

# VASCULAR FLORA OF THE OKIĆNICA EDUCATIONAL TRAIL IN ŽUMBERAK-SAMOBORSKO GORJE NATURE PARK (NW CROATIA)

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Vascular flora of the 2.5 km long circular Okićnica educational trail in Žumberak-Samoborsko gorje Nature Park contains 287 species and subspecies, with *Fabaceae*, *Asteraceae* and *Rosaceae* the most abundant families. The domination of Eurasiatic and Central European floral elements reflects the phyto-geographical position of the area; however, the presence of Illyricoid plants of mesophylous forests on the NW border of Dinarides is what makes the flora unique. The most common life forms (hemicryptophytes, phanerophytes and geophytes) are the result of a moderate climate and the dominant forest vegetation. Six vulnerable, five near threatened, ten strictly protected, two endemic and nine invasive taxa were recorded along the trail. Our results contribute to the knowledge on the flora of the Nature Park and can be used in the future design of an educational botanical trail.

**Key words:** biodiversity, Illyrian chorotype, NW Dinarides, Okić

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Vaskularna flora 2,5 km duge edukativne kružne staze „Okićnica“ u Parku prirode Žumberak-Samoborsko gorje broji 287 vrsta i podvrsta, a najbrojnije porodice su *Fabaceae*, *Asteraceae* i *Rosaceae*. Dominacija euroazijskog i srednjoeuropskog flornog elementa odražava fitogeografski položaj istraživanog područja, no jedinstvenost flore čine ilirikoidne vrste mezofilnih šuma na SZ granici Dinarida. Najčešći životni oblici su hemikriptofiti, fanerofiti i geofiti koji ukazuju na umjerenu klimu i dominaciju šumske vegetacije. Uzduž istraživane staze zabilježeno je šest osjetljivih, pet gotovo ugroženih, deset strogo zaštićenih, dvije endemične i devet invazivnih svojiti. Rezultati ovog istraživanja prilog su poznavanju flore Parka prirode i mogu biti temelj za planiranje buduće edukativne botaničke staze.

**Ključne riječi:** bioraznolikost, ilirski florni element, SZ Dinaridi, Okić

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## INTRODUCTION

Žumberak-Samoborsko gorje Nature Park is situated in north-western Croatia and encompasses both the southern parts of Žumberačko gorje Mts (Mt Žumberak), as well as Samoborsko Gorje Mts, across its total area of 333 km<sup>2</sup>. Both mountains are part of Žumberačka Gora (BUZJAK, 2011), a 40 km long massif stretching between the rivers Sava and Kupa in Croatia, and the River Krka in Slovenia. The elevation of the mountain ranges from 180 m up to 1,178 m (Sveta Gera peak). It is oriented in the NE-SW direction, and is characterized by Dinaric tectonics and karst formations (VRBEK, 2005). The climate of the area is moderately warm and rainy, without extremely dry periods. The average annual precipitation ranges between 1,100 and 1,700 mm (PENZAR & PENZAR, 1982). The area belongs to the colline and montane forest belt (HORVAT, 1962; ŠUGAR, 1972; VUKELIĆ, 2012).

Phytogeographically, Mt Žumberačka gora is a bridge between the SE Alps and the NW Dinarides, with many alpine elements on low altitudes and Dinaric elements on the NW border of their distribution (HORVAT, 1929; TRINAJSTIĆ, 1995). The largest part of the area is covered by forests, dominated by sessile oak (*Quercus petraea* (Matt.) Liebl.) on lower and beech (*Fagus sylvatica* L.) on higher elevations. Most of the grassland areas are not of natural origin but were created as a result of long lasting deforestation during the centuries. Recently, rapid succession towards shrub and forest vegetation has been taking place, due to the abandonment of traditional land use (pasturing and mowing). The flora of Samoborsko Gorje Mts has previously been investigated by ŠUGAR (1972) (890 taxa), while systematic research of Mt Žumberačka Gora revealed as many as 1,006 plant taxa (VRBEK, 2005). Several recent field studies have focused on the flora of various specific habitats, e.g. pits and cave entrances (BUZJAK *et al.*, 2010), collapsed dolines (BUZJAK *et al.*, 2011), fens (ŠOŠTARIĆ *et al.*, 2012), springs and ponds (ŠOŠTARIĆ *et al.*, 2011), waterfalls and rivulets (ŠOŠTARIĆ *et al.*, 2013) or the flora of certain plant groups, e.g. orchids (VRBEK & FIEDLER, 1998) and bryophytes (ALEGRO *et al.*, 2015). In 1999, Nature Park of Žumberačko gorje Mts, with the adjacent Samoborsko gorje Mts, was established.

The aim of this research was to study and analyse the flora along the 2.5 long Okićnica Educational Trail, which is situated around the hill of Okić (halfway between the towns of Samobor and Jastrebarsko). The trail is beneath the old medieval castle Stari grad Okić located on the peak of this hill at 495 m a. s. l., representing a valuable example of Romanesque architecture in continental Croatia. The circular Okićnica Educational Trail was opened in spring 2017, presenting the geology, history, archaeology and ethnology of the Okić region in ten educational panels (Fig 1.). The collected data are the basis for the future design of an educational botanical trail.

## MATERIAL AND METHODS

The field study was conducted from April to June 2018, within a student field project undertaken as a part of the practical course Flora of Croatia that forms part of the undergraduate curriculum of the Faculty of Science in Zagreb.

Most of the plant material was identified in the field, although several specimens were collected and dried for further precise identification in the lab, while strictly protected specimens (e.g. orchids) were photographed only. Identification was performed using standard literature (HORVATIĆ, 1954; DELFORGE, 1995; DOMAC, 1994; JAVOR-

KA & CSAPODY, 1991; ROTHMALER, 2000; EGGENBERG & MÖHL, 2007). Nomenclature follows the Flora Croatica Database (NIKOLIĆ, 2020). Authors of all the taxa names are given in the species list in Tab. 1, but not within the text. All collected plant material was deposited in Herbarium Croaticum collection (ZA) and is publicly available via the Flora Croatica Database and Virtual Herbarium (REŠETNIK & ŠEGOTA, 2020).

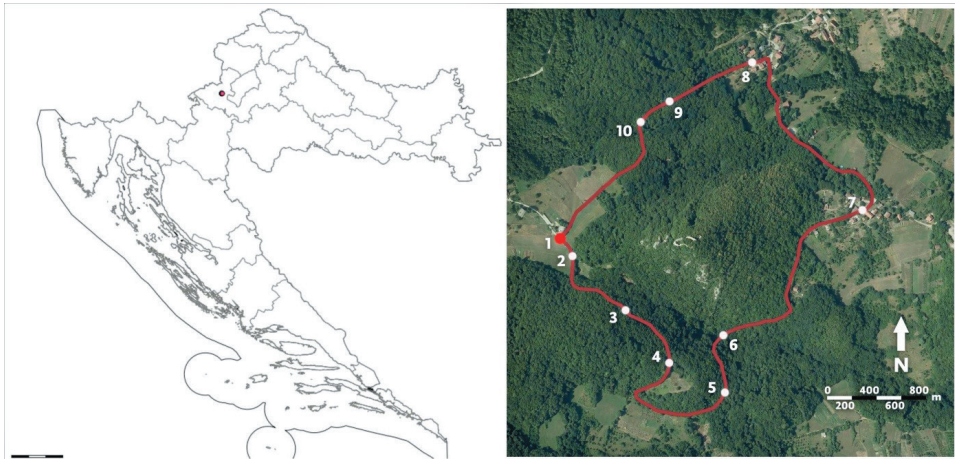


Fig. 1. Geographical position of the studied area in Croatia (left) and the shape of the Okićnica trail (right).

Chorology is based on HORVATIĆ (1963) and HORVATIĆ *et al.* (1967-1968), with some recent revisions following LANDOLT *et al.* (2010). Life forms, as defined by RAUNKIAER (1934) (phanerophytes, chamaephytes, hemicryptophytes, therophytes and geophytes) were taken from the Flora Croatica Database (NIKOLIĆ, 2020), based on ELLENBERG & LAUSCHNER (2010). Several updates were made according to the recent approaches of ALEGRO *et al.* (2013) and VUKOVIĆ *et al.* (2013). Endemic taxa were checked according to NIKOLIĆ *et al.* (2015) and NIKOLIĆ (2020), invasive taxa according to NIKOLIĆ *et al.* (2014) and NIKOLIĆ (2020), legally protected taxa according to ANONYMOUS (2013, 2016) and threatened taxa according to NIKOLIĆ & TOPIĆ (2005).

## RESULTS AND DISCUSSION

In the course of our research, 287 plant taxa of vascular plants from 74 families were recorded along the circular “Okićnica Educational Trail” (Tab. 1). The trail is placed mostly within floristically rich beech-dominated forests; however, several segments going through dry grasslands and along traditional vineyards and orchards as well as the pronounced anthropogenic impact on the trail contribute considerably to species richness. Since the whole area was not investigated evenly, only the flora along the trail, comparisons with the flora of other similar areas were not applicable.

The vast majority of taxa (98%) belong to Spermatophyta (Pinidae and Magnoliidae), while only eight belong to Pteridophyta (Polypodiidae and Equisetidae). Most taxa are members of *Fabaceae* (8.04%), *Asteraceae* (7.34%), *Rosaceae* (6.99%), *Lamiaceae* and *Poaceae* (5.94% each) (Fig. 2).

**Tab. 1.** List of vascular flora of the trail "Okićnica". Chorotypes (1 - Mediterranean, 2 – Illyrian-Balkan, 3 – South European, 4 - Atlantic, 5 – East European-Pontic, 6 – Southeastern European, 7 – Central European, 8 - European, 9 - Eurasiatic, 10 – circumholarctic, 11 - cosmopolits, 12 – adventive and cultivated taxa), life forms (P – phanerophytes, Ch – chamaephytes, H – hemicryptophytes, G – geophytes, T – therophytes), IUCN category (LC – least concern, NT – near threatened, VU – vulnerable), legal protection (SP – strictly protected), endemism (E), invasive taxa (I).

Family	Taxa	Chorotype	Life form	IUCN category	Protection	Endemism	Invasiveness
<b>PTERIDOPHYTA</b>							
<i>Aspleniaceae</i>	<i>Asplenium scolopendrium</i> L.	10	H				
	<i>Asplenium trichomanes</i> L.	11	H				
<i>Dryopteridaceae</i>	<i>Polystichum aculeatum</i> (L.) Roth	11	H				
<i>Equisetaceae</i>	<i>Equisetum arvense</i> L.	10	G				
	<i>Equisetum telmateia</i> Ehrh.	10	G				
<i>Hypolepidaceae</i>	<i>Pteridium aquilinum</i> (L.) Kuhn	11	G				
<i>Polypodiaceae</i>	<i>Polypodium vulgare</i> L.	11	H				
<i>Woodsiaceae</i>	<i>Athyrium filix-femina</i> (L.) Roth	9	H				
<b>SPERMATOPHYTA</b>							
<i>Aceraceae</i>	<i>Acer campestre</i> L.	9	P				
	<i>Acer obtusatum</i> Willd.	2	P				
	<i>Acer pseudoplatanus</i> L.	8	P				
<i>Amaryllidaceae</i>	<i>Allium ursinum</i> L.	7	G				
	<i>Galanthus nivalis</i> L.	9	G	LC			
<i>Apiaceae</i>	<i>Aegopodium podagraria</i> L.	9	H				
	<i>Anthriscus sylvestris</i> (L.) Hoffm.	7	H				
	<i>Daucus carota</i> L.	1	H				
	<i>Hacquetia epipactis</i> (Scop.) DC.	2	H				
	<i>Heracleum sphondylium</i> L.	9	H				
	<i>Sanicula europaea</i> L.	9	H				
<i>Apocynaceae</i>	<i>Vinca major</i> L.	12	Ch				
	<i>Vinca minor</i> L.	7	Ch				
<i>Aquifoliaceae</i>	<i>Ilex aquifolium</i> L.	3	P	VU	SP		
<i>Araceae</i>	<i>Arum maculatum</i> L.	7	G				
<i>Araliaceae</i>	<i>Hedera helix</i> L.	7	P				
<i>Aristolochiaceae</i>	<i>Asarum europaeum</i> L.	9	H				
<i>Asparagaceae</i>	<i>Ornithogalum pyramidale</i> L.	3	G				
	<i>Ornithogalum umbellatum</i> L.	3	G				
	<i>Polygonatum multiflorum</i> (L.) All.	9	G				
	<i>Ruscus hypoglossum</i> L.	12	G	NT			
	<i>Scilla bifolia</i> L.	3	G				
<i>Asteraceae</i>	<i>Achillea millefolium</i> L.	9	H				
	<i>Ambrosia artemisiifolia</i> L.	12	T				I
	<i>Arctium lappa</i> L.	9	H				
	<i>Artemisia verlotiorum</i> Lamotte	12	H				I
	<i>Artemisia vulgaris</i> L.	9	H				
	<i>Bellis perennis</i> L.	9	H				
	<i>Bupthalmum salicifolium</i> L.	7	H				
	<i>Centaurea jacea</i> L.	9	H				

Family	Taxa	Chorotype	Life form	IUCN category	Protection	Endemism	Invasiveness
Asteraceae	<i>Chamomilla suaveolens</i> (Pursh) Rydb.	12	T				I
	<i>Cirsium arvense</i> (L.) Scop.	9	G				
	<i>Cirsium vulgare</i> (Savi) Ten.	9	H				
	<i>Conyza canadensis</i> (L.) Cronquist	9	H				I
	<i>Doronicum austriacum</i> Jacq.	3	H				
	<i>Erigeron annuus</i> (L.) Pers.	12	H				I
	<i>Leucanthemum vulgare</i> Lam.	9	H				
	<i>Petasites albus</i> (L.) Gaertn.	7	G				
	<i>Petasites hybridus</i> (L.) P. Gaertn., B. Mey. et Schreb.	9	G				
	<i>Senecio ovatus</i> (P. Gaertn., B. Mey. et Scherb.) Willd.	7	H				
	<i>Solidago gigantea</i> Aiton	12	H				I
<i>Tanacetum corymbosum</i> (L.) Sch. Bip.	7	H					
<i>Tussilago farfara</i> L.	9	H					
Betulaceae	<i>Alnus glutinosa</i> (L.) Gaertn.	9	P				
	<i>Betula pendula</i> Roth	9	P				
Boraginaceae	<i>Lithospermum purpureocaeruleum</i> L.	3	H				
	<i>Myosotis sparsiflora</i> Pohl	9	T				
	<i>Pulmonaria officinalis</i> L.	6	H				
	<i>Symphytum officinale</i> L.	8	H				
	<i>Symphytum tuberosum</i> L.	3	G				
Brassicaceae	<i>Alliaria petiolata</i> (M. Bieb.) Cavara et Grande	9	H				
	<i>Armoracia rusticana</i> P. Gaertn., B. Mey. et Scherb.	11	G				
	<i>Capsella bursa-pastoris</i> (L.) Medik.	11	T				
	<i>Cardamine bulbifera</i> (L.) Crantz	7	G				
	<i>Cardamine enneaphyllos</i> (L.) Crantz	3	G				
	<i>Cardamine hirsuta</i> L.	1	T				
	<i>Cardamine impatiens</i> L.	9	H				
	<i>Cardamine trifolia</i> L.	2	G				
	<i>Lepidium virginicum</i> L.	12	T				I
<i>Rorippa sylvestris</i> (L.) Besser	9	H					
<i>Thlaspi alliaceum</i> L.	3	T					
Campanulaceae	<i>Campanula patula</i> L.	7	H				
	<i>Campanula rapunculus</i> L.	9	H				
	<i>Campanula trachelium</i> L.	9	H				
	<i>Phyteuma spicatum</i> L.	7	H				
Cannabaceae	<i>Humulus lupulus</i> L.	9	H				
	<i>Lonicera caprifolium</i> L.	3	P				
	<i>Sambucus ebulus</i> L.	1	H				
	<i>Sambucus nigra</i> L.	7	P				
	<i>Viburnum lantana</i> L.	3	P				
Caryophyllaceae	<i>Arenaria serpyllifolia</i> L.	11	T				
	<i>Cerastium glomeratum</i> Thuill.	1	T				
	<i>Dianthus giganteus</i> D' Urv ssp. <i>croaticus</i> (Borbás)	6	H	VU	SP	E	
	<b>Tutin</b>						
	<i>Lychnis flos-cuculi</i> L.	9	H				
	<i>Moenchia mantica</i> (L.) Bartl.	3	T				
<i>Myosoton aquaticum</i> (L.) Moench	9	H					

Family	Taxa	Chorotype	Life form	IUCN category	Protection	Endemism	Invasiveness
Caryophyllaceae	<i>Silene italica</i> (L.) Pers.	6	H				
	<i>Stellaria holostea</i> L.	9	Ch				
	<i>Stellaria media</i> (L.) Vill.	1	T				
Celastraceae	<i>Euonymus europaeus</i> L.	9	P				
Chenopodiaceae	<i>Chenopodium album</i> L.	11	T				
Cichoriaceae	<i>Aposeris foetida</i> (L.) Less.	3	H				
	<i>Crepis biennis</i> L.	7	H				
	<i>Hieracium murorum</i> L.	9	H				
	<i>Hieracium pilosella</i> L.	5	G				
	<i>Hieracium praealtum</i> Vill. ex Gochnat	9	H				
	<i>Lactuca serriola</i> L.	11	H				
	<i>Lapsana communis</i> L.	9	H				
	<i>Mycelis muralis</i> (L.) Dumort.	7	H				
	<i>Prenanthes purpurea</i> L.	7	H				
	<i>Sonchus oleraceus</i> L.	9	T				
	<i>Taraxacum officinale</i> Weber	9	H				
<i>Tragopogon pratensis</i> L. ssp. <i>orientalis</i> (L.) Čelak.	9	H					
Cistaceae	<i>Helianthemum nummularium</i> (L.) Mill. ssp. <i>obscurum</i> (Čelak.) Holub	3	Ch				
Clusiaceae	<i>Hypericum hirsutum</i> L.	11	H				
	<i>Hypericum perforatum</i> L.	9	H				
Colchicaceae	<i>Colchicum autumnale</i> L.	7	G				
Convolvulaceae	<i>Convolvulus arvensis</i> L.	11	H				
Cornaceae	<i>Cornus mas</i> L.	3	P				
	<i>Cornus sanguinea</i> L.	8	P				
Corylaceae	<i>Carpinus betulus</i> L.	7	P				
	<i>Corylus avellana</i> L.	8	P				
Crassulaceae	<i>Sedum acre</i> L.	11	Ch				
	<i>Sedum sexangulare</i> L.	7	Ch				
Cupressaceae	<i>Juniperus communis</i> L.	10	P				
Cyperaceae	<i>Carex digitata</i> L.	9	H				
	<i>Carex flacca</i> Schreb. ssp. <i>flacca</i>	11	G				
	<i>Carex hallerana</i> Asso	3	H				
	<i>Carex hirta</i> L.	7	H				
	<i>Carex muricata</i> L.	9	H				
	<i>Carex otrubae</i> Podp.	6	H				
	<i>Carex spicata</i> Huds.	9	H				
	<i>Carex sylvatica</i> Huds.	9	H				
Dioscoreaceae	<i>Tamus communis</i> L.	3	G				
Dipsacaceae	<i>Knautia drymeia</i> Heuff.	2	H				
Euphorbiaceae	<i>Euphorbia amygdaloides</i> L.	7	Ch				
	<i>Euphorbia cyparissias</i> L.	9	H				
	<i>Euphorbia dulcis</i> L.	5	H				
	<i>Euphorbia verrucosa</i> L.	8	H				
	<i>Euphorbia virgata</i> Waldst. et Kit.	9	H				
	<i>Mercurialis perennis</i> L.	8	G				

Family	Taxa	Chorotype	Life form	IUCN category	Protection	Endemism	Invasiveness
Fabaceae	<i>Astragalus glycyphyllos</i> L.	9	H				
	<i>Chamaecytisus hirsutus</i> (L.) Link	9	Ch				
	<i>Coronilla varia</i> L.	8	H				
	<i>Dorycnium germanicum</i> (Gremli) Rikli	3	H				
	<i>Genista tinctoria</i> L.	9	G				
	<i>Lathyrus niger</i> (L.) Bernhardt	8	G				
	<i>Lathyrus pratensis</i> L.	9	H				
	<i>Lathyrus vernus</i> (L.) Bernhardt	1	H				
	<i>Lembotropis nigricans</i> (L.) Griseb.	5	P				
	<i>Lotus corniculatus</i> L.	11	H				
	<i>Medicago falcata</i> L.	9	H				
	<i>Medicago lupulina</i> L.	1	T				
	<i>Medicago sativa</i> L.	11	H				
	<i>Robinia pseudoacacia</i> L.	12	P				I
	<i>Trifolium campestre</i> Schreber	11	T				
	<i>Trifolium montanum</i> L.	9	H				
	<i>Trifolium pratense</i> L.	9	H				
	<i>Trifolium repens</i> L.	9	H				
	<i>Trifolium rubens</i> L.	9	H				
	<i>Vicia dumetorum</i> L.	9	H				
<i>Vicia oroboides</i> Wulfen	2	H					
<i>Vicia sativa</i> L.	1	T					
<i>Vicia villosa</i> Roth ssp. <i>varia</i> (Host) Corb.	1	T					
Fagaceae	<i>Castanea sativa</i> Mill.	3	P				
	<i>Fagus sylvatica</i> L.	7	P				
	<i>Quercus cerris</i> L.	7	P				
	<i>Quercus petraea</i> (Matt.) Liebl.	7	P				
Fumariaceae	<i>Corydalis bulbosa</i> (L.) DC.	9	G				
Gentianaceae	<i>Gentiana asclepiadea</i> L.	3	H	NT			
Geraniaceae	<i>Geranium columbinum</i> L.	9	T				
	<i>Geranium phaeum</i> L.	3	H				
	<i>Geranium pusillum</i> Burm. f.	9	T				
	<i>Geranium robertianum</i> L.	10	H				
Juglandaceae	<i>Juglans regia</i> L.	12	P				
Juncaceae	<i>Juncus inflexus</i> L.	9	H				
	<i>Luzula campestris</i> (L.) DC.	9	H				
	<i>Luzula luzuloides</i> (Lam.) Dandy et Wilmott	7	H				
Lamiaceae	<i>Ajuga reptans</i> L.	9	H				
	<i>Betonica officinalis</i> L. ssp. <i>serotina</i> (Host) Murb.	2	H				
	<i>Clinopodium vulgare</i> L.	11	H				
	<i>Glechoma hederacea</i> L.	9	H				
	<i>Glechoma hirsuta</i> Waldst. et Kit.	3	H				
	<i>Lamium galeobdolon</i> (L.) L.	5	H				
	<i>Lamium maculatum</i> L.	9	H				
	<i>Lamium orvala</i> L.	2	H				
<i>Lamium purpureum</i> L.	1	T					

Family	Taxa	Chorotype	Life form	IUCN category	Protection	Endemism	Invasiveness
Lamiaceae	<i>Melittis melissophyllum</i> L.	7	H				
	<i>Mentha arvensis</i> L.	10	H				
	<i>Prunella vulgaris</i> L.	10	H				
	<i>Salvia glutinosa</i> L.	9	H				
	<i>Salvia pratensis</i> L.	8	H				
	<i>Stachys sylvatica</i> L.	9	H				
	<i>Teucrium chamaedrys</i> L.	3	Ch				
	<i>Thymus pulegioides</i> L.	3	Ch				
Liliaceae	<i>Gagea lutea</i> (L.) Ker Gawl.	9	G				
	<i>Lilium martagon</i> L.	9	G	VU	SP		
Linaceae	<i>Linum catharticum</i> L.	11	T				
Loranthaceae	<i>Loranthus europaeus</i> Jacq.	9	P				
Malvaceae	<i>Hibiscus syriacus</i> L.	12	P				
Melanthiaceae	<i>Paris quadrifolia</i> L.	9	G				
Moraceae	<i>Ficus carica</i> L.	1	P				
	<i>Morus alba</i> L.	12	P				
Oleaceae	<i>Forsythia europaea</i> Degen et Bald.	12	P	LC			
	<i>Fraxinus ornus</i> L.	3	P				
	<i>Ligustrum vulgare</i> L.	7	P				
Onagraceae	<i>Circaea lutetiana</i> L.	11	H				
Orchidaceae	<i>Himantoglossum adriaticum</i> H. Baumann	6	G	NT	SP		
	<i>Neottia nidus-avis</i> (L.) Rich.	9	G		SP		
	<i>Orchis morio</i> L. ssp. <i>picta</i> (Loisel.) K. Richt.	7	G		SP		
	<i>Orchis pallens</i> L.	8	G	VU	SP		
	<i>Orchis simia</i> Lam.	1	G	VU	SP		
	<i>Platanthera bifolia</i> (L.) Rich.	9	G	VU	SP		
Orobanchaceae	<i>Orobanche crenata</i> Forssk.	3	T				
Oxalidaceae	<i>Oxalis acetosella</i> L.	9	H				
Papaveraceae	<i>Chelidonium majus</i> L.	11	H				
Plantaginaceae	<i>Plantago lanceolata</i> L.	9	H				
	<i>Plantago major</i> L. ssp. <i>intermedia</i> (Gilib.) Lange	9	H				
Poaceae	<i>Alopecurus pratensis</i> L.	9	H				
	<i>Anthoxanthum odoratum</i> L.	9	H				
	<i>Avena sterilis</i> L.	5	H				
	<i>Avenula pubescens</i> (Dumort.) Dumort.	9	H				
	<i>Brachypodium sylvaticum</i> (Huds.) P. Beauv.	9	H				
	<i>Briza media</i> L.	9	H				
	<i>Cynosurus cristatus</i> L.	11	H				
	<i>Dactylis glomerata</i> L.	9	H				
	<i>Festuca pratensis</i> Huds.	9	H				
	<i>Holcus lanatus</i> L.	9	H				
	<i>Hordeum murinum</i> L. ssp. <i>murinum</i>	11	T	LC			
	<i>Lolium perenne</i> L.	8	H				
	<i>Melica uniflora</i> Retz.	7	G				
	<i>Poa annua</i> L.	9	T	LC			
<i>Poa pratensis</i> L.	10	H					



Family	Taxa	Chorotype	Life form	IUCN category	Protection	Endemism	Invasiveness
Poaceae	<i>Setaria viridis</i> (L.) P. Beauv.	9	T				
	<i>Trisetum flavescens</i> (L.) P. Beauv.	10	H				
Polygalaceae	<i>Polygala comosa</i> Schkuhr	9	H				
Polygonaceae	<i>Polygonum aviculare</i> L.	11	T				
	<i>Rumex acetosa</i> L.	9	H				
	<i>Rumex crispus</i> L.	9	H				
	<i>Rumex obtusifolius</i> L.	9	H				
Primulaceae	<i>Anagallis arvensis</i> L.	11	T				
	<i>Cyclamen purpurascens</i> Mill.	2	G	NT			
	<i>Lysimachia nummularia</i> L.	8	H				
	<i>Primula vulgaris</i> Huds.	10	H				
Ranunculaceae	<i>Aconitum lycoctonum</i> L. ssp. <i>vulparia</i> (Rchb.) Nyman	9	H				
	<i>Actaea spicata</i> L.	9	H				
	<i>Anemone nemorosa</i> L.	7	G				
	<i>Clematis vitalba</i> L.	7	P				
	<i>Helleborus atrorubens</i> Waldst. et Kit.	2	G	LC	SP	E	
	<i>Hepatica nobilis</i> Schreber	7	H				
	<i>Isopyrum thalictroides</i> L.	9	G				
	<i>Ranunculus acris</i> L.	9	H				
	<i>Ranunculus ficaria</i> L.	7	H				
<i>Ranunculus lanuginosus</i> L.	7	H					
Rhamnaceae	<i>Rhamnus cathartica</i> L.	9	P				
Rosaceae	<i>Agrimonia eupatoria</i> L.	10	H				
	<i>Aruncus dioicus</i> (Walter) Fernald	11	H				
	<i>Crataegus monogyna</i> Jacq.	9	P				
	<i>Filipendula vulgaris</i> Moench	9	H				
	<i>Fragaria moschata</i> Duchesne	7	H				
	<i>Fragaria vesca</i> L.	11	H				
	<i>Geum urbanum</i> L.	9	H				
	<i>Malus domestica</i> Borkh.	12	P				
	<i>Potentilla inclinata</i> Vill.	9	H				
	<i>Potentilla micrantha</i> Ramond ex DC.	3	H				
	<i>Potentilla reptans</i> L.	11	H				
	<i>Prunus avium</i> L.	9	P				
	<i>Prunus domestica</i> L.	12	P				
	<i>Prunus spinosa</i> L.	9	P				
	<i>Pyrus communis</i> L.	12	P				
	<i>Rosa canina</i> L.	9	P				
	<i>Rubus caesius</i> L.	9	P				
<i>Sanguisorba minor</i> Scop.	9	H					
<i>Sorbus aria</i> (L.) Crantz	11	P					
<i>Sorbus aucuparia</i> L.	9	P					
Rubiaceae	<i>Cruciata glabra</i> (L.) Ehrend.	3	H				
	<i>Galium aparine</i> L.	9	T				
	<i>Galium lucidum</i> All.	3	H				
	<i>Galium mollugo</i> L.	9	H				

Family	Taxa	Chorotype	Life form	IUCN category	Protection	Endemism	Invasiveness
Rubiaceae	<i>Galium odoratum</i> (L.) Scop.	9	G				
	<i>Galium sylvaticum</i> L.	7	G				
	<i>Galium verum</i> L.	11	H				
Salicaceae	<i>Salix *sepulcralis</i> Simonk.	12	P				
Scrophulariaceae	<i>Lathraea squamaria</i> L.	9	G				
	<i>Linaria vulgaris</i> Mill.	9	G				
	<i>Melampyrum sylvaticum</i> L.	8	T				
	<i>Scrophularia nodosa</i> L.	10	H				
	<i>Veronica anagalloides</i> Guss.	3	T				
	<i>Veronica chamaedrys</i> L.	9	Ch				
	<i>Veronica persica</i> Poir.	12	T				I
	<i>Veronica serpyllifolia</i> L.	9	H				
	<i>Veronica urticifolia</i> Jacq.	7	Ch				
Thymelaeaceae	<i>Daphne mezereum</i> L.	9	P	NT			
Tiliaceae	<i>Tilia platyphyllos</i> Scop.	7	P				
Ulmaceae	<i>Ulmus laevis</i> Pall.	7	P				
Urticaceae	<i>Urtica dioica</i> L.	9	H				
Violaceae	<i>Viola alba</i> Besser	3	H				
	<i>Viola reichenbachiana</i> Jord. ex Boreau	7	H				
Vitaceae	<i>Vitis vinifera</i> L.	11	P				

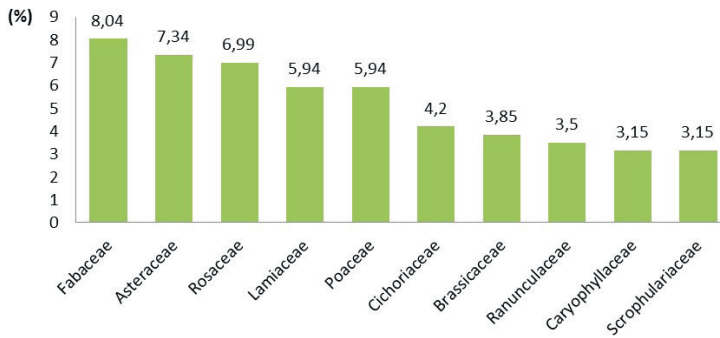


Fig. 2. The percentages of the most abundant families in the flora of trail "Okićnica".

The predominant life form is hemicryptophytes, which account for 52.96% of the taxa, reflecting the moderate climate of the wider area, followed by phanerophytes (16.38%) and geophytes (15.68%) (Fig. 3).

The chorological analyses placed the taxa within 12 floristic elements: Mediterranean, Illyrian-Balkan, South European, Atlantic, East European-Pontic, Southeast European, Central European, European, Eurasiatic, Circumholarctic, cosmopolites and adventive and cultivated taxa. The dominance of Eurasiatic taxa (39.02%), followed by Central European (13.94%) and South European taxa (10.80%) (Fig. 4) reflects the phytogeographical position of the researched area. Žumberačko Gorje Mts and Samobor-

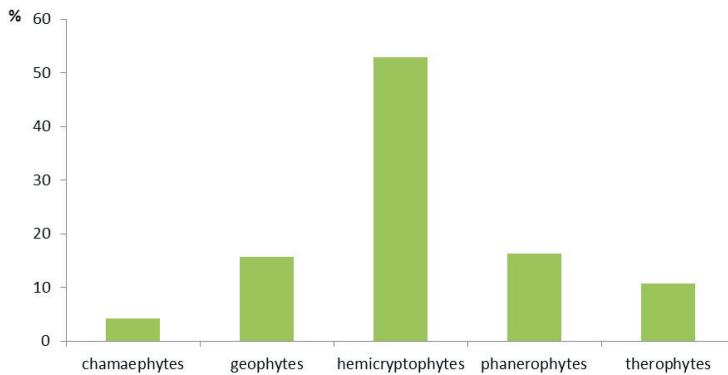


Fig. 3. Life form spectrum of the flora of trail "Okićnica".

sko gorje Mts are situated on the western border of the Pannonian plain, constituting a bridge between the Dinarides and Alps, resulting in miscellaneous plant taxa of diverse origins and recent distribution (TRINAJSTIĆ, 1995). TRINAJSTIĆ (1992, 1995) described a distinct Illyricoid chorotype on the boundary between the SE Alps and NW Dinarides, encompassing Tertiary relict flora, extinct in Central Europe during the Ice Ages, which survived in some refugia within mesophilic beech forests. The representatives of this flora are represented in the flora of the researched area by *Aposeris foetida*, *Cardamine ennaeaphyllos*, *Cardamine trifolia*, *Cyclamen purpurascens*, *Euphorbia dulcis*, *Geranium phaeum*, *Hacquetia epipactis*, *Helleborus atrorubens*, *Knautia drymeia*, *Lamium orvala* and *Vicia oroboides*.

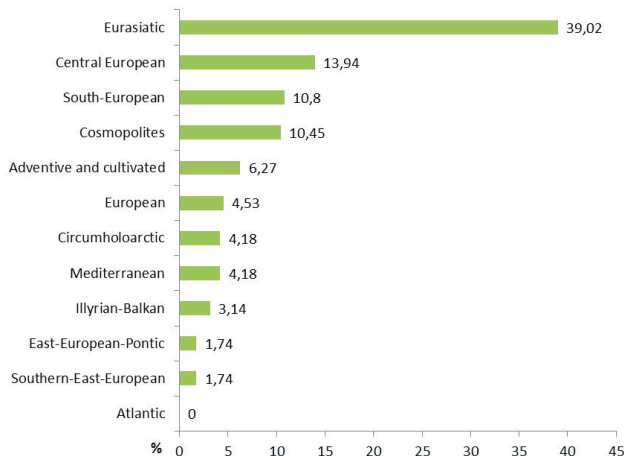


Fig. 4. The percentages of chorological types in the flora of trail "Okićnica".

As for threatened taxa, in the flora of the trail six vulnerable (VU) (*Dianthus giganteus* subsp. *croaticus*, *Ilex aquifolium*, *Lilium martagon*, *Orchis pallens*, *Orchis simia* and *Platanthera bifolia*) and five near threatened (NT) taxa (*Ruscus hypoglossum*, *Gentiana asclepiadea*, *Himantoglossum adriaticum*, *Cyclamen purpurascens* and *Daphne mezereum*)

were found. All of them are strictly protected by law, as are an additional three taxa (*Helleborus atrorubens*, *Neottia nidus-avis* and *Orchis morio* subsp. *picta*). Two of them (*Dianthus giganteus* subsp. *croaticus* and *Helleborus atrorubens*) are endemic species.

Along the trail, nine invasive taxa (3.14%) were registered (*Ambrosia artemisiifolia*, *Artemisia verlotiorum*, *Chamomilla suaveolens*, *Conyza canadensis*, *Erigeron annuus*, *Solidago gigantea*, *Lepidium virginicum*, *Robinia pseudoacacia* and *Veronica persica*), six of them belonging to the family *Asteraceae*. None of these taxa show pronounced invasive capacity in the researched area, since the trail runs through predominantly forest vegetation, into which aliens rarely intrude and expand. Moreover, the trail has hitherto seldom been used by visitors and hikers, making the unintentional spread of alien species less likely.

## CONCLUSIONS

Plant diversity along the Okićnica Trail has a high potential to be used for education in a natural environment. Special emphasis could be given to relict taxa of beech forests on the NW border of the Western Dinarides, as well as orchids as representatives of endangered and protected taxa. It would not be difficult to present the use of indigenous plants in local folk medicine and the traditional cuisine. Within the already existing promotion of the ethnological heritage of this particular region, such a presentation could be combined with advocacy for the preservation of the grasslands as local biodiversity hotspots.

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