



Original Scientific Paper

The wild raspberry in Serbia: an ethnobotanical study

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ABSTRACT:

An ethnobotanical survey of the traditional use of the wild raspberry (*Rubus idaeus*) was conducted on nine sites in the regions of southwest (SWS) and southeast (SES) Serbia. The regions studied belong to mountainous rural areas in Serbia, mainly populated by Serbian people of the Orthodox faith. In total, 93 respondents were interviewed about the medicinal, food and cosmetic uses of the wild raspberry. In terms of plant parts in traditional use, the leaf and fruit are known to be used frequently. The dry leaf is more commonly used in the SES (78%) than in the SWS (25%) region. In the SWS region, the most frequent use of the wild raspberry leaf is linked to gastrointestinal disorders and prostate inflammation. In the SES region, the leaves are mostly used for the prevention and healing of gynecological disorders during both pregnancy and lactation. The local population of the SWS region uses the fruits mainly for the preparation of syrup juice (92%), fruit preserves (42%) and in desserts (62%), while in the SES area the fruits are most frequently used for the preparation of nonalcoholic (97.4%) and alcoholic beverages (35.9%). Our results provide some novel information on the use of the wild raspberry in Serbia and in the Balkans, such as for the treatment of prostate inflammation, use during breastfeeding and to alleviate inflammation of the eyes.

Keywords:

Rubus idaeus, ethnobotany, leaf and fruit, folk medicine, traditional products

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INTRODUCTION

The use of plants is highly dependent on social, cultural, and economic needs (ARI *et al.* 2015). Wild edible plants (WEP) and plants spontaneously occurring within agroecosystems have always been recognized as an integral part of traditional culture, supporting the food requirements of different local communities (ASHAGRE *et al.* 2016). Despite the fact that WEP have become a less important food source over time because of the development of agriculture and food industries, the trend of their use is on the increase (LICATA *et al.* 2016). The

raspberry is among the most used and appreciated edible fruits on the Balkan Peninsula. The raspberry (*Rubus idaeus* L.) is a member of one of the largest genera of the family Rosaceae – *Rubus*, comprising approximately 700 species (ROMOLEROUX 1992). The raspberry is thought to originate from north Asia and east Europe, where “*idaeus*” means “from Mt. Ida”, Greece –thus indicating the possibility of the fruit being first found by the ancient Greeks (JENNINGS 1988).

The wild raspberry is a perennial shrub with a height of between 100 cm and 150 cm. The stem is erect, cylindrical, and grey in colour, with a number of small thorns

on the surface. The leaves are pinnate of 5-7 leaflets or sometimes 3, glabrous on the surface and very hairy on the abaxial side. The terminal leaflet is oblong or ovate and shallowly lobed, whereas the stipules are fibrous or hairy. The cyme inflorescences are made of flowers that are usually prostrate, composed of narrow white, glabrous and whitish petals. The fruit is pale pink or light orange in colour (TATIĆ 1972).

On the Balkan Peninsula and in Serbia, the wild raspberry mostly grows at altitudes above 1000 m a.s.l., occurring on the edges of beech forests, in extensive orchards and vineyards, hedges, pastures and abandoned meadows and other unmanaged habitats (DUJMOVIĆ PURGAR *et al.* 2012).

The raspberry is used in folk medicine and nutrition. The biological activity of the raspberry fruit is linked to the presence of different polyphenols, such as gallic acid, ellagic acid conjugates, hydroxycinnamic acid, anthocyanins, and flavonols (MÄÄTTÄ-RIIHINEN *et al.* 2004), in addition to vitamin C (BENVENUTI *et al.* 2004). Raspberry fruits are produced for the fresh fruit market, and they are also used in a number of traditional and industrial food products, such as juice, jam, marmalade, spirits, and confectionery (DONNELLY *et al.* 1986).

Previous data from the Balkan Peninsula and Serbia refer to the synthetic ethnobotanical analysis of all taxa used, including the wild raspberry. However, there is a very little information about the wild raspberry, including details pertaining to its phylogeography, ecology, phytochemistry and quality and, particularly, its traditional uses. Given that Serbia is a country where several varieties of raspberries are grown on large areas, the wild raspberry was chosen for analysis in order to obtain data that could potentially be used to improve the usage of existing varieties.

The aim of this study was to assess the traditional use (medicinal and dietary) of the wild raspberry in different areas of Serbia, where the wild raspberry grows within its natural habitat.

MATERIAL AND METHODS

Study site. The study was carried out at nine sites in the mountainous region of Serbia (Fig. 1). The sites were selected based on the criterion of the richness of the natural wild raspberry populations as determined by our recent field tours, analyses of existing floristic and phytogeographical data and insight into the comprehensive vegetation data bases for the central Balkan Peninsula (AĆIĆ *et al.* 2012). All of the selected sites represent the villages at the closest distance to the target wild raspberry population. The altitude of the studied sites ranges from 675 to 1985 m a.s.l. The typical vegetation of natural wild raspberry habitats in Serbia is in the form of beech, miscellaneous beech-fir forests and high-alpine dry grasslands (AĆIĆ *et al.* 2015). Although the ru-

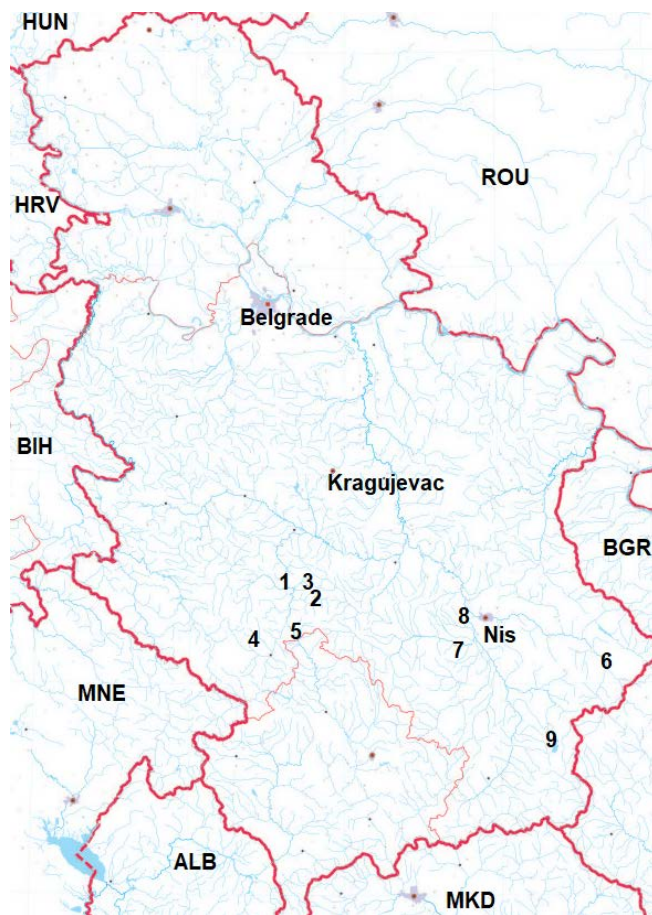


Fig. 1. Map of the investigated localities (SWS: 1- Mt. Studena planina; 2 - Mt. Željina; 3 - Mt. Goč; 4 - Mt. Golija; 5 - Mt. Kopaonik; 6 - Mt. Stara planina; 7- Mt. Ozren; 8 - Mt. Rtanj; 9 - Vlasina Lake).

ral hilly-mountainous regions of Serbia and the entire Balkan Peninsula are characterized by very high floristic biodiversity and impressive natural landscapes, the land is under-utilized and most of the agricultural areas have been abandoned, including semi-natural meadows and pastures (DAJIĆ-STEVAŃOVIĆ *et al.* 2008). The isolated rural areas are characterized by low population density, mainly due to the ageing population and city migration. The number of inhabitants of the studied sites (Table 1) was assessed according to data from the Statistical Office of the Republic of Serbia (<http://www.stat.gov.rs/WebSite/Public/ReportView.aspx>).

The studied sites (locations) can be grouped into two major geographical regions, i.e. “macro-localities”: Southwestern Serbia - SWS (includes the sites of Mt. Studena planina, Mt. Željina, Mt. Goč, Mt. Golija and Mt. Kopaonik, identified as 1-5 on the map, Fig. 1) and Southeastern Serbia - SES (includes the sites of Mt. Stara planina, Mt. Ozren, Mt. Rtanj and Vlasina Lake, identified as 6-9), to evaluate any possible differences in the traditional use of the wild raspberry on a larger spatial scale.

Table 1. The geographic position and number of inhabitants of the studied sites

Macro-locality	Locality	Study site (Village)	GPS	Elevation (m)	No. of inhabitants	No of households	Habitat type
Southwestern Serbia - SWS	Mt. Studena planina	Popova reka	N43.51729933 E20.64440374	983	53	19	Open habitat, grassland
	Mt. Željina	Rokci	N43.47037465 E20.82764226	1357	102	42	Miscellaneous beech-spruce forest
	Mt. Goč	Brezna	N43.57179799 E20.73005118	875	65	27	Beech forest
	Mt. Golija	Sebimilje	N43.19140735 E20.25105463	1432	64	26	Beech forest edge
	Mt. Kopaonik	Semeteš	N43.18337160 E20.49538319	1985	68	29	Spruce forest edge
Southeastern Serbia - SES	Mt. Stara planina	Balta Berilovac	N43.361622 E22.578614	1710	105	46	Open habitat with juniper
	Mt. Ozren	Levovik	N43.36538238 E21.53281832	931	101	39	Beech forest
	Mt. Rtanj	Rtanj	N43.4617 E21.5602	1131	82	36	Open habitat, grassland
	Vlasina lake	Vlasina Stojkovićevo	N42.4128 E22.2208	1332	130	42	Birch edge forest

The climate in Serbia is moderately continental. In southwest Serbia, the climate has more pronounced mountain characteristics, with short fresh summers and long sharp winters, whereas in the southeastern part of Serbia, the climate has more continental characteristics with generally higher summer temperatures and less precipitation (DUCIĆ & RADOVANOVIĆ 2005).

Data collection. The ethnobotanical survey was carried out between June and September 2016. During the survey, 93 people were interviewed, consisting of 66 women and 27 men. A higher number of female respondents were interviewed because of the fact that women mostly deal with the collection of wild fruit and herbs, as well as the making of fruit-based products. The age of the respondents varied between 20 and 80, with the largest number of respondents belonging to the 50 to 60 age group. There were no specific criteria for the selection of the respondents. Usually, the respondents suggested who could be interviewed next. The minimum number of respondents at each site was ten, having in mind the low number of households and occupations involving seasonal agricultural activities (accessibility). All those interviewed lived in rural areas and the main activity of the households was agriculture and livestock farming, mostly for their own needs. The surveyed population was ethnically homogeneous: all of the respondents were of Serbian nationality, of the Orthodox faith, and spoke the Serbian language. The demographic characteristics of the interviewed inhabitants are shown in Table 2.

The interviews were carried out face-to-face using a semi-structured interview. Ambiguous answers were

not recorded. The interviews lasted between 30 minutes and one hour. The purpose of the study was explained and all of the participants gave their consent to be interviewed. The information obtained in the interviews was recorded in a field diary.

During the interviews, the following information was collected: name and surname; gender; age; level of education; the main activity of the household; the number of household members; the local names for the wild raspberry; the general use of raspberry leaf; the general use of the fruit; when the leaves and fruits are collected; which diseases are treated by wild raspberry leaves and fruits; other uses of the raspberry; the use of fruits in food and beverages; which traditional products are made from wild raspberries and how they are prepared; which other berries are collected.

Specimen collection and identification. Herbarium samples from each site were taken and deposited at the Department of Applied Botany of the Faculty of Agriculture, University of Belgrade. The material was checked by Prof. Dajić-Stevanović.

Statistical analysis. Basic descriptive statistics were used to summarize the demographic characteristics of the population, and Fisher's exact test (2-sided) was used to evaluate differences in categorical variables. The observed relationship was considered statistically significant when the *p*-value was less than 0.05. The data analysis was carried out using SPSS software (SPSS 18.0 for Windows, SPSS Inc., Chicago, IL, USA).

Table 2. The demographic characteristics of the interviewees, sample size N = 93

Demographic characteristics	Locality							Macro-region				
	Mt Studena planina	Mt Željina	Mt Goč	Mt Golija	Mt Kopaonik	Mt Stara planina	Mt Ozren	Mt Rtanj	VlasinaLake	SWS	SES	Total
Sex												
Female	8 (72.7%)	7 (70%)	6 (60%)	8 (80%)	9 (81.8%)	8 (72.7%)	6 (60%)	7 (70%)	7 (70%)	38 (73.1%)	28 (68.3%)	66 (71%)
Male	3 (27.3%)	3 (30%)	4 (40%)	2 (20%)	2 (18.2%)	3 (27.3%)	4 (40%)	3 (30%)	3 (30%)	14 (26.9%)	13 (31.7%)	27 (29%)
Age												
20-30	0 (0%)	0 (0%)	2 (20%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (3.8%)	0 (0%)	2 (2.2%)
30-40	1 (9.1%)	2 (20%)	0 (0%)	2 (20%)	3 (27.3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	8 (15.4%)	0 (0%)	8 (8.6%)
40-50	6 (54.5%)	0 (0%)	5 (50%)	3 (30%)	3 (27.3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	17 (32.7%)	0 (0%)	17 (18.3%)
50-60	2 (18.2%)	8 (80%)	0 (0%)	2 (20%)	3 (27.3%)	7 (63.6%)	6 (60%)	4 (40%)	3 (30%)	15 (28.8%)	20 (48.8%)	35 (37.6%)
60-70	1 (9.1%)	0 (0%)	3 (30%)	2 (20%)	1 (9.1%)	4 (36.4%)	4 (40%)	6 (60%)	2 (20%)	7 (13.5%)	16 (39%)	23 (24.7%)
70-80	1 (9.1%)	0 (0%)	0 (0%)	1 (10%)	1 (9.1%)	0 (0%)	0 (0%)	0 (0%)	5 (50%)	3 (5.8%)	5 (12.2%)	8 (8.6%)
Level of education												
Primary school	4 (36.4%)	3 (30%)	0 (0%)	1 (10%)	3 (27.3%)	4 (36.4%)	0 (0%)	6 (60%)	2 (20%)	11 (21.2%)	12 (29.3%)	23 (24.7%)
Secondary school	7 (63.6%)	7 (70%)	7 (70%)	9 (90%)	7 (63.6%)	4 (36.4%)	10 (100%)	4 (40%)	8 (80%)	37 (71.2%)	26 (63.4%)	63 (67.7%)
College	0 (0%)	0 (0%)	3 (30%)	0 (0%)	1 (9.1%)	3 (27.3%)	0 (0%)	0 (0%)	0 (0%)	4 (7.7%)	3 (7.3%)	7 (7.5%)

RESULTS AND DISCUSSION

The traditional use of the wild raspberry indicates its use in the form of various traditional products, as well as for medicinal purposes (Table 3). Most of the respondents use the widely accepted name for the raspberry – “malina”, which was also a popular female name in the rural areas of Serbia decades ago. Although the name is the same as for the cultivated raspberry, all of the respondents indicated that this refers to the wild-growing species at their site. Apart from the most common name (“malina”), “crvena kupina” (“red blackberry”) was the second most frequent name (12.9% of the total number of respondents), followed by wild raspberry – “divlja malina” (9.6%) and small blackberry – “sitna kupina” (5.2%).

Based on the descriptive statistics and Fisher’s exact test, significant differences were observed between the sites in terms of the age groups and the respondents’ level of education, while there was no statistical difference between the respondents’ gender. The macro-localities (SWS and SES regions) were similar in terms of demographic characteristics, significant differences being observed only for the age groups ($p = 0.000$). It is noticeable that none of the interviewees were under 50 years of age in the SES region, while more than half of the respondents in the SWS region were under the age of 50 (Table 2).

In terms of plant parts in traditional use, the leaf and fruit are known to be in frequent usage. Only one respondent indicated the use of the whole plant when preparing herbal baths. When comparing the macro-localities, the dry leaf is more commonly used in the SES region than in the SWS region (Table 4). Fisher’s exact test showed that use of the fruit does not differ significantly among the sites or macro-localities (p -value > 0.05), while the use of dry and fresh leaves shows a significant difference (p -value < 0.05). Almost all of the respondents (95.7%) use the fruit, while half of them also use the dry leaves, and a small percentage of the respondents referred to the use of fresh leaves (Table 4).

No significant effects of the respondents’ gender and level of education on the use of different parts of the wild raspberry were found. Significant differences were observed in the use of the wild raspberry leaves in relation to the respondent age groups.

The respondents stressed that tea from the raspberry leaves helps in the treatment of multiple ailments (Table 5; Fig. 2), but the most common application is in the treatment of stomach problems. In fact, this use was linked to general stomach pain relief and the treatment of diarrhea. The leaves are used more in the SES than in the SWS region.

The raspberry is used in traditional medicine in Serbia in a similar way to its use in other European countries. It is known that extracts from the leaves and fruit of the *Rubus* species are used in various countries as natural remedies to treat several diseases, such as di-

Table 3. The use of the wild raspberry for medical purposes and nutrition at the sites.

Locality	Local name (in Serbian)	Translated name (in English)	Part of the plant used	The purpose of using the leaves in folk medicine	Use in cosmetics	Traditional products made from wild raspberry fruit	Other fruits that are collected
Mt. Studena planina	Malina, crvena kupina	Raspberry, red blackberry	Leaf, fruit	Stomach problems, inflammation of prostate	/	Non alcoholic(juice) and alcoholic (liqueur) beverage, fruit preserve, sweets (baklava, raspberry cake)	Blackberry, wild strawberry, rosehip; blueberry, wild apple, dogwood
Mt. Željin	Malina, sitna kupina	Raspberry, small blackberry	Fruit	/	/	Non alcoholic (juice) and alcoholic (liqueur) beverage, fruit preserve, sweets (baklava, raspberry cake, strudel)	Juniper, blueberry, wild strawberry, blackberry, dogwood
Mt. Goč	Malina, milina, divlja malina	Raspberry, goodness, wild raspberry	Whole plant, leaf, fruit	Inflammation of prostate, stomach problems, anemia	Bath decoction (boiled shoot)	Non alcoholic (juice) and alcoholic (liqueur, spirit) beverage, fruit preserve, sweets (baklava, raspberry cake, strudel)	Blackberry, wild strawberry, wild apple, wild pear, rosehip, wild cherry, sloe
Mt. Golija	Malina, crvena kupina	Raspberry, red blackberry	Leaf, fruit	Stomach problems	Squashed fruits for massage	Non alcoholic(juice) and alcoholic (liqueur) beverage, fruit preserve, sweets (baklava, raspberry cake)	Juniper, blueberry, wild strawberry, blackberry, dogwood
Mt. Kopaonik	Malina, crvena kupina, sitna kupina	Raspberry, red blackberry, small blackberry	Leaf, fruit	Stomach problems, inflammation of prostate	/	Non alcoholic (juice) and alcoholic (liqueur, spirit) beverage, fruit preserve, sweets (baklava, raspberry cake)	Juniper, blueberry, wild strawberry, blackberry, rosehip, dogwood
Mt. Stara planina	Malina, divlja malina	Raspberry, wild raspberry	Leaf, fruit	Anemia, immunity	/	Non alcoholic (juice) and alcoholic (liqueur) beverage, fruit preserve, sweets (baklava, raspberry cake, strudel)	Juniper, blueberry, wild strawberry, blackberry, cranberry, dogwood
Mt. Ozren	Malina, crvena kupina	Raspberry, red blackberry	Leaf, fruit	Stomach problems, pregnancy (miscarriage prevention)	/	Non alcoholic (juice) beverage, fruit preserve	Blackberry, wild strawberry
Mt. Rtanj	Malina	Raspberry	Leaf, fruit	Anemia, stomach problems (diarrhea), in pregnancy (miscarriage prevention), breast feeding, eye inflammation	/	Non alcoholic (juice) and alcoholic (liqueur) beverage, fruit preserve	Wild strawberry, blackberry, blueberry, dogwood
Vlasina Lake	Malina, ženska biljka	Raspberry, female plant	Leaf, fruit	Immunity, stomach problems (diarrhea), anemia, in pregnancy (miscarriage prevention), breast feeding, gynecological disorders, eye inflammation	/	Non alcoholic (juice) and alcoholic (liquor) beverage, fruit preserve, sweets (raspberry cake, strudel)	Blueberry, wild strawberry, blackberry

Table 4. The use of different parts of the plant in the investigated areas

Plant part	Locality						Macro-region			Total		
	Mt. Studena planina	Mt. Željina	Mt. Goč	Mt. Golija	Mt. Kopaonik	Mt. Stara planina	Mt. Ozren	Mt. Rtanj	Vlasina Lake		SWS	SES
Fruit	11(100%)	10 (100%)	10 (100%)	10 (100%)	9 81.8(%)	11 (100%)	10 (100%)	8 (80%)	10 (100%)	50 (96.2%)	39 (95.1%)	89(95.7%)
Dry leaf	6(54.5%)	0 (0%)	4 (40%)	1 (10%)	2 (18.2%)	5 (45.5%)	7 (70%)	10 (100%)	10 (100%)	13 (25%)	32 (78%)	45 (48.4%)
Fresh leaf	3(27.3%)	0 (0%)	0 (0%)	0 (0%)	1 (9.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (7.7%)	0 (0%)	4 (4.3%)

Table 5. Cross-tabulation analysis of habits related to the medicinal use of wild raspberry leaves according to locality

Medicinal uses	Locality						Macro-region					
	Mt. Studena planina	Mt. Željina	Mt. Goč	Mt. Golija	Mt. Kopaonik	Mt. Stara planina	Mt. Ozren	Mt. Rtanj	Vlasina Lake	SWS	SES	
Stomach problems	4 (66.7%)	0 (0%)	2 (50%)	1 (100%)	2 (100%)	0 (0%)	7 (100%)	7 (70%)	5 (55.6%)	9 (69.2%)	19 (61.2%)	
Inflammation of prostate	2 (33.3%)	0 (0%)	1 (25%)	0 (0%)	1 (50%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (30.8%)	0 (0%)	
Anemia	0 (0%)	0 (0%)	1 (25%)	0 (0%)	0 (0%)	3 (60%)	0 (0%)	5 (50%)	2 (22.2%)	1 (7.7%)	10 (32.3%)	
Immunity	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (40%)	0 (0%)	0 (0%)	3 (33.3%)	0 (0%)	5 (16.1%)	
Gynecological disorders	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (33.3%)	0 (0%)	3 (9.7%)	
Pregnancy	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (14.3%)	2 (20%)	6 (66.7%)	0 (0%)	9 (29%)	
Breastfeeding	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (10%)	3 (33.3%)	0 (0%)	4 (12.9%)	
Eye inflammation	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (40%)	3 (33.3%)	0 (0%)	7 (22.6%)	

Percentages are based on the respondents who gave at least one positive answer.

Table 6. Cross-tabulation analysis of wild raspberry fruit use in traditional food and beverage products

Usage	Locality						Macro-region					
	Mt. Studena planina	Mt. Željina	Mt. Goč	Mt. Golija	Mt. Kopaonik	Mt. Stara planina	Mt. Ozren	Mt. Rtanj	Vlasina Lake	SWS	SES	
Non alcoholic beverage	10 (90.9%)	10 (100%)	8 (80%)	9 (90%)	9 (100%)	11 (100%)	10 (100%)	7 (87.5%)	10 (100%)	46 (92%)	38 (97.4%)	
Alcoholic beverage	3 (27.3%)	3(30%)	1 (10%)	1 (10%)	1 (11.1%)	6 (54.5%)	0 (0%)	3(37.5%)	5 (50%)	9 (18%)	14 (35.9%)	
Fruit preserve	3 (27.3%)	3 (30%)	1 (10%)	7 (70%)	7 (77.8%)	9 (81.8%)	6 (60%)	5 (62.5%)	7 (70%)	21 (42%)	27 (69.2%)	
Sweets	4 (36.4%)	10 (100%)	8 (80%)	6 (60%)	3 (33.3)	3 (27.3%)	0 (0%)	0 (0%)	5 (50%)	31 (62%)	8 (20.5%)	

Percentage are based on the respondents who gave at least one positive answer.

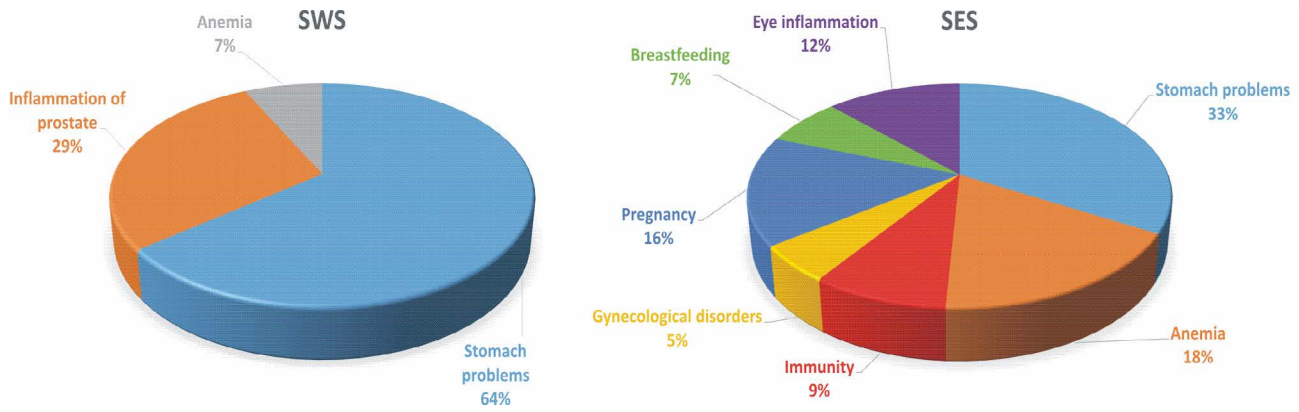


Fig. 2. The medicinal use of dry raspberry leaves in the SES and SWS macro-regions.

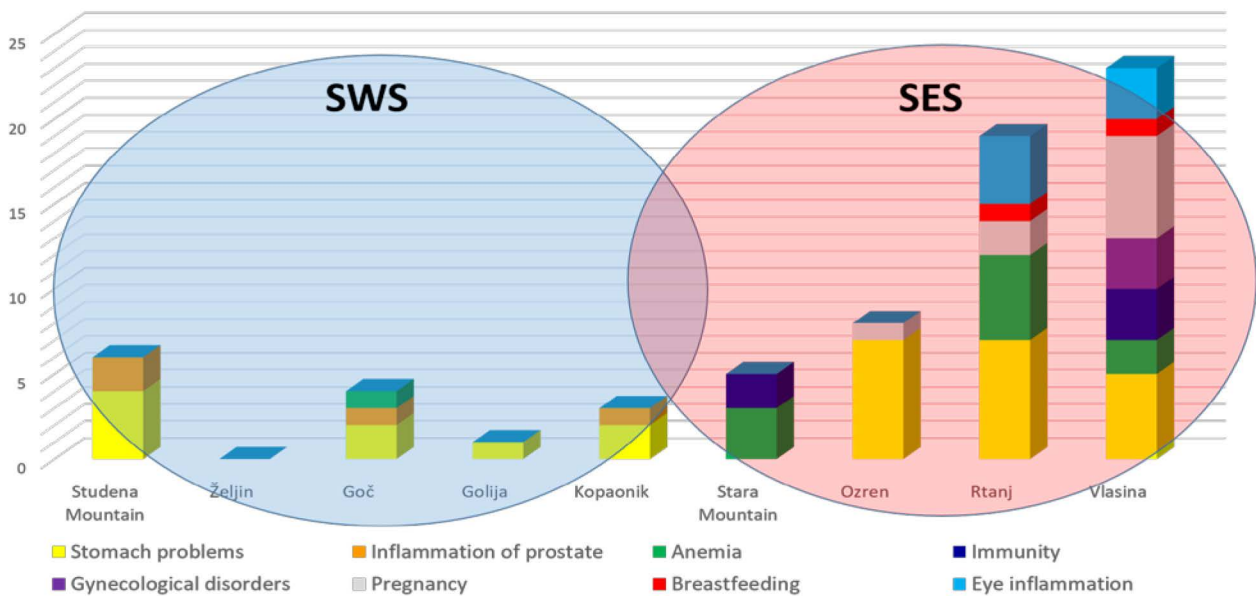


Fig. 3. Differences in the traditional use of the wild raspberry leaf among the studied sites and macro-regions.

abetes, many types of infections, colic and burns (PATEL *et al.* 2004). It was reported that raspberry leaves are used as an antigonadotrophic, astringent, antiviral remedy, and parturition facilitator, as well as for the treatment of tonsillitis, conjunctivitis, diabetes and hypertension (RITCH-KRC *et al.* 1996), but they are used mostly for their health benefits in treating fever, influenza, diabetes, menstrual pain, diarrhoea and colic pain (GUDEJ & TOMCZYK 2004). SÖUKAND & PIERONI (2016) indicated that in areas of Romania and Ukraine a tea from raspberry branches is used to treat fever and colds.

In a review of the ethnobotanical data for the Balkan Peninsula and Serbia, it was noted that raspberry and blackberry leaves are widely used in herbal teas (JARIĆ *et al.* 2007) as a remedy for boosting immunity, for the treatment of anemia and to soothe a sore throat

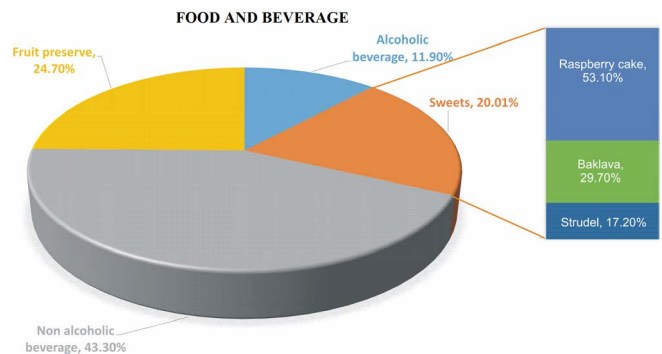


Fig. 4. The use of the raspberry fruit in food and beverages.

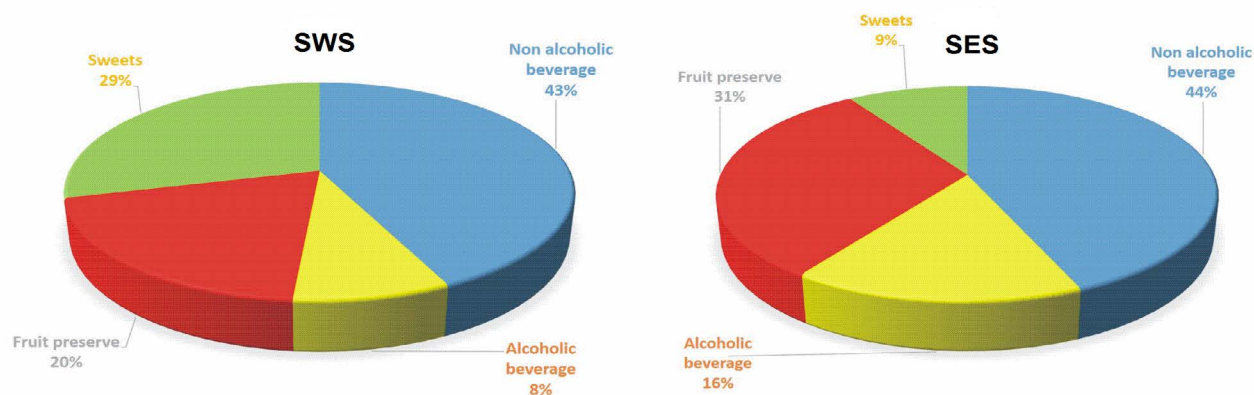


Fig. 5. Differences in the use of the wild raspberry fruit in the SWS and SES macro-regions.

(ZLATKOVIĆ *et al.* 2014), the cessation of bleeding (JARIĆ *et al.* 2015), as well as for diarrhoea and for rinsing the mouth and pharynx (MENKOVIĆ *et al.* 2014). PIERONI *et al.* (2017) reported on the use of raspberry leaves as a “remedy for all diseases” (panacea). Generally, blackberry leaves are more frequently used than raspberry leaves in the treatment of various disorders, such as respiratory problems, stimulating appetite, healing wounds, treating diarrhoea, and externally for inflammation of the mouth and pharynx (REDŽIĆ & FERRIER 2014).

In our study, a difference was observed between the macro-locations in the uses of dry leaves (Fig. 3). In the area of SWS, a significant use of dry leaves was recorded among the respondents of Mt. Studena planina (by about half of the respondents) and Mt. Goč (40%). In the area of Mt. Željina, none of the respondents cited any use of raspberry leaves. Such a result could be explained by the fact that a high number of local inhabitants have migrated to urban areas (<http://www.stat.gov.rs/WebSite/Public/ReportView.aspx>) and consequently, a loss of traditional knowledge is evident.

In SES, more than 78% of the respondents use dry leaves. Only at the Mt. Stara planina site was there a smaller percentage of the local population using dry raspberry leaves (45.5%), which is probably due to the tradition of collecting wild berries, rather than medicinal herbs (PETERS & DAJIĆ-STEVAŃOVIĆ 2006). It is noticeable that in SES, where the leaves are more frequently used, more medicinal uses of the leaves were recorded (Table 5; Figs. 2, 3). Moreover, this part of Serbia is known as the major centre for the collection and use of wild medicinal and aromatic plants, acknowledged as having a long tradition of using herbs in folk medicine (DAJIĆ-STEVAŃOVIĆ & ILIĆ 2005).

It is interesting that the use of raspberries for stomach disorders was mentioned with similar frequency at both macro-localities, but more specifically in the region of SWS. In contrast to SWS, many respondents in SES mentioned the use of raspberry tea during pregnancy

(miscarriage prevention was specifically mentioned at some sites) and lactation, as well as for some gynecological disorders (mainly referring to ovary inflammation and vaginitis). Therefore, the local name of “ženska biljka” – “the female plant” was recorded only in the SES region, at the locality of Vlasina Lake.

In the SWS region, the use of raspberries in cosmetics was recorded. One respondent mentioned the use of a shoot decoction for a bath promoting skin hydration and skincare in addition to the use of the fruits for massage. A number of respondents from the SWS region mentioned the use of a herbal tea for treating prostate inflammation, which was not recorded by the respondents of the SES region. There were significant differences in the majority of the reported medicinal uses of wild raspberry dry leaves between the sites and macro-regions. Hence, in contrast to previous ethnobotanical studies for the regions of Serbia and the Balkan Peninsula (JARIĆ *et al.* 2007; PIERONI *et al.* 2017), our study indicates some novel data on the traditional uses of the wild raspberry leaf in terms of both medicinal and cosmetic uses.

There was no mention of the use of wild raspberry fruit in traditional medicine, in contrast to reports of the use of blackberry fruit for treating anemia, for example (ŠAVIKIN *et al.* 2013). In SWS, a cosmetic use of wild raspberry fruit was recorded. Several respondents from Mt. Golija (already known for raspberry cultivation, like many sites in SWS) commented on the use of crushed fruits for body massage, which provides new data concerning cosmetic use in the Balkans and Serbia. At both macro-localities, a significant use of wild berries was recorded, including blackberry, strawberry, rosehip, blueberry, wild apple, dogwood, juniper, wild pear, wild cherry, sloe and cranberry. All of these berries and fruits are used in a way similar to that recorded for the wild raspberry, primarily in the preparation of different traditional food products.

In general, the use of raspberries in traditional medicine is widespread in both of the surveyed regions. Knowledge of the use of medicinal herbs was passed

down through generations due to the long history of using medicinal plants by the Slavs (JARIĆ *et al.* 2011).

It is well known that in Serbia, among traditional products (food and beverages) made from fresh or frozen fruits, the following are the most common: juices, syrup juices, liqueurs, spirits (“rakija”), wine, mash, pulp, marmalade, jams, compotes, candied fruit, biscuits, pies, and cakes, as well as the traditional sweet fruit preserve known as “slatko”, which literally means the “sweet”.

The findings on the traditional uses of wild raspberry fruit in Serbia were expected, as some earlier studies showed the importance of fruit genetic resources in traditional foods (DAJIĆ-STEVAŃOVIĆ *et al.* 2014). According to JARIĆ *et al.* (2015), fresh raspberry fruits are used in the diet, or are cooked and processed into juices, syrups, compotes, jams, and as sweet fruit preserves. PIERONI *et al.* (2017) stated that in the Kosovo region, wild raspberries are used in nutrition either consumed fresh, or processed as juices and wine. SÖUKAND *et al.* (2015) reported that fermented products from the raspberry leaves and fruits (distillate, pickle, wine) are produced in Eastern Europe (Bulgaria, Estonia, Hungary, and Poland). DEI CAS *et al.* (2015) highlighted the use of raspberries (wild and cultivated) in Italy. The fruits are consumed fresh or processed into jam.

Our results indicate that the widest use of raspberries in Serbia is in nutrition. In addition to fresh consumption, the wild raspberry fruit is also used for preparing a range of traditional products, primarily for non-alcoholic drinks (mainly syrup juice), followed by sweet fruit preserves, sweets and alcoholic drinks (Table 6; Fig. 4).

The use of the wild raspberry fruit (Table 4) is equally represented in our two macro-locations (SWS 96.2%, SES 95.1%). Regarding the purpose for which the fruit is used, apart from the highest and similar popularity of use in juice syrup preparation, it is noticeable that in the SES region the fruits also serve for the production of alcoholic beverages [liqueurs and fruit spirits (“rakija”)] and less for making sweet dishes (Fig. 5).

Based on Fisher’s exact test, a non alcoholic drink is made frequently in all of the studied sites (no significant difference). The wild raspberry fruits are more commonly used for sweets in the SWS region, while their usage in the preparation of alcoholic beverages and fruit preserves is much more frequent in the SES region.

The use of the fruit in the preparation of various sweets is much more pronounced in the SWS region. In this region, there is also a wider spectrum of desserts made by or with the addition of the wild raspberry, and therefore, many more recipes are recorded for strudel, baklava and raspberry cake in comparison with the SES region. This represents new ethnobotanical data on the use of wild raspberry fruits. Such results can be explained by the intense cultivation and use of raspberries in the SWS region. The occurrence of “baklava”, the traditional Turkish sweet dish (BARDENSTEIN 2010) record-

ed in the SWS region, but not in the SES region, could be explained by the influence and close cultural interaction of the Muslim population (the “Bosniaks”) inhabiting the Sandžak area of SWS. Such influences could also be the cause of less frequent records on the preparation of alcoholic drinks from wild raspberry fruit in the SWS region.

CONCLUSION

Our research, carried out in regions of Serbia where natural populations of the wild raspberry (*Rubus idaeus*) occur, showed that the species is used for various purposes, both in different food products and in folk medicine. Herbal teas made with raspberry leaf are used for different ailments, and of nine mentioned in our study, the most common were stomach disorders and anemia. The use of wild raspberries as a food and in food products is more frequent in the region of SWS, known for the cultivation of commercial raspberry varieties, while uses in folk medicine were reported more frequently for sites in southeast Serbia, a region with a long tradition of collecting wild medicinal and aromatic plants. The finding related to liqueurs and fruit spirits (“rakija”), made exclusively from the wild raspberry fruit, is the first report of such use for Serbia and the Balkans, together with the report on its use in different sweet desserts.

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REZIME



Botanica
SERBICA

Divlja malina sa prostora Srbije: etnobotanička studija

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Etnobotaničko istraživanje upotrebe divlje maline (*Rubus idaeus*) je sprovedeno na devet lokaliteta koji pripadaju jugozapadnoj (JZS) i jugoistočnoj Srbiji (JIS). Istraživani lokaliteti pripadaju visokoplaninskim, ruralnim delovima Srbije, koje uglavnom naseljavaju Srbi, pravoslavne veroispovesti. Ukupno je intervjuisano 93 ispitanika, kako bi se utvrdila upotreba u medicinske svrhe, zatim u ishrani, ali i u kozmetičke svrhe. Posmatrajući deo biljke koji se koristi, u najširoj upotrebi su list i plod. Suvi listovi se više koriste na području JIS (78%) nego JZS (25%). U JZS, najučestalija upotreba listova je povezana sa gastrointestinalnim problemima i upalom prostate. U JIS, listovi se najčešće koriste za prevenciju i lečenje ginekoloških oboljenja, kao i tokom trudnoće i perioda dojenja. Stanovništvo JZS koristi plodove divlje maline za pripremu sokova (sirupa) (92%), slatkog (42%) i kao dodatak poslasticama (62%), dok se u JIS plodovi uglavnom koriste za pripremu bezalkoholnih (97.4%) i alkoholnih napitaka (35.9%). Naši rezultati ukazuju na potpuno novu upotrebu divlje maline na prostoru Srbije, ali i Balkanskog poluostrva, kao što su tretman upale prostate, upotreba tokom dojenja i protiv upale oka.

Ključne reči: *Rubus idaeus*, etnobotanika, list i plod, narodna medicina, tradicionalni proizvodi

