic/herbophylic country. In comparison with Poland, which was classified as herbophylic country, as was recorded 112 plants (3.7% of Polish flora) (Łuczaj, 2008), and Slovakia, where 106 species (3% of Slovak flora) was listed (Łuczaj, 2012), we can say that the Czech people are herbophylic. Unfortunately, it is uneasy to compare the use of wild food plants in the Czech Republic with other neighbouring countries, Austria and Germany, as they lack similar ethnobotanical reviews. However, the author has found some field ethnobotanical studies conducted in these countries indicating the use of wild edible plants (Schunko and Vogl, 2010; Schunko et al., 2012; Pieroni and Gray, 2008). Comparing our study with south European countries, Czechia should be classified as herbophobic. Spain and Sicily are typical herbophylic countries. According to Tardío et al. (2006), in Spain wild culinary plants constitutes 6% of local flora. Lentini and Venza (2005) recognized in Sicily, an island 3 times smaller than Czechia, 188 wild edible species (6.2 % of the flora). To emphasize this is even higher number as in our study. In Spanish region Catalonia was listed 75 edible species (Bonet and Vallès, 2002). Likewise in Madrid (8000 km²) 123 species was recognized as edible (Tardío et al., 2005). In Bosnia-Herzegovina, smaller country than the Czech Republic, was listed around 10 % of flora (Redzic, 2006). These studies are other examples of Mediterranean countries with rich heritage of food plants. To sum up Czech lands according to this study should be classified as herbophobic.

According to Łuczaj (2007) two reasons could be responsible for this contrast. One factor is the gradual impoverishment of plants towards to north. Czech flora is poorer than in Mediterranean countries, thus the choice of species is poorer as well. Czech flora has 3,557 species, compared to around 6,700 species in Italy (Conti et al., 2005.) or 7,000 in Spain (Tardío et al., 2005). On the other hand in two small regions in Cyprus, with a flora around 2,000 species, the use of 78 species as wild food plants was recorded (Della et al., 2006). Therefore, this indicates higher significance of culinary habits, the other factor. In the Mediterranean basin people use wild plants mainly as appetizers, spices or

ingredients of omelettes, salads and beverages. In countries as the Czech Republic, Slovakia or Poland people use wild plants as staple food (Guarrera et al., 2006; Leonti et al., 2006; Tardío et al., 2005). The diversity could be caused by different climate. In countries in the Central Europe, with temperate climate, people do not have to use so much additives plants for keeping foods from spoiling, whereas in Mediterranean countries there is higher preference for such plants. Another explanation is that Central European countries are agricultural with regular rainfalls and a large proportion of arable land. Thus vegetable could be easily cultivated. The mountainous countries of the Mediterranean Basin are mostly covered by semi-arid pastures. Therefore, cultivation of field crops is more difficult and wild plants were used instead of cultivated vegetable (Łuczaj, 2008). Another aspect of different climate was mentioned in Łuczaj (2010). Slavic people mostly avoid bitter tastes because they occupy cold temperate climates with sufficient rainfalls where large amounts of non-bitter green vegetables are available in spring. In southern Europe, where rainfall is lower, herbaceous plants tend to be more bitter and harder. People are used to eat them and they do not avoid bitter tasted plants, e.g. *Lactuca viminea* (L.) J. Presl. & C. Presl. or *Reseda alba* L. (Leonti et al., 2006).

In accordance with Łuczaj et al. (2013) in Croatia many wild species are still sold in the markets, e.g. *Sonchus oleraceus* L., *Papaver rhoeas*, *Taraxacum* sp. These species are also collected in the Czech lands, even though they are not sold on the market. Comparing to France, there we can see dandelion sold even in the supermarkets. Similarly in Germany where cooked green sauce from dandelion was proclaimed by J. W. Goethe (Ptáček, 2011). As against to Hungary (Dénes et al., 2012), use of most wild fruits and vegetable is very similar to the Czech Republic with a difference especially in consumption of the species from the Liliaceae family. In Czechia there was no complete absence of using this family, contrary to Hungary where species of Liliaceae constitute one of the most important groups in categories green vegetable or underground parts as well as in several Mediterranean countries.

The use of wild fruits of Rosaceae and Ericaceae families is nearly identical in all European countries (Dénes et al. 2012; Kalle and Sõukand, 2012; Łuczaj, 2012; Łuczaj and Szymański, 2007; Svanberg, 2009; Tardío et al., 2006). With decreasing price of sugar in the early 20th century, European people have found enthusiasm in collecting wild fruits and turning them into jams or pasteurized compotes and it became a part of everyday cuisine (Łuczaj, 2012). The proportion of families in other food categories in the Czech Republic

context it is the most similar to Slovakia, Poland and Spain (Łuczaj, 2012; Łuczaj and Szymański, 2007; Tardío et al., 2006). In these countries Asteraceae dominates in the category of vegetable, Apiaceae and Lamiaceae among seasonings.

If we focus on non-vascular plants as *Cetraria islandica* and *Cladonia* spp., both were used in Estonia and in Bosnia and Herzegovina. Analogous to this study, there was report of using them for making bread ingredient during times of famine (Kalle and Sõukand, 2012; Redzic et al., 2010).

5.2 Unidentified species needing verification

In a few records neither scientific species nor genus name could be matched, mostly due to the fact that folk name is commonly used to describe two or three genera, e.g. *hřebíček* for *Geum urbanum* L. and *Achillea millefolium* L. or *volový jazyk* for *Echium vulgare* L. and *Fumaria officinalis* L. The liqueur from *zeměžluč* was possibly made from *Corydalis cava* Schweigger & Korte or *Centaurium erythraea* Rafn. The usage of *routa planá* probably refer to species *Ruta montana* Mill. or *Fumaria officinalis* L. *Žebříček* was added to soups and the name may refer to *Potentilla anserina* L. or *Achillea millefolium*. Other plants, such as *husí topol*, *jelení roh* and *pět bratří*, could not be verified taxonomically.

5.3 Cultivated versus wild species

Wild species could be closely related to cultivated plants. Most of plants noticed in this study grow in managed ecosystems such as forests, meadows or hedgerows. Few species can get strict status of managed plants. It means that they grow naturally but are helped by humans (Pardo-de-Santayana et al., 2005). This is the case of *Sambucus nigra* and *Cornus mas*, which mostly grow in home gardens, village surroundings or are set out in the parks. Another examples could be thorny bushes as *Crataegus* spp., *Prunus spinosa* and *Rosa canina*, which often grow in hedgerows. Some species such as *Corylus avellana* can be considered wild, managed and cultivated as well. These species grow wild in forests. However, they could be find around some villages either. Herbs e. g. *Levisticum officinale*, *Mentha* spp. and *Origanum vulgare* are commonly sold in the markets. They are cultivated, but it is possible to collect them in the wild. Another example of plant offered on the market might be *Valerianella locusta*, which cultivation is rather recent and the

utilization of this crop is not yet common among the Czech population. Furthermore, vegetable species *Daucus carota* L. and *Pastinaca sativa* L. are also mainly grown as horticultural or field crops. We must bear in mind that many wild species could replace common vegetables sold on the markets, especially when the offering of vegetable species is very low (Arcidiacono, 2002). In place of spinach (*Spinacia oleracea* L.) people may use species from Chenopodiaceae family or *Urtica dioica*. As listed Łuczaj (2010) in his study from Poland, leaves of *Glechoma hederacea* were used in soups „instead of parsley“ or „like parsley“ suggesting that parsley (*Petroselinum crispum* (Mill.) A.W.Hill) could be replaced by *Glechoma* sp. Wild species differ from cultivated ones in chemical compositions and nutritional value. Wild plants contained lower amounts of nitrates, probably due to the environmental conditions where they grow, mainly regarding the absence of fertilizers (Zeghichi et al., 2003). In general wild species shows higher concentrations and diversity of secondary compounds. In exchange of sweeter taste and less fibre, cultivated species have lower nutritive value. (Johns, 1990).

5.4 Green vegetable and edible weeds

Weeds are wild plants, which are regularly present in smaller or larger quantities among cultivated plants in cases when these plants are in some manner detrimental to crops and reduces not only quantity, but also quality (Baudyš, 1941).

According to HERBA database (2013) twenty-two per cent of appreciated plants are considered weedy species. According to Pyšek et al. (2012), most of them were autochthonous species with the exception of 6 naturalized plants and one invasive species. Consumption of a large number of weedy species as vegetable plants is a characteristic feature of agricultural communities. In such societies the utilization of weeds as food, provides extra calories during food shortages. In general, when the danger of food scarcity was removed, some societies reject weeds as vegetable as a symbol of famine. Sometimes at least some of famine vegetables were preserved as a traditional foods or food additives (Łuczaj, 2008).

5.5 Possible toxicity and medicinal edibles

Many wild species compared to cultivated ones have some obvious advantages as they are good source of vitamins and minerals (Tardío et al, 2006). Underground organs of

plants are valuable source of carbohydrates, proteins and fats. Young shoots and leaves are rich in vitamin C and carotene (Redzic, 2006), so many wild food plants are appreciated for their antioxidant activity (Pereira et al., 2011). Moreover it is well known that many of them could be used for medicinal purposes (Bonet and Vallès, 2006). However, some of the wild plants consumed commonly in Czech Republic might have some toxic effects as shown in the following examples.

Chenopodium album L., *Rumex* spp. (Giul et al., 1996) and *Polygonum* spp., *Oxalis acetosella* (Krčálová, 2009) contains oxalic acid, which gives plants their acrid flavour. This chemical agent in large quantities can lock up some of the nutrients in the food. Cooking the plant will reduce its content of oxalic acid (Savage et al. 2000). Despite this, people with tendency to kidney disease or kidney stones should be aware of including these plants in their diet (Palaniswamy et al., 2004). On the other hand leaves of *Rumex acetosa* L. are taken as diuretic and *Rumex crispus* L. as emollient and laxative (Obón and Rivera in Rivera-Núñez and Obón de Castro, 1993, p. 122). Pregnant women should avoid *Artemisia vulgaris* and *Cichorium intybus* as they may stimulate the uterus to contract and induce abortion (Ernst, 2002). In medicinal purposes leaves of *Cichorium intybus* are used as hypoglycemic (Rigat et al., 2009). Although saponins in *Medicago sativa* (Pecetti et al., 2006), *Primula veris* L. and *Aesculus hippocastanum* (Moravcová, 2006) are poisonous and may cause the breakdown of red blood cells, they are poorly absorbed by the human body. They are quite bitter but they can be removed by leaching in running water. Thorough cooking and changing the water once, will also should remove most of them (PFAF, 2013). Furocoumarins in the genus *Angelica* increase skin sensitivity to sunlight so the consumption may cause dermatitis (Skopalová, 2008). Problems with liver damage or liver cancer could be associated with consumption of *Borago officinalis* (Dodson and Stermitz, 1986), *Symphytum officinale* L. (Ernst, 2002) and *Senecio vulgaris* L. (Cao et al., 2008) as they contain toxic pyrrolizidine alkaloids which can have a cumulative effect upon the liver (Prakash et al., 1999). Repeated use of *Juniperus communis* cause diarrhoea and large doses of the fruit could lead to renal damage (PFAF, 2013). *Solanum dulcamara* overdose may paralyse the central nervous system, slow heart, low temperature, dilated pupils, delirium and even death (Smith et al., 2008). In case of *Pteridium aquilinum*, there are a lot of reports connect with the possible health risks. The huge quantity of spores released by large areas are suggested to be implicated in stomach cancers (Rasmussen et al., 2013). Also substance (thermolabile thiaminase) in the leaves of bracken deprive the

body of vitamin B1 (Vetter, 2009). On the other hand this substance could be damaged by cooking. Seeds of *Prunus spinosa* produce cyanogenic glycosides (Kumarasamy et al., 2003), which is readily detected by its bitter taste. However, when cyanogenic plants are eaten slowly or over a period of time there may be no harmful effect of cyanide poisoning (Jones, 1998). Medicinally is *Prunus spinosa* used as sedative (Rigat et al., 2009). Among other poisonous species could be mentioned fresh roots of *Acorus calamus* (Bjornstad et al., 2009). Surface of all species from Araceae family coats calcium oxalate crystals, microscopic double needles. When plants are eaten fresh, crystals cause unpleasant sensation like formication sense in mouth, tongue and throat (Paull et. al., 1999).

Many species are not toxic but surroundings where they grow could influence their suitability for consumption. Species from Amaranthaceae, Brassicaceae and Asteraceae family are usually perfectly wholesome, even though when they grow on nitrogen rich soils they accumulate nitrates in their leaves. Nitrate *per se* is relatively non-toxic, but its metabolites and reaction products e.g., nitrite, nitric oxide and N-nitroso compounds, which implicate adverse health effects such as methaemoglobinaemia and carcinogenesis. This problem occurs in the areas where chemical fertilizers have been fed (Alexander et al., 2008). *Nasturtium officinale* W. T. Aiton is very wholesome and nutritious plant, nevertheless some care should be taken if collected from the wild. If the species grows in water draining from fields grazed by animals, especially sheep, it should not be eaten raw as the water could be infested with the liver fluke parasite (Fica et al., 2012). Interestingly, in case of *Vaccinium uliginosum*, which large quantities lead to headaches, the plant is not toxic but the probable reason is the infestation by a fungus *Sclerotinia megalospora* (Batra, 1983). *Rosa canina* and *Urtica dioica* are neither toxic at all, but the consumption could be unfavourable due to their hairs. In case of *Rosa canina*, there is a layer of hairs around the seeds just under the flesh of the fruit (Polívka, 1900-1904). It is better get clear of them as they can irritate the mouth and digestive tract if ingested (Stach, 1938). The leaves of *Urtica dioica* have stinging hairs which irritate to the skin. This is neutralized by cooking (Lust in Mithril and Dragsted, 2012), p. 4462). Nevertheless, just young leaves should be eaten as older one develop gritty particles called cytoliths (Upton and Dayu, 2013).

To sum up, a lot of more or less toxic species exist amongst the wild edibles. Fortunately, most of toxic agents could be destroyed by cooking or drying as mentioned above, nonetheless we must be careful about the quantities (Tardío et al., 2006). According to Rivera-Núñez and Obón de Castro (1993) wild food plants play a major role as the

preventive medications through nutritional habit considered as healthful (rightly or not) and a significant part in the healing repertory. In this chapter, I should mention liquors and other beverages as they are often considered digestive. These plants are called folk functional foods and they represent suitable target for further chemical studies to develop new products in the interface of diet and medicine (Rigat et al., 2009)

5.6 Past and future perspective of wild food plants

In humankind history culinary habits were never static. During the communist era, Czech people were focused mostly on collecting wild fruits. On the other hand during the last few years we can observe a slow revival in the use of wild plants. Thanks to local food producers who are trying to popularise local gastronomic products, people have rediscovered forgotten use of species from the past. In many health food shops now we can find alternatives to coffee from *Cichorium intibus* or from acorns but they are appreciated mostly by people who cannot drink caffeine. Likewise in Poland (Łuczaj, 2007) in the Czech Republic drinking tree sap from *Betula pendula* and *Acer* spp. was gradually disappearing during the beginning of 20th century. However, it is now revitalising as a part of health fashion. In case of *Urtica dioica*, which was widely used up until the beginning of the 20th century (Łuczaj, 2012) the usage is practically vanished. The plant was associated with poverty and nowadays it is used just by people who particularly like it. Until today a few species remain as a common ingredient in household kitchens, mostly seasoning as seeds of *Carum carvi* and juniper berries (*Juniperus communis*). During spring the situation is quite different, mostly through the strong influence of media which propagate trend of spring purification. *Viola* spp., *Bellis perennis*, *Urtica dioica* or *Taraxacum* spp. are principal examples of spring plants. Nevertheless wild plants collection is restricted by growing number of cities and roads. People avoid the collection in these areas and other polluted locations (Łuczaj et al. 2012). On the other hand the Czech Republic is still open to people who want to collect these plants, compared to England, which has so called trespassing law. People living there have strictly limited public access to paths, roadsides, seaside and common lands. Furthermore, it is noteworthy that selling of wild plants could be regulated as well (Łuczaj et al. 2012). This regulation is applied especially to fungi regarding to the danger of poisoning. For example in case of *Russula* spp., which is commonly eaten specie, nonetheless selling is restricted due to its

substitution to the most poisonous mushroom *Amanita phalloides* (Fr.) Link. That is why in most Eastern European countries selling the wild food is restricted to wild berries, herbs for making tea and some specific mushrooms. (Łuczaj et al. 2012).

Intrinsigly, recently consumption of wild plants is being enlarged by people living in cities. (Bonet and Vallès, 2002). In Croatia, several respondents mentioned that there is a demand for vegetable mixtures of wild plants by young health-oriented people (vegetarians etc.). It is without doubt that selling wild vegetable mixes has long continuous tradition in Dalmatia. However, very few restaurants on the coast of Croatia cook with this vegetable product. Nevertheless, many people in Zagreb, the capital of Croatia, buy the mixes imported from the coast (Łuczaj et al., 2013).

Today, in times of decreasing quality of foods sold in supermarkets, collecting wild foods have got a lot of media attention. Edible plants are advertised in culinary magazines, webpages or television shows. In the past, people gained information from parents or grandparents and it was a cognitive process (smelling plants and learning their location), not only abstract learning. Probably that is why workshops and seminars are so popular as being more akin to the tradition practices (Łuczaj et al. 2012). It must be mentioned that one popular wild food guide in whole Easter Europe and even in Spain was written by the Czech author Dagmar Lánská (Łuczaj et al. 2012). Last year, a thesis on wild food plants has been published. It was focused on teaching programme listing 60 edible species (Dudková, 2012). It follows growing interest of rediscovering wild edible plants by people. Modern agriculture should turn profit and through agricultural and rural development policies support the creation for profit activities, such as the controlled gathering of weedy herbs. Mainly they should start with re-introduction of old and archaic crops and start development of agro- and eco- tourism and farmer's market (Turner et al., 2013). Furthermore wild edible plants comprise an important phytogenetic heritage as a genetic source for breeding programmes. Ethnobotanical studies may possibly point out species suitable for further cultivation (Branca, 2002). In the Czech Republic at least two studies has been elaborated for using wild species as vegetable crops. One was focused on *Silene vulgaris* (Moench) Garcke and *Sinapis arvensis* (Sojka, 2012) and other on *Taraxacum* sect. *Ruderalia* and *Urtica dioica* (Ptáček, 2011), both mentioned in this paper as wild plants. This is very important aspect because according to FAO (2009) "nutrition and biodiversity converge to a common path leading to food security and sustainable development" and that "wild species and intraspecies biodiversity have key roles in global

nutrition security.” Efforts to conserve biodiversity and preserve traditional food and farming practices need to be combined with modern practices to enhance them. Moreover wild edible species offer a potentially critical role against food scarcity caused by a changing climate. They could play an important role during periods of lower agricultural productivity associated with climate changes (Fentahun and Hager, 2009). Analogous to situations mainly during 18th and first half of the 19th centuries, when in Europe came repeatedly periods of food scarcity caused by crop failures and when many peasants had to look for alternatives even to traditional flour from cereals (Winter, 1892).

Ethnobotanical studies indicate that more than 7000 species have been used at some stage during the human history. Nowadays 50% of the world’s daily requirement of proteins and calories are covered by three crops: wheat, maize and rice (Jaenicke and Höschle-Zeledon, 2006). Surprisingly wild foods are excluded from official statistics on economic values of natural resources. By FAO estimates, around one billion people use wild foods (including wild animals) in their diet. It is obvious that wild foods form a significant part of the global food basket.

CONCLUSION

This review investigated use of wild food plants in Czechia. At least 175 vascular species, 3 lichens and 1 bryophyte have been reported from 37 literature sources. Literature sources were focused on Czech food history, culinary use of wild plants, ethnography and botany. All plants belong to 57 botanical families, most represented by Asteraceae, Rosaceae and Brassicaceae. Most reported species were *Rubus idaeus*, *Sambucus nigra* and *Rosa canina*. Of the twelve different use category considered, green vegetable formed the largest group, closely followed by plants used for making beverages. Thirty-eight per cent of the investigated species were appreciated for their leaves, 17% for underground parts (bulbs, rhizomes, tubers and roots) and 14 % were important for their fruits. It should be stressed that 7% of reported plants are considered as famine food so they were not commonly consumed. In fact, most wild edible plants are not now gathered. However, some species are marketed as coffee substitutes, acorn flour and some vegetable or collected by people who enjoy walking and collecting wild edibles.

In comparison with Poland and Slovakia, where relevant ethnobotanical research was carried, the proportion of families consumed in Czechia is very similar. On the other hand, compared to the south European countries the proportion of flora utilized as edibles is much lower.

Accordingly this study further special ethnobotanical research in the ethnographic archives is recommended as well as in the field to find all possible wild edible plants. Most of this traditional wisdom only survive in the memories of the elderly and nowadays is in danger of disappearing. This review attempts to gather these information from literature sources to complete ethnobotanic data to potential future monograph of wild food plants of Europe and simplify research into new food sources.

REFERENCES

- Alexander J, Benford D, Cockburn A, Cravedi J-P, Dogliotti E, Di Domenico A et al. 2008. Opinion of the Scientific Panel on Contaminants in the Food chain on a request from the European Commission to perform a scientific risk assessment on nitrate in vegetables. *The EFSA Journal* 689: 1-79.
- Arcidiacono S. 2002. *Premesse, Etnobotanica nella provincia di Catania, Nuova Zangara Stampa, Siracusa: 5-6.*
- Batra LR. 1983. *Monilinia vaccinii-corymbosi (Sclerotiniaceae): Its biology on blueberry and comparison with related species. Mycologia 75 (1): 131-152.*
- Baudyš E. 1941. *Plevele a jejich hubení. Zemský odbor Spolku českých zemědělských inženýrů, Brno, 234 pp.*
- Beranová M. 2001. *Tradiční české kuchařky: jak se vařilo před M.D. Rettigovou. Libri, Praha, 279 pp.*
- Beranová M. 2005. *Jídlo a pití v pravěku a ve středověku. Academia, Praha, 359 pp.*
- Bjornstad K, Helander A, Hulten P, Beck O. 2009. Bioanalytical investigation of asarone in connection with *Acorus calamus* oil intoxications. *J Anal Toxicol* 33: 604-609.
- Bonet MÀ, Vallès S. 2002. Use of non-crop food vascular plants in Montseny biosphere reserve (Catalonia, Iberian Peninsula) [online]. *International Journal of Food Sciences and Nutrition* 53 (3): 225-248. Available at: <http://informahealthcare.com/doi/abs/10.1080/09637480220132841> (accessed on 10 March 2013).
- Branca F. 2002. *Indirizzi per la coltivazione di specie spontanee di interesse alimentare in Sicilia, Etnobotanica nella provincia di Catania. Nuova Zangara Stampa, Siracusa: 55-63.*
- Cao Y, Colegate SM, Edgar JA. 2008. Safety assessment of food and herbal products containing hepatotoxic pyrrolizidine alkaloids: interlaboratory consistency and the importance of N -oxide determination [online]. *Phytochemical Analysis* 19 (6): 526-533. Available at: <http://doi.wiley.com/10.1002/pca.1079> (accessed on 6 April 2013).

- CBD (Convention on Biological Diversity). 2005. Report of the consultation on the cross-cutting initiative on Biodiversity for Food and Nutrition, Brasilia, 12–13 March [online]. Available at: <http://www.cbd.int/doc/meetings/agr/ibfn-01/official/ibfn-01-03-en.pdf> (accessed on 9 April 2013).
- Conti F, Abbate G, Alessandrini A, Blasi C. 2005. Annotated checklist of the Italian vascular flora. Roma, Palombi.
- Danihelka J, Chrtek Jr. J, Kaplan Z. 2012. Checklist of vascular plants of the Czech Republic. *Preslia* 84: 647–811.
- Della A, Paraskeva-Hadjichambi D, Hadjichambis ACh. 2006. An ethnobotanical survey of wild edible plants of Paphos and Larnaca countryside of Cyprus [online]. *Journal of Ethnobiology and Medicine* 2 (34). Available at <http://www.ethnobiomed.com/content/2/1/34> (accessed on 13 March 2013)."
- Dénes A, Papp N, Babai D, Czúcz B, Molnár Z. 2012. Wild plants used for food by Hungarian ethnic groups living in the Carpathian Basin [online]. *Acta Societatis Botanicorum Poloniae* 81(4): 381–396. Available at <https://pbsociety.org.pl/journals/index.php/asbp/article/view/asbp.2012.040> (accessed on 13 March 2013).
- Dodson CD, Stermitz FR. 1986. Pyrrolizidine Alkaloids from Borage (*Borago officinalis*) Seeds and Flowers [online]. *Journal of Natural Products* 49 (4): 727-728. Available at: <http://pubs.acs.org/doi/abs/10.1021/np50046a045> (accessed on 6 April 2013).
- Dudková P. 2012. Historické a současné možnosti využití jedlých planých rostlin na území České republiky. Diploma thesis. Univerzita Palackého v Olomouci. Olomouc
- Ernst E. 2002. Herbal medicinal products during pregnancy [online]. *BJOG: An International Journal of Obstetrics and Gynaecology* 109 (3): 227-235. Available at: <http://doi.wiley.com/10.1111/j.1471-0528.2002.t01-1-01009.x> (accessed on 30 March.2013).
- FAO. 2009. The state of food insecurity in the world. Rome, Italy: FAO
- Fentahun MT, Hager H. 2009. Exploiting locally available resources for food and nutritional security enhancement: wild fruits diversity, potential and state of exploitation in the Amhara region of Ethiopia [online]. *Food Security* 1 (2): 207-219. Available from <http://link.springer.com/article/10.1007%2Fs12571-009-0017-z> (accessed on 17 March 2013).

- Fialová JA. 1958. Moderní kuchařka pro ženu i muže. Státní nakladatelství technické literatury, Praha, 305 pp.
- Fialová JA. 1989. Česká kuchařka. Praha. Merkur, 405 pp.
- Fialová JA, Styblíková K. 1983. Česká kuchyně tradiční i dnešní, sváteční i všední. Artia, Praha, 232 pp.
- Fica A, Dabanch J, Farias C, Castro M, Jercic MI, Weitzel T. 2012. Acute fascioliasis—clinical and epidemiological features of four patients in Chile [online]. *Clinical Microbiology and Infection* 18 (1): 91-96. Available at: <http://doi.wiley.com/10.1111/j.1469-0691.2011.03575.x> (accessed on 6 April 2013).
- Flora Europaea. 2013. Royal Botanic Garden Edinburgh [online database]. Available at: <http://rbg-web2.rbge.org.uk/FE/fe.html> (accessed on 30 January 2013).
- Guarrera PM, Salerno G, Caneva G. 2006. Food, flavouring and feed plant traditions in the Tyrrhenian sector of Basilicata, Italy [online]. *Journal of Ethnobiology and Ethnomedicine* 2 (37). Available at <http://www.ethnobiomed.com/content/2/1/37> (accessed on 12 March 2013).
- Guil JL, Torija M E, Giménez J J, Rodríguez-García I, Giménez A. 1996. Oxalic Acid and Calcium Determination in Wild Edible Plants [online]. *Journal of Agricultural and Food Chemistry* 44 (7): 1821-1823. Available at: <http://pubs.acs.org/doi/abs/10.1021/jf950472a> (accessed on 29 March 2013).
- Gumowska I. 1994. Zdraví na talíři: o výživných a léčivých vlastnostech bylin, ovoce a zeleniny. Mladá fronta, Praha, 190 pp.
- Hajný A. 1912. Z lidové kuchyně v okolí Nymburka. In: Zíbrt Č. (ed). *Český lid XI*. F. Šimáček, Praha, pp. 311.
- Heinrich M, Leonti M, Nebel S, Peschel W. 2005. ‘Local food-nutraceuticals’: an example of a multidisciplinary research project on local knowledge. *Journal of Physiology and Pharmacology* 56: 5–22.
- HERBA. 2013. Weed atlas [online database]. Version 2.2. Available at <http://www.jvssystem.net/app19/Welcome.aspx> (accessed on 19 March 2013)
- Jaenicke H, Hoschle-Zeledon I. (eds). 2006. Strategic framework for underutilized plant species research and development. Rome, Italy: ICUC, Colombo and Global Facilitation Unit for Underutilized Species.

- Jakouběová V. 2000. "Chléb se peče, polévka se už vaří": lidová strava. Okresní muzeum Českého ráje, Turnov, 13 pp.
- Jakouběová V. 2009. V babiččině kuchyni od Tří králů do Vánoc: lidové obyčeje a lidová strava v Pojizeří. Muzeum Českého ráje, Turnov, 159 pp.
- Janalík F, Marhold J. 2003. Lovecká kuchařka, aneb, Zvěřina a ryby nejen na talíři. Plot, Praha, 151 pp.
- Janča J, Zentrich JA. 1994-1999. Herbář léčivých rostlin. Eminent, Praha. Vol 1-6.
- Janků-Sandtnerová M, Janků F. 2007. Klasická česká kuchařka, kniha rozpočtů a kuchařských předpisů. XYZ, Praha, 423 pp.
- Johns T. 1990. With bitter herbs they shall eat it: Chemical ecology and the origins of human diet and medicine. The University of Arizona Press, Tuscon, Arizona.
- Jones DA. 1998. Why are so many food plants cyanogenic? *Phytochemistry* 47 (2): 155-162.
- Kaizl L. 1944. Lidová výživa: význam lidové stravy, její zvláštnosti, návrat k lidové stravě a dnešní doba. Část I. Strava v Podkrkonoší. Dr. Eduard Grégr a syn, Praha, 154 pp.
- Kalle R, Sõukand R. 2012. Historical ethnobotanical review of wild edible plants of Estonia (1770s-1960s) [online]. *Acta Societatis Botanicorum Poloniae*, 81 (4): 271-281. Available at <https://pbsociety.org.pl/journals/index.php/asbp/article/view/asbp.2012.033> (accessed on 3 March 2013)
- Karlík F (ed.). 2007. Jak se vaří na venkově: seznámení se staršími i novými úpravami jídel lidové kuchyně. Agentura VPK, Praha, 106 pp.
- Krčálová K. 2009. Nutriční aspekty kyseliny šťavelové. Bachelor thesis. Masarykova univerzita. Brno.
- Kubát K (ed.) 2002. Klíč ke květeně České republiky. Academia, Praha, 927 pp.
- Kubátová M. 2003. Kouzlo rodinného stolu. Sláfká, Praha, 146 pp.
- Kumarasamy Y, Cox PJ, Jaspars M, Nahar L, Sarker SD. 2003. Cyanogenic glycosids from *Prunus spinosa* (Rosaceae) [online]. *Biochemical Systematics and Ecology* 31 (9): 1063-1065. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S0305197803000632> (accessed on 6 April 2013).
- Lánská D. 1990. Plané rostliny v kuchyni. Artia, Praha, 159 pp.

- Lentini F, Venza F. 2007. Wild food plants of popular use in Sicily [online]. *Journal of Ethnobiology and Ethnomedicine* 3 (15). Available at <http://www.ethnobiomed.com/content/3/1/15> (accessed on 10 March 2013).
- Leonti M, Nebel S, Rivera D, Heinrich M. 2006. Wild gathered food plants in the European Mediterranean: a comparison analysis. *Economic Botany* 60 (2): 130-142.
- Łuczaj Ł. 2008. Archival data on wild food plants used in Poland in 1948 [online]. *Journal of Ethnobiology and Ethnomedicine* 4 (4). Available at: <http://www.ethnobiomed.com/content/4/1/4> (accessed on 30 March 2013).
- Łuczaj Ł. 2010. Changes in the utilization of wild green vegetables in Poland since the 19th century: A comparison of four ethnobotanical surveys [online]. *Journal of Ethnopharmacology* 128 (2): 395-404. Available at <http://linkinghub.elsevier.com/retrieve/pii/S0378874110000553> (accessed on 9 March 2013).
- Łuczaj Ł. 2010. Plant identification credibility in ethnobotany: a closer look at Polish ethnographic studies [online]. *Journal of Ethnobiology and Ethnomedicine* 6 (36). Available at <http://www.ethnobiomed.com/content/6/1/36> (accessed on 3 March 2013).
- Łuczaj Ł. 2012. Ethnobotanical review of wild edible plants of Slovakia [online]. *Acta Societatis Botanicorum Poloniae* 81 (4): 245-255. Available at <https://pbsociety.org.pl/journals/index.php/asbp/article/view/asbp.2012.030> (accessed on 2 March 2013).
- Łuczaj Ł, Pieroni A, Tardío J, Pardo-de-Santayana M, Sõukand R, Svanberg I, Kalle R. 2012. Wild food plant use in 21st century Europe: the disappearance of old traditions and the search for new cuisines involving wild edibles [online]. *Acta Societatis Botanicorum Poloniae* 81 (4): 359-370. Available at <https://pbsociety.org.pl/journals/index.php/asbp/article/view/asbp.2012.031> (accessed on 18 March 2013).
- Łuczaj Ł, Szymański WM. 2007. Wild vascular plants gathered for consumption in the Polish countryside: a review [online]. *Journal of Ethnobiology and Ethnomedicine* 3(17). Available at <http://www.ethnobiomed.com/content/3/1/17> (accessed on 3 March 2013).

- Łuczaj Ł, Zovko-Končić M, Miličević T, Dolina K, Pandža M. 2013. Wild vegetable mixes sold in the markets of Dalmatia (southern Croatia) [online]. *Journal of Ethnobiology and Ethnomedicine* 9 (1). Available at: <http://www.ethnobiomed.com/content/9/1/2> (accessed on 13 March 2013).
- Marhold J. 2008. *Krkonošská kuchařka*. Ikar, Praha, 435 pp.
- Mithril Ch, Dragsted LO. 2012. Safety evaluation of some wild plants in the New Nordic Diet [online]. *Food and Chemical Toxicology* 50: 4461–4467. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S0278691512006898> (accessed on 6 April 2013).
- Moravcová J. 2006. *Biologicky aktivní přírodní látky*. Vysoká škola Chemicko-technologická. Praha.
- Nebel S, Pieroni A, Heinrich M. 2006. *Ta chòrta*: Wild edible greens used in the Graecanic area in Calabria, Southern Italy [online]. *Appetite* 47: 333-342. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S0195666306003989> (accessed on 9 April 2013).
- Novotná S et al. 2005. Tradiční recepty současných pamětníků. In Šafr P, Taureová I (eds.). *Jak se dříve vařivalo*. Jihočeské muzeum, České Budějovice, pp 3-5. Sborníček prací členů Národopisného sdružení při Jihočeském muzeu v Českých Budějovicích, vol 51.
- Palaniswamy UR, Bible BB, McAvoy RJ. 2004. Oxalic acid concentrations in Purslane (*Portulaca oleraceae* L.) is altered by the stage of harvest and the nitrate to ammonium ratios in hydroponics. *Scientia Horticulturae* 102 (2): 267-276.
- Pardo-de-Santayana M, Tardío J, Morales R. 2005. The gathering and consumption of wild edible plants in the Campoo (Cantabria, Spain) [online]. *International Journal of Food Sciences and Nutrition* 56 (7): 529-542. Available at <http://informahealthcare.com/doi/abs/10.1080/09637480500490731> (accessed on 9 March 2013).
- Paull RE, Chung-Shih T, Gross K, Uruu G. 1999. The nature of the taro acidity factor. *Postharvest Biology and Technology* 16: 71–78.

- Pecetti L, Tava A, Romani M, De Benedetto MG, Corsi P. 2006. Variety and environment effects on the dynamics of saponins in lucerne (*Medicago sativa* L.) [online]. *Europ. J. Agronomy* 25: 187–192. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S1161030106000529> (accessed on 6 April 2013).
- Pereira C, Barros L, Carvalho AM, Ferreira ICFR. 2011. Nutritional composition and bioactive properties of commonly consumed wild greens: Potential sources for new trends in modern diets [online]. *Food Research International* 44 (9): 2634-2640. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S0963996911003115> (accessed on 7 April 2013).
- PFAF. 2013. Plants for a Future: edible, medicinal and useful plants for a healthier world [online database]. Available at <http://www.pfaf.org/user/default.aspx> (accessed on 17 March 2013).
- Pieroni A, Gray Ch. 2008. Herbal and food folk medicines of the Russlanddeutschen living in Künzelsau/Taläcker, South-Western Germany. *Phytotherapy Research* 22 (7): 889-901. Available at: <http://doi.wiley.com/10.1002/ptr.2410> (accessed on 30 March 2013).
- Pieroni A, Nebel S, Santoro RF, Heinrich M. 2005. Food for two seasons: Culinary uses of non-cultivated local vegetables and mushrooms in a south Italian village [online]. *International Journal of Food Sciences and Nutrition* 56 (4): 245-272 Available at: <http://informahealthcare.com/doi/abs/10.1080/09637480500146564> (accessed on 9 April 2013).
- Polívka F. 1900-1904. Názorná květena zemí koruny české: obsahující též čelnější rostliny cizozemské, pěstované u nás pro užitek a okrasu se zvláštním zřetelem k zjevům životním. *Knihkupectví R. Prombergera, Olomouc*, vol 1-4.
- Prakash AS, Pereira TN, Reilly PEB, Seawright AA. 1999. Pyrrolizidine alkaloids in human diet. *Mutation Research* 443: 53–67.
- Ptáček V. 2011. Hodnocení vybraných charakteristik některých planě rostoucích druhů rostlin při kulturním pěstování. Diploma thesis. Czech University of Life Sciences Prague
- Pyšek P, Danihelka J, Sádlo J, Chrtěk Jr, Chytrý M, Jarošík V et al. 2012. Catalogue of alien plants of the Czech Republic (2nd edition): checklist update, taxonomic diversity and invasion patterns. *Preslia* 84: 155–255.

- Rasmussen LH, Schmidt B, Sheffield E. 2013. Ptaquiloside in bracken spores from Britain. *Chemosphere* 90 (10): 2539–2541.
- Redzic S. 2006. Wild edible plants and their traditional use in the human nutrition in Bosnia-Herzegovina [online]. *Ecology of Food and Nutrition*, 45 (3): 189-232. Available at <http://www.tandfonline.com/doi/abs/10.1080/03670240600648963> (accessed on 10 March 2013).
- Redzic S, Barudanovic S, Pilipovic S. 2010. Wild Mushrooms and Lichens used as Human Food for Survival in War Conditions; Podrinje -- Zepa Region (Bosnia and Herzegovina, W. Balkan). *Human Ecology Review* 17 (2): 175-187.
- Rettigová M. D. 2005. Domáci kuchařka, aneb, Pojednání o masitých a postních pokrmech pro dcery české a moravské. Centa, Brno, 398 pp.
- Rigat M, Bonet MÀ, Garcia S, Garnatje T, Vallès J. 2009. Ethnobotany of Food Plants in the High River Ter Valley (Pyrenees, Catalonia, Iberian Peninsula): Non-Crop Food Vascular Plants and Crop Food Plants with Medicinal Properties [online]. *Ecology of Food and Nutrition* 48 (4): 303-326. Available at: <http://www.tandfonline.com/doi/abs/10.1080/03670240903022320> (accessed on 7 April 2013).
- Rivera-Núñez D, Obón de Castro. 1993. Plant food as medicine in Mediterranean Spain. In Schröder E (ed.), Balansard G (ed.), Cabalion Pierre (ed.), Fleurentin J (ed.), Mazars G (ed.). *Médicaments et aliments: approche ethnopharmacologique = Medicines and foods: ethnopharmacological approach*. Paris; Metz: ORSTOM; SFE, 1996, pp. 121-128. (Colloques et Séminaires).
- Rodovský z Hustiřan B. 1975. Kuchařství to jest Knížka o rozličných krmích, kterak se užitečně s chutí strojiti mají, jakožto zvěřina, ptáci, ryby a jiné mnohé krmě: Každému kuchaři aneb hospodáři knížka tato potřebná i užitečná. Tichá Z (ed.). Avicenum, Praha, 193 pp. Podle původního vydání z roku 1591.
- Roubal J. 1902. Rostliny v lidovém podání na Klatovsku. In Zíbrt Č (ed.). *Český lid XI. F.* Šimáček, Praha. pp 436-439.
- Rozmarová OR. 1938. Česká kuchyně: kuchařská rukověť, obsahující v 49 oddílech přes 1.200 osvědčených předpisů. *Praktická hospodyňka*, Praha, 321 pp. Poučná knihovna "Praktické hospodyňky"; vol 3.
- Rystonová I. 2007. Průvodce lidovými názvy rostlin a jiných léčivých přírodnin a jejich produktů. Academia, Praha, 735 pp.

- Savage GP, Vanhanen L, Mason SM, Ross AB. 2000. Effect of Cooking on the Soluble and Insoluble Oxalate Content of Some New Zealand Foods [online]. *Journal of Food Composition and Analysis* 13 (3): 201-206. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S0889157500908792> (accessed on 6 April 2013).
- Schunko Ch, Vogl ChR. 2010. Organic farmers use of wild food plants and fungi in a hilly area in Styria (Austria) [online]. *Journal of Ethnobiology and Ethnomedicine* 6 (17). Available at: <http://www.ethnobiomed.com/content/6/1/17> (accessed on 30 March 2013).
- Schunko Ch, Grasser S, Vogl ChR. 2012. Intracultural variation of knowledge about wild plant uses in the Biosphere Reserve Grosses Walsertal (Austria) [online]. *Journal of Ethnobiology and Ethnomedicine* 8 (23). Available at: <http://www.ethnobiomed.com/content/8/1/23> (accessed on 30 March 2013).
- Skalická A, Větvička V, Zelený V. 2012 *Botanický slovník rodových jmen cévnatých rostlin: latinsko-český, česko-latinský*. Aventinum, Praha, 279 pp.
- Skopalová K. 2008. *Fototoxické reakce xenobiotik*. Lékárna U Madony. Kroměříž.
- Skopová K. 2009. --ale máma to vařila líp: 222 osvědčených receptů české lidové kuchyně, hrst dobrůtek posbíraných po světě, něco o koření a bylinách. Akropolis, Praha, 113 pp.
- Smith SW, Giesbrecht E, Thompson M, Nelson LS, Hoffman RS 2008. Solanaceous steroidal glycoalkaloids and poisoning by *Solanum torvum*, the normally edible susumber berry [online]. *Toxicon* 52 (6): 667-676. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S0041010108004546> (accessed on 6 April 2013).
- Sojka J. 2012. First approach to introduce wild species of interest as vegetable crops: study of germination process, crop density and post-harvest conservation. Diploma thesis. Czech University of Life Sciences Prague.
- Stach Z. 1938. Důležité naše i cizí jedovaté a léčivé rostliny se zřetelem k jejich významu, pěstování a sběru. Ministerstvo zemědělství republiky Československé, Praha, 300 pp. Publikace Ministerstva zemědělství ročník 1938, č. 101.
- Stoličná R. Alternatívne zdroje rastlinnej stravy v strednej Európe [online]. *Slovenský národopis*. 45 (3): 285–294. Available at <http://www.sav.sk/journals/nar/full/sn397c.pdf> (accessed on 19 March 2013).

- Svanberg I. 2009. The use of wild plants as food in pre-industrial Sweden [online]. *Acta Societatis Botanicorum Poloniae* 81 (4): 317-327. Available at <https://pbsociety.org.pl/journals/index.php/asbp/article/view/asbp.2012.039> (accessed on 13 March 2013).
- Štika J, Habustová M. 1980. *Lidová strava na Valašsku*. Profil, Ostrava, 170 pp.
- Tardío J, Pardo-de-Santayana M, Morales R. 2006. Ethnobotanical review of wild edible plants in Spain [online]. *Botanical Journal of the Linnean Society* 152 (1): 27-71. Available at <http://doi.wiley.com/10.1111/j.1095-8339.2006.00549.x> (accessed on 2 March 2013).
- Tardío J., Pascual H., Morales R. 2005. Wild food plants traditionally used in the province of Madrid, central Spain. *Economic Botany* 59(2): 122-136.
- Tardío J, Pardo-De-Santayana M. 2008. Cultural Importance Indices: A Comparative Analysis Based on the Useful Wild Plants of Southern Cantabria (Northern Spain) [online]. *Economic Botany*, 62(1): 24–39. Available at: <http://www.springerlink.com/index/10.1007/s12231-007-9004-5> (accessed on 9 April 2013).
- The Local Food-Nutraceutical Consortium. 2005. Understanding local Mediterranean diets: a multidisciplinary pharmacological and ethnobotanical approach [online]. *Pharmacological Research* 52: 353–366. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S1043661805001283> (accessed on 9 April, 2013).
- Trachtová M. 1902. *Kuchařská kniha pro hospodyně venkovské*. Mich. Emanuel Holakovský, Chrudim, 197 pp. *Československá Matice rolnická* XI. vol. 1-2.
- Triwaldová G. 1909. *Praktická česká kuchařka pro každou domácnost: sbírka 336 receptů na upravení osvědčených, silných a laciných pokrmů masitých i postních, mimo užitečná a podrobná navedení ku vedení kuchyně nejenom způsobu jemnějšího, nýbrž i také obyčejné domácí kuchyně, zároveň s poučením jak lze v cukru a octu ovoce zavařovati*. A. Reinwart, Praha, 108 pp.
- Tropicos.org. 2013. Missouri Botanical Garden [online database]. Available at: <http://tropicos.org/Home.aspx> (accessed on 30 January 2013).

- Turner NJ, Łuczaj ŁJ, Migliorini P, Pieroni A, Dreon AL, Sacchetti LE, Paolett MG. 2011. Edible and Tended Wild Plants, Traditional Ecological Knowledge and Agroecology [online]. *Critical Reviews in Plant Sciences* 30: 198–225. Available at <http://www.tandfonline.com/doi/abs/10.1080/07352689.2011.554492> (accessed on 17 March 2013).
- Úlehlová-Tilschová M. 1937. Jak a čím se živit: zdravá výživa dneška. Družstevní práce, Praha, 435 pp. Svět. Nová řada; vol 14.
- Úlehlová-Tilschová M. 2000. Staročeská kuchařka. Ikar, Praha, 473 pp.
- Úlehlová-Tilschová M. 2011. Česká strava lidová. Triton, Praha, 444 pp.
- Úlehlová-Tilschová M, Goldhammer J. 1970. Chuťový místopis: Československý místopis dobrého jídla a pití. Avicenum, Praha, 340 pp. Minikuchařky.
- Upton R, Dayu RH. 2013. Stinging nettles leaf (*Urtica dioica* L.): Extraordinary vegetable medicine [online]. *Journal of herbal medicine* 3: 9-38. Available at: <http://dx.doi.org/10.1016/j.hermed.2012.11.001> (accessed on 6 April 2013).
- Vetter J. 2009. A biological hazard of our age: Bracken fern [*Pteridium aquilinum* (L.) Kuhn] - A Review [online]. *Acta Veterinaria Hungarica* 57 (1): 183-196. Available at: <http://www.akademiai.com/openurl.asp?genre=article> (accessed on 6 March 2013).
- Vrabec V, Smotlacha M. 1982. Jihočeská houbařská kuchařka. Jihočeské nakladatelství, České Budějovice, 253 pp.
- Winter Z. 1892. Kuchyně a stůl našich předků: líčení dějepisné ze XVI. Století. František Bačkovský, Praha, 192 pp. Všeobecná zajímavě poučná knihovna; č. 3.
- Zeghichi S, Kallithraka S, Simopoulos AP, Kyriotakis Z. 2003. Nutritional composition of selected wild plants in the diet of Crete. In Simopoulos A. P. and Gopalan C. (eds.) *Plants in human health and nutrition policy*. *World Review of Nutrition and Diet* 91: 22-40. Karger, Basel, Switzerland.
- Zíbrt Č. 2000. Česká kuchyně za dob nedostatku před sto lety. *Opus Bohemiae*, Přerov, 95 pp.
- Zíbrt Č. 2012. Staročeské umění kuchařské. Faktor V, Hrubý M (eds.). Dauphin, Praha, 584 pp. Sporáček, vol 3.
- Zuntová A. 2005. Co se vařilo před šedesáti lety. In Šafr P, Taureová I (eds.). *Jak se dříve vařivalo*. Jihočeské muzeum, České Budějovice, pp. 3-5. Sborníček prací členů Národopisného sdružení při Jihočeském muzeu v Českých Budějovicích, vol 51.

APPENDIX 1

Appendix 1. List of wild plant species used for food purposes in the Czech Republic. Reference numbers are given in Table 1.

Family and Species	Standard Czech name	Cr. *	Folk name	Parts used †	Use categories ‡ (no. of reports)	Mode of use	References
LICHENS							
CLADONIACEAE							
<i>Cladonia rangiferina</i> (L.) Weber ex F. H. Wigg.	dutohlávka sobí	O	sobí lišejník	thallus	OTHflo (1)	ground into flour during famine	[35]
PARMELIACEAE							
<i>Cetraria islandica</i> (L.) Ach.	puklérka islandská	O	lišejník	thallus	OTHflo (3)	ground into flour during famine	[3, 14, 35]
<i>Everia prunastri</i> (L.) Ach.	větvičník slivový	N	mech trnkový	thallus	OTHflo (1)	ground into flour during famine	[35]
BRYOPHYTES							
SPHAGNACEAE							
<i>Sphagnum palustre</i> L.	rašeliník člunkolistý	O		thallus	OTHflo (2)	ground into flour during famine	[3, 35]
VASCULAR PLANTS							
ADOXACEAE							
<i>Sambucus nigra</i> L.	bez černý	O	bezinky	inflorescence	FLO (16)	fried dough coated flowers or added to porridges	[1, 2, 3, 15, 17, 19, 22, 24, 25, 29, 30, 31, 32, 34, 35, 36]
				fruit	FRU (16)	soups, chutneys, for making jams/jellies	[4, 5, 6, 8, 10, 17, 20, 22, 24, 27, 28, 29, 30, 31, 32, 36]

Appendix 1. (continued)

Family and Species	Standard Czech name	Cr. *	Folk name	Parts used †	Use categories ‡ (no. of reports)	Mode of use	References
				seed	BEV (7) OTHoil (1)	juices pressed into oil	[2, 6, 14, 17, 24, 25, 32] [3]
ACORACEAE							
<i>Acorus calamus</i> L.	puškovec obecný	O	pišišvor	rhizome	SEA (4) SUB (3) BEV (1) BEVliq (6)	NS rhizomes preserved with sugar syrups used for making spirits or added into beers	[3, 9, 17, 36] [20, 31, 36] [36] [2, 10, 17, 20, 24, 36]
ALISMATACEAE							
<i>Sagittaria sagittifolia</i> L.	šípatka střelolistá	O	čapí capa	rhizome	SUB (1)	used in vegetable dishes	[20]
AMARANTHACEAE							
<i>Amaranthus blitum</i> L.	laskavec hrubozel	O	blít	leaf	VEG (2)	steamed leaves in vegetable dishes (steamed)	[20, 31]
<i>Amaranthus retroflexus</i> L.	laskavec ohnutý	O	amarant	seed	OTHflo (3)	ground into flour during famine	[3]
<i>Atriplex patula</i> L.	lebeda rozkladitá	O	špenát	leaf	VEG (2)	raw in salads	[20, 23]
<i>Atriplex</i> spp.	lebeda	O	špenát	leaf	VEG (10)	soups, steamed in vegetable dishes	[2, 3, 14, 15, 18, 24, 29, 31, 32, 36]
<i>Chenopodium album</i> L.	merlík bílý	O	lebedník	leaf	VEG (1)	raw in salads	[20]
<i>Chenopodium bonus-henricus</i> L.	merlík všedobr	O	chřestový špenát	leaf	VEG (3)	vegetable dishes	[12, 20, 35]
AMARYLLIDACEAE							
<i>Allium schoenoprasum</i> L.	pažitka pobřežní	O	šnitlík	stem	SEA (1)	NS	[17]

Appendix 1. (continued)

Family and Species	Standard Czech name	Cr. *	Folk name	Parts used †	Use categories ‡ (no. of reports)	Mode of use	References
<i>Allium ursinum</i> L.	česnek medvědí	O	divoký česnek	whole plant	SEA (3)	NS	[3, 17, 31]
<i>Galanthus nivalis</i> L.	sněžinka podsněžník	O	sněhovka	bulb	OTHflo (1)	ground into flour during famine	[35]
					SUB (1)	dried and ground into porridges	[14]
<i>Leucojum vernum</i> L.	bledule jarní	O	blednivka	bulb	OTHflo (1)	dried and ground into flour during famine	[35]
					SUB (1)	dried and ground into porridges	[14]
APIACEAE							
<i>Aegopodium podagraria</i> L.	bršlice kozí noha	O, N	brzlice, jarous	leaf	VEG (5)	raw or steamed	[3, 12, 20, 31, 35]
<i>Angelica archangelica</i> L.	andělíka lékařská	O	děhel andělíka	leaf	SEA (1)	NS	[3]
<i>Berula erecta</i> (Huds.) Coville	potočnick vzpřímený	N	berla úzkolistá	leaf	VEG (1)	raw	[20]
<i>Bunium bulbocastanum</i> L.	bulvuška hlíznatá	O	bulka, zemský kaštan	tuber	SUB (1)	eaten raw or roasted	[31]
<i>Carum carvi</i> L.	kmín kořený	O	chlebové koření	leaf	SEA (1)	seasoning soups	[31]
				NS	SEA (6)	NS	[11, 17, 22, 34, 35, 36]
<i>Daucus carota</i> L. subs. <i>Carota</i>	mrkev obecná pravá	N	mrkvous	root	SUB (1)	roots, raw as a snack	[35]
<i>Heracleum sphondylium</i> L.	bolševník obecný	O	kmín sviňský	leaf	VEG (2)	used in soups	[3, 35]
<i>Chaerophyllum bulbosum</i> L.	krabilice hlíznat	O	krabilice bulvatá	tuber	SUB (2)	boiled or roasted	[31, 35]
<i>Levisticum officinale</i> W. D. J. Koch	libeček lékařský	O, N	magíčko, vopich	leaf	SEA (4)	NS	[10, 11, 18, 32]
					VEG (4)	used in soups	[14, 18, 31, 33]
				rhizome	SEA (1)	dried as a seasoning	[18]
				NS	BEVliq (1)	for making spirits	[10]
<i>Pastinaca sativa</i> L.	pastinák setý	O	dřenka	root	SUB (1)	NS	[35]

Appendix 1. (continued)

Family and Species	Standard Czech name	Cr. *	Folk name	Parts used †	Use categories ‡ (no. of reports)	Mode of use	References
<i>Pimpinella</i> spp.	bedrník	O	bedřinec	leaf	VEG (4) SEA (4)	used raw in salads NS	[3, 20, 31, 35] [3, 12, 17, 29]
ARACEAE							
<i>Calla palustris</i> L.	ďáblík bahenní	O	divoká kala	rhizome	OTHflo (1)	NS	[20]
<i>Arum maculatum</i> L.	áron plamatý	O	blázivec	rhizome	SUB (2) OTHflo (2)	boiled ground into flour during famine	[20, 35] [3, 20]
ASPARAGACEAE							
<i>Asparagus officinalis</i> L.	chřest lékařský	N	špargl	leaf	VEG (1)	young leaves used in vegetable dishes	[35]
<i>Polygonum</i> spp.	kokořík	O	ďáblík	NS	BEVliq (1)	for making spirits	[34]
ASPLENIACEAE							
<i>Phyllitis scolopendrium</i> (L.) Newman	jelení jazyk celolistý	O	bylina studnová	leaf	VEG (1)	used in soups	[36]
ASTERACEAE							
<i>Achillea ptarmica</i> L.	řebříček bertrám	O	persán	leaf	SEA (3) VEG (7)	seasoning in soups used in vegetable dishes	[2, 3, 11] [2, 3, 17, 18, 25, 31, 36]
<i>Anthemis arvensis</i> L.	rmen rolní	O	hořká tráva	leaf	SEA (1)	NS	[3]
<i>Arctium</i> spp.	lopuch	O	babák, bejlí	root	SUB (1)	vegetable dishes	[3]
<i>Artemisia vulgaris</i> L.	pelyněk černobýl	O	černobýl	stem	SEA (4) BEVliq (2) OTH (1)	NS for making spirits vinegar	[3, 9, 17, 18] [24, 34] [2]
		O		leaf	VEG (2)	vegetable dishes	[3, 31]

Appendix 1. (continued)

Family and Species	Standard Czech name	Cr. *	Folk name	Parts used †	Use categories ‡ (no. of reports)	Mode of use	References
<i>Bellis perennis</i> L.	sedmikráska obecná	O	chudobka	flower	SEA (3)	NS	[18, 20, 31]
		O, N		leaf	VEG (8)	young leaves used in salads or soups during spring	[2, 3, 10, 13, 17, 27, 31, 35]
				flower	FLO (3)	raw, preserved with sugar	[3, 17, 36]
<i>Carduus acanthoides</i> L.	bodlák obecný	O	chablák, ježatec	leaf	BEV (1)	for making syrups	[17]
				VEG (1)	raw leaves used in salads	[35]	
<i>Carlina acaulis</i> L.	pupava bezlodyžná	O	bodláček	flower	FLO (4)	raw receptacles as a children's snack food, vegetable dishes	[12, 27, 26, 31]
<i>Centaurea</i> spp.	chrpa	O	chrpina, modráček	flower	BEV (1)	for making juices, syrups	[2]
				FLO (4)	preserved with sugar, colourings	[1, 3, 34, 36]	
				SEA (1)	NS	[22]	
<i>Cichorium intybus</i> L.	čekanka obecná	O, N	cikorie, štěrbák	leaf	VEG (4)	young leaves eaten raw or added to soups	[18, 21, 31, 35]
				root	SUB (1)	used raw in salads, preserved into sugar	[35]
				NS	BEVoth (7)	ground into coffee substitutes	[2, 14, 15, 20, 26, 31, 35]
				BEVliq (1)	NS	[34]	
<i>Matricaria chamomilla</i> L.	heřmáněk pravý	O	voňav rmen	flower	BEVliq (1)	flowers for making spirits	[34]
<i>Onopordum acanthium</i> L.	ostropes trubil	O	kostropes	leaf	VEG (1)	leave buds used in salads	[20]
				flower	VEG (1)	young receptacles used in salads	[20]
				root	SUB (1)	young roots used in salads	[20]

Appendix 1. (continued)

Family and Species	Standard Czech name	Cr. *	Folk name	Parts used †	Use categories ‡ (no. of reports)	Mode of use	References
<i>Petasites hybridus</i> (L.) P. Gaertn., B. Mey. & Scherb.	devětsil lékařský	O	podběl	leaf	VEG (1)	used in soups, vegetable dishes	[35]
<i>Picris hieracioides</i> L.	hořčík jestrábníkovitý	O		leaf	VEG (1)	used in soups, vegetable dishes	[35]
<i>Scorzonera hispanica</i> L.	hadí mord španělský	O	černokořen	root	SUB (1) BEVoth (1)	raw in salads ground into coffee substitutes	[20] [20]
<i>Senecio vulgaris</i> L.	starček obecný	O	buřena, teranka	leaf	VEG (1)	soups, vegetable dishes	[35]
<i>Silybum marianum</i> (L.) Gaertner	ostropestřec mariánský	O	jaterní semínko	flower	SEA (1)	flowers as a seasoning	[20]
<i>Sonchus oleraceus</i> L.	mléč zelinný	O, N	mlíčí	leaf	VEG (2)	raw, soups	[18, 35]
<i>Tanaceum vulgare</i> L.	vratič obecný	O, N	cicvár, kopretina	leaf	SEA (3) BEVliq (1)	NS substitute for hops in beer brewing	[3, 22, 34] [20]
<i>Taraxacum</i> sect. <i>Ruderalia</i> Kirschner, H. Ollgaard et Štěpánek	pampeliška	O, N	smetánka	leaf flower	VEG (10) OTH (3) BEV (1) BEVliq (3)	raw, soups, vegetable dishes boiled flowers with sugar to make a honey flowers for making syrups	[3, 6, 10, 15, 17, 18, 20, 29, 31, 32] [10, 17, 18] [18] [10, 17, 18]
<i>Tragopogon pratensis</i> L.	kozí brada luční	O	kozibradka	leaf rhizome	VEG (1) SUB (3)	NS children's snack food	[20] [26, 31, 35]
BERBERIDACEAE							
<i>Berberis vulgaris</i> L.	dříšťál obecný	O	berberka	leaf fruit	VEG (2) FRU (6)	raw children's snack food, jams/jellies	[17, 35] [12, 17, 24, 29, 31, 32]

Appendix 1. (continued)

Family and Species	Standard Czech name	Cr. *	Folk name	Parts used †	Use categories ‡ (no. of reports)	Mode of use	References
					BEV (2)	juices	[2, 3]
BETULACEAE							
<i>Betula pendula</i> Roth	bříza bělokorá	O	bříza bradavičnatá	trunk	BEV (3)	sap drunk fresh during spring	[1, 3, 20]
				bark	OTHflo (1)	inner bark ground into flour during famine	[14]
					OTH (1)	vinegar	[36]
				leaf	FLO (1)	leave buds	[35]
<i>Corylus avellana</i> L.	liska obecná	O		fruit	FRU (12)	used raw or added to pastry and confectionary	[2, 6, 13, 16, 18, 19, 24, 27, 29, 31, 32, 36]
					OTHoil (1)	fruits pressed into oil	[31]
					PRE (1)	rennet substitutes	[36]
BORAGINACEAE							
<i>Anchusa officinalis</i> L.	pilát lékařský	O	sláza	leaf	VEG (2)	raw young leaves	[31, 35]
<i>Borago officinalis</i> L.	brutnák lékařský	O, N	bareč	leaf	VEG (2)	used in soups, vegetable dishes, pickles	[12, 18]
<i>Echium vulgare</i> L.	hadinec obecný	O	koňský ocas	leaf	VEG (1)	young leaves in soups	[18]
<i>Pulmonaria officinalis</i> L.	plicník lékařský	O		leaf	VEG (3)	raw, vegetable dishes	[3, 17, 31]
<i>Symphytum officinale</i> L.	kostival lékařský	O	černý kořen	leaf	VEG (2)	vegetable dishes	[3, 35]
				rhizome	SUB (1)	NS	[35]
BRASSICACEAE							
<i>Lepidium</i> spp.	řeřicha	O		leaf	VEG (9)	raw, soups, confectionery (filling doughnuts)	[2, 18, 20, 21, 24, 27, 29, 31, 35]
					SEA (2)		[2, 5]

Appendix 1. (continued)

Family and Species	Standard Czech name	Cr. *	Folk name	Parts used †	Use categories ‡ (no. of reports)	Mode of use	References
				tuber	SEA (1)	dried as a seasoning	[18]
<i>Alliaria petiolata</i> (M. Bieb.) Cavara et Grande	česnáček lékařský	O	česnačka	seed	OTHoil (1)	NS	[20]
<i>Barbarea vulgaris</i> W.T. Aiton	barborka obecná	O		leaf	VEG (3)	raw, vegetable dishes	[3, 18, 31]
<i>Bunias</i> spp.	rukevnik	O		leaf	VEG (2)	soups, vegetable dishes	[3, 31]
<i>Capsella bursa-pastoris</i> (L.) Med.	kokoška pastuší tobolka	O	babí kapsa	leaf	VEG (2)	steamed young leaves	[31, 35]
				stem	SEA (1)	NS	[3]
<i>Cardamine pratensis</i> L.	řeřišnice luční	O		leaf	VEG (2)	raw, soups	[3, 35]
<i>Lepidium didymus</i> L.	vranožka podvojná	N		leaf	VEG (2)	raw	[31, 35]
<i>Nasturtium officinale</i> W.T. Aiton	potočnice lékařská	O	černý pepř	leaf	VEG (2)	raw	[20, 31]
<i>Raphanus raphanistrum</i> L.	ředkev ohnice	O	blejskava	leaf	VEG (2)	basal leaves in vegetable dishes	[3, 31]
<i>Sinapis arvensis</i> L.	hořčice polní	O	blejskavice	leaf	VEG (3)	soups, vegetable dishes	[20, 31, 35]
<i>Sisymbrium officinale</i> (L.) Scop.	hulevník lékařský	O	klukovka	leaf	VEG (2)	raw stolons in salads	[31, 35]
CAMPANULACEAE							
<i>Campanula rapunculoides</i> L.	zvonek řepkovitý	O		root	SUB (2)	used raw in salads	[20, 35]
				leaf	VEG (1)	used raw in salads	[20]
<i>Campanula rapunculus</i> L.	zvonek řepka	O	rozponka	root	SUB (1)	NS	[35]
<i>Phyteuma orbiculare</i> L.	zvonečník hlavatý	N	řepka hlavatá	leaf	VEG (1)	used raw in salads	[20]
<i>Phyteuma spicatum</i> L.	zvonečník klasnatý	N	řepka klasnatá	leaf	VEG (1)	used raw in salads	[20]
				root	SUB (2)	used raw in salads	[20, 35]

Appendix 1. (continued)

Family and Species	Standard Czech name	Cr. *	Folk name	Parts used †	Use categories ‡ (no. of reports)	Mode of use	References
CANNABACEAE							
<i>Humulus lupulus</i> L.	chmel otáčivý	O		leaf	VEG (1)	stolons used in soups, egg dishes	[17]
CARYOPHYLLACEAE							
<i>Silene vulgaris</i> (Moench) Garcke	silenska nadmutá	O	běhen	leaf	VEG (1)	used in soups, vegetable dishes	[35]
<i>Stellaria</i> spp.	ptačinec	O	hadí pusa	leaf	VEG (1)	raw	[35]
CORNACEAE							
<i>Cornus mas</i> L.	dřín jarní	O	dřínové jahůdky	fruit	FRU (4) BEV (1) BEVliq (9)	raw, jams/jellies juices wines, spirits	[3, 17, 29, 31] [17] [17]
<i>Cornus sanguinea</i> L.	svída krvavá	O	krvavý prut	fruit	FRU (1)	NS	[3]
CRASSULACEAE							
<i>Hylotelephium maximum</i> (L.) Holub	rozchodník velký	O	kozí zelí	leaf	VEG (1)	raw in salads	[20]
<i>Sedum album</i> L.	rozchodník bílý	O	bělorozchodník	leaf	VEG (1)	raw in salads	[35]
<i>Sedum reflexum</i> L.	rozchodník skalní	O	panetřesk	leaf	VEG (1)	soups	[20]
<i>Sedum</i> spp.	rozchodník			leaf	VEG (1)	raw in salads	[31]
<i>Sempervivum tectorum</i> L.	netřesk střešní	N	netřesk zední	leaf	VEG (1) BEV (1)	raw in salads for making juices	[17] [17]
CUCURBITACEAE							
<i>Bryonia dioica</i> Jacq.	posed dvoudomý	O	díblík, oseh	root	SUB (1)	NS	[35]

Appendix 1. (continued)

Family and Species	Standard Czech name	Cr. *	Folk name	Parts used †	Use categories ‡ (no. of reports)	Mode of use	References
CUPRESSACEAE							
<i>Juniperus communis</i> L.	jalovec obecný	O	boleráz, břín	branch	PRE (3)	fruiting leafy branches to preserve meat	[1, 3, 36]
				fruit	SEA (24)	seasoning (mostly game)	[1, 2, 3, 4, 5, 6, 9, 10, 11, 13, 17, 18, 20, 21, 22, 24, 27, 28, 29, 30, 31, 33, 34, 36]
					BEVliq (6)	spirits	[2, 17, 20, 24, 29, 34]
CYPERACEAE							
<i>Carex</i> spp.	ostřice	O	psárka, tuřice	stem	VEG (1)	stalks as a children's snack food	[26]
<i>Cyperus esculentus</i> L.	šáchor jedlý	O	galgán planý	tuber	SUB (1)	used raw, fried or baked	[35]
DENNSTAEDTIACEAE							
<i>Pteridium aquilinum</i> (L.) Kuhn	hasivka orličí	O	hasina	rhizome	OTHflo (3)	ground into flour during famine	[3, 14, 35]
ERICACEAE							
<i>Vaccinium myrtillus</i> L.	brusnice borůvka	O	černá jahoda	leaf	SEA (1)	seasoning in soups during spring	[18]
				fruit	FRU (22)	fruits, raw as a children's snack food, soups, jams/jellies	[2, 3, 6, 7, 9, 10, 13, 14, 15, 17, 18, 19, 20, 24, 25, 26, 28, 29, 30, 31, 32, 36]
					BEV (4)	juices	[2, 6, 31, 32]
					BEVliq (3)	wines and spirits	[15, 18, 24]
<i>Vaccinium oxycoccos</i> L.	klikva bahenní	N	klikva žoravina	fruit	FRU (2)	for making chutneys	[17, 20]

Appendix 1. (continued)

Family and Species	Standard Czech name	Cr. *	Folk name	Parts used †	Use categories ‡ (no. of reports)	Mode of use	References
<i>Vaccinium uliginosum</i> L.	vlochyň bahenní	O	bažinná borůvka	fruit	FRU (2)	NS	[20, 31]
<i>Vaccinium vitis-idaea</i> L.	brusnice brusinka	O	červená borůvka	fruit	FRU (24)	for making fruit soups, jams/jellies	[3, 4, 5, 6, 7, 9, 10, 11, 13, 17, 18, 19, 20, 21, 24, 25, 27, 28, 29, 30, 31, 32, 33, 36]
					BEV (1)	juices	[2]
					BEVliq (1)	spirits	[24]
FABACEAE							
<i>Astragalus glycyphyllos</i> L.	kozinec sladkolistý	O	dřezovec	seed	BEVoth (1)	ground into coffee substitutes	[14]
<i>Lathyrus tuberosus</i> L.	hrachor hlíznatý	O	halucha, ořeší	tuber	SUB (3)	children's snack food	[26, 31, 35]
<i>Lathyrus vernus</i> (L.) Bernh.	hrachor jarní	O	hrachor lecha	tuber	SUB (1)	children's snack food	[35]
<i>Medicago sativa</i> L.	tolice setá	N	vojtěška	leaf	VEG (1)	used in soups and vegetable dishes	[35]
<i>Robinia pseudoacacia</i> L.	trnovník akát	O	akát	flower	FLO (1)	fried flowers	[18]
<i>Trifolium</i> spp.	jetel	O	čudlek, dětel	flower	FLO (3)	boiled or fried; children's snack food	[24, 31, 35]
					BEVliq (1)	for making spirits	[24]
					OTHflo (3)	ground into flour during famine	[3, 14, 35]
<i>Vicia sativa</i> L.	vikev setá	O		leaf	VEG (1)	soups	[3]
					SEA (1)	NS	[3]
				NS	BEVoth (1)	ground into coffee substitutes	[14]

Appendix 1. (continued)

Family and Species	Standard Czech name	Cr. *	Folk name	Parts used †	Use categories ‡ (no. of reports)	Mode of use	References
FAGACEAE							
<i>Fagus sylvatica</i> L.	buk lesní	O	bučina	flower	FLO (1)	flower buds	[35]
				fruit	FRU (2)	fruits (beechnuts) raw or dried	[20, 31]
<i>Quercus robur</i> L.	dub letní	O	doubí		OTHoil (4)	pressed into oil	[3, 20, 26, 31]
				leaf	BEVliq (1)	spirits	[34]
				flower	OTHflo (1)	flower buds ground into flour during famine	[35]
				fruit	BEVoth (6)	ground into coffee or cacao substitutes	[2, 14, 20, 26, 31, 35]
					OTHoil (1)	pressed into oil	[3]
					OTHflo (4)	fruits (acorns) ground into flour during famine	[3, 14, 31, 35]
	PRE (1)	rennet substitutes	[36]				
GENTIANACEAE							
<i>Gentiana lutea</i> L.	hořec žlutý	N	encián	NS	SEA (1)	NS	[3]
GROSSULARIACEAE							
<i>Ribes uva-crispa</i> L.	srstka angrešt	O		fruit	FRU (1)	raw in meat dishes	[31]
HYPERICACEAE							
<i>Hypericum</i> spp.	třezalka	O	zděšník	fruit	OTH (1)	boiled with sugar to make a honey	[10]
LAMIACEAE							
<i>Glechoma hederacea</i> L.	popenec obecný	O, N	kundrlátek, openec	leaf	VEG (19)	soups, vegetable dishes, egg dishes	[2, 3, 5, 6, 10, 13, 17, 18, 20, 21, 25, 27, 30, 31, 32, 33, 35, 36, 37]

Appendix 1. (continued)

Family and Species	Standard Czech name	Cr. *	Folk name	Parts used †	Use categories ‡ (no. of reports)	Mode of use	References
<i>Lamium</i> spp.	hluchavka	O	cucáček	flower	SEA (1)	flowers as a seasoning	[3]
<i>Mentha pulegium</i> L.	polej obecná	O	bleší máta	NS	SEA (1)	NS	[3]
<i>Mentha</i> spp.	máta	N	balšán	leaf	SEA (1)	NS	[3]
<i>Origanum vulgare</i> L.	dobromysl obecná	O	oregáno	flower	BEVliq (1)	substitute for hops in beer brewing	[20]
<i>Prunella vulgaris</i> L.	černohlávek obecný	O	černohlávka	NS	VEG (1)	used in soups and vegetable dishes	[35]
<i>Salvia pratensis</i> L.	šalvěj luční	O	babí bruch	leaf	BEVliq (2)	substitute for hops in beer brewing or for making spirits	[20, 34]
<i>Thymus</i> spp.	mateřídouška	O	démut	stem	SEA (7)	dried flowering shoots as a seasoning	[2, 3, 11, 17, 30, 31, 36]
					BEVliq (1)	added into spirits as flavor	[10]
LYTHRACEAE							
<i>Trapa natans</i> L.	kotvice plovoucí	O	vodní ořech	fruit	FRU (5)	raw	[3, 20, 31, 35, 36]
					OTHflo (2)	fruits ground into flour	[20, 31]
MALVACEAE							
<i>Althaea officinalis</i> L.	proskurník lékařský	O		leaf	VEG (1)	used in soups and vegetable dishes	[35]
<i>Malva alcea</i> L.	sléz velkokvětý	O	sléz léčivý	leaf	VEG (1)	soups and vegetable dishes	[35]
<i>Malva neglecta</i> Wallr.	sléz přehlížený	N	bochničky	fruit	FRU (4)	immature fruits raw as a children's snack food	[12, 26, 31, 35]
<i>Malva</i> spp.	sléz	O		NS	SEA (2)	NS	[3, 36]
<i>Malva sylvestris</i> L.	sléz lesní	O	boží koláčky	leaf	VEG (1)	soups and vegetable dishes	[35]
<i>Tilia</i> spp.	lípa	O		NS	BEVliq (2)	spirits	[10, 34]

Appendix 1. (continued)

Family and Species	Standard Czech name	Cr. *	Folk name	Parts used †	Use categories ‡ (no. of reports)	Mode of use	References
				flower	FLO (1)	boiled flower buds	[35]
				fruit	FRU (1)	fruits as a children's snack food	[26]
ONAGRACEAE							
<i>Epilobium angustifolium</i> L.	vrбка úzkolistá	O	chmýří, pejří	root	SUB (1)	soups	[3]
<i>Oenothera biennis</i> L.	pupalka dvouletá	O	noční hvězda	root	SUB (4)	first year root eaten raw as a children's snack food	[12, 20, 31, 35]
ORCHIDACEAE							
<i>Dactylorhiza majalis</i> (Rchb.) P. F. Hunt et Summerh.	prstnatec májový	N	vstavač širolistý	tuber	SUB (1)	formerly used as food	[35]
<i>Orchis</i> spp.	vstavač	O	divoká orchidej	tuber	SUB (1)	formerly used as food	[35]
OXALIDACEAE							
<i>Oxalis acetosella</i> L.	šťavel kyselý	O	zaječí jetel	leaf	VEG (3)	raw, vegetable dishes, children's snack food	[3, 26, 31]
PAPAVERACEAE							
<i>Papaver rhoeas</i> L.	mák vlčí	O	ohníček	NS	BEVliq (1)	spirits	[34]
PLANTAGINACEAE							
<i>Plantago</i> spp.	jitrocel	O	babí ucho	leaf	VEG (2)	fried or used in salads, soups	[3, 17]
					SEA (1)	NS	[17]
					BEVliq (6)	spirits	[34]

Appendix 1. (continued)

Family and Species	Standard Czech name	Cr. *	Folk name	Parts used †	Use categories ‡ (no. of reports)	Mode of use	References
POACEAE							
<i>Digitaria sanguinalis</i> (L.) Scop.	rosička krvavá	O	proso krvavé	seed	OTHflo (2)	ground into flour	[3, 35]
<i>Echinochloa crus-galli</i> (L.) P. B.	ježatka kuří noha	O	bér planý	seed	OTHflo (1)	ground into flour	[35]
<i>Elymus repens</i> (L.) Gould	pýr plazivý	O, N	pejř	rhizome	OTHflo (4)	ground into flour during famine	[3, 14, 26, 35]
<i>Glyceria fluitans</i> (L.) R. Br.	zblochan vzplývavý	O	vrabčí proso	seed	OTHflo (2)	ground into flour	[3, 35]
<i>Milium effusum</i> L.	pšeničko rozkladité	O	prosíčko	seed	OTHflo (1)	ground into flour	[35]
<i>Setaria viridis</i> (L.) P. B. subsp. <i>Viridis</i>	bér zelený pravý	O	bár	seed	OTHflo (1)	ground into flour	[35]
POLYGONACEAE							
<i>Bistorta officinalis</i> Delarbre	rdesno hadí kořen	O	beraní ocas	leaf	VEG (2)	raw young leaves used in salads	[18, 20]
<i>Fallopia convolvulus</i> (L.) Á. Löve	opletka obecná	O	hruštička	seed	OTHflo (1)	ground into flour during famine	[3]
<i>Persicaria</i> spp.	rdesno	O	hořčák	seed	OTHflo (8)	ground into flour during famine	[3]
<i>Rumex acetosa</i> L.	šťovík kyselý	O, N	kyselanda	leaf	VEG (2)	used raw in salads, soups and vegetable dishes	[17, 20]
<i>Rumex aquaticus</i> L.	šťovík vodní	O	sladký list	leaf	VEG (1)	raw in salads	[20]
<i>Rumex crispus</i> L.	šťovík kadeřavý	O	sladké listí	leaf	VEG (1)	raw in salads	[20]
<i>Rumex</i> spp.	šťovík	O		stem	VEG (2)	leafy stems chewed by children and shepherds against thirst	[23, 26]
				leaf	VEG (14)	used raw, in soups, vegetable dishes, egg dishes	[2, 3, 9, 10, 15, 18, 27, 28, 29, 30, 31, 32, 35, 36]
					BEV (3)	syrup	[1, 3, 36]
					BEVliq (2)	spirits	[10, 34]

Appendix 1. (continued)

Family and Species	Standard Czech name	Cr. *	Folk name	Parts used †	Use categories ‡ (no. of reports)	Mode of use	References
					PRE (1)	rennet substitutes	[31]
				seed	OTHflo (1)	seeds ground into flour during famine	[35]
POLYPODIACEAE							
<i>Polypodium vulgare</i> L.	osladič obecný	O		rhizome	SUB (1)	raw as a children's snack food	[31]
PORTULACACEAE							
<i>Montia fontana</i> L.	zdrojovka potoční	O	kozlík červený	NS	VEG (2)	raw in salads	[31, 35]
<i>Portulaca oleracea</i> L.	šrucha zelná	O, N	kuří noha, portulák	leaf	VEG (5)	used in vegetable dishes	[3, 15, 20, 29, 35, 15]
					SEA (1)	NS	[29]
PRIMULACEAE							
<i>Cyclamen purpurascens</i> Mill.	brambořík nachový	O	brambořík evropský	tuber	SUB (1)	boiled	[20]
<i>Primula veris</i> L.	prvosenka jarní	N	petrklič	flower	BEV (2)	for making syrups	[3, 36]
ROSACEAE							
<i>Aronia melanocarpa</i> (Michx.) Elliott	temnoplodec černoplodý	N	aronie černá	fruit	FRU (1)	for making jams/jellies	[12]
					BEVliq (1)	NS	[25]
<i>Alchemilla vulgaris</i> L.	kontryhel ostrolaločný	O	alchemilka	NS	SEA (1)	NS	[3]
<i>Crataegus</i> spp.	hloh	O	hlohoží	flower	BEVliq (1)	spirits	[10]
				fruit	FRU (1)	raw	[3]
					BEVliq (3)	spirits	[34]
<i>Fragaria vesca</i> L.	jahodník obecný	O	jahodníček	leaf	SEA (8)	seasoning in soups during spring	[6, 10, 15, 18, 25, 27, 31, 35]
					PRE (1)	rennet substitutes	[36]

Appendix 1. (continued)

Family and Species	Standard Czech name	Cr. *	Folk name	Parts used †	Use categories ‡ (no. of reports)	Mode of use	References
				fruit	BEVliq (2)	spirits	[17, 24]
					BEV (1)	syrops	[17]
					FRU (10)	eaten raw as a children's snack food, jams/jellies	[5, 6, 9, 10, 17, 18, 24, 26, 31, 32]
<i>Geum urbanum</i> L.	kuklík městský	O	kuklice	rhizome	SEA (1)	dried as a seasoning	[17]
					BEVliq (2)	added to beers	[17, 20]
<i>Potentilla anserina</i> L.	mochna husí	O	husí kvítko	rhizome	SUB (1)	NS	[3]
<i>Prunus spinosa</i> L.	trnka obecná	O	slivoň	fruit	FRU (6)	eating raw after frosts, children's snack food, used in fruit soups	[9, 10, 17, 26, 31, 36]
					BEVliq (3)	for making wines, spirits	[17, 24, 31]
					OTH (5)	vinegar	[2, 3, 22, 34, 36]
				seed	OTHoil (1)	oil from seeds	[31]
<i>Rosa canina</i> L.	růže šípková	O	merhelec	fruit	FRU (25)	fruits for making soups, chutneys, jams/jellies, preserved with sugar	21, 5, 6, 4, 18, 11, 31, 30, 29, 32, 1, 3, 35, 36, 14, 22, 19, 9, 28, 15, 24, 13, 27, 10, 17
					BEV (1)	NS	[17]
					BEVliq (9)	for making wines and spirits	[10, 14, 15, 17, 18, 24, 25, 31, 34]
				seed	BEVoth (3)	ground into coffee substitutes	[14, 31, 35]
<i>Rubus caesius</i> L.	ostružiník ježiník	O		fruit	FRU (14)	eaten raw as a children's snack, for making jams/jellies	[3, 6, 10, 12, 13, 17, 20, 22, 24, 26, 29, 31, 32, 34]
					BEV (3)	juices	[24, 29, 32]
					BEVliq (4)	wines	[10, 20, 24, 31]

Appendix 1. (continued)

Family and Species	Standard Czech name	Cr. *	Folk name	Parts used †	Use categories ‡ (no. of reports)	Mode of use	References
<i>Rubus chamaemorus</i> L.	ostružiník moruška	O	moruška krkonošská	fruit	FRU (1)	NS	[3]
<i>Rubus idaeus</i> L.	ostružiník maliník	O	malina	fruit	FRU (27)	fruits, eaten raw, for making soups	[1, 2, 3, 4, 5, 6, 9, 10, 12, 13, 15, 17, 18, 20, 21, 22, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 36]
					BEV (16)	juices	[2, 3, 4, 10, 14, 17, 20, 21, 24, 25, 27, 28, 29, 31, 32, 36]
					BEVliq (6)	wines and spirits	[2, 10, 17, 24, 28, 36]
					OTH (3)	vinegar	[2, 24, 28]
<i>Rubus nemorosus</i> Hayne et Willd.	ostružiník hajní	O		fruit	FRU (1)	NS	[20]
<i>Sanguisorba officinalis</i> L.	krvavec toten	O	krvavec	leaf	VEG (3)	used raw in salads	[20, 31, 35]
<i>Sorbus</i> spp.	jeřáb	O, N		fruit	FRU (8)	eaten raw, children's snack food, making jams/jellies	[6, 17, 18, 24, 25, 30, 31, 32]
					BEV (1)	juices	[17]
					BEVliq (5)	wines and spirits	[10, 15, 17, 24, 31]
RUBIACEAE							
<i>Galium odoratum</i> (L.) Scop.	svízel vonný	N	mařinka vonná	stem	BEV (1)	NS	[17]
<i>Galium verum</i> L.	svízel syřišťový	O	mařena	leaf	PRE (1)	rennet substitutes	[20]
SALICACEAE							
<i>Populus</i> spp.	topol	O		leaf	FLO (1)	leave buds	[35]
<i>Salix</i> spp.	vrba	O		bark	OTH (1)	vinegar	[36]
SAPINDACEAE							
<i>Acer pseudoplatanus</i> L.	javor klen	O	klenka	trunk	BEV (1)	sap drunk fresh during spring	[20]
<i>Acer platanoides</i> L.	javor mléč	O	mléč	trunk	BEV (1)	sap drunk fresh during spring	[20]

Appendix 1. (continued)

Family and Species	Standard Czech name	Cr. *	Folk name	Parts used †	Use categories ‡ (no. of reports)	Mode of use	References
<i>Acer</i> spp.	javor	O		trunk	BEV (1)	sap drunk fresh during spring	[3]
<i>Aesculus hippocastanum</i> L.	jírovec maďal	O	koňský kaštan	fruit	OTHflo (2)	dried fruits ground into flour	[14, 35]
SCROPHULARIACEAE							
<i>Verbascum</i> spp.	divizna	O	babí knot	NS	BEVliq (2)	spirits	[10, 34]
<i>Veronica beccabunga</i> L.	rozrazil potoční	O	potočník	leaf	VEG (3)	used raw in salads, vegetable dishes	[3, 18, 31]
					BEVliq (1)	spirits	[34]
SOLANACEAE							
<i>Physalis alkekengi</i> L.	mochyně židovská	O	židovská třešeň	fruit	FRU (1)	NS	[3]
<i>Solanum dulcamara</i> L.	lilek potměchuť	O		fruit	FRU (1)	NS	[3]
TYPHACEAE							
<i>Typha latifolia</i> L.	orobinec širokolistý	O	cigára	inflorescence	OTHflo (1)	narrow spikes ground into flour during famine	[3]
ULMACEAE							
<i>Ulmus glabra</i> Huds.	jilm drsný	O	jímel	leaf	VEG (1)	NS	[35]
URTICACEAE							
<i>Urtica dioica</i> L.	kopřiva dvoudomá	O, N	žihavka	leaf	VEG (20)	young steamed leaves used in soups, vegetable dishes, egg dishes	[3, 5, 6, 8, 10, 13, 14, 17, 18, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 37]
					BEVliq (2)	spirits	[10, 34]
					OTHflo (1)	added to bread during famine	[14]
					PRE (2)	rennet substitutes, preservative for living crayfish	[28, 31]

Appendix 1. (continued)

Family and Species	Standard Czech name	Cr. *	Folk name	Parts used †	Use categories ‡ (no. of reports)	Mode of use	References
VALERIANACEAE							
<i>Valerianella locusta</i> (L.) Betcke	kozlíček polníček	O, N	jarní salát	leaf	VEG (8)	raw used in salads, soups and vegetable dishes	
				NS	OTHflo (1)	ground into flour during famine	
<i>Valeriana officinalis</i> L.	kozlík lékařský	N	baldrián	NS	SEA (1)	NS	[3]
VIOLACEAE							
<i>Viola</i> spp.	violka	O		leaf	SEA (13)	seasoning in soups during spring	[2, 3, 6, 10, 15, 17, 18, 25, 27, 30, 31, 32, 35]
				rhizome	SEA (2)	NS	[22, 36]
					BEVliq (1)	wines	[2]
				flower	BEV (6)	flowers for making syrups	[1, 2, 3, 24, 34, 36]
					FLO (5)	colourings, preserved with sugar	[2, 3, 22, 34, 36]
	OTH (1)	vinegar	[2]				

† NS – non specified

* Botanical name identified using: O – obvious common name universally used in a large area; N – identified using comparative analysis of folk names.

‡ Used categories: VEG – green vegetable and edible weeds (aerial parts raw, boiled or fried); FRU – fruits (raw or in preserves); SUB – subterranean parts (rhizomes, roots, bulbs and tubers) as a snack or added to boiled dishes; SEA – seasoning; FLO – flowers (their nectar as a snack or flowers added to dishes in larger quantities); BEV – non-alcoholic beverages; BEVliq – alcoholic beverages; BEVoth – other beverages (coffee and cacao substitutes); PRE – preservatives including rennet substitutes; OTHoil – oils; OTHflo – flours; OTH – other uses