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Ethnobotanical review of wild edible plants of Slovakia

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Abstract

This paper is an ethnobotanical review of wild edible plants gathered for consumption from the 19th century to the present day, within the present borders of Slovakia. Twenty-four sources (mainly ethnographic) documenting the culinary use of wild plants were analysed. The use of 106 species (over 3% of the Slovak flora) has been recorded. Nowadays most of them are no longer used, or used rarely, apart from a few species of wild fruits. The most frequently used plants include the fruits of *Rubus idaeus*, *Fragaria* spp., *Rubus* subgenus *Rubus*, *Vaccinium myrtillus*, *V. vitis-idaea*, *Fagus sylvatica*, *Corylus avellana*, *Prunus spinosa*, *Pyrus* spp., *Malus* spp., *Crataegus* spp. and the leaves of *Urtica dioica*, *Rumex acetosa*, Chenopodiaceae species, *Cardamine amara*, *Glechoma* spp., *Taraxacum* spp. and *Oxalis acetosella*. The most commonly used wild food taxa are nearly identical to those used in Poland, and the same negative association of wild vegetables with famine exists in Slovakia, resulting in their near complete disappearance from the present-day diet.

Keywords: historical ethnobotany, ethnobiology, wild green vegetables, wild food plants, wild edible plants

Introduction

The growing interest in the use of wild food plant resources nowadays stems from efforts to find alternatives to the industrialization and globalization of agriculture and to provide food security in times of agricultural crisis. In the not so distant past many wild plants, instead of being eliminated from agricultural systems, constituted valuable supplementary sources of nutrition [1]. Within the last two decades, detailed ethnobotanical studies have been carried out in European countries to preserve the disappearing traditions of wild food plant use. Such studies were performed for instance on the Iberian Peninsula (e.g. [2–8]), in Italy [9–13], Greece [13,14], Turkey [15,16], Bosnia and Herzegovina [17], Albania [18] and Austria [19]. The phenomenon of foraging in Europe has been, however, studied from different perspectives for centuries. It was present in economic plant encyclopaedias [20–23] and later appeared as the subject of ethnographic studies. A separate branch of study concerns wild food plants as a means of alleviating food shortages during times of crop failures and wars [24,25]. Countries where ethnobotanical studies are most intensive now are usually places where little ethnobotanically oriented research has been done before. In contrast, there are a few European countries in which research on the ethnobotany of rural populations started at the end of the 19th century. Here we shall first of all mention two of them. One is Poland, where local ethnographic monographs, Józef Rostafiński's study of 1883, and the "Polish ethnographic atlas" all contributed to a large body of data concerning the use of wild food plants [26–29]. The other country is Estonia, where a similarly large number of ethnographic elaborations and queries is available- and it has been recently synthesized [30].

Łuczaj and Szymański [26] pointed out that the cross-cultural and geographical analysis of the patterns of plant use in Europe is hindered by the fact that most publications were written in national languages, mainly in small ethnographic journals and monographs. Thus English-language critical reviews in widely available journals can constitute "building blocks" for further international analyses. The studies from Poland show a gradual disappearance of traditions of wild food gathering, since the 19th century or even earlier [26–29]. A similar gradual decrease must have occurred in other European countries as well.

Slovakia has extensive published data on wild food plant use in the 19th and 20th century, but lacks a comprehensive review of them, apart from a short entry in a dictionary of folk culture [31] and three short essays with only a few literature references [32–34]. Hence a review of Slovak publications concerning this topic became the aim of the study.

Material and methods

Slovakia – its flora, geography and history

Slovakia covers an area of 49 thousand km^2. It has a population of 5.4 million inhabitants [35], and lies within the cold temperate climate zone, in the intermediate zone between

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the maritime and continental climate. The dominant natural vegetation is composed of deciduous and mixed forests, dominated, depending on the elevation, by *Quercus* spp., *Carpinus betulus*, *Fagus sylvatica*, *Abies alba* and *Picea abies* [35]. Slovak vascular flora is made up of ~3000 native and naturalized species of vascular plants [36,37].

Publications used in the review

The documentation of traditions of plant use in Slovakia was begun by a distinguished scholar, Jozef Ľudovit Holuby (1836–1923) in the 19th century. He was a very active researcher both in studying Slovak flora and documenting the ethnographic traditions of western Slovakia [38]. Most of his work concerns the area around the village of Zemianske Podhradie near Trenčin (W Slovakia), where he lived for more than half his life [39–44]. The depth of Holuby's ethnobotanical observations must be emphasized. He not only carefully studied the adult world but also devoted a separate article to children's ethnobotany, which is the first of its kind in the history of ethnobotany [41].

Another important individual in this area of study was Michal Markuš (1912–2004). He was the leading expert on the ethnography of traditional Slovak food, and devoted parts of some of his publications to foraging in central and eastern Slovakia [45–49] (Fig. 1).

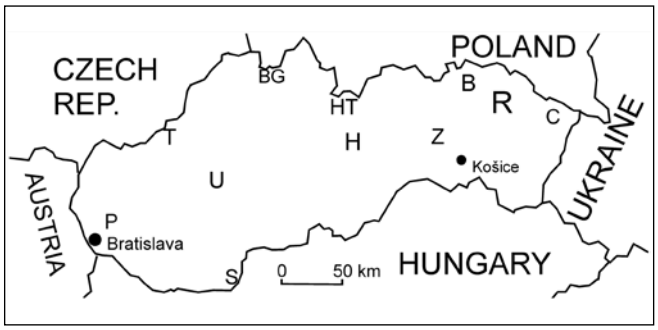


Fig. 1 Localities of the regional studies on Slovak wild food plants: B – Bardejov [47]; BG – south of Mount Babia Góra [52]; H – Horehronie region [46,48]; HC – Horna Cirocha [49,57]; HT – the High Tatra Mountains [54–56] (and K. Zlkovanová's letter); P – Pezinok [42]; R – Rusyn minority areas in general [51]; S – Z. Melečková's letter from Šturovo; T – Trenčin area [39–41,44]; U – Uhrovska Dolina [58]; Z – Žakarovce [45].

A few other ethnographers also devoted parts of their ethnographic publications to wild food provision, which leaves us with 24 publications altogether, usually containing both Latin and/or local plant names of wild edible plants used in Slovakia [31–34,39–58] (Fig. 1). From Stoličná's essays [32,33], only information not quoted from other sources analysed in the review was taken into account.

The review also includes two letters received in response to a query about wild food plants which I sent to 170 Slovak botanists:

(***i***) From Ms Zuzana Melečková, a PhD student from Bratislava, who listed 25 wild food snacks from her childhood in the vicinity of Šturovo (formerly Parkan, Párkány), and provided local Hungarian names (the area is predominantly Hungarian-speaking). Only 18 species, which were listed at least once by some other source than this review, were included.

(***ii***) From Ms Katarína Zlkovanová (Tatra National Park), who listed 14 wild food snacks from her childhood in the Tatra Mounatins. Only 9 species, which were listed at least once by some other source than this review, were included.

Methodology of plant identification

All the available publications containing data on wild food plant use were included. Most of them had Latin names provided along with local names. In a few cases data without Latin names of plants were also used for plants with widely known, unambiguous names. Latin names of plants were critically evaluated in order to avoid the introduction of "ghost data" sensu Svanberg [59,60]. Such ghost data is information about some use attributed to an incorrectly identified taxon, later repeated by other authors. Distribution of species was checked using standard Slovak floras. A list of taxa from all the publications was created, using a special code for the credibility of identification following Łuczaj [61] (Tab. 1). Plant names were given according to "Flora Europaea" [62].

Results

The use of at least 106 species of vascular plants as food, seasoning or beverages has been recorded in Slovakia since the 19th century (Tab. 1, Tab. 2). They belong to 79 genera from 36 plant families. The list includes 14 species of trees, 24 species of shrubs (including 2 species of dwarf shrubs), 54 species of perennials, 6 species of biennials and 8 species of annuals. The two largest categories are nearly of equal size: "ripe fruits" (both fleshy and dry fruit and seeds) – 41 species, and "green vegetables" – 39 species. Also the underground parts of 12 species, and flowers of 7 species were consumed. Various parts of 8 species were used as seasoning, and 4 taxa were used as bread ingredients. Eighteen species were collected for making beverages – 8 for liqueurs, 7 for herbal infusions used on an everyday basis, and three taxa were sources of tree sap.

Fruits and seeds

Out of 41 species whose use was recorded in the category of fruits and seeds (excluding species used only as seasoning), nearly half, i.e. 19 species, belonged to the Rosaceae family. The other best represented families are Caprifoliaceae and Grossulariaceae, with 4 species.

The fruits most commonly collected from the wild include *Rubus idaeus*, *Vaccinium vitis* idaea, *Rubus* subgenus *Rubus* spp. and *Fragaria* spp. (Tab. 2). Fruits are the most appreciated category of wild plants collected in Slovakia – they are both eaten raw and made into preserves (jams, juices, sauces). In Communist Slovakia large amounts of them were bought by special collection points, but even now they are sometimes collected for personal use. In the past rosehips, mainly from *Rosa* spp. were also widely used, mainly to make a type of jam.

In the past most fruits were eaten fresh or dried. In the latter half of the 20th century the preserving of soft fruits in the form of jams, wines and pasteurized compotes became popular (due to the decreasing prices of sugar). However over the last few years it has been in decline due to growing affluence.

Green vegetables

Green vegetables, including plants whose green parts such as leaves, stalks or unripe fruits are eaten raw or after special preparation (cooking, frying, etc.), and excluding plants used

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Tab. 1 List of wild food plants used in Slovakia since the 19th century.

Family	Latin name	Cr.	Local names	Parts used	Mode of use	Reference No.
Aceraceae	*Acer campestre* L. (only this species is mentioned with a Latin name but probably *Acer pseudoplatanus* and *A. platanoides* were used as well)	A	klen	BEVsap	sap drunk fresh or frozen by children;	[40,41]
		L	javor	VEG	immature fruits sucked as a snack	[46]
	Acer sp.	O	javor	BEVsap	sap made into sugar in the early 19th century	[32,33]
Apiaceae	*Anthriscus cerefolium* (L.) Hoffm.	L	mačia madra	VEG SUB	whole plants as an ingredient of soup or other boiled dishes	[46,48]
	Angelica archangelica L.	N	(archangelika)**	VEGfam	famine food	[55]
	Carum carvi L.	L	rasca	VEG	aerial parts added to boiled dishes	[49]
				SEA	seeds as spice for bread, soups and vodka	[46], KZ
	Chaerophyllum bulbosum L.	A	repa, repka, krkoška	SUB	raw tubers eaten in spring "until the first thunder" mainly by children	[39,40,46]
	(?) *Daucus carota* L.	L?	poľna mrkva, knahenka	SUB	eaten in the fields after ploughing; this information may, at least partly, refer to Stachys palustris whose rhizomes were on the Polish side of the Carpathians (at the feet of the Tatras) gathered from fields after ploughing and called dzika marchew, i.e. wild carrot [26].	[46]
	(?) *Pastinaca sativa* L.	A?	paštrnák	SUB?	first year root, not clear if the reference reports actual use	[40], KZ?
	Pimpinella saxifraga L.	L	bedrenčok	BEVliq	roots formerly added to vodka	[46]
Asteraceae	*Arctium lappa* L.	L	lopuch, lopúch	VEGfam	boiled as famine food	[46,55]
				BEVliq	roots added to vodka	[46]
	Carlina acaulis L.	L	repka	VEG	inner part of inflorescences raw	[46,48]
	Cichorium intybus L.	A	čakanka, tuhovňik	VEG	young leaves raw	[40,46], KZ
	(?) probably *Cirsium oleraceum* (L.) Scop. or/and *C. rivulare* (Jacq.) All	N?	štrbak (as *Cichorium endivia*), bodiak	VEG	potherb	[46,55]
	Inula helenium L.	L	maškuľin, mačkuľin	BEVliq	spice for vodka	[46]
	Chamomilla recutita (L.) Rauschert	N	rum'janok	BEVher	infusion drunk until the mid-20th c.	[51]
	Petasites sp.	L	ďeviasel, ďiviasel	SUBfam	rhizomes as famine food	[46]
	Tanacetum sp. (probably *Tanacetum offcinale* L.)	L	boľačkovo žilja, boľačkovo ziľa, boľačkovoj ziľa	SEA	chopped as spice mainly for scrambled eggs	[49,57]
	Taraxacum sp. (as *T. officinale*)	A	pupava, popovňak, HU: pitypang	VEG	raw or fried – for a snack, salads and potherb; often the use was a new tradition introduced at the end of the 19th century by returning emigrants	[40,45,46], ZM, KZ
	Tragopogon orientalis L.	A	koria brada	VEG	stalks sucked by children	[40,41]
	Tussilago farfara L.	L	podbeľ, podmačka, podlieu, podbieľ, veľki podbeľ, žltie pierka	VEG	commonly made into soup until 1920s, VEG were chopped, spiced with flour, pig fat and vinegar, it was a popular food in Horehronie	[46,48]
				SUB	raw, eaten by children, supposedly tasted like cabbage head cores	[46]
Berberidaceae	*Berberis vulgaris* L.	A	nd, HU: sóskaborbolya	VEG	young shoots eaten raw in spring or added to sauces	[40]
				FRU	nd	[40], ZM
Betulaceae	*Betula pendula* Roth.	A	breza	BEVsap	sap drunk fresh or frozen by children	[40,41,45]
Brassicaceae	*Armoracia rusticana* P. Gaertn., B. Mey & Scherb.	L	chren	VEG	boiled, sometimes also after lactofermentation, mainly famine use	[46,55]
				SEA	roots as meat condiment, also added to vodka	[46], KZ

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Tab. 1 *(continued)*

Family	Latin name	Cr.	Local names	Parts used	Mode of use	Reference No.
	Brassica nigra (L.) W. D. J. Koch	L	čierná kapusta, podlubki	VEG	soups and sauces	[46,58]
	Cardamine amara L.	A	žerucha, režucha, žerušnica, horká, šalvija, krasch, kreschbrunn, kressbrunnen	VEG	eaten mainly before St George's Day (24 Apr), raw with vinegar or oil, also added to soups and meat dishes	[39,40,43,44, 46,54,56], KZ
	(?) *Lepidium latifolium* L.	L?	žerucha	VEG	raw	[46]
	(?) *Nasturtium officinale* R. Br.	L?	žerucha	VEG	raw	[46,48]
Cannabaceae	*Cannabis sativa* L.	L	konope	FRU	seeds raw, crushed and sucked	[46,48]
Caprifoliaceae	*Sambucus ebulus* L.	A	podzemní bez; podzemný bez	FRU	fried into jam, used mainly as medicine against respiratory infections	[39,40]
	Sambucus nigra L.	A	bez, čierna baza, čierny bez, kozičky, chabs	FRU	as above	[39,40,45,49], KZ
	Viburnum lantana L.	A	nd	FRU	raw (by chidren)	[40]
	(?) *Viburnum opulus* L.	NO?	kalina	FRU	nd	[55]
Chenopodiaceae (recently moved to Amaranthaceae)	*Atriplex hortensis* L. and *Chenopodium bonus-henricus* L. mentioned but probably more species from these genera were used	L	loboda, ľebeda, natina, zeľina, gracka, mastná zelina	VEG	boiled and/or fried as potherb, soup or with potatoes and flatbread	[46–48,53, 55,58]
Cornaceae	*Cornus mas* L.	N	drienky	FRU	formerly mainly raw, in the 20th c. also made into vodka	[40] (mistakenly as *C. sanguinea* L.) [45,46]
Corylaceae	*Corylus avellana* L.	AO	lieska, fruits as oriešky	FRU	raw, or added to bread or cakes	[40,41,46,48, 49,58]
			catkins called brost, riasa	FLOfam	dried catkins ground into flour at the beginning of the 19th	[46,55,58]
Cupressaceae	*Juniperus communis* L.	AO	jadlovec, jalovec, borovka, borovňice	FRU	spice for vodka and sauerkraut	[40,45,46]
Equisetaceae	*Equisetum* sp. (probably *E. arvense* L.)	N	(praslička)**	VEGfam	famine food	[55]
Ericaceae	*Vaccinium myrtillus* L.	AO	čučoriedky, jafury, borovňice, borovki, HU: áfonya	FRU	raw, jams, wines, dried for infusions	[40,45,46,48, 49,55,56,58], ZM
	Vaccinium vitis-idaea L.	AO	brusnica, brušnica	FRU	preserves	[40,45,46,55, 56]
Fabaceae	*Lathyrus tuberosus* L.	A	repnica, repňica, orešíc, orešina, červené orešie, oresie	SUB	tubers raw or baked in ashes, eaten by shepherds and children	[39–41,46,48]
	Onobrychis viciifolia Scop. (as *Onobrychis*)	L	slaninka	FLO	eaten raw by children	[46]
	Robinia pseudoacacia L.	A	biely agát, HU: akác	VEG	fried in oil (coated in batter)	[39], ZM
				FLO	flowers as children snack	ZM
	Trifolium pratense L.	L	červeni chľebik	FLO	nectar from flowers sucked by children	[46]
	Trifolium sp.	L	lóhere	VEG	leaves as children snack	ZM
	Vicia lathyroides L.	L	ľadňik, dĩvi hrach	FLO VEG	flowers and green pods raw (by children)	[46]
Fagaceae	*Fagus sylvatica* L.	AO	buk, fruit called bukvica	FRU	raw or dried, or pressed into oil	[39,40,49,58]
				OTHfam	wood shavings added to food during the 1847 famine	[52]
			buková voda	BEVsap	raw, also as medicine	[45]
	Quercus petraea Matt. (Liebl.) (as *Q. sessilis* Ehrh.) and probably *Q. robur* L. as well	L	žalude	FRUfam	famine food	[46,58]
	Quercus sp.	L	HU: tölgy	FRU	raw, children's snack	ZM

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Tab. 1 *(continued)*

Family	Latin name	Cr.	Local names	Parts used	Mode of use	Reference No.
Gentianaceae	*Gentiana cruciata* L.	L	terlie, trlie, terleč	BEVher	roots gathered until recently as spice for tea	[57]
	Gentiana punctata L.	L	horec	BEVliq	highly prized addition to vodka	[46]
	Gentiana sp. (?; as *Gentianella*)	LD	goročka, gorička	BEVliq	"roots like fingers" used as an addition to vodka or as infusion	[46]
Grossulariaceae	*Ribes uva-crispa* L. (as *Ribes grossularia** and *Grossularia*)	L	egreš, gigadze, muchinki, muchiňak	FRU	raw, eagerly sought after by children	[40,46]
	Ribes nigrum L.	A	čierný rýbiz, smrdlenka	FRU	raw	[40]
	Ribes rubrum L. (maybe a related *R. spicatum* Robson)?	L	kvasňice	FRU	raw	[46]
	Ribes petraeum Wulfen	L	kvasňice	FRU	raw	[46]
Lamiaceae	*Glechoma hederacea* L. and *Glechoma hirsuta* Waldst. & Kit.	A	nádešník, nádešníček, oponka, kocurovo vajca/vajcia, kocurovo jajca, kocurovo jajička	VEG	leaves as spice for soups, sauces and potatoes; widely used until the 1940s	[39,40,43,44, 46,48,49,52, 57]
	Lamium album L.	L	hlucha pokriva	VEG	potherb	[45]
	(?) *Origanum vulgare* (as Melissa)	N?	lebitka	SEA	flowering shoots as a spice	[49]
	Mentha sp.	N	mjata kruta	SEA	spice	[49]
	Symphytum officinale L.	A	madunica, medunica	FLO	nectar from flowers sucked by children	[39,41]
	Thymus sp.	L	materina duška	SEA BEVher	flowering shoots	[49,51]
(?) Lamiaceae	unidentified (as *Nepeta* sp.)	?	madra	SEA	seasoning	[49]
Liliaceae (recently moved to Amaryllidaceae)	*Allium scorodoprasum* L.	A	divý česnek	SEA	used as a garlic surrogate	[40]
	Allium ursinum L.	A	remža	VEG	potherb	[42]
		L	HU: medvehagyma	FRU	fruits as children's snack	ZM
Lythraceae	*Trapa natans* L.	L	nd	FRU	eaten boiled in S Slovakia until the end of the 19th century	[32,33]
Malvaceae	*Malva pusilla* Sm. (as *M. rotundifolia* L. and *M. borealis* Wallr.)	A	pánbožkové koláčky, pánbozkové kolácky, pagačica, pánbíčkové koláčky, peniažková zelina	VEG	unripe (green) fruit eaten raw by children	[39–41,43]
	Malva sp.	L	sliz	VEG	added to cooked dishes	[49]
	Malva sylvestris L.	A	rindziki, sirjeňak, sirjenčak	VEG	soup	[46]
				VEG	unripe (green) fruit eaten raw by children	[46]
Orchidaceae	*Orchis morio* L.	L	žaludkovi koreň, vlaski orech	BEVliq SUB	tubers added to vodka and formerly used as food	[46]
Oxalidacaceae	*Oxalis acetosella* L.	A	zajačía ďetalinka, zajačková kapusta	VEG	mainly raw as children's snack, also added to sauces	[40,46], ZM, KZ
Pinaceae	*Abies alba* Mill.	L	jedľina	VEGfam	raw as famine snack	[46]
	Larix decidua Mill.	L	červeni smrek	OTH	resin chewed mainly by children	[46,48]
Plantaginaceae	*Plantago major* L.	A	babka, kolocier, kološija	VEG	mainly as potherb	[40,43,46,49]
	Plantago media L.		volovo ucho	VEG	potherb	[43]
Poaceae	*Elymus repens* (L.) Gould (as *Triticum repens* L.)	L		SUBfam	rhizomes, in 1847 (famine), dried, ground for bread	[39]
Polygonaceae	*Rumex acetosa* L.	A	štiav, kvasinka, šťava, štaveľ, šťovik, kozina, mokri križ	VEG	soups and sauces	[40,41,46,49, 55,58]
	Rumex sp. (some large-leaves species, given probably mistakenly as *R. hydrolapathum* Huds.)	LNR	konský šťav	VEGfam	boiled – only famine food	[46]

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Tab. 1 *(continued)*

Family	Latin name	Cr.	Local names	Parts used	Mode of use	Reference No.
Polypodiaceae	*Polypodium vulgare* L.	A	sladič, sladĭčka, sladĭca, soldečka, HU: páfrány	SUB	sucked by children, also used as sweetener	[40,46], ZM, Dr. N. Varchol – pers. comm.
Portulacaceae	*Portulaca oleracea* L. (as *P. sativa* L.)	A	nd	VEG	salad	[40]
Myrsinaceae (recently moved to Primulaceae)	*Cyclamen purpurascens* Mill.	ND	cyclaminy	SUBfam	tubers as famine food at the beginning of the 19th century	[45]
Ranunculaceae	*Ranunculus ficaria* L. (*Ficaria verna* Huds.)	A	blyskáč, blýštek, blyšček, liži kvet	VEG	salad	[39,40,42–44, 46]
				SUBfam	bulbils as famine food, especially in 1844	[42,43,46]
				BEVher	formerly drunk as infusion, also added to dishes as spice	[46]
				SEA		
Rosaceae	*Aruncus dioicus* (Walter) Fernald	N	parilo	BEVher	infusion as beverage	[51]
	Crataegus spp. (*C. monogyna* Jacq., *C. laevigata* (Poir.) DC. and other species)	L	hloh, HU: galagonya	FRU	mainly as children's snack	[40] (as *C. oxyacantha* L. and *C. monogyna* Jacq.), [46] (as *C. oxyacantha**), ZM
	Fragaria spp. (mainly the commonest *Fragaria vesca* L.)	AO	lesné jahody, jahoda, vtáčenička, sunyca, HU: eper	FRU	raw, very commonly eaten	[40,46,49,51, 55,58], ZM
	Fragaria moschata Duchesne (as *Fragaria elatior* Ehrh.)	A	smokva	FRU	raw	[40]
	Fragaria viridis Duchesne (as *Fragaria collina* Ehrh.)	A	truskavec, druzgavec	FRU	raw	[40]
	Geum urbanum L.	L	prestriť, pristriť	BEVliq	until the 1950s used as spice for wine	[57]
	Malus sp. (partly as *M. silvestris**, *Pirus malus* L.)	AO	plánky, planki, HU: vadalma	FRU	raw or added to sauerkraut; also as famine food	[40,46,49,56, 58], ZM
	Potentilla erecta L.	L	červienkovi koreň	BEVliq	roots added to vodka	[46]
	Sanguisorba minor Scop. (as *Poterium sanguisorba* L.)	A	žabacia zelinka	VEG	soups	[39,40]
	Prunus avium L.	A	nd	FRU	raw	[40]
	(?) *Prunus fruticosa* Pall. (mistakenly as *P. chamaecerasus* Jcq.)	DR?	nd	FRU	raw, eaten by shepherds	[40]
	Prunus spinosa L.	A	tereň, tŕnky, tarňik, psí trn, trnka, HU: kökény	FRU	eaten raw after frosts (esp. by children) or used to make plum brandy	[39,40,45,46, 49,55,56], ZM
	Pulmonaria officinalis L.	L	čmeľik, pľúcna zelina, medunica, včelka, cicalka	FLO	nectar from flowers sucked by children	[46]
	Pyrus spp. (as *P. communis* L., *P. piraster**)	A	planki	FRU	added to sauerkraut, eaten raw	[40,45,46,58]
	Rosa spp. (mainly *R. canina* L., *R. rubiginosa* L.)	A	šverboritki, šverboritky, šip, šipová ruža, šipki, sviboritki, HU: csipkebogyó	FRU	mainly made into fried jam (lekvar), also made into wine (since 20th century) and extensively used as famine food (unsweetened jam)	[39] (as *R. canina* L.and *R. rubiginosa* L.), [40,45] (as *R. canina**), [46] (as *R. canina**), [47], ZM

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Tab. 1 *(continued)*

Family	Latin name	Cr.	Local names	Parts used	Mode of use	Reference No.
	Rubus subgenus *Rubus*	AO	čornica, černica, čierna malina, ostružina, užyna, HU: rina (for *R. caesius*), szeder (for the other species from the subgenus)	FRU	mainly raw, also made into jam, or brandy and drunk as infusion	[39] (as *Rubus candicans* Whe, *R. corylifolius* Sm., *R. hybridus* Vill. *R. fruticosus* L.), [45,46] and ZM (both as *R. fruticosus** and *R. caesius**), [49,58,51]
	Rubus idaeus L.	AO	malina, malyna, červená malína, HU: málna	FRU	raw or jam	[40,49,51,55, 58] ZM
				VEG	infusion	[49,51]
	Sorbus aucuparia L.	A	skorucha, skoruša, karušniak	FRU	eaten mainly as famine food, dried for winter for food, also added to vodka	[40,46] (mistakenly as *S. domestica**), [55]
	Sorbus aria L.	A	skorucha, skoruša, karušniak	FRU BEVliq	dried for winter for food, also added to vodka	[40,46]
Scrophulariaceae (recently moved to Plantaginaceae)	*Veronica beccabunga* L.	A	bobovník	VEG	soup	[40]
Tiliaceae	*Tilia* sp. (*Tilia cordata* Mill. and *Tilia platyphyllos* Scop.)	O	lipa	BEVher	infusion from flowers, until the mid-20th century	[51]
Urticaceae	*Urtica dioica* L.	AO	žichľava, pokriva, kopriva, veliká žihlava, veľká žihľava, pŕhľava, pŕhlava	VEG	young shoots in soups, potherb, sauces, used mainly until World War I	[39,45,46,48, 49,50,51,55, 58], KZ
Valerianaceae	*Valeriana* sp. (probably *Valerianella* sp.?)	LD	čortove zilja	VEG	shoots added to cooked dishes	[49]
	Valerianella locusta (L.) Laterr. (as *Valeriana olitoria* Poll.)	A	nd	VEG	young plants in salads with vinegar	[40]

Cr. – credibility of identification: ? and (?) – identification uncertain; A – Latin names identified by a botanical expert; L – Latin name given by other researchers. Botanical name identified using: D – species description; N – local name; R – analysis of the range of related species. Local names: HU – a local Hungarian name; KZ – Zlkovanová's letter; nd – no data on local Slovakian names; ZM – Melečková's letter. Parts used: BEVher – herbal infusions; BEVliq – alcoholic beverages; BEVsap – tree sap; fam – used only in times of famine; FLO – flowers (their nectar eaten raw or flowers added in larger quantities to dishes); FRU – fruits (raw or in preserves); OTH – other; SEA – only small amounts added to dishes as seasoning; SUB – subterranean parts (rhizomes, roots, bulbs, tubers) – raw as a snack or added to boiled dishes; VEG – green vegetables: aerial parts (leaves and shoots), raw, boiled or fried.

in small quantities only as seasoning, constitute the second largest use category, with 39 species recorded. The most represented families are Asteraceae (7 species), Brassicaceae (5 species) and Apiaceae (3 species). Most of the recorded green vegetables are plants, which were eaten in times of scarcity, usually as mixed potherb or soup, often with an admixture of potatoes, cereals, butter, milk or cream. The only widely used green vegetable, which is still commonly used in nutrition is *Rumex acetosa* (leaves used to make soup). In some parts of Slovakia *Cardamine amara* leaves were also used relatively frequently, in a similar fashion to cultivated cress – raw or added to boiled dishes (Tab. 1). Up until the beginning of the 20th century the shoots of *Urtica dioica* and Chenopodiaceae species were often used with a variety of cooked and fried dishes, particularly in the years of bad harvest. As these plants were associated with poverty, their use is practically extinct nowadays (Tab. 1).

Underground parts

The use of underground parts of plants (roots, rhizomes, bulbs) was recorded only for 12 species. The sweet rhizomes of *Polypodium vulgare* were particularly widely used. Other

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species were used less frequently, as children's snacks (e.g. *Chaerophyllum bulbosum*, *Lathyrus tuberosus*) or famine food (*Elymus repens*, *Ranunculus ficaria*).

Seasoning and preservatives

Out of the ten species used as seasoning, only four have been used commonly: *Glechoma hederacea* and *G. hirsuta* (leaves of both as spice for soups and sauces), *Carum carvi* (seeds) and *Armoracia rusticana* (grated roots, as spice for meat). The use of *Glechoma* species gradually decreased in the 20th century and by the 1970s was only practiced by the older generation.

Beverages

A few species of mainly medicinal plants were drunk locally on an everyday basis (e.g. *Tilia* spp., *Chamomilla recutita*). In spring fresh tree sap was drunk, mainly by children (*Betula pendula* and *Acer* spp.). Making juices, wine and liqueurs out of wild fruits seems to be mainly a 20th century fashion, rarer in earlier times (due to the high price of sugar), which became an extremely widespread activity in the countryside in the second half of the 20th century in the Communist period, then diminished due to the increasing affluence of society. On the other hand adding wild plants to liqueurs as flavouring was commonly practiced both in the 19th and 20th century.

Bread ingredients

The reviewed article contains surprisingly few references to wild food bread ingredients, even in times of famine. Altogether only 4 such taxa are mentioned (*Fagus sylvatica*, *Elymus repens*, *Rosa* spp. and *Crataegus* spp.).

Children's snacks

A large proportion of the presented species list is made up by children's snacks. The use of some wild snacks, such as the unripe seeds of *Malva* spp. or *Polypodium vulgare* rhizomes may be a relic of use of food plants by adults, whereas using the nectar sucked from flowers is a part of pan-European children's ethnobotanical folklore [2,28].

Tab. 2 Wild food species reported by at least three authors.

Latin name	No. of authors
Urtica dioica L.	7
Rubus idaeus L.	6
Fragaria spp., *Malus* sp., *Rubus* subgenus *Rubus*, *Vaccinium myrtillus* L., *Rumex acetosa* L.	5
Atriplex and *Chenopodium* spp., *Cardamine amara* L., *Glechoma* spp., *Oxalis acetosella* L., *Polypodium vulgare* L., *Prunus spinosa* L., *Pyrus* sp., *Taraxacum* spp.	4
Armoracia rusticana P. Gaertn., B. Mey & Scherb., *Cichorium intybus* L., *Corylus avellana* L., *Crataegus* spp., *Fagus sylvatica* L., *Quercus* spp., *Rosa* spp., *Sambucus nigra* L., *Sorbus* spp., *Vaccinium vitis-idaea* L.	3

Discussion

Comparison with other countries

The pattern of species use in Slovakia is very similar to that Polish, Ukraine and Hungary [26–28,63,64]. In these areas, usually only a few species of fruits and wild vegetables were used within one village or small region, and a larger number was used only in times of famine. The use of fruits in both countries is nearly identical – nearly the same species (mainly various Rosaceae and *Vaccinium* spp.) have been collected and eaten raw or turned into jams, juices and alcoholic beverages. Both in Poland and Slovakia the larger scale processing and preserving of fruits with the addition of sugar is a relatively new phenomenon, which was originally restricted to the aristocracy, but throughout the 19th and 20th century it became a part of everyday cuisine [29]. This similarity to plant use in the Polish and Ukrainian parts of the Carpathians is caused by the linguistic and habitat similarities between these areas: all of them inhabited by people speaking related languages and dialects with very similar vegetation and rural economies.

Nowadays Slovaks use relatively few species of wild food plants, however in the olden times people knew many species of wild green vegetables, which could be used to supplement nutrition during spring food shortages. Markuš [48] wrote that up to 50 species of wild greens may have been gathered in times of poverty (without specifying all of them). However due to the negative reputation of wild greens they have not been preserved the in modern diet, apart from the use of sorrel (*Rumex acetosa*). Similarly to Poland, the most commonly used wild greens were *Rumex acetosa*, *Urtica dioica* and Chenopodiaceae species. There are actually more parallels with the use of plants in the Polish Carpathians: using the leaves of *Glechoma* spp. as soup seasoning and the use of the rhizomes of *Polypodium vulgare* as a children snacks and sweeteners [29].

A specific feature of some parts of Slovakia is the use of *Cardamine amara*, not reported from other surrounding countries. Another particular feature of Slovakia is the widespread use of medicinal herbs as seasoning for liqueurs. These species are relatively frequently mentioned in the literature on wild food plants, which suggests that they were culturally salient [40,46,57].

On the whole, Slovak culinary culture could positioned on the herbophobous side of the "herbophilia – herbophobia" spectrum. These terms, introduced by the author of this article in 2008, distinguish cultures where large amounts of wild greens are consumed directly as food or medicine (herbophilous cultures) from those which are "herbophobous", in which wild greens are used almost exclusively as famine food, and even in herbal medicine are not consumed directly but in the form of infusions, decoctions or liqueurs [26,27]. The lack of interest in eating wild greens in contrast to calorie-rich dairy and cereal products was summed up by Holuby in 1872 with a popular saying: "Nemcom zelina, Ma'arom slanina, a Slovákom kaša s mliekom" which can be translated as "greens for Germans, lard for Hungarians and kasha and milk for Slovaks" [39].

It is more difficult to compare the use of wild food plants in Slovakia, with that of other neighbouring countries (Czech Republic, Austria and Romania) as they lack detailed ethnobotanical reviews. However in all of them wild fruits seem to be more appreciated and used than wild green vegetables [19,65,66]. It is only in the Hungarian ethnographic literature

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[64], e.g. in the works of Bella Gunda [67], about the eastern part of the Pannonian Plain (eastern Hungary), that we get a description of the use of water and aquatic plants in nutrition, e.g. *Glyceria* and *Typha* sp. This category of plants (apart from *Cardamine amara*) is hardly present among Slovak food plants, mainly due to the natural conditions of Slovakia, which is a country composed mainly of hills, mountains and, to a lesser extent, fertile flatlands taken up by intense agriculture, with little area covered by marshy habitats.

The proportion of families in the wild plants consumed in Slovakia is similar to that of Poland [28,29], as in both countries Rosaceae dominate among fruits, Lamiaceae in the category of seasoning and Asteraceae among wild vegetables. Also, similarly to Poland and in contrast to the Mediterranean countries [1], hardly any wild Liliaceae were used in nutrition.

Credibility of presented material

The reviewed material was critically evaluated in search of possible identification mistakes. As shown by Łuczaj [61], ruling out identification mistakes is not possible without voucher specimens. On the other hand the credibility of identification can be assessed indirectly, for example by the profession and expertise of the author of the publication, and by analysing the data from other publications, particularly those concerning local plant names and distribution maps of the analysed taxa. Expert botanists tend to report a much lower number of incorrect ethnobotanical taxa [61]. It seems that the publications of Holuby, the leading 19th century Slovak botanist, are highly credible (although even he confused the Latin names of the edible *Cornus mas* and inedible *Cornus sanguinea*). The works of Markuš, an ethnographer by profession, can however contain a few erroneous identifications (marked in Tab. 1). There is no problem with the identifications of other authors as they reported only common, widely known species.

Scope for future studies

Slovakia is a modern country which underwent intense industrialization processes in the Communist period. The loss of ethnobotanical knowledge and local tradition was enhanced by the collectivization and destruction of private farming, causing the abandonment of "old ways". However there is still much scope for local studies on traditional plant uses in some parts of the country, including the large ethnic minority groups of Hungarians, Roma and Carpatho-Rusyns. How much of the knowledge is still preserved can be seen from Varchol's study on the beliefs about plants among the Carpatho-Rusyns of the Prešov area [68]. A study of the use and traditional knowledge of wild food plants by Roma communities in Slovakia could be a particularly interesting issue, as only scraps of their ethnobotanical knowledge are recorded [69]. Return studies to the areas where Holuby and Markuš researched wild food plant use could also be of great interest, as well as a survey of wild food snacks among children parallel to the one carried out in Poland [70].

Conclusions

It must be stressed that the analysed literature documents an absolutely dramatic decrease in the use of wild plants as food. Most species formerly used as green vegetables are not used any more. Less of the traditional heritage has been lost in the case of fruits. The majority of the fruits reported in most publications are still gathered. Actually their use increased in the 20th century, due to the use of sugar as a preservative.

Slovak use of wild food plants is very similar to that of southern Poland and can be characterized by a high appreciation of wild fruits and low appreciation of wild green vegetables, which are regarded mainly as famine plants. There is still scope for local ethnobotanical studies in Slovakia, particularly as Slovakia is a country with well-preserved natural vegetation and a few large ethnic minorities.

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