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MEDICINAL PLANTS BIODIVERSITY AND THEIR RESOURCES OF ONE SERPENTINE SITE IN THE RHODOPE MTS. (BULGARIA)

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SYNOPSIS

This study is basic situation analysis about medicinal plants in one of the largest serpentine outcrops in the Eastern Rhodope Mts. and is the first necessary level of research about complete medicinal plants resources assessment. Total number of medicinal plants is established (66), their biodiversity and the subsequent multi-criteria analysis (biological type, modes of reproduction, collection for personal use, commercial purposes, and their use for specific healing, used part, main chemical compounds, economical importance) enabled the determination of groups of "effective medicinal plants" and group of "target medicinal plants", including fourteen medicinal plants: *Juniperus oxycedrus, Sanguisorba minor*, *Hypericum perforatum, Rosa canina, Sedum acre, Thymus* spp. diversa, *Cotinus coggygria, Fragaria vesca, Fraxinus ornus, Plantago lanceolata, Digitalis lanata, Teucrium chamaedrys*, *Teucrium polium* and *Filipendula vulgaris.* This number represents 21.2% from total registered medicinal plants at study area and 41.2% from "effective herbs". According to available resources, their ability to use and their potential, these species divided into several subgroups.

INTRODUCTION

Medicinal and aromatic plants (MAPs) play an important role in the healthcare of people around the world and continue to be the main source for obtaining compounds with complete range of biological activities. Some studies in recent

years have focused on screening about medicinal and aromatic plants growing under different environment such as various stress conditions (Obratov-Petković et al., 2006; Rajakaruna et al., 2002). Such plants can be considered as an another source for compounds with medicinal activities and as a genetic resources for agricultural relations (cultivation) for adaptation to low nutrient soils and soils contaminated with heavy metals, drought tolerant. On the other hand some of the medicinal plants may accumulate heavy metals in different plant tissues, that is in relation to the quality of the herbs. Medicinal plant resource assessment is a part of the modern approach to study medicinal plants, their conservation and sustainable use (Lange, 1998, 2002; MPSG, 2007).

Serpentine (ultramafic) outcrops in all over the world attract the attention of the botanist for many years due to the unusual edaphic conditions they provide for plants growing on them. Serpentines and their soils are characterized by low nutrient status, cation imbalances, toxic quantities of heavy metals (particularly Ni and Cr), low Ca/Mg ratio, drought, and wide temperature fluctuations and plant populations growing on serpentine sites are likely adapted at some level to these special edaphic conditions (Brooks, 1987; Kruckeberg, 1984, 1992). These factors limit plant growth and survival in serpentine habitats and appeared unique to explore the process of speciation (Kruckeberg, 1986; Rajakaruna & Bohm, 1999), interactions plant-soil and plant-herbivore (Boyd & Martens, 1998; Mesjasz-Przybylowicz & Przybylowicz, 2001), as well discovery of novel compounds that may be produced in response to edaphic stresses.

These rocks are associated with a unique flora with rare, endemic and different races of plants. The uniqueness of serpentine floras according to Kruckeberg (1984, 1992) derives from particular mixes of four types of floristic elements: endemics to the serpentine substrate; local indicator species; wide-ranging species that occur in variety of habitats and species that are excluded from ultramafics. In last two groups quite often are included plants considered of medicinal importance. The distribution and the degree of presence of medicinal plants are directly correlated to edaphic factors (Obratov-Petković et al. 2006). The most important for the plants used as a medicinal is the quality of their active substances. The quality of active substances present in the plant is depended not only on its physiological potential and condition, but also on some environmental factors (Lombini et al., 1999; Obratov-Petković et al., 2004). Plants growing in serpentine soil and environments may be interesting and promising subject for the study of plants with specific biological activities. RAJAKARUNA et al. (2002) studying pharmacological properties of the Sri Lanka serpentine plants document that 29 of the 45 species are active against at least one microorganism tested and suggest that these plants may produce chemical compounds with important antimicrobial properties.

In Bulgaria, a country with a tradition in the use and study of medicinal plants, systematically carried out an assessment of biodiversity and resource characteristics

of certain territories, as well as those focused on individual species (Hardalova et al., 1998; Evstatieva & Hardalova, 2000; Evstatieva & Vitkova, 2000; Evstatieva, 2003; Evstatieva et al., 2007). Among them is the first study of medicinal plants and their resource importance on serpentine terrains in Vlahina Mt. (Southwestern Bulgaria) (Nedelcheva & Pavlova, 2006).

Medicinal plant resource assessment is also included in the forest management projects and in the municipal ecological programs (Evstatieva, 2003; Evstatieva et al., 2007).

In this paper, we review preliminary findings of a biodiversity survey of medicinal plants and their resources in one of the largest serpentine outcrops in the Eastern Rhodope Mts.

MATERIALS AND METHODS

During April-July 2010 the investigations were concentrated on serpentine site situated southwards from village Fetler (UTM Grid: LF- 58) in the Eastern Rhodope Mts. shown on an UTM Grid map 15×15 km (Fig. 1).

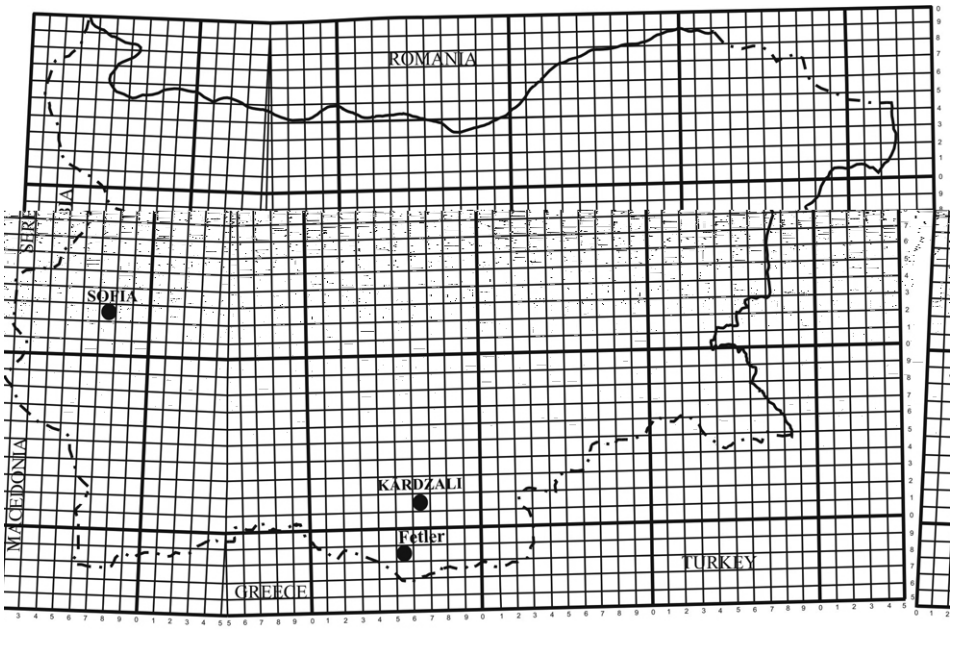

Figure 1: Map of the study area.

General characteristics of study area

The climate in the northern foothill of the mountain is characterised by comparatively mild winters, with a characteristic southern wind, and relatively cool summers with mean July temperature 22.5°C. In the Eastern Rhodope Mts., at

altitudes 400-1000 m, the mean January temperature is 0.5°C with moderately warm summers, and mean July temperature 18°C. The winter precipitation exceeds the summer values with 9-11% (Moraliysky & Goceva, 1989; Koleva, 1989).

This serpentine site is one of the largest in the Rhodope Mts. It is located on left site of the Varbitza river, 3 km long and 1 km wide (Fig. 2). The terrain has south and southwest facing exposure. This is a rocky slope between 250 m and 425±20 m a.s.l. The serpentine forms screes where the ferns *Cheilanthes maranthe* (L.) Domin, *Asplenium cuneifolium* Viv. and *Asplenium trichomanes* L., *Micromeria dalmatica* Benth., *Silene spergulifolia* Bieb., *Convolvulus boissieri* Stend. ssp. *parnassicus* (Boiss. et Orph.) Kuzm., and the endemics *Potentilla regis-borisii* Stoj., *Onosma pavlovae* Tan et Petrova, *Verbascum humile* Janka, and *Saponaria stranjensis* D. Jord. grow. The tree and shrub vegetation is weak presented mainly from *Fraxinus ornus* L., *Carpinus orientalis* Mill., *Ulmus minor* Mill., *Juniperus oxycedrus* L., *Ligustrum vulgare* L., *Rubus* sp. etc. Near the river on thicker soil and higher humidity, the tree and shrub vegetation is represented by *Alnus glutinosa* (L.) Garth., *Populus nigra* L., *Prunus mahaleb* L., *Vitis vinifera* L., *Salix* sp., etc.

The herbar specimens are kept in the Bulgarian Serpentine Flora thematic collection in the Sofia University Herbarium (SO) (Nedelcheva et al., 2009). As medicinal plants were accepted the species included in the “Law of the medicinal plants” (MOEW, 2000) in Bulgaria.

Figure 2: View of study area: serpentine site of the Varbitza river (left site), Eastern Rhodope Mts.

RESULTS AND DISCUSSION

In the study were found a total of sixty-six species (66) of medicinal plants, which belong to Polypodiophyta (3) Spermatophyta (63) Pinophytina (1) and Magnoliophytina (62) (Table 1). Among the identified thirty-four families with the bigger number of species are Lamiaceae (9), Fabaceae (5), Rosaceae (4), Asteraceae (3), Boraginaceae (3). Most of the families contain one or two species.

Fifty-three percent of medicinal plants are perennial herbaceous plants. With the same proportion (15.2%) are the annual plants, the group of shrubs and trees and of 4.5% goes to biennial herbaceous plants. In some cases, environmental conditions determine the plants as annual or biennial (9.09%) or perennial-biennial (3.03%).

The species determined possess different modes of reproduction: seeds (66.7%), spores (4.6%), or in a vegetative way (seeds, veg 28.8%). The huge number of species capable of vegetative resumption shows potential for sustainable exploitation of medicinal plants in the study area.

According IUCN category and criteria *Ficus carica* is assigned as LC (Least Concern) and included in Red List of Bulgarian vascular plants (Petrova & Vladimirov, 2009) – the population status have been evaluated but do not qualify for any other category.

Some of the established species (8.2%) are weeds and ruderals. The study area is lees of human impact, less intensification of farming - small off-road vehicles rarely pasture and small family gardens.

Analysis of the recorded species showed that from all identified sixty six species only for thirty-four (51.5%) has established data for their collection for personal use, commercial purposes, and their use for specific healing. They form a group of “effective medicinal plants” used actually nowadays, according to information collected in field and historical ethnobotanical data (herbs for economic use and herbs gathered for personal needs). In Table 1 data about used part, medicinal use and main chemical compounds are mentioned. Only those species were analysed further, because of their potential or real importance as a resource of economic importance.

Different parts of these plants are used as herbs, dominated by those that collect aboveground part (herba, 50%). The rest are listed as follows: folia (12.1%), radix or rhizoma et radix (9.1%), fructus (4.6%), cortex (4.6%), semen (1.5%) and galbulae (1.5%). In seven of the species may be collected and used by more than one plant part *Buglossoides purpurocoerulea, Ficus carica*, *Plantago lanceolata*, *Plantago carinata, Fragaria vesca*, *Sanguisorba minor* and *Salix alba.*

The analysis of biological characteristics of the species was focused on the relationship between mode of reproduction and which part of the plant is collected as herb. For most of the species with seed reproduction are collected aboveground

part during of the full flowering or ripe fruit (seeds-herba (17), seeds-galbulae (1), seeds-fructus (3), seeds, veg-radix or rhizome (2) (MOEW, 2004). Because of difficulties in their restoration the populations of species with “Radix et rhizome” used parts (*Fragaria vesca*, *Sanguisorba minor*) should be placed under special control.

From established species cultivated in Bulgaria are *Hypericum perforatum*, *Ficus carica*, *Fraxinus ornus* and *Thymus* spp. diversa (Evstatieva & al., 2007). Part of the recorded species are of special interest, because they (their herbs) are in the list of twenty-five most exported medicinal plant species (herbs) from Bulgaria - Fructus Rosae cum semini, Fructus Rosae-semini, Fructus Rosae-frozen, Fructus Juniperi and Herba Hyperici (Evstatieva & al., 2007). Group of species and their herbs are classified as poisonous: *Herniaria glabra, Herniaria hirsuta, Convolvulus arvensis, Cuscuta europaea, Anagalis arvensis* and *Digitalis lanata.*

After the field collected data and literature review on medicinal effect of the herbs were identified a wide range of biologically active properties of medicinal plants in the research area. More than 38 different medicinal uses are determined according to Nikolov (2006): diuretic (12), antiinflamatory (11), astringent (9), antihaemorrhagic (6), antimicrobial (5), appetite stimulant (5), laxative (4), antitussive (4), pain relief (3), spasmolytic (3), sedative (2), antiseptic (2), antimycotic (2), tonic (2), expectorant (1), epithelization (1), keratolytic (1), regenerative (1), insecticide (1), cardiotonic (1), vitaminose (3), antipyretic (2), antirheumatic (2), antirheumatic (2), hypotensive effect (2), varicose vein treatment (2), cholagogue (2), overall tonic to boost the body (1), antiulcer (1), anthelmintic (1), anticoagulant (1), control blood sugar levels (1).

According to the accessibility of resources, three of the species are under special governmental control of protection and use by order of MOEW - *Cnicus benedictus*, *Sedum acre* and *Asplenium trichomanes* (MOEW, 2010) - determine the permissible gathered annual quantity or full collection ban at wild localities on the whole territory of the country. Forbidden for gathering at wild localities on the whole territory of the country are *Cnicus benedictus* and *Asplenium trichomanes*. In the Annex about collection on eligible amounts of dried herbs (annual quotas) administrative regions of the country *Sedum acre* is included. For administrative Kardzhali district (included studied area) are not authorized to collect specified amounts. The lack of such quota shows poor state of populations of species and its limited resources for this region. Admittedly goldmoss stonecrop is market demand herb (source of alkaloids), while a limited resource in the country. The population on serpentines are valuable genetic material for future cultivation.

After the baseline study of the species composition of medicinal plants and their biological characteristics and resource potential were defined group of species designated as “*target species*”, including fourteen medicinal plants. This number represents 21.2% from total registered medicinal plants at study area and 41.2%

from “effective herbs”. According to available resources, their ability to use and their potential, these species divided into several subgroups.

A. Target species with significant resources, good potential for sustainable wild collection and widely current economic importance: *Juniperus oxycedrus* and collected Galbulae Juniperi. In the Kardzhali district (closer to serpentine site) is the only oil mills in the area, but not used effectively. A day in oil mills can be processed 20-30 t. Juniper pickers are few depending on the low price per kg. Juniper has significant resource potential for development as one of the main medicinal plants in the region.

B. Target species with significant resources good potential for sustainable wild collection, limited current economic importance: *Sanguisorba minor*.

C. Target species with limited resources, limited potential for sustainable wild collection and widely current economic importance: *Hypericum perforatum, Rosa canina, Sedum acre, Thymus* spp. diversa, *Cotinus coggygria, Fragaria vesca, Fraxinus ornus, Plantago lanceolata, Digitalis lanata* and *Teucrium chamaedrys.* One of the species contains cardiac glycosides (cardenolides) - *Digitalis lanata* which is a raw for pharmaceutical industry for receiving digitalis medicines. Cortex Frangulae is an industrial raw material for receiving coumarin.

D. Target species with limited resources, limited potential for sustainable wild collection and limited economic importance: *Teucrium polium* and *Filipendula vulgaris.*

In addition to this group of species, and to the total list of herbs can be added *Arceuthobium oxycedri* (DC.) M.Bieb. (Loranthaceae) (Zaidi et al., 2006; Akkol et al., 2009) semi-parasitic plant that lives on the branches of *Juniperus oxycedrus* as the host plant. According to preliminary observations about 20% by the juniper shrubs are infected. In Bulgarian folk medicine, the species is not prescribed as medicinal plant. Species can to be assign as a category perspective (species not cotemporary used, but with scientific and practical data for their use) (target group D).

CONCLUSIONS

This study is analysis of basic situation of medicinal plants in one serpentine site and is the first necessary level of research about complete medicinal plants resources assessment (Lange, 1998, 2002; MPSG, 2007). Total number of established medicinal plants, their biodiversity and the subsequent multi-criteria analysis enabled the determination of groups of “effective medicinal plants” and group of “target medicinal plants”. This study allows the application of modern inventory and monitoring methods for a limited number of species: *Juniperus oxycedrus, Sanguisorba minor*, *Hypericum perforatum, Rosa canina, Sedum acre, Thymus* spp. diversa, *Cotinus coggygria, Fragaria vesca, Fraxinus ornus, Plantago*

lanceolata, Digitalis lanata, Teucrium chamaedrys, *Teucrium polium* and *Filipendula vulgaris.*

Data from this study compared to other investigations in serpentine areas (Nedelcheva & Pavlova, 2006) gives possibility to determine group of medicinal plants related to serpentine habitats. Future studies are needed on the biological and phytochemical characteristics associated with the specific serpentine rock. This will enable to establish a strategy for conservation and sustainable use of medicinal plants growing on serpentine.

The present results provide a basis for further steps in the assessment of plant resources and correspond to the modern state, trends and perspectives of medicinal plants researches and use in Bulgaria.

Table 1: List of the medicinal plants recorded in the study area.

	TAXA	Common name	Biological type	Reproduction	Used part	Medicinal use	Main compounds
	POLYPODIOPHYTA **Aspleniaceae**						
1	*Asplenium trichomanes* L.	iztravniche, sindzhir paprat	per	spores, veg	herba	astringent, diuretic, expectorant, sedative	amino acids
2	*Asplenium cuneifolium* Viv.		per	spores, veg	herba		
	Hypolepidiaceae						
3	*Pteridium aquilinum* (L.) Kuhn	orlova paprat	per	spores, veg	herba		
	SPERMATOPHYTA PINOPHYTINA **Cupressaceae**						
4	*Juniperus oxycedrus* L.	chervena hvoyna, smrika	h1	seeds	galbulae	antiseptic, epithelization, insecticide, antimycotic, keratolytic	etheric oils
	MAGNOLIOPHYTINA **Anacardiaceae**						
5	*Cotinus coggygria* Scop.	smradlika	h1-h2	seeds	folia	astringent, antiinflamatory, antihaemorrhagic	tannins, etheric oils
	Apiaceae						
6	*Eryngium campestre* L.	vetrogon	per	seeds	radix	diuretic, spasmolytic	triterpene saponins
7	*Ferulago sylvatica* (Bess.) Reichenb.	gorska zimyanka	per	seeds			

	Asteraceae						
8	*Cnicus benedictus* L.	benediktinski tran, presechka	bi	seeds	herba	appetite stimulant, tonic, antimicrobial, diuretic	sesquiterpene lactones, lignanes, sterols
9	*Inula aschersoniana* Janka	oman	per	seeds	radix		
10	*Inula ensifolia* L.	oman	per	seeds	radix		
	Boraginaceae						
11	*Anchusa officinalis* L.	lechebno vinche	per-bi	seeds	radix	antitussive	alkaloids, tannins
12	*Buglossoides purpurocoerulea* (L.) Johnst.	beloochitsa	per	seeds	radix, semen, herba	diuretic	pigments, oil, alkaloids
13	*Echium italicum* L.	italiansko usoyniche	bi	seeds			
14	*Echium vulgare* L.	obiknoveno usoyniche	bi-per	seeds			
	Brassicaceae						
15	*Capsella bursa-pastoris* (L.) Medic.	ovcharska torbichka	bi-ann	seeds	herba	antihaemorrhagic	biogene amines
16	*Lepidium campestre* (L.) R.Br. in Ait.	goruha	ann	seeds	herba	control blood sugar levels	glucosinolates
	Campanulaceae						
17	*Jasione montana* L.	planinsko vyatarche	ann-bi	seeds			
	Caryophyllaceae						
18	*Herniaria glabra* L.	golo izsiplivche	ann	seeds	herba	diuretic, spasmolytic poisonous!	saponins
19	*Herniaria hirsuta* L.	vlaknesto izsiplivche	ann-bi	seeds	herba	diuretic, spasmolytic poisonous!	saponins
20	*Scleranthus perennis* L.	hrustyalka	per	seeds, veg			
	Convolvulaceae						
21	*Convolvulus arvensis* L.	povetitsa	per	seeds	herba	laxative, cholagogue poisonous!	resin glycoside, tannins
	Crassulaceae						
22	*Sedum album* L.	byala tlastiga	per	seeds, veg	herba		
23	*Sedum acre* L.	lyutiva tlastiga	per	seeds, veg	herba	hypotensive, diuretic, pain relief	alkaloids
	Cuscutaceae						

24	*Cuscuta europaea* L.	kukuvicha prezhda	ann	seeds, veg parasite plant	herba	laxative, diuretic, pain relief poisonous!	glucosides, flavonoids
	Fabaceae						
25	*Lotus corniculatus* W. et K.	obiknoven zvezdan	per	seeds			
26	*Melilotus alba* Med.	byala komuniga	ann	seeds	herba	sedative, spasmolytic, anticoagulant	coumarins, flavonoids
27	*Trifolium arvense* L. ssp. *strictus* Mert. et Koch	plevelna detelina	ann	seeds			
28	*Trifolium repens* L.	palzyashta detelina	ann	seeds			
29	*Vicia craca* L.	pticha glushina	per	seeds			
	Gentianaceae						
30	*Centaurium erythraea* Rafn. ssp. *erythraea*	obiknoven cherven kantarion	bi	seeds	herba	appetite stimulant, cholagogue, antipyretic	bitter compounds, glycosides, flavonoids
31	*Centaurium pulchellum* (Swartz) Druce	cherven kantarion	ann	seeds	herba		
	Geraniaceae						
32	*Erodium cicutarium* (L.) L'Herit	chasovniche	ann-bi	seeds	herba		
	Globulariaceae						
33	*Globularia aphylanthes* Crantz	gologlavche	per	seeds	herba		
	Hypericaceae						
34	*Hypericum perforatum* L.	zhalt kantarion	per	seeds	herba	antiinflamatory, tonic, regenerative	tannins, flavonoids
	Lamiaceae						
35	*Acinos arvensis* (Lam.) Dandy	acinos	ann-bi	seeds	herba		
36	*Prunella vulgaris* L.	obiknovena prishnitsa	per	seeds	herba		
37	*Salvia pratensis* L.	livadna kakula	per	seeds, veg			
38	*Sideritis montana* L.	mirizliv buren	ann	seeds			
39	*Teucrium chamaedrys* L.	podabiche	per	seeds, veg	herba	astringent, antihaemorrhagic, appetite stimulant,	tannins, flavonoids, iridoids

						antimicrobial	
40	*Teucrium montanum* L. ssp. *skorpilii* (Vel.) Peev	planinsko podabiche	per	seeds, veg	herba		
41	*Teucrium polium* L. ssp. *capitatum* (L.) Arcang.	byalo podabiche	per	seeds, veg	herba	astringent, antihaemorrhagic, appetite stimulant, antimicrobial	tannins, flvonoids, resines
42	*Teucrium scordium* L. ssp. *scordioides* (Schreb.) Maire et Petitm.	lukovo podabiche	per	seeds, veg	herba		
43	*Thymus* spp. diversa	mashterka	per	seeds, veg	herba	antiinflammatory, antitussiva, antimicrobial, anthelmintic	etheric oils
	Moraceae						
44	*Ficus carica* L.	smokinya	h1-h2	seeds	fructus, folia	laxative (fruits), astringent (folia), antiinflammatory, antimycotic, diuretic	innvert sugar (fructus), etheric oils, tannins (folia)
	Oleaceae						
45	*Fraxinus ornus* L.	mazhdryan	h1-h2	seeds	cortex	astringent, antiseptic, varicose vein treatment	coumarins, flavonoids, tannins
46	*Ligustrum vulgare* L.	maslinka	h1	seeds			
	Orobanchaceae						
47	*Orobanche minor* Sm in Sm. et Sowery	malak volovodets	per	seeds, parasite plant			
	Plantaginaceae						
48	*Plantago lanceolata* L.	tesnolist zhivovlek	per	seeds, veg	folia, herba	antitussive, antiinflamatory, laxative, antiulcer	mucus compounds, glycosides, flavonoids, tannins
49	*Plantago carinata* L. (Plantago holosteum)	grebenest zhivovlek	per	seeds, veg	folia, herba		
	Poaceae						
50	*Briza media* L.	salzitsa	per	seeds, veg			
	Polygalaceae						
51	*Polygala vulgaris* L.	obiknovena telcharka	per	seeds	herba		
	Polygonaceae						
52	*Polygonum arenarium* W. et K. ssp. *pulchellum*	pyasachna pacha treva	ann	seeds	herba		

	(Loiseli) Thell.						
53	*Rumex acetosella* L. ssp. *multifidus* (L.) Arcangeli	kozi kiselets	per	seeds, veg	folia	vitaminose, appetite stimulant	carboxylic acids, vitamines, flavonoids, tannins
	Primulaceae						
54	*Anagallis arvensis* L. ssp. *foemina* (Mill.) Schintz. et Thell.	polsko ognivche	ann-bi	seeds	herba	diuretic, antitussive, antiinflamatory, poisonous!	saponins, flavonoids, tannins
55	*Primula vulgaris* Huds.		per	seeds			
	Resedaceae						
56	*Reseda lutea* L.	zhalta rezeda	ann-per	seeds	herba	diuretic, varicose vein tratment	flavonoids
	Rhamnaceae						
57	*Paliurus spina-christi* Mill.	draka	h1	seeds	fructus	astringent, antiinflamatory, antihaemorrhagic, antimicrobial	tannins, flavonoids (rutin)
	Rosaceae						
58	*Filipendula vulgaris* Moench	obiknoveno orehche	per	seeds, veg	herba	antirheumatic, diuretic, antiinflamatory	glycosides, flavonoids, etheric oils
59	*Fragaria vesca* L.	gorska yagoda	per	seeds, veg	rhizoma et radix, folia, fructus	vitaminose, hypotensive effect, diuretic, antiinflamatory,	vitamines, tannins, flavonoids
60	*Rosa canina* L.	shipka	h1	seeds	fructus	vitaminose, overall tonic to boost the body	vitamines, tannins, sugars (monosa-ccharides)
61	*Sanguisorba minor* Scop. ssp. *minor*	drebna dinka	h1	seeds, veg	rhizoma et radix, herba	astringent, antihaemorrhagic, antiinflamatory	tannins
	Salicaceae						
62	*Salix alba* L.	byala varba	h2	seeds	cortex, folia	antirheumatic, pain relief, antipyretic	salicin, fenol glycosides, tannins
	Scrophulariaceae						
63	*Digitalis lanata* Ehrn.	valnest naprastnik	per	seeds, veg	folia	cardiotonic, poisonous!	cardiac glycosides
64	*Veronica austriaca* L. ssp. *jaquinii* (Bamg.) Maly	velikdenche	per	seeds, veg			

	Ulmaceae						
65	*Ulmus minor* Mill.	bryast	h2	seeds	cortex	astringent, antiinflamatory	triterpenoids, sterols, tannins
	Valerianaceae						
66	*Valerianella coronata* (L.) DC.	motovilka	ann	seeds			

Legend: ann (annual), bi (biannual), per (perennial), h1 (shrub), h2 (tree); veg (vegetative).

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