



**10th Symposium
on the Flora of Southeastern Serbia
and Neighbouring Regions**
Vlasina Lake 17 to 20 June 2010

**10. Simpozijum
o flori jugoistočne Srbije
i susednih regiona**
Vlasinsko jezero 17. do 20. jun 2010.



**ABSTRACTS
APSTRAKTI**

Niš, 2010

Vlasina 17 to 20 June 2010

**10th Symposium on the Flora of
Southeastern Serbia
and Neighbouring regions,
Vlasina 17 to 20 June 2010**

ABSTRACTS

APSTRAKTI

**Ovaj Simpozijum je organizovan uz materijalnu podršku
Ministarstva za nauku i tehnološki razvoj
i
Ministarstva za životnu sredinu i prostorno planiranje
Republike Srbije**

PROGRAM

Thursday, June 17, 2010

20- 22 h

Registration

Friday, June 18, 2010

8- 9³⁰ h

Registration

10- 10³⁰ h

Opening Ceremony

Plenary Presentation , Hall No 1

10⁴⁵- 11⁰⁵ h

Randelović, N., Dimitrijević, D.

The 25th anniversary of the 1st Symposium on Flora of Southeastern Serbia and Neighbouring Regions

11⁰⁵- 11²⁵ h

Randelović, V., Zlatković, B.

Flora and vegetation of Vlasina plateau

(Book promotion)

11²⁵- 11⁴⁵ h

Tomović, G., Stevanović, V.

Balkanski endemiti u flori Jugoistočne i Južne Srbije

11⁴⁵- 12⁰⁵ h

Karadžić, B., Randelović, V., Zlatković, V., Lakušić, D.

Mogućnosti Softwer-a "FLORA_10"u analizi i reviziji vegetacije primer vegetacija stena (*Asplenietea trichomanis* Br.-Bl. 1934 Corr. Oberd. 1977) Srbije

12³⁰- 14³⁰ h Lunch

ORAL PRESENTATIONS, 1

Phytogeography, Floristics and Phytoecology, Hall No 1

Chairs of the section: Snežana Vukojičić, Antun Alegro

15 - 15¹⁵ h

Blaženčić, J., Stanković, M., Vesić, A.

Harofite (Charophyta) specijalnog rezervata prirode "Zasavica"

15¹⁵ - 15³⁰ h

Stanković, M.

Flora arheoloških lokaliteta rimskog grada Sirmiuma (Sremska Mitrovica)

15³⁰ - 15⁴⁵ h

Bulić, Z.

Vascular flora of Moraca river basin in Montenegro

15⁴⁵ - 16 h

Stojanović, V., Lazarević, P., Petrić, I., Jovanović, S., Vukojičić, S.

"Flora u okolini Beogradskoj"- 145 godina nakon Pančića

16- 16¹⁵ h

Jotić, B., Marković, M., Petrović, B., Zlatković, B., Fusijanović, I.

Rezultati istraživanja flore brda Vučje kod Pirota u istočnoj Srbiji

16¹⁵ - 16³⁰ h

Milosavljević, V., Cvetković, S., Ranđelović, N., Ranđelović, V.

Flora i vegetacija Ljubatske reke

Coffee break 16³⁰ - 17 h

17⁰⁰ - 17¹⁵ h

Nikolić, Lj., Blagojević, B., Matevski, V., Ranđelović, N.

Flora and vegetation of North-Eastern Macedonia

17¹⁵ - 17³⁰ h

Milosavljević, V., Hristov, A., Ranđelović, N., Ranđelović, V.

Flora i vegetacija sliva reke Bistrica u Krajištu

17³⁰ - 17⁴⁵ h

Blagojević, I., Ranđelović, N., Marković, M., Veličković, V.

Flora and vegetation of Basarski kamen on Vidlic

17⁴⁵ - 18 h

Milosavljević, V., Stojnev, O., Ranđelović, N.

Flora i vegetacija sliva Božičke reke u Krajištu

18⁰⁰ - 18¹⁵ h

Jovanović, V., Cvetković, D.

**Dynamics of sexually dimorphic traits in *Mercurialis perennis* L.
(Euphorbiaceae) from Suva Mountain**

18¹⁵ - 18³⁰ h

Redžić, S.

**The origin, syndynamics and syntaxonomy of thermophilous
vegetation of class *Festuco-Brometea* Br.-Bl. et R.Tx in Br.-Bl. 1943 at
the Dinaric Alps (W. Balkan)**

ORAL PRESENTATIONS, 2

Zoology, Hall No 2

Chairs of the section: Vladimir Žikić

15⁰⁰ - 15¹⁵ h

Stanković, S., Žikić, V., Ilić, M.

***Betula alba* and *B.pubescens* as host plants for various Insects
parasitized by braconids (Hymenoptera: Braconidae) in Serbia**

15¹⁵ - 15³⁰ h

Ilić, M., Žikić, V., Stanković, S.

**Trofičke asocijacije insekata štetočina na topolama (*Populus sp.*) i
brakonidnih parazitoida (Hymenoptera: Braconidae) na teritoriji Srbije i
Jugoistočne Evrope**

15³⁰ - 15⁴⁵ h

Milosević, Đ., Žikić, V., Simić, V.

Checklist of subfamily Chironominae (Diptera: Chironomidae) of Serbia

15⁴⁵ - 16⁰⁰ h

Randelović, N., Jakšić, P.

Simplified way of appropriating habitats for fanerobiotic insects

16⁰⁰ - 16¹⁵ h

Jakšić, P., Momirović, M.

Contribution to understanding the origin and the genesis of Nisava's riverside fauna

16¹⁵ - 16³⁰ h

Gnjatović, I., Žikić, V.

Cerambycidae of South-east Serbia (Coleoptera, Cerambycidae)

Coffee break 16³⁰ - 17 h

Agriculture, Forestry and Landscape Architecture, Hall No 2

Chairs of the section: Nebojša Anastasijević

17⁰⁰ - 17¹⁵ h

Anastasijević, V., Anastasijević, N., Bobić, A.

Zelena infrastruktura središta Beograda

17¹⁵ - 17³⁰ h

Anastasijević, V., Anastasijević, N., Mešiček, M.

Potencijal novih drvoreda u ekološkoj sanaciji najzagađenijih ulica Beograda

17³⁰ - 17⁴⁵ h

Anastasijević, V.

Privatno zelenilo kao izvor brže revitalizacije Beogradskog središta

17⁴⁵ - 18 h

Anastasijević, N., Anastasijević, V.

Sudbina terazijskog parka u Beogradu

18 - 18¹⁵ h

Anastasijević, V., Anastasijević, N., Stojanović, N.

Procena estetskih vrednosti gradskih drvoreda

18¹⁵ - 18³⁰ h

Anastasijević, N., Anastasijević, V.

Istorija i tradicija u srpskoj pejzažnoj arhitekturi

POSTER SESSION

19³⁰ - 21 h First group (Phytogeography, Floristics and Phytoecology)

Saturday, June 19, 2010

ORAL PRESENTATIONS, 1

Phytogeography, Floristics and Phytoecology, Hall No 1

Chairs of the section: Gordana Tomović, Goran Anačkov

10- 10¹⁵ h

Anačkov, G.

**Variability of the Larg Yellow Vetch *Vicia grandiflora* Scop. 1772
(*Fabaceae*, *Vicieae*)**

10¹⁵- 10³⁰ h

Milić, D., Anačkov, G., Đan, M., Luković, J., Zorić, L., Veselić, S., Boža, P.

**Morpho-anatomical and genetic variability of *Salicornia europaea*
group, (*Chenopodiaceae*, *Salicornioideae*) populations from
geographically distant localities**

10³⁰-10⁴⁵ h

Rat, M., Božić, S., Anačkov, G., Vukov, D., Igić, R., Boža, P.

**Morphological variability of the species *Ambrosia artemisiifolia* L. 1753
and *A. trifida* L. 1753 (*Asteraceae*, *Heliantheae*) from different habitats
in Backa (Vojvodina, Serbia)**

10⁴⁵- 11 h

Statti, G., Uzunov, D., Conforti, F., Marrelli, M., Menichini, F., Tundis, R., Bonesi, M.,
Menichini, F.

Mediterranean phytochemical plant diversity. The case of calabrian flora

11- 11¹⁵ h

Cvetković, D.

**Reproductive allocation along the altitudinal gradient in a dioecious
plant**

11¹⁵- 11³⁰ h

Rat, M., Andrić, A., Živanović, S.

**Značajni karakteri infraspecijskih taksona vrste *Ornithogalum
umbellatum* L. 1753 (*Hyacinthaceae*)**

11³⁰ - 11⁴⁵ h

Petrović, B., Jotić, B.

**Rezultati merenja gornje temperaturne granice rasprostranjenja vrste
Salix cinerea L.**

11⁴⁵ - 12 h

Cvetković, D., Jovanović, V., Rubinjoni, L., Novčić, R., Komatović, S.

**Population on edge: life history traits in a high altitude population of
dog's mercury**

Coffe break: 12- 12¹⁵ h

12¹⁵ - 12³⁰ h

Pavlović, D., Petronić, S.

Vegetacija budućeg Zaštićenog pejzaža „Javorina“

12³⁰ - 12⁴⁵ h

Petronić, S., Kadić, J., Radošević, D., Panić, G., Kovačević, D., Travar, J.

Flora budućeg Posebnog rezervata prirode „Gromiželj“

12⁴⁵ - 13 h

Lazarević, P.

Mires of Serbia

13- 13¹⁵ h

Randelović, V., Zlatković, B., Dimitrijević, D., Vlahović, T.

**Phytogeographical and phytocoenological analysis of the endangered
plant taxa in the flora of the Vlasina plateau (SE Serbia)**

13¹⁵ - 13³⁰ h

Bulić, Z.

**Activities on creating bibliographies of botanical researches in
Montenegro**

Taxonomy and Systematics, Hall No 1

13³⁰ - 13⁴⁵ h

Bozin, B., Anackov, G., Zlatkovic, B., Orcic, D., Balog, K., Mimica-Dukic, N.

**Taxonomic significance of primary volatile sulfur and phenolic
compounds in the section *Allium***

13⁴⁵ - 14⁰⁰ h

Zorić, L., Luković, J., Merkulov, Lj.

Kristali vrsta roda *Trifolium* L. – morfologija, distribucija i struktura

ORAL PRESENTATIONS, 2

Nature protection and Environment, Hall No 2

Chairs of the section: Biljana Panjković

10- 10¹⁵ h

Panjković, B., Perić, B., Stojšić, V.

**Krčedinska ada-značajno područje u Podunavlju za očuvanje
diverziteta flore i vegetacije**

10¹⁵- 10³⁰ h

Čopić, M., Romčević, D., Travar, J.

Populacijska vrijednost mekolisne veprine u NP Kozara

10³⁰- 10⁴⁵ h

Stojković, M., Simić, V.

**Ichthyological integral indices, the history of development and
possibility of application on rivers in Serbia**

10⁴⁵- 11 h

Nikolić, M., Stamenković, S.

**Fizičko-hemijski i lišajski monitoring kvaliteta vazduha na urbanoj
teritoriji grada Leskovca (Južna Srbija) 2002-2008**

11¹⁵- 11³⁰ h

Stanković, M.

Retke, ugrožene i reliktno vrste u flori SRP Zasavica

Phytochemistry and Phytotherapy, Hall No 2

Chairs of the section: Biljana Božin

11³⁰ - 11⁴⁵ h

Cvetković, D., Marković, D.

**Stability of flavonoids toward UV-irradiation and inhibition of lipid
peroxidation: correlation of structure and function**

11⁴⁵ - 12⁰⁰ h

Stanisavljević, D., Ristić, M., Đorđević, S., Veličković, D., Randelović, N.

Efekat različitih metoda sušenja na hemijski sastav i prinos etarskog ulja biljke *Mentha longifolia* L.

12⁰⁰ - 12¹⁵ h

Bozin, B., Lakic, N., Samojlik, I., Mimica-Dukic, N, Igic, R., Anackov, G.

Health properties of extracts of two wild garlic taxa (*Allium vineale*, Alliaceae)

12¹⁵ - 12³⁰ h

Stojanović, I., Radulović, N., Jovanović, O., Petrović, G., Stojanović, G.

Antimikrobna aktivnost metanolnih ekstrakata odabranih vrsta lišajeva familije *Parmeliaceae*

POSTER SESSIONS

15- 16³⁰ h Second group (Taxonomy and Systematics, Nature protection and Environment)

17- 18³⁰ h Third group (Phytochemistry and Phytotherapy, Biotechnology, Selection and Genetics)

19- 20³⁰ h Fourth group (Agriculture, Forestry and Landscape Architecture, Zoology)

21h Dinner party

***10th Symposium on the Flora of
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**Plenary presentations
Plenarna predavanja**

Flora and vegetation of Vlasina plateau

Ranđelović, V., Zlatković, B.

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The Vlasina plateau is situated in southeastern Serbia between Vardenik, Čemernik, Plana and Bukova Glava mountains. Flora of Vlasina plateau contains 178 species of mosses, 5 species of horsetail, 14 fern species and 925 species of spermatophytes. 178 species of moss species are divided into the following classes: *Marchantiopsida* (30 species), *Sphagnopsida* (12 species) and *Bryopsida* (136 species). The taxonomical analysis indicates that mosses are represented by 96 genera and 56 families. The most numerous genus *Sphagnum* contains 12 species. Vascular plants are represented by 383 genera and 94 families. Families richest in genera are: *Asteraceae* (53), *Poaceae* (38) and *Apiaceae* (23). Families with the most species are: *Asteraceae* (132 species), *Poaceae* (79) and *Scrophulariaceae* (57). The analysis of the particular genera occurrence in flora of Vlasina plateau has shown an absolute domination of representatives of genus *Carex* (34 species) while *Trifolium* (19 species) and *Ranunculus* (15) genus were of less importance.

The flora of mosses contains 52 different floristic elements divided into 5 basic area types. While more detail phytogeographical analysis reveals the dominance of boreal (60) and holarctic species (75). The phytogeographic analysis of flora of Vlasina plateau region reveals the presence of 310 different floristic elements, classified into 10 basic area types and 20 different area groups. The species of Eurasian area type (459 species, 48,6%) are the most abundant ones, followed by specific high-mountain elements of the Eurasian mountain (123 species). The analysis shows that the floras of Vlasina consider 45 endemics and 30 subendemics.

The illustration of life conditions (especially of climate occasions) keeps proportional representation of life plant forms in the flora of Vlasina plateau. The hemicryptophytic character of Vlasina plateau flora, together with significant contribution of therophytes and geophytes, is established by analyzing the presence of vascular plants' life forms.

Phytocoenological analysis shows 63 different associations from 35 alliances, 24 orders and 19 classes. The next types of vegetation can be differentiated from the ecological stand-point: aquatic and moor vegetation, vegetation of flooded places, wet grasslands, vegetation of springs, tall herbaceous vegetation, herbaceous vegetation of woodland clearings, peat-bogs vegetation, vegetation of meadows and pastures in mountain and subalpine zone, vegetation of dwarf-shrubs, forest vegetation, nitrophilous and ruderal vegetation.

The 25th anniversary of the 1st Symposium on Flora of Southeastern Serbia and Neighbouring Regions

Ranđelović, N., Dimitrijević, D.

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A scientific meeting dedicated to the 100th anniversary of publishing one of Dr Sava Petrović's main works «Niš Region Flora» was organized 25 years ago by a group of biologists from Doljevac, Leskovac, Prokuplje and Niš. At that time, nobody could presume that this type of botanist gathering from Serbia and surrounding countries would become one of the brightest traditions of Serbian botany at the end of previous and the beginning of this century.

Balkanski endemiti u flori jugoistočne i južne Srbije

Tomović, G., Stevanović, V.

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Jugoistočna i južna Srbija se u florističkom i vegetacijskom smislu ubrajaju u najbogatija područja na teritoriji uže Srbije. To je pre svega rezultat prisustva različitih tipova staništa koja su zastupljena kako u planinskim i visokoplaninskim regionima (Suva planina, Vlasinska visoravan, planine u okolini Vranja i Pirota, Rudina planina, Rujan planina, itd.), zatim u velikom broju klisura (Sićevačka klisura, klisura Jerme, klisura Pčinje, Grdelička klisura, Končuljska klisura), ali i u nizijskim delovima u kojima preovlađuju stepski i submediteranski tipovi staništa (okolina Niša, Pirota, Leskovca, Vranja). Posebnu vrednost i specifičnost flore ovih područja predstavljaju endemični, subendemični i reliktni taksoni. Potrebno je istaći da postoji duga tradicija proučavanja endemične flore južne i jugoistočne Srbije, jer prvi podaci potiču još iz druge polovine devetnaestog veka od dr Josifa Pančića i dr Save Petrovića. Nešto kasnije, značajne florističke radove objavili su i Adamović, Ničić, Ilić, Fritsch, Katić, Košanin, Jurišić, Vandas, Velenovský, itd. Ipak, najveći broj novijih podataka o prisustvu endemičnih biljaka u južnoj i jugoistočnoj Srbiji potiče iz druge polovine dvadesetog veka, kao rezultat rada velikog broja srpskih botaničara (Diklić, Nikolić, Jovanović, B., Jovanović-Dunjić, Stevanović, Niketić), od kojih pre svega treba istaći predstavnike tzv. južnosrpske botaničke škole (Ranđelović, N., Stamenković, Ružić, Sotirov, Jovanović, V., Ranđelović, V., Zlatković, itd.). Upravo zahvaljujući florističkim podacima publikovanim od strane

velikog broja botaničara koji su radili na području jugoistočne i južne Srbije, kao i pregledom obimne herbarijumske građe, i sopstvenim terenskim istraživanjima, došlo se do podatka da u jugoistočnoj i južnoj Srbiji raste nešto više od 180 balkanskih endemičnih taksona vaskularne flore. Ovaj rad ima za cilj da predstavi rasprostranjenje odabranih balkanskih endemičnih taksona (u rangu vrsta i podvrsta) u jugoistočnoj i južnoj Srbiji, ali i da prikaže osnovne taksonomske, fitogeografske i ekološke analize, kao i analizu centara diverziteta balkanske endemične flore na teritoriji južne i jugoistočne Srbije. Taksonomska analiza pokazuje da je u endemičnoj flori ovih područja najbrojnija familija Compositae (sa 42 taksona), dok se po značajnom broju endemičnih biljaka ističu još i familije Caryophyllaceae (22 taksona), Leguminosae (15 taksona), Scrophulariaceae (11 taksona) i Labiatae (9 taksona). U smislu rodova najbogatijih po brojnosti endemičnih taksona, tu se posebno ističe rod Hieracium (s.s.) (22 endemične vrste i podvrste), a zatim rodovi Centaurea (incl. Cyanus) (11), Silene (incl. Heliosperma) (9), Dianthus (8) i Crocus (7 endemičnih biljaka). Fitogeografska analiza predstavnika balkanske endemične flore u južnoj i jugoistočnoj Srbiji pokazuje izrazitu dominaciju planinskih areal grupa (južno-evropsko planinsku i srednje-evropsko planinska areal grupa), što ukazuje na visoku povezanost endemičnih taksona sa planinskim i visokoplaninskim regionima u ovim područjima. Relativno veliki broj endemita koji pripadaju mediteransko-submediteranskoj areal grupi, posledica je značajnog upliva (sub)mediterana na teritoriju južne i jugoistočne Srbije. Pontska i srednje-evropska areal grupa, karakterišu se relativno malim brojem endemičnih biljaka. Spektar životnih formi endemične flore ukazuje da je balkanska endemična flora u južnoj i jugoistočnoj Srbiji hemikriptofitskog karaktera, jer najveći broj endemita pripada ovoj životnoj formi, što je u saglasnosti sa dominacijom hemikriptofita u celokupnoj endemičnoj flori Srbije, ali i Balkanskog poluostrva. Terofite i geofite kao životne forme predstavljene su sa znatno manjim brojem balkanskih endemita u flori ovih područja, što je i očekivano jer su ove dve grupe biljaka prevashodno karakteristične za područje Mediterana. Sumarna karta rasprostranjenja svih balkanskih endemičnih taksona u južnoj i jugoistočnoj Srbiji, urađena je u cilju izdvajanja centara diverziteta ove specifične kategorije biljaka na ovim teritorijama. Konačnim analizama distribucije i stepena zastupljenosti endemičnih taksona na UTM areal kartama 10x10 km, krečnjačko područje Suve planine (55 taksona na UTM polju EN98) izdvaja se kao apsolutni centar diverziteta balkanske endemične flore u jugoistočnoj i južnoj Srbiji. Područje Vlasinske visoravni sa okolnim planinama (Čemernik, Vardenik, Strešer, Besna kobila), sa 34-48 endemičnih taksona po UTM poljima 10x10 km, predstavlja značajan centar diverziteta endemične flore koja se prevashodno razvija na silikatnim terenima ili na visokoplaninskim tresavama. S obzirom na stepen ugroženosti ovih ekosistema, ova područja su od visokog značaja za očuvanje diverziteta flore i vegetacije kako na nivou Srbije tako i na globalnom nivou.

**Mogućnosti software-a "Flora_10" u analizi i reviziji
vegetacije: Primer vegetacija stena (*Asplenetea
trichomanis* Br.-Bl. 1934 corr. Oberd. 1977) Srbije**

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2 Odsek za biologiju i ekologiju, Prirodno-matematički fakultet, Univerzitet u Nišu, Srbija

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U okviru klase *Asplenetea trichomanis* za područje Srbije je do sada registrovano prisustvo 53 asocijacije, sa 7 subasocijacija, koje su svrstane u 13 sveza i 9 redova. Iako se radi o relativno velikom broju zabeleženih sintaksona, na osnovu čega bi se moglo zaključiti da je vegetacija stena u Srbiji dobro istražena, ipak mnogi tipovi ove vegetacije ni izbliza nisu dovoljno istraženi, tako da je realni diverzitet vegetacije u pukotina stena Srbije mnogo veći nego što to pokazuju dosadašnji podaci.

Osim toga, poseban problem u sagledavanju stvarnih fitocenoloških karakteristika hazmofitske vegetacije Srbije, predstavlja i činjenica da pri opisivanju novih sintaksona nisu korišteni objektivni numeričko-statistički alati, već je čitav sistem klasifikacije baziran na subjektivnim i u određenoj meri provizornim kriterijuma koji su se bazirali ili na nedovoljno dobro definisanim karakterističnim vrstama ili na intuitivnom pristupu autoriteta koji su definisali više sintaksone u ovom tipu vegetacije.

Jedan od osnovnih zadataka savremene fitocenološke nauke je da obilje fitocenoloških podataka, publikovanih u brojim radovima u prethodnom periodu, objedini i obradi standardnim matematičkim procedurama, koje omogućavaju maksimalnu objektivizaciju u interpretaciji dobijenih rezultata.

Softver "FLORA_10", predstavlja unapredjenu verziju softver-a "FLORA", koji omogućava veoma udoban rad i mnogobrojne numeričke (ordinacione i klasifikacione) analize.

U radu će biti prikazani rezultati numeričkih analiza kojima su obuhvaćeni svi fitocenološki snimci koji se odnose na vegetaciju stena u Srbiji.

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**Taxonomy and Sistematics
Taksonomija i sistematika**

**Variability of the Larg Yellow Vetch *Vicia grandiflora* Scop.
1772 (*Fabaceae*, *Vicieae*)**

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The large yellow vetch (*Vicia grandiflora* Scop. Fl. Carn. 2:65 (1772)) is a Pontic-Balkan-Caucasian species native to the Southeastern Balkans. It is common on the territory of Serbia, especially in the Pannonic floral region. It grows in various habitats, most typically on grassy patches, pasture lands, and meadows. Its taxonomic variation on the territory of the Pannon Plain includes three variants and two forms. The variants differ in leaflet shape, whereas the forms are distinguished on the basis of flower hue.

Using comparative morphological methods, we have carried out a taxonomic and variation analysis of the large yellow vetch on individuals collected in three populations on the territory of Novi Sad. The analysis concentrated on more than 30 morphological features in 30 individuals from each population. The features have been grouped into quantitative and qualitative categories. We have subdivided the category of quantitative features into measurement and calculation subcategories. Both the quantitative and qualitative features have been statistically analysed with the Statistica for Windows ver. 80 software package, relying on the method of multivariational analysis.

The preliminary findings have proved to be promising and may be further verified by more detailed analyses still ahead. We have found completely new features that are not mentioned in the literature at all. Based on these results, it may be possible to describe a new variant of the large yellow vetch. This new variant differs from those already described in leaflet shape, vexillum colour and size, as well as seed colour.

Taxonomic significance of primary volatile sulfur and phenolic compounds in the section *Allium*

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The genus *Allium* comprises between 750 and 850 species. According to the latest intrageneric classification it is divided into 15 subgenera and 72 sections. The subgenus *Allium* is the largest, comprising around 280 species, 114 of which compose its largest section, *Allium*. Although extensive research has been done on garlic and a few related species, there was no comprehensive study on the significance of primary volatile and phenolic compounds in the taxonomy of garlies. With respect to this, the chemical composition of phenolic and volatile sulfur fractions of 10 taxa of section *Allium*, including *A. sativum* (namely *A. rotundum* subsp. *waldsteinii*, *A. scorodoprasum*, *A. sphaerocephalon*, *A. atroviolaceum*, *A. guttatum* subsp. *dalmaticum* and subsp. *sardoum*, *A. vineale* var. *vineale*, var. *compactum* and var. *capsuliferum*) was studied. Cluster analysis based on the main phenolic (phenolic acids, flavonoids and anthocyanins) and volatile sulfur compounds (different kinds of sulfides) pointed on the closest relation between *A. sativum* and three investigated varieties of *A. vineale*. Second group made the examined subspecies of *A. guttatum*, joined with *A. sphaerocephalon*. *A. scorodoprasum* and *A. rotundum* subsp. *waldsteinii* presented the third group and *A. atroviolaceum* was, according to the linkage distance, the most distant from all other investigated taxa.

Taxonomy, ecology and distribution of *Acer hyrcanum* Fisch. & Mey. *sensu lato*

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Acer hyrcanum was described as a new species by Fischer and Meyer (1837) from southeast Caucasus (mountain Talüsch in Azerbaijan). Taxonomy, ecology and distribution of the species with seven subspecies: *A. h.* subsp. *hyrcanum*, *A. h.* subsp. *stevenii* (Pojark.) E. Murray, *A. h.* subsp. *tauricola* (Boiss. & Balansa) Yalt., *A. h.* subsp. *shaerocaryum* Yalt., *A. h.* subsp. *keckianum* (Pax) Yalt., *A. h.* subsp. *reginae-amaliae* (Orph. ex Boiss.) E. Murray and *A. h.* subsp. *intermedium* (Pančić) Bornm. are given in this paper. *Acer hyrcanum* s. l. prefers very specific ecological conditions and it is relatively rare in forest communities of Caucasus, Crimea, Asia Minor and Balkan Peninsula. Today, different populations of the species are much endangered, especially, by human impact which needs very sophisticated protection measures. Also, the IUCN categorization for the territory of Montenegro is given in the paper.

The genus *Plectania* in Montenegro

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The paper presents three species of the genus *Plectania* Fuckel 1870, identified in Montenegro: *Plectania nigrella* (Pers. : Fr.) Karsten, Acta Soc. Fauna Fl. Fen. 2 (6) : 119, 1885, *Plectania melaena* (Fr.) Paden, in Korf, Mycotaxon 14(1): 1 (1982), *Plectania rhytidia* f. *platensis* (Speg.) Donadini, Boll. Gruppo Micol. 'G. Bresadola' (Trento) 28(1-2): 24 (1985) and *Plectania* spec. Since this genus has not been studied in Montenegro up to now, the data presented here are new to the area. The material was collected in the Mediterranean, sub-Mediterranean and continental region of Montenegro. *P. rhytidia* f. *platensis* is a species that develops in very hot climates, often with eucalyptus. In Europe was not so frequently observed. In our country so far was observed only in two localities (Herceg Novi, Podgorica) in broadleaf stands of *Quercus* spp. *P. melaena* and *P. nigrella* occur at continental and mountain sites, along the line of melting snow, in damp places, on lignicolous substrates. Both species were observed only in National Park Biogradska gora. *Plectania* spec. was found only in one site (Podgorica) in the introductory stand of

Pinus halepensis Miller. The study was conducted on fresh material, while checking on several occasions were made on the exccata. Macroscopic description of the species and photo illustrations were performed in situ by reflex camera Nikon FG20 and Nikon digital 100. Microscopic analysis was performed with the help of optical microscope (Leica DMLS) while micro illustrations were made with the help of digital cameras (Dc300). Drawings of micro elements were performed using pen and ink, then processed in Adobe Photoshop. The microscopic preparations were observed in water, Congo red, Melzer's reagent (for observing amiloid reaction of asci), Cotton blue, and Lactophenol (for observing ascospore ornamentation). Size of ascospores are presented based on measurements of 30 ascospores from different apothecia. The material is preserved in the herbarium of Mycological Centre, Biotechnical Faculty in Podgorica. Comments on ecological and taxonomic characteristics are given.

Kristali vrsta roda *Trifolium* L. – morfologija, distribucija i struktura

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Ispitivanje morfologije, distribucije i strukture kristala u vegetativnim i reproduktivnim organima izvršeno je kod dvadeset vrsta roda *Trifolium* L. korišćenjem svetlosne i skening elektronske mikroskopije, kao i pomoću Energy Dispersive spektroskopije. Ustanovljeno je prisustvo pojedinačnih kristala kalcijum oksalata, prizmatičnog oblika, u svim analiziranim biljnim delovima. U listu, zaliscima i čašici kristali se nalaze u ćelijama parenhimske sare oko provodnih snopića, dok su u lisnoj dršci, stablu i dršci cvasti prisutni u ćelijama sare iznad sklerenhimskih grupa uz floemski deo snopića. U zaliscima i čašici kristali se takođe nalaze i u jednom sloju ćelija mezofila. Na osnovu tipa, morfologije i distribucije kristala vrste roda *Trifolium* se međusobno ne razlikuju, te stoga analizirani parametri nisu od taksonomskog značaja za ovaj rod. Primećeno je da su kristali malobrojni ili čak odstvuju u organima gajenih vrsta ovog roda, što verova tno, uz ostale histološke karakteristike, doprinosi većoj svarljivosti i kvalitetu krme.

The Family Boletaceae s.l. (Excluding *Boletus*) in the Republic of Montenegro

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The Family Boletaceae s.l. (Excluding *Boletus*) in the Republic of Montenegro This paper contains results of systematic research into Boletaceae s.l. (excluding *Boletus* L.) in the Republic of Montenegro. 45 species belonging to 18 genera are presented. One genus and three species are reported for the first time from Montenegro. For each species, the published and unpublished sources of data are given, as well as the collections in which the material is deposited. Also, the review of macrofungi with national and international significance is given.

Genetic and morphological diversity of closely related *Sphagnum angustifolium*, *S. fallax* and *S. flexuosum*

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We are investigating genetic and morphological diversity of Hungarian and European *S. angustifolium*, *S. fallax* and *S. flexuosum* populations. We are utilizing ten microsatellite loci and five sequencing primer to evaluate the taxonomic value/rank of the investigated species. Morphological measurements are held on spreading and hanging branches, stem leaves, pendent and spreading branch leaves. At present we are in the process of generating microsatellite profiles for 200 specimens distributed across the distribution range of the species in Europe. Until now we analysed microsatellite loci on 100 samples, from 14 countries (next 100 samples are in progress). Most markers showed high variability and thus appear to be appropriate to study the relationship of the closely related species. Although there were alleles specific to each of the three species the majority of the alleles are shared among them confirming their close genetic relatedness. To see whether accessions of the three described morphological species comprise distinct genetic entities pairwise genetic distances were subjected to multivariate analysis (PCOA). The PCOA suggest that two of the three pairwise species comparison (*S. fallax* vs. *S. flexuosum* and *S. fallax* vs. *S. angustifolium*) are well separated from each other

whereas accessions of *S. angustifolium* and *S. flexuosum* are largely overlapping. This was confirmed by a molecular variance analysis. Morphological indices were subjected to the same multivariate analysis (PCOA) as molecular markers to separate morphological species. On the basis of morphological characters the species are overlapping. The three investigated taxa are very similar both genetically and morphologically, which may be caused the recent speciation or hybridization after speciation. The project financed by Hungarian Scientific Research Fund (OTKA 67755).

Significant characters for the infraspecies taxa of the species *Ornithogalum umbellatum* L. 1753 (Hyacinthaceae)

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Ornithogalum umbellatum L. 1753 is widespread species in Serbia. In Europe, it is widespread in Central and Southern Europe, while in other areas is naturalized. Its areal covers, except Europe, Northern Africa, Western Asia and the Caucasus. Relatively large areal of distribution and adaptation to different habitats cause large, clearly visible variability of the species. This variability occurs in morphological, anatomical, cytological and molecular characters. Due to the large variability within the species, many infraspecies categories are described. However, different literature sources give variety of different characters of taxonomic importance for a clear differentiation of infraspecies categories. Studies have included biometric analysis of morphological characters of *O. umbellatum* L. 1753, plants were collected in five different and geographically distant sites. A total of 33 characters of vegetative and generative region (10 qualitative and 23 quantitative) were analyzed. The results were processed with classical and multivariate statistics methods and the software package Statistica for Windows ver. 9.0 was used. Based on the data obtained by biometric analysis, characters were distinguished (length and width of the leaf, the ratio of the length of leaf and scapus, number of flowers in inflorescence, length of flower stalk, length and width of the bulb, the presence of bulbils) according to which it could be define the infraspecies taxa.

The taxonomic review of the genus *Linum* L. (*Linaceae*) in the flora of Eastern Europe

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According to our revision, genus *Linum* is represented in Eastern Europe by 23 species including 6 subspecies that belong to 2 subgenera, 6 sections and 6 subsections. System of the genus is changed and augmented. One new subgenus (Subgen. *Cathartolinum* (Reichenb.) Svetlova), one new section (Sect. *Tubulinum* Svetlova) and 4 new subsections (Subsect. *Longiunguiculata* Svetlova, Subsect. *Flava* Svetlova, Subsect. *Taurica* Svetlova, Subsect. *Grandiflora* Svetlova) are described. Key words: *Linum*, taxonomic review, Eastern Europe. *Linum* L. is the largest genus with the most complicated system in *Linaceae* DC. ex Perleb. It numbers more than 200 species that belong to 2 subgenera and 9 sections. *Linum* species dwell in moderate areas in both hemispheres (Svetlova, 2009). The highest species diversity was found in the Mediterranean (78 species; Romo, 1989) and in North America (47 species; Rogers, 1984). The Mediterranean is the center of origin of *Linum* genus (Wulff, 1940). The most superspecies taxa are represented in the Mediterranean; some of them include species with the most primitive characters. In the regions adjacent to the Mediterranean number of species is considerably lower: 36 in Western Europe (Ockendon, Walters, 1968), less than 10 in Northern Africa, 39 in Asia Minor (Davis, 1967). We revised and adjusted the species composition of *Linum* L. genus in Eastern Europe. Material and Methods The study of *Linum* species was based on critical analysis of herbal materials including typical specimen from the following Herbaria: LE, LECB, WIR, MW, MWG, MOSP, MHA, RV, RWBG, YALT, SIMF, CSAU, KW, BP. Results and discussion According to our review, in the studied area *Linum* genus is represented by 23 species with 6 subspecies that belong to 2 subgenera, 6 sections and 6 subsections. System of the genus was changed and augmented. One new subgenus, one new section and 4 new subsections were described. Investigations allowed to separate *L. catharticum* in subgenus *Cathartolinum* (Reichenb.) Svetlova (Svetlova, 2008), and to separate *L. nodiflorum* into monotypic Sect. *Tubulinum* Svetlova (Svetlova, 2006a). Taxonomic revision of Sect. *Adenolinum* (Svetlova, 2005a, b), *Linum* (Svetlova, 2007a) and *Syllinum* (Svetlova, 2006b, 2007b) allowed to adjust their species composition and to separate some of them into new subsections. Sect. *Adenolinum*: Subsect. *Longiunguiculata* Svetlova; Sect. *Syllinum*: Subsect. 1. *Flava* Svetlova, Subsect. 2. *Taurica* Svetlova; Sect. *Linum*: Subsect. *Grandiflora* Svetlova. The short conspectus of *Linum* genus in flora of Eastern Europe is enclosed. The sequence of taxa in the conspectus conforms our ideas of their evolutionary relations. More often the listed

species of this genus are found on dry stone, clay, limestone and grassy slopes, in mountain steppe, in subalpine and alpine grasslands. *Linum* L. – Subgen. 1. *Linum*. Lectotypus (Small, 1907: 67): *L. usitatissimum* L. Sect. 1. *Adenolinum* (Reichenb.) Juz. – Lectotypus (Egorova, 1996: 354): *L. perenne* L. Subsect. *Longiunguiculata* Svetlova. – Typus: *L. perenne* L. 1. *L. austriacum* L., 1753, Sp. Pl.: 278. 1a. *L. austriacum* subsp. *austriacum*. 2. *L. perenne* L., 1753, Sp. Pl.: 277. 3. *L. komarovii* Juz., 1949, in Fl. URSS.14: 719, 112. 3a. *L. komarovii* subsp. *boreale* (Juz.) T. V. Egorova, 1996, in Fl. Vostochnoi Evropy. 9: 354. 4. *L. squamulosum* Rudolphi, 1809, in Willd., Enum. Pl. Horti Bot. Berol.: 338. 5. *L. marschallianum* Juz., 1949, in Fl. URSS 14: 721, 120. 6. *L. extraaxillare* Kit., 1864, Linnaea 32: 573. Sect. 2. *Linum*. – Typus: generis lectotypus. Subsect. 1. *Nervosa* Optasyuk, 2006, Ukr. Bot. Zhurn. 63, 6: 813. – Typus: *L. nervosum* Waldst. et Kit. 7. *L. nervosum* Waldst. et Kit., 1803-1805, Pl. Rar. Hung. 2: 109, tab. 105. 7a. *L. nervosum* subsp. *nervosum*. 7b. *L. nervosum* subsp. *jailicola* (Juz.) T. V. Egorova, 2000, Bot. Zhurn. 85, 7: 170. Subsect. 2. *Linum*. – Typus: generis lectotypus. 8. *L. bienne* Mill., 1768, Gard. Dict., ed. 8: № 8. 9. *L. crepitans* (Boenn.) Dumort., 1827, Fl. Belg.: 111. 10. *L. usitatissimum* L., 1753, Sp. Pl.: 277. 10a. *L. usitatissimum* var. *usitatissimum*. 10b. *L. usitatissimum* var. *humile* (Mill.) Pers., 1805, Syn. Pl. 1: 334. Subsect. 3. *Grandiflora* Svetlova, 2009, Novosti Sist. Vyssh. Rast. 41: 137. – Typus: *L. grandiflorum* Desf. 11. *L. grandiflorum* Desf., 1800, Fl. Alt. 1: 278, tab. 78. Sect. 3. *Syllinum* Griseb., 1843, Spicil. Fl. Rumel. 1: 115. – Lectotypus (Egorova, 1996: 351): *L. flavum* L. Subsect. 1. *Flava* Svetlova, 2007, Novosti Sist. Vyssh. Rast. 39: 220. – Typus: *L. flavum* L. 12. *L. flavum* L., 1753, Sp. Pl.: 279. 12a. *L. flavum* subsp. *flavum*. 12b. *L. flavum* subsp. *basarabicum* (Săvul. et Rayss) Svetlova, 2006, Novosti Sist. Vyssh. Rast. 38: 150. Subsect. 2. *Taurica* Svetlova, 2007, Novosti Sist. Vyssh. Rast. 39: 221. – Typus: *L. tauricum* Willd. 13. *L. linearifolium* (Jávorka) Juz., 1949, in Fl. URSS 14: 133, cum auct. Jávorka. 14. *L. tauricum* Willd., 1809, Enum. Pl. Horti Bot. Berol.: 339. 15. *L. pallasianum* Schult., 1820, in Roem. et Schult., Syst. Veg. 6: 758. 16. *L. czernjajevii* Klok., 1947, in Journ. Bot. Acad. Sci. Ukraine 3, 1–2: 24. 17. *L. ucranicum* (Griseb. ex Planch.) Czern., 1859, Consp. Pl. Charcov: 12. 17a. *L. ucranicum* subsp. *ucranicum*. 17b. *L. ucranicum* subsp. *uralense* (Juz.) T. V. Egorova, 1996, in Fl. Vostochnoi Evropy. 9: 353. Sect. 4. *Tubulinum* Svetlova, 2006, Bot. Zhurn. 91, 2: 310. – Typus: *L. nodiflorum* L. 18. *L. nodiflorum* L., 1753, Sp. Pl.: 280. Sect. 5. *Dasylinum* (Planch.) Juz., 1949, in Fl. URSS 14: 140. – Lectotypus (Egorova, 1996: 358): *L. hirsutum* L. 19. *L. hirsutum* L., 1753, Sp. Pl.: 277. 19a. *L. hirsutum* subsp. *hirsutum*. 19b. *L. hirsutum* subsp. *lanuginosum* (Juz.) T. V. Egorova, 1996, in Fl. Vostochnoi Evropy. 9: 358. Sect. 6. *Linopsis* (Reichenb.) Engelm., 1852, in A. Gray, Smithson. Contr. Knowl. 3, 5: 25. – Lectotypus (Rogers, 1982: 230): *L. quadrifolium* L. 20. *L. tenuifolium* L., 1753, Sp. Pl.: 278. 21. *L. corymbulosum* Reichenb., 1832, Fl. Germ. Excurs.: 834. 22. *L. trigynum* L., 1753, Sp. Pl.: 279. Subgen. 2. *Cathartolinum* (Reichenb.) Svetlova,

2008, Bot. Zhurn. 93, 2: 335. – Lectotypus (Rogers, 1963: 108, «typus»): *L. catharticum* L. 23. *L. catharticum* L., 1753, Sp. Pl.: 281. Literature Davis P. H. Linaceae // Flora of Turkey and the East Aegean Islands / P. H. Davis (ed.). Edinburgh, 1967. Vol. 2. P. 425–450. Ockendon D. J., Walters S. M. *Linum* L. // Flora Europaea. Cambridge, 1968. Vol. 2. P. 206–211. Rogers C. M. Linaceae S. F. Gray // North American Flora. New York, 1984. Ser. 2. Pt 12. 58 p. Romo A. M. Linaceae // Med-Checklist / W. Greuter, H. M. Burdet, G. Long. (eds.). Genève, 1989. Vol. 4. P. 216–226. Svetlova A. A. Systematics of the genus *Linum* (Linaceae) species of the section *Adenolinum* in the flora of Eastern Europe // Bot. Zhurn. 2005a. Vol. 90. N 7. P. 1076–1087. Svetlova A. A. The taxonomic review of the section *Adenolinum* species of the genus *Linum* (Linaceae) of the flora of Northern Eurasia // Novosti Sist. Vyssh. Rast. St. Petersburg, 2005b. Vol. 37. P. 112–133. Svetlova A. A. A new section of the genus *Linum* (Linaceae) // Bot. Zhurn. 2006a. Vol. 91. N 2. P. 306–311. Svetlova A. A. The taxonomic review of the section *Syllinum* Griseb. species of the genus *Linum* (Linaceae) of the flora of Eastern Europe and Caucasus // Novosti Sist. Vyssh. Rast. St. Petersburg, 2006b. Vol. 38. P. 143–161. Svetlova A. A. The genus *Linum* L. (Linaceae DC. ex Perleb) in the flora of Northern Eurasia: systematics, geography and evolution: PhD thesis. St. Petersburg, 2007a. 26 p. Svetlova A. A. New subsections of the genus *Linum* (Linaceae) of the section *Syllinum* Griseb. // Novosti Sist. Vyssh. Rast. St. Petersburg, 2007b. Vol. 39. P. 220–221. Svetlova A. A. A new subgenus of the genus *Linum* (Linaceae) // Bot. Zhurn. 2008. Vol. 93. N 2. P. 330–337. Svetlova A. A. The taxonomic review of the genus *Linum* (Linaceae) of the flora of Russia and adjacent states // Novosti Sist. Vyssh. Rast. St. Petersburg, 2009. Vol. 41. P. 99–165. Wulff E. V. Сем. Linaceae (DC.) Dumort. – *Linum* // Horticulture flora of USSR / Ed. E. V. Wulff. Moscow; St. Petersburg, 1940. Vol. 5. Pt. 1. P. 97–206. The work is supported by grant of the President of Russian Federation (MK-379.2009.4).

Habitats of peat mosses (*Sphagnum* L.) in Croatia

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During years 2008 and 2009 extensive field research was done in order to update the knowledge about species of peat mosses occurring in Croatia, their distribution and habitats. It was found 20 species on 19 localities growing in very different plant communities. Their habitats physiognomically can be classified as bogs, different wood types or microhabitats within these woods (spruce, fir, beech, chestnut and sessile oak, and shrubberies of mountain pine) and periodically wet

karst fields. The majority of species were found on open peatlands (*Sphagnum palustre*, *Sph. capillifolium*, *Sph. denticulatum*, *Sph. contortum*, *Sph. subsecundum*, *Sph. cuspidatum*, *Sph. magellanicum*, *Sph. angustifolium*, *Sph. squarrosum*, *Sph. teres*, *Sph. compactum*, *Sph. centrale*, *Sph. flexuosum*, *Sph. papillosum* and *Sph. tenellum*). In terms of plant sociology bog communities belongs to ass. *Drosero* – *Caricetum stelullatae* and *Rhynchosporium albae*, both communities of transitive peatlands. Stand s of *Sphagnum medium* – *Polytrichum strictum* and *Sphagnum capillifolium* – *Polytrichum longisetum* can be recognised as fragments of raised bogs. All peatlands are under strong pressure of natural succession. *Sph. quinquefarium* was found on granite and silicate rocks within beech woods (ass. *Blechno-Fagetum* and stands of *Fagus sylvatica* – *Sphagnum quinquefarium*). This species is also known from stands of *Pinus mugo*. This stands of mountain pine are developed in deep karst dolines and could be classified as ass. *Pino mugo* – *Sphagnetum*. Other peat moss species present here is *Sph. girgensohnii*. In wet woods of spruce and/or fir (ass. *Carici brizoidis* – *Abietetum*, *Blechno* – *Abietetum*, stands of *Picea abies* – *Sphagnum* sp. div.) *Sph. platyphyllum*, *Sph. squarrosum*, *Sph. fimbriatum*, *Sph. angustifolium*, *Sph. palustre* and *Sph. girgensohnii* develops loose or more or less dense mats. Only one locality in wood of sessile oak and chestnut is known (ass. *Quercu* – *Castanetum sativae*) with spesies *Sph. angustifolium* and *Sph. fimbriatum* distributed around small shallow lake. The most unusual habitat of peat mosses is periodically flooded karst field where they grow in different grassland communities (e.g. ass. *Nardetum strictae*, *Crepidid conyzaefoliae* – *Molinietum altissimae*) and community of blister sedge (ass. *Caricetum vesicariae*). Peat mosses growing in karst field are *Sph. subnitens*, *Sph. capillidolium*, *Sph. teres*, *Sph. palustre* and *Sph. denticulatum*. All described habitats have very narrow areas of distribution, and are under strong pressure of succession, change of hydrology, deforestation, and different negative human impacts. Therefore active protection measures are of urgent necessity.

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**Phytogeography, Floristics and Phytoecology
Fitogeografija, floristika i fitoekologija**

Flora and vegetation of North-Eastern Macedonia

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Northeastern Macedonia is area bounded by Republic Serbia on the north, Republic Bulgaria on the east, Bregalnica on the south and by the river Pcinja on the west. In this area the next mountain are situated: Kozjak, Široka mountain, German and Biljin on the north, Osogovske mountains on the east, Mangovica and Gradištanske mountain on the west.

According to hydrologic meaning, all waters from this area are collected by Kriva Reka and its creeks from which Kratovska is biggest. Kriva disembogues to Pcinja. Beside them, we could mentioned Nikolska river and Zletovska. Nikolska river overflows Ovcje polje, and Zletovska "descends" the water from Osogovske mountains to Bregalnica. On the Kratovska and Zletovska rivers, there are mines which pollute their water.

The geological substrate of this area is mostly consisted by crystal slates, mika-schist and gneisses.

There are three kinds of zonal soils: plain (alluvium and diluvium), hill (rigosol, rendzina and smonica) and mountain (lytosol, brown forest soil).

The climate of this area is moderate continental, in higher areas it is changed mountainous, and in the river valleys it is submediterranean.

The flora is very specific, with great number of endemic plants: *Silene frivaldzyana*, *Dianthus viscidus*, *Astragalus wilmottianus*, *Astragalus haarbachii*, *Astragalus parnasii*, *Stachys milanii*, *Salvia jurisicii*, *Stachys horvaticii*, *Stachys serbica*, *Stachys plumosa*, *Satureja fukarekii*, *Achillea serbica*, *Achillea frasii*, *Centaurea grisebachii*, *Crocus tommasinianus*, *Crocus pallidus*, *Astragalus austriacus*, *Crocus veluchensis*, *Crocus palsii*, *Artemisia maritima*, *Astragalus vesicarius*, *Scutellaria orientalis*, *Phlomis herba-venti*, *Phelipaea boissieri* etc.

In this area, on altitude from 300 to 2252 m, the vegetation of serbian-macedonian-bulgarian type is grown with next fitocenosas: *Inulo-Stachyetum horvaticii*, *Astragalo-Morinetum*, *Cyperatum longi*, *Genisto-Agrostietum byzantinae*, *Helianthemo-Euphorbietum thessatum capitatae*, *Diantho-Centauretum diffusae*, *Carpinetum orientalis macedonicum*, *Quercu-Ostryctum carpinifoliae*, *Orno-Quercetum petreae*, *Fagetum submontanum et montanum* etc.

**The origin, syndynamics and syntaxonomy of
thermophilous vegetation of class *Festuco-Brometea* Br.-
Bl. et R.Tx in Br.-Bl. 1943 at the Dinaric Alps (W. Balkan)**

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At the Dinaric area dominated calcareous stones of different geological age. They enter into the construction of well-known and very diverse Dinaric karst. On this geological background, developed various soils: rendzine, calcomelanosol, calcocambisol and luvisol. In terms of different climate (sub-Mediterranean, continental and mountain) have developed different types of deciduous forests. In the ecological view, they belong to order *Quercetalia pubescentis* and order *Ostryo-Carpinetalia orientalis*. Some cooler habitats occupy thermophilous beech forests of order *Fagetalia* with the alliance *Fagion moesiaca*. In the area of these forests, in open habitats, they are still developed very diverse thermophilic meadows. Sintaxonomically are included in class *Festuco- Brometea*. Moving towards the Mediterranean, this class makes syndynamic relationship with vegetation of rocky grasslands of class *Thero-Brachypodietea*. The old volcanic rocks, the vegetation is in close connection with the class *Festucetea vaginatae*. In the sub-alpine area, the vegetation continues to sub- alpine pastures of class *Elyno-Seslerietea*. Coldest habitats, thermophilic meadows in the area are dark coniferous forest class *Vaccinio-Piceetea* on the continental Dinarides. By using the method of Braun-Blanquet made more than 1000 releves. Releves were later grouped in the analytical and the synthetic tables. Vegetation class *Festuco-Brometea* at the Dinarides to be differentiated at the orders: *Brometalia erecti*, *Scorzonero-Chrysopogonetalia* and *Koelerietalia splendentis*. The order *Brometalia erecti* differentiated in the alliances: *Cirsio acauli-Bromion erecti*, *Carici humilis-Bromion erecti* and *Fumano-Scabiosion leucophyllae*. The alliance *Cirsio acauli-Bromion inhabits* the coldest habitats. They belong to sub-alliances: *Gentiano tergestinae-Crepidenion dinaricae*, *Filipendulo vulgaris-Danthonenion alpinae* and *Cirsio acauli-Bromenion erecti*. Order *Scorzoneretalia villosae* includes alliances: *Scorzonerion villosae*, *Saturejion subspicatae* and *Saturejion montanae*. The vegetation of the class includes more than 100 associations. In the composition of inputs around 1 700 species of plants. Many of them are endemic, and some are relicts.

The Flora of the archeological sites and localities of the Roman city Sirmium (Sremska Mitrovica)

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Modern-day Sremska Mitrovica, the imperial Roman city, is situated on the left bank of the Sava River. The exceptionally long and turbulent history of Sremska Mitrovica, which is one of the oldest cities in our country and in Europe, has left numerous traces from past centuries. The first excavations were carried out in 1882 and systematic archeological excavations were started in 1957.

To six years of research there were a total of 181 plant species. Of the total number of species determined seven or 3.8% is protected as a natural rarity of Serbia in the new Regulation, while six or 3.3% on the Regulation under the control of the trade of wild species of plants. The largest number of protected species at the site of 85 and 31 by five, which amounts to 2,7% of total number of species. The largest number is 102 determined species at the site of 31 of which are 11 species of trees, six species of shrubs kind liana and 162 herbaceous plant species are the biggest percentage ruderal species. Dominate the Eurasian species flour element, a sub species are dominant nantne flour Central European elements as well as cosmopolitan species. The much smaller percentage of the plants present Mediterranean, Pannonian, Pont, South Sibirian flour element. From a total of 15 species allochthonous 12 species from North America, two species from South America and one species from Asia (China). Seventeen species is present at all five sites during the period of field research. For all the archaeological sites distinguish the two types of colonization of plants, the first type are the kind that appear in the bottom of the site and another type of species that inhabit the cracks of the walls digs. All excavations are surrounded by or located near the green area where there are some ornamental horticultural species, so it is not surprising that some of these ornamental species recorded on the archaeological sites themselves were at the bottom or walls. It is primarily thinking of anemochorae species that have seed and easily as possible, spreading through the wind. In addition anemochoring kind of sites are noticed and zoochorae species whose berries and fleshy fruits are often with stone fruit food for birds and spread them. Two of the five sites (sites 1a and 28) are held ie. hair grass, remove trees and wild shrubbery, while the remaining three sites are still not maintained. Coverage of the site 1a was preceded by a detailed cleaning and removal of entire plants. So, since 2007. The 1a site ceases to be subject to any kind of biological research because the site restored and covered on all the latest regulations.

Harofite (Charophyta) specijalnog rezervata prirode "Zasavica"

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"Zasavica" je jedno od devet Ramsarskih područja Srbije, geografski situirano u južnom delu Vojvodine i severnoj Mačvi, istočno od reke Drine, južno od reke Save, na teritoriji Opštine Sremska Mitrovica i Bogatić.

U okviru kompleksnih proučavanja biodiverziteta biljnog i životinjskog sveta u Zasavici, poslednjih godina pažnja je bila usmerena na istraživanje prisustva, taksonomske raznovrsnosti i ekoloških karakteristika algi razdela Charophyta.

Konstatovano je prisustvo vrsta rodova *Chara*, *Nitella* i *Tolypella*. Najčešća staništa harofita u Zasavici su plitke, često efemerne, lokve u depresijama poplavnih šuma i močvarnih livada. Osim toga, nalaze se i u priobalju vodenih tokova, izvorima i kanalima, u plitkoj vodi (10 - 120 cm), neutralne do alkalne reakcije (pH= 7,4-8,8), na različitim supstratima (mulj, treset, ritska crnica).

Bogatstvu i specifičnosti flore i faune specijalnog rezervata prirode «Zasavica» ovim radom, dodajemo i podatke o harofitama, koje su na relativno malom prostoru, u specifičnim životnim uslovima, zastupljene raznovrsnom florom, pri čemu je za vrstu *Tolypella intricata* nalazište u «Zasavici» jedini pouzdani podatak o prisustvu ove vrste na području zapadnog i centralnog Balkana.

Novi taksoni za floru cvetnica Srbije i susednih područja

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Tokom prethodnih deset godina, na osnovu terenskih istraživanja i revizije herbarskog materijala, konstatovano je više novih biljnih taksona za floru Srbije i/ili susednih područja. Ovom prilikom će biti navedene neke od vrsta i podvrsta, kao i hibrida, čije prisustvo u flori Srbije nije bilo poznato ili potvrđeno. Takođe je jedna od navedenih vrsta ujedno i nova za floru Bosne i Hercegovine, dok su tri vrste alohtonog porekla. Pored toga, vrsta *Asphodeline lutea* za koju se pretpostavljalo da je iščezla iz flore Srbije, ponovo je nađena na oko 12 km udaljenosti od prvobitno

navedenog lokaliteta. Nakon komparacije tipskih materijala, u skladu sa pravilom prioriteta, nazivi *Dianthus vodnensis* i *Centaurea nervosa* subsp. *promota* prebačeni su u sinonimiku. Novi takson za floru Srbije i Bosne i Hercegovine: *Viola chelmea* Boiss. & Heldr s.l. (Kosovo: Ošljak; Maglić: Prijedor). Novi taksoni za floru Srbije: *Dianthus stenopetalus* Griseb. (= *Dianthus vodnensis* Micevski, syn. nov.) (Rujan planina: Blizanci). Ne navodi se u Flora SR Srbije. U literaturnim podacima navodi se i za Kosovo, ali bez preciznijeg lokaliteta. *Erysimum microstylum* Hausskn. (Kosovo: man. Devič; Metohija: klisura Prizrenske Bistrice, Đakovica). *Lunaria telekiana* Jáv. (Prokletije: Koprivnik). *Primula* × *tommasinii* (*P. veris* subsp. *suaveolens* × *P. vulgaris*) (Sićevačka klisura: Oblik) - Autohtoni hibrid. *Impatiens balfourii* Hooker fil. (Niš, Jelašnička klisura, Beograd). - Naturalizovana dekorativna vrsta. *Knautia degeni* Borbás ex Formánek (Bela Palanka: Vrandol-Krupac). Nova za područje uže Srbije. Ne navodi se u Flora SR Srbije. Do sada jedini liteaturni podatak odnosi se na područje Kosova (Klina). *Alkanna stribrnyi* Velen. (Bela Palanka: Klenje-Ljubatovica). *Myosotis sylvatica* Hoffm. subsp. *cyanea* (Boiss. & Heldr.) Vestergren (Kučaj: izvor Ravne reke ispod vrha Lisac, Majdanpečka domena). *Bidens pilosus* L. (Banja Koviljača: Grabovci). - Alohtona vrsta. *Centaurea pugioniformis* E. I. Nyárády (Đerdap: Lepenski vir, Kazan). *Centaurea nervosa* L. subsp. *josifovicii* Gajić (= *C. nervosa* subsp. *promota* Gamal-Eldin & Wagenitz, syn. nov.) (Šar-planina: Stojkova kuća - Jezerska čuka, Jažinačko jezero, Kobilica). *Eragrostis curvula* (Schrad.) Nees (Veliko Gradište: Srebrno jezero). - Alohtona vrsta. Ponovo pronađeni takson za floru Srbije: *Asphodeline lutea* (L.) Rchb. Suva planina (Sokolov kamen). Prvi put je navedena za Sićevačku klisuru (Vis) 1884. godine, ali kasnije nije nađena.

Korovska apiflora okoline Kladova

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Istraživanje je obuhvatilo određivanje medonosnog potencijala najzastupljenijih korovskih vrsta na prostranim ruderalnim staništima u okolini Kladova u cilju procene njihovog doprinosa i značaja za pčelinju pašu. Analiza medonosnosti odabranih vrsta, uz procenu zastupljenosti, obuhvatila je merenje ukupne dnevne količine nektara po cvetu, kao i praćenje frekvence poseta oprašivača. Zapremina nektara u cvetu određivana je metodom mikrokapilare. U korovskoj flori ispitivanog područja najzastupljenije su medonosne biljne vrste koje pripadaju familijama Lamiaceae, Fabaceae, Scrophulariaceae, Asteraceae i Boraginaceae. Najbrojnije su populacije vrsta *Trifolium repens*, *Trifolium pratense*,

Carduus acanthoides, *Salvia nemorosa*, *Astragalus onobrychis*, *Medicago sativa*, *Vicia villosa*, *Lamium purpureum* i *Ballota nigra*. Najveći intenzitet sekrecije nektara u toku 24 časa, zabeležen je kod vrsta *Prunella vulgaris*, *Mentha aquatica*, *Lamium purpureum* i *Linaria vulgaris*, a najmanja dnevna količina nektara je izlučena u cvetovima *Melilotus officinalis*. Poređenjem nektarskog potencijala biljaka u ispitivanoj korovskoj apiflori, a s obzirom na atraktivnost za polinatore, floralnu produktivnost, brojnost i pokrovnost, kvalitetnom dopunskom pčelinjom pašom mogu da se smatraju sledeće vrste: *Salvia nemorosa*, *Echium vulgare*, *Vicia villosa*, *Astragalus onobrychis*, *Medicago sativa*, *Balota nigra*, *Prunella vulgaris* i *Trifolium pratense*.

Morphological variability of the species *Ambrosia artemisiifolia* L. 1753 and *A. trifida* L. 1753 (Asteraceae, Heliantheae) from different habitats in Backa (Vojvodina, Serbia)

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Invasive plant species, introduced from the North American, disturb the autochthonous vegetations in the area of the Pannonian Serbia. Taken measures against invasive species that are carried out in Vojvodina, indicate the necessity of analyzing their morphological characteristics and phenotypic plasticity. Primarily, this analysis are important for the efficient prevention of their spread.

Studies have included morphological characteristics of species *Ambrosia artemisiifolia* and *A. trifida*, from ecologically different habitats in Backa region. The analysis was conducted on 180 individuals from three localities, which are processed at 14 biometric characters of vegetative and generative region. The growth rate is based on measurements after mechanical treatment plants at each location.

The data were analyzed by classical methods and multivariate statistics. Analysis were conducted using Statistica for Windows ver. 9.0. The data indicate a different degree of phenotypic adaptation observed in different types of habitats on the basis of several characters (leaf area, number of inflorescence etc.). Mechanical treatment plants that have been exposed to, lead to a reduction in the area of potential growth, which directly affect the growth rate and number of lateral shoots, which is highly correlated with the inflorescence organization, and number of flowers in them.

Distribution of the some rare plant taxa from the mountains of the north part of Montenegro

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During the floristical investigation of mountains massif of the Sinjavina, Bjelasica, Jerinja glava and Zeletin in period 2004-2009 abundant botanical material were collected. Several taxa with insufficiently known distribution and/or considered to be rare were recorded. These are: *Cephalaria pastricensis* Dörfner & Hayek, *Cruciata balcanica* Ehrend., *Silene vallesia* L. subsp. *graminea* (Vis. & Reichenb.) Nyman, *Dianthus nitidus* Waldst.& Kit. subsp. *lakusicii* Wraber, *Achillea fraassi* Schultz Bip. and *Tozzia alpina* L.

Contribution to the bryophyte flora of South-Eastern Serbia: Suva Planina Mts and its surroundings

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Altogether 229 bryophyte taxa (25 liverworts and 204 mosses) were collected during a field trip made in 2006 in SE Serbia (Suva Planina, Sićevačka gorge, Jerma gorge). 11 taxa (3 liverworts and 8 mosses) are recorded for the first time in Serbia. Two species occurring in the investigated area (*Pseudoleskea saviana*, *Taxiphyllum densifolium*) are red listed in Europe and 19 species are included in the preliminary national red list of Serbia. The bryophyte flora of the investigated region is very diverse. In the mountain area the high number of boreal and subboreal species is characteristic besides the predominance of species of temperate zones of Europe. While around the high peaks several species with even alpine, subalpine-subarctic character can be found, on the lower parts of the mountain and in the gorges at the foothills numerous sub-Mediterranean, sub-Atlantic taxa occur.

Vegetacija budućeg Zaštićenog pejzaža „Javorina“

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Javorina pripada kontinentalnim Dinaridima i pravi je reprezent stanja ekosistema tog područja. Zahvaljujući povoljnim hidrološkim uslovima prirodna vegetacija je znatno bolje razvijena i očuvana bez obzira na velike sječe u bliskoj prošlosti. Zbog povoljnih ekoloških uslova obnavljanje je relativno brzo. Krečnjački vrhovi doprinose značajnom povećanju biodiverziteta. Budući Zaštićeni pejzaž „Javorina“ će sačuvati prirodne karakteristike i vrijednosti ovoga prostora. Na vertikalnom profilu Jahorine smjenjuje se vegetacija koju predstavljaju različite i brojne asocijacije.

Vegetacijski diverzitet se ogleda u postojanju 55 različitih asocijacija koje su raspoređene u 14 klasa, 18 redova, 29 sveza i 10 podsveza.

Flora budućeg Posebnog rezervata prirode „Gromiželj“

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Budući Posebni rezervat prirode „Gromiželj“ nalazi se na krajnjem sjeveroistoku Republike Srpske, na području opštine Bijeljina. Prirodno dobro obuhvata površinu od 831 hektar. Osnovnu vrijednost rezervata prirode čini močvara Gromiželj.

U radu su prikazani rezultati dvogodišnjeg istraživanja flore. Florističkom analizom je konstatovano prisustvo 400 vrsta vaskularnih biljaka. Analizom areal spektra utvrđena je dominacija vrsta evroazijskog flornog elementa, a od životnih formi hemikriptofita.

Flora of accumulation Vrtac (Budoske bare), Niksic

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In the southern part of the Nikšić field are situated Budoske bare (accumulation Vrtac) which occupies an area of 13,42 km². This accumulation was formed in 1958 by packed-bed dam Vrtac which was dammed the river Zeta. Accumulation level rises usually 2 to 3 times a year during the heavy rainfall and snow melting. Marshy gley soil is present in this area. During the study of the flora and vegetation of accumulation Vrtac 166 plant species that occur both in water and in the surrounding flood meadows were noted. The ass. *Chenoplectetum lacustris* Lakušić et Pavlović 1976 is present here. We found 2 new species (*Edrianthus dalmaticus* (A. DC.) A. DC., *Viola pumila* Chaix in Vill) for the flora of Montenegro. Key words: accumulation Vrtac (Budoske bare), Montenegro, flora, diversity. *E. prunastri* extracts inhibited *A. niger* and *C. albicans* more than nistatine standard which suggests their possible use as active ingredients in phyto-therapeutics.

Horological and phytogeographical characteristics of genus *Geum* L. in Serbia

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The genus *Geum* belongs to the Rosaceae family. This genus includes eight species in Serbia: *G. bulgaricum* Pančić, *G. coccineum* Sibth. & Sm, *G. molle* Vis. & Pančić, *G. montanum* L., *G. reptans* L., *G. rhodopeum* Stoj. & Stefanov, *Geum rivale* L. and *G. urbanum* L. In addition, there is also a large number of hybrids, from which the most interesting *Geum rhodopaeum* x *G. rivale*. *G. rhodopeum* Stoj. & Stefanov is endemic of Moesian floristic provinces of the Balkan floristic subregion. *G. bulgaricum* Pančić is endemic of Scardo-Pindian and Moesian Provinces of the Balkan floristic subregion. *G. coccineum* Sibth. & Sm is subendemic of South Carpathian and Balkan. This paper will summarize current knowledge about distribution of these plants in Serbia.

Horološke i ekološke karakteristike vrste *Pinus nigra* Arn. u Srbiji

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Pinus nigra Arn. (Pinaceae) je vrsta širokog i vrlo isprekidanog areala. Kao posledica istorijskih, ekoloških, genetičkih i drugih faktora, ova vrsta je danas diferencirana na više infraspecijskih taksona različitog ranga. Naime, reč je kolektivnoj vrsti (agregatu) čiji su taksoni prilagođeni različitim staništima. U flori Srbije vrsta *Pinus nigra* Arn. je zastupljena sa podvrstama *P. nigra* Arn. subsp. *pallasiana* (Lamb.) Holmboe i *P. nigra* Arn. subsp. *nigra* (Arn.) Hay. U ovom radu će biti prikazane horološke i ekološke karakteristike vrste na području Srbije.

New records to the flora of SE Serbia and adjacent regions

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Several new and important floristic records were established during the last floristic investigations of SE Serbia and adjacent regions. Special attention was given to the area portions influenced by etesian Mediterranean climate that force xero-termophilous flora to spread over the warm inland habitats. *Minuartia mediterranea* and *Turritis pseudo* are reported for the first time from Serbia. *Jurinea polycephala* and *Dittrichia graveolens*, species with dubious presence, and neglected taxa *Euphorbia velenovskyi*, *Symphytum bulbosum* and *Vallerianela microcarpa* were found in Serbia again. And finally, recently reported novelties to the flora *Salvia verbenaca*, *Carlina corymbosa* and *Trachynia distachya* are recorded from the many new positions. Phytogeographical importance of new records is discussed in the scope of forming northern distribution limits of enumerated species at Balkan Peninsula.

Rezultati istraživanja flore brda Vučje kod Pirota u istočnoj Srbiji

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Brdo Vučje se nalazi u istočnoj Srbiji, 8 kilometara jugoistočno od Pirota, iznad sela Krupac. Predstavlja obronke Stare planine, jer pripada planinskom vencu Vidliča. Najviši deo se nalazi na nadmorskoj visini od 1108 m, a brdo je izduženo u pravcu jugoistok – severozapad. Terenska istraživanja su obavljena tokom 2008., 2009. i 2010. godine i obuhvatila su južnu padinu brda. Na istraživanom području je, u tom periodu, zabeleženo oko 250 biljnih taksona u rangu vrste i podvrste. Mnoge od njih su endemiti, a istovremeno se nalaze pod nekom vrstom nacionalne i međunarodne zaštite, kao retke i ugrožene vrste. Kao vredni nalazi mogu se izdvojiti: *Prunus tenella* Batsch, *Pulsatilla montana* (Hoppe) Reichenb. subsp. *bulgarica* Rummelspecher, *Orchis pallens* L., *Ophrys apifera* Huds., *Ophrys cornuta* Stev. I mnogi drugi. S obzirom da u proteklom periodu nije detaljnije istraživana flora tog područja, rezultati ovih istraživanja istovremeno predstavljaju značajan prilog poznavanju flore čitavog Vidliča. U radu je data taksonomska analiza flore, kao i fitogeografska i analiza biološkog spektra, sa posebnim osvrtom na ugroženost.

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Although mires represent less than 1% of the total Serbian territory, they are not still enough explored in Serbia. On the bases of all relevant literature references, personal field investigations and comments, the general database of Serbian mires and mires complexes is made. For each site, the following data are presented: distribution (GIS layers), assessed cover area, altitudes, geological substrate, and references. For many of them other relevant data are also included: vascular plant and moss cover, syntaxonomy overview, habitat type, peat characteristic (thickness, pH, etc), protection status (protected or not, degree of protection, Ramsar site, IPA-

Important Plant Areas, IBA - Important Bird Areas, PBA - Prime Butterfly Area, etc). Within Serbian Mire Database, for all recorded plant species we have data on its endemism and type of endemism, national and international protection status (protected, strictly protected, National Red Book, Preliminary National Red List, IUCN, CITES, Bern Convention, Habitat Directive), allochthonous or invasive species, medical usage etc. On the bases of all of this, sets of thematic maps are produced. Serbian mires (peatlands) distribution map is given, together with distribution maps of particular syntaxonomical units and habitat types. Assorted other maps, graphs and analyses are also represented. Problems, missing points and further steps for database improvement are discussed.

Rezultati merenja gornje temperaturne granice rasprostranjenja vrste *Salix cinerea* L.

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Biljna vrsta *Salix cinerea* L. (barska iva) tipični je stanovnik zabarenih, močvarnih staništa, na kojima gradi karakterističnu zajednicu *Salicetum cinereae* Zol.. Značaj ove vrste ogleda se u tome što ona potiče iz hladnijeg i vlažnijeg perioda, te se može smatrati reliktnom. Samim tim, vezana je za hladne vode, te su njene populacije međusobno udaljene i po nekoliko desetina kilometara. Populacija barske ive je zabeležena i na Krupačkom Blatu kod Pirota u istočnoj Srbiji, gde ona striktno prati vijugavi tok hladne izvorske vode. Kako je proteklih decenija, zbog promena u vodnom režimu izazvanih ljudskim aktivnostima, došlo do smanjenja površine koju ova vrsta zauzima, pristupilo se merenjima temperature vode na mestima gde je ona prisutna. Cilj je utvrđivanje gornje temperaturne granice rasprostranjenja ove vrste. Kao kontrolna grupa uzeta je populacija na bari iznad Dimitrograda. Ovo bi trebalo da doprinese sprečavanju daljeg uništavanja staništa i populacija ove reliktno vrste na našim prostorima

Borealna flora centralnog dela Balkanskog poluostrva

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Područje Balkanskog poluostrva, bilo je refugijum ne samo za arktotercijarnu, glacijalnu, već i za borealno-tercijarnu floru četinarskih šuma i, delimično, tresetišta i vriština za vreme maksimalnih glacijacija. Po prestanku glacijacija borealna flora se vraćala nazad ka severu s jedne, i prema subalpijskim pojasevima balkanskih planina, s druge strane. Borealnim reliktima na prostoru Balkanskog poluostrva, danas, mogu se smatrati sve vrste koje su se tokom perioda interglacijacija i određenih faza glacijacija doselile na prostor Balkana iz borealnih oblasti Evroazije, kada su imale i svoje maksimalno rasprostranjenje, prema južnim delovima Evrope (npr. *Huperzia selago*, *Lycopodium clavatum*, *Blechnum spicant*, *Pyrola rotundifolia*, *Moneses uniflora*, *Orthilia secunda*, *Comarum palustre*, *Corallorhiza trifida*, *Goodyera repens*, *Cypripedium calceolus*, *Vaccinium vitis-idaea*, *Drosera rotundifolia*, *Menyanthes trifoliata*, *Swertia perennis*). Sve ove biljke pratile su pulzacije ledničkih masa za vreme Pleistocena te su njihovi današnji areali posledica ovih glacijalnih migracija i u velikoj meri imaju odlike borealno-subalpijske disjunkcije. Njihovo prisustvo na južnim granicama areala na planinama srednje i južne Evrope, pa i Balkanskog poluostrva, svakako su posledica migracija za vreme Ledenog doba.

Cilj ovog rada je formiranje baze podataka o rasprostranjenju i ekološkim karakteristikama 67 borelnih taksona na teritoriji Srbije, Crne Gore i Makedonije, kao i taksonomska, fitogeografska i ekološka analiza ove, borealno reliktno flore, na istraživanom području. Sumarne karte distribucije po nadmorskim visinama, životnim formama, podlozi, kao i sumarna karta distribucije ovih, borelno reliktnih taksona, na teritoriji Srbije, Crne Gore i Makedonije doprineće boljem sagledavanju ove specifične kategorije biljaka, kao i utvrđivanju njihovih centara diverziteta na prostoru centralnog Balkana.

Chorological additions to the flora of Montenegro

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In the paper we give some new chorological additions to the vascular flora of the territory of Montenegro and ex Yugoslavia. The following taxa: *Aristolochia lutea*, *Centaurea iberica*, *Festuca circummediterranea*, *Scrophularia canina* subsp. *bicolor*, *Sedum urvillei*, *Sesleria robusta* subsp. *skanderbeggii*, *Symphoricarpos albus*, *Tragopogon porrifolius* subsp. *australis* and *Ulmus x hollandica* are recorded for the first time for the territory of Montenegro. *Anagallis arvensis* subsp. *parviflora* and *Catapodium rigidum* subsp. *majus* are recorded for the first time for the territory of ex Yugoslavia. The taxa which were cited by Rohlena (1942) have to be excluded from the flora of Montenegro: *Aristolochia pallida*, *Lotus glaber*, *Oenanthe incrassans*, *Potentilla hirta*, *Tamarix africana* and *Teucrium polium*.

Material for the Red book of Montenegro (second contribution)

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The first contribution to the "Material for the red book of Montenegro" was published in 2008 and it included 30 threatened taxa of vascular flora. In the mean time, new floristic surveys were undertaken and some new chorological data, that helped us to define a conservation status of some rare species, were gathered. In this paper we are presenting those species (*Medicago carstiensis* Wulfen, *Orchis pallens* L., *Geranium cinereum* Cav. ssp. *subcaulescens* (L' Hér. ex DC.) Hayek, *Galactites tomenstosa* Moench, *Hydrocharis morsus-ranae* L. etc.). Their latin name and the list of synonyms are followed by a short description of habitus and habitat, distribution area (Europe and Montenegro), literature source, map of a distribution at the territory of Montenegro, IUCN category in Montenegro, international status, causes of threats and proposed measures of protection.

Zavisnost mase perifitona i primarne produkcije od sredinskih uslova u reci Nišavi

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Praćenjem dinamike primarne produkcije, kako u vremenskim odrednicama tako i duž toka reke, dolazimo do činjenica koje nam omogućavaju zaključivanje o mnogim karakteristikama vodenih ekosistema. Ovim istraživanjem je, na osnovu stepena primarne produkcije, zaključeno da veći deo reke nišave pripada eutrofičnom stepenu trofičnosti, dok znatno manji deo pripada eu-politrofičnom stepenu. Veličina primarne produkcije određena je mnogim sredinskim faktorima. U ovom radu je razmatran uticaj koncentracije nutrijenata: ukupog fosfora i ukupnog azota na primarnu produkciju. Takođe je sagledano povećanje koncentracije ovih nutrijenata (alohtonog porekla) sa aspekta zagađenja ekosistema. Razmatran je uticaj stepena radijacije na primarnu produkciju sa dva aspekta: stepen osenčenosti poreklom od riparijalne vegetacije i uticaj mere turbiditeta. Perifitonska zajednica je takođe razmatrana sa aspekta zavisnosti od koncentracije nutrijenata i stepena prisutnosti stabilne podloge. Reka Nišava je istražena duž 151 km njenog toka u trajanju od godinu dana.

Relationships between life forms and ecological indices of the flora in lake Provala (Vojvodina, Serbia)

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A several-year floristic study of Lake Provala and its riparian zone was carried out in the period 1996-2004. Presence of 65 vascular plants was registered in the course of the study. All of these plant species belonged to the category of Magnoliophyta, of which 41 were in the class Magnoliopsida and 24 in the class Liliopsida. In this paper relationships are analyzed for the first time between ecological indices (F, R, N, H and D) and the life forms of the vascular flora of the lake, which may serve as a reliable indicator of ecological conditions prevailing in the investigated ecosystem. Starting from the hypothesis that the development of certain life forms, in addition to climatic conditions, depends also on plant requirements for major environmental factors, which are expressed via ecological indices, our intention was to establish the exact relationship between the two groups

of factors by means of the correspondence analysis. Based on the obtained data, it was concluded that there existed a significant correlation between the development of certain life forms on one side and levels of substrate moisture (F), nutrient content (N) and substrate dispersion/aeration (D) on the other. These relationships in the riparian zone of the examined lake resulted in the predominance of life forms belonging to hemicryptophytes and hydro-helophytes, the forms which are perfectly adapted to water-saturated or aquatic environment, rich in nutrients and relatively well aerated. There was no indication of significant relationships between the development of certain life forms on one side and substrate (environment) pH (R) and the content of organo-mineral compounds (humus) (H) on the other.

**Priroda promenljivosti morfoloških karaktera taksona
Jovibarba heuffelii (Schott) A. Löve & D. Löve
(Crassulaceae) u Srbiji**

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U radu će biti prikazana analiza prirode promenljivosti morfoloških karaktera vrste *Jovibarba heuffelii* (Schott) A. Löve & D. Löve u Srbiji. Glavni cilj rada je da se utvrdi struktura i korelacija varijabilnosti morfoloških karaktera kao i zavisnost varijabilnosti morfoloških karaktera od orografije, podloge i bioklimatskih karakteristika staništa. Analizom je obuhvaćeno 25 morfoloških karaktera sa 96 individua iz 9 različitih populacija sakupljenih na teritoriji Srbije. Od statističkih analiza korišćene su: osnovna deskriptivna statistika, analiza korelacija, analiza varijansi (ANOVA), analiza glavnih komponenta (PCA) i regresiona analiza (linearna regresija). Za kvantifikaciju varijabilnosti svih morfoloških karaktera korišćen je koeficijent varijacije (CV). Korelaciona analiza je urađena da bi se utvrdila međusobna povezanost samih karaktera, ANOVA da bi se utvrdila statistička značajnost variranja svih morfometrijskih karaktera, a linearna regresija da bi se utvrdio nivo zavisnosti varijabilnosti morfoloških karaktera u odnosu na orografiju, podlogu i bioklimatske parametre na datim staništima. DIVA-GIS softver je korišćen za ekstrakciju bioklimatskih podataka i njihovo povezivanje sa morfološkim karakteristikama analiziranih individua.

Flora i vegetacija sliva reke Bistrica u Krajištu

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Bistrica izvire u obliku dva vrela. Južno vrelo nalazi se ispod Biljin planine i Belih voda i ono gradi Golemu reku. Severno vrelo izvire ispod Belih voda (Dukat planina) i od njega polazi Belovodski potok, koji kasnije prerasta u Jarešničku reku. Ona se na nivou Beluta spaja sa Golemom rekam i grade Bistarsku reku ili Bistricu koja se kod graničnog prelaza Ribarci uliva u Dragovišticu. Levu obalu sliva Bistrice grade Granične planine i Biljin, a severni revir čini Dukat planina (Doganička i Crnook).

Osnovnu geološku masu doline Bistrice čine gnajsevi na severnom reviru, mikašisti na Belim vodama i andeziti na južnom reviru. Na ovoj geološkoj podlozi nastali su sledeći tipovi zemljišta: crvenkasto-rudo, smeđe šumsko i planinske crnice. Pored njih javljaju se močvarna, higrofilno-glejna i organogeno-močvarna tresetišta.

Klima ove planinske oblasti je umereno-kontinentalna sa приметnim uticajima submediteranske i stepske varijante.

Dosadašnjim istraživanjima flore ove oblasti zabeležili smo 519 biljnih taksona, svrstanih u 260 rodova i 70 familija.

Endemične biljke u slivu Bistrice su: *Dianthus cruentus*, *D. pinifolius*, *D. noeanus*, *Silene sendtneri*, *S. asterias*, *Minuartia bulgarica*, *Armeria rumelica*, *Digitalis viridiflora*, *Stachys plumosa*, *Thymus jankae*, *Asperula apiculata*, *Cephalaria flava*, *Scabiosa fumarioides*, *Cirsium appendiculatum*, *Cyanus tuberosus*, *Crocus veluchensis*, *Festuca valida*, *Trifolium dalmaticum*, *T. trichopterum*, *T. velenovskyi*, *Pastinaca hirsuta*, *Viola aetolica* (?), *Linum capitatum*, *Geum rhodopeum*.

Analizom biljnih zajednica utvrdili smo da ovde raste oko 40 asocijacija od kojih navodimo: *Trifolio-Geetum rhodopaei*, *Polystachio-Ranunculetum serbicae*, *Eriophoro-Caricetum flavae*, *Diantho-Armerietum rumelicae*, *Hyperico-Trifolietum trichopteri*, *Poo concinae-Plantaginetum carinatae*, *Lino-Nardetum strictae*, *Genisto-Chamaecytisetum polytrichi*, *Vaccinio-Pinetum palasiana* idr.

Ovaj tip vegetacije uslovno smo nazvali rodopski jer obrasta Rodopske planine i karakteriše se istim endemičnim vrstama i fitocenozama.

Flora and vegetation of Basarski Kamen on Vidlič

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The one of the most significant and the most famous mountain peak and locality at Vidlič is Basarski kamen, situated on the east part of Balkan Serbia. This mountain peak is famous because of its 200 m high vertical boulders, and it is situated at the altitude of 1376 m. Vidlič is extended from Pirot to the border between Serbia and Bulgaria. Together, Basarski kamen and Vidlič (many people say that it belongs to massif of Stara Mountain) represent special orographic-tectonic complex.

The geologic basis consists of the lime stones from period of cretaceous, and in some parts, we can find the Jurassic sediments.

There are numerous pedologic elements: red soils, brown forest soil, alluvium soils near the springs and smonica.

The climate of Vidlič is moderate continental with significant influence of Mediterranean and steppe climate.

The area of Basarski kamen is part of park of nature Stara Mountain.

Flora is very rich, and we found next rare plants: *Ranunculus, psilostachys, Ranunculus illyricus, Pulsatilla montana, Dianthus petraeus, Hypericum umbellatum, Malcolmia serbica, Potentilla detomasii, Genista subcapitata, Cytisus petrovicii, Knautia midzorensis, Pedicularis petiolaris, Pedicularis fidrichi-augusti, Campanula bulgarica, Achillea serbica, Leucanthemum seratonina, Hieracium pannosum, Crocus adamii, Crocus tommasianus* etc.

The forest vegetation of Basarski kamen is built by next associations: *Fagetum montanum moesiacum, Querco-Carpinetum, Coryletum avellanae, Pruno-Crataegetum, Seslerietum rigidae, Geranietum macrirrhizi, Epilobietum angustifoliae, Pedicularo-Seslerietum rigidae* etc.

Flora i vegetacija sliva Božičke reke u Krajištu

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Sliv Božičke reke sastoji se od istoimene reke čiji se izvori nalaze ispod vrha Krvavi kamik (1738), Ploča (1705), Oštrika (1671) i Bandera (1136) na levoj obali, i Toplodolske reke čiji se izvori nalaze ispod Toplodolske planine i Vardenika, i Lisinske reke čiji se izvori nalaze ispod Toplodolske reke, Vardenika i Gloške planine. Ona se sa Ljubatskom rekam sastaje kod Bosilegrada i sa njom gradi Dragovišticu.

Geološku podlogu sliva grade mikašisti, granit-gnajsevi i dijabaz-filitoidna formacija, a u rečnim dolinama konglomerati šljunka, peska i gline. Najvažniji i najrasprostranjeniji tipovi zemljišta su: planinske crnice, smeđa šumska zemljišta sa pojavom močvarnih i trestnih kraj rečnih tokova.

Klima doline reke Božice je kontinentalnija u odnosu na sliv Bistrice, što se primećuje analizom flore i vegetacije.

Dosadašnjim istraživanjima flore ove oblasti zabeležili smo 535 biljnih taksona. Posebno su interesantne sledeće vrste: *Melampyrum scardicum*, *Achillea ligulata*, *Knautia magnifica*, *Arcostaphylos uva-ursi*, *Centaurea kotschyana*, *Festuca valida*, *Calamogrostris arundinacea*, *Drosera rotundifolia*, *Cyanus tuberosus*, *Allium melanantherum*, *Linaria dalmatica*, *Crepis conyzifolia*, *Botrychium lunaria*, *Campanula rotundifolia* var. *sandrae*, *Sisyrinchium montanum*, *Genista sericea*, *Angelica pancici*, *Ranunculus aquatilis* idr.

Ovaj predeo započinje nadmorskim visinama od 700-1753 m na Golemom vrhu na Vardeniku i na tom dijapazonu sreće se veliki broj zajednica, kako šumskih, tako i livadskih i tresetnih kraj izvora i brojnih močvarnih i vodenih biocenoza: *Peucedano-Festucetum paniculatae*, *Lino-Nardetum strictae*, *Festuco nigrescenti-Nardetum strictae*, *Vaccinio-Bruckenthalietum spiculifoliae*, *Sempervivo-Minuartietum bulgaricae*, *Drosero-Caricetum stelulatae*, *Sparganietum erecti*, *Deschampsietum caespitosae*, *Geo-Filipenduletum ulmariae*, *Pteridietum aquilini*, *Epilobietum angustifoliae* idr.

Flora i vegetacija Ljubatske reke

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Sliv Ljubatske reke sastoji se od više izvorišta i potoka koji se nalaze na ili se slivaju sa Musulske, Božičke, Dukat planine i Patarice i Šuplje padine. Ljubatska reka prima ispod Donje Ljubate Dukatsku reku, zajedno se sastaju kod Bosilegrada sa Božičkom rekom gradeći Dragovišticu, jednu od pritoka reke Strume. Severni revir Ljubatske reke čine planine: Musulska i Gloška, a zapadni Prosečenica, Šuplja padina i Patarica, dok južni revir čini Dukat planina odakle i dolazi Dukatska reka. Ona se sa Ljubatskom rekom spaja ispod Donje Ljubate i sa Božičkom grade Dragovišticu. Sam vrh Musulske planine-Besna kobila (1923) građen je od mikašista, desni ili severni revir od granit gnajseva, a levi od dijabaz-filitoidne formacije u gornjem i mikašista u donjem toku. Na ovoj geološkoj podlozi razvila su se sledeća zemljišta: planinske crnice u subalpskom i alpskom regionu, smeđa šumska zemljišta u planinskom i brdske crvenice-ruda zemljišta u tom regionu. Kraj potoka i kraj izvora sreću se močvarna i tresetna zemljišta.

Klima sliva Ljubatske reke je umereno kontinentalna, dosta izmenjena uticajima planinske, subalpske i alpske klime, a na vrhovima Besne Kobile i nivalna.

Svi ovi faktori su uticali da se na dijapazonu od vrha do Bosilegrada pojavi veliki broj fitocenoza koje se ovde pravilno visinski smenjuju sa specifičnim biljnim vrstama koje ih diferenciraju. Retke biljne vrste ovih prostora su: *Achillea chrysocoma*, *Allium melanantherum*, *Bupleurum sibthorpiatum*, *Carduus scardicus*, *Cyanus velenovskyi*, *Crocus flavus*, *Crocus veluchensis*, *Corylus colurna*, *Genista sericea*, *Hypericum barbatum*, *Minuartia bulgarica*, *Polystichum lobatum*, *Potentilla chrysocraspeda*, *Peucedanum aequiradium*, *Polygonum alpinum*, *Rumex balcanicus*, *Trifolium spadiceum*, *Sesleria comosa*, *Thymus balcanus*, *Lycopodium clavatum* i *L. sellago* idr. U ovoj oblasti najzanimljivija ja alpska i subalpska vegetacija *Sempervivo-Minuartietum bulgaricae*, *Achilleo-Genistetum saricae*, *Festuco-Seslerietum comosae (coerulentis)*, *Linario-Polygonetum alpinae*, *Centaureo-Festucetum valida*, *Peucedano-Festucetum paniculatae*, *Poo coccinae-Polygonetum carinatae*, *Rumicetum balacanicae*, *Cirsietum appendiculatae*, *Epilobietum angustifoliae* i dr.

Cenoekološka diferencijacija vrsta *Acer campestre* L., *A. platanoides* L., *A. pseudoplatanus* L. i *A. tataricum* L. u Srbiji

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Vrste *Acer campestre* L., *Acer platanoides* L., *Acer pseudoplatanus* L. i *Acer tataricum* L. su relativno uobičajene biljne vrste sa širokim rasprostranjenjem u zonama listopadnih i mešoviti listopadno-četinarskih šuma na Balkanskom poluostrvu. Cilj ovog rada je bio da se utvrdi i opiše geografska i ekološka diferencijacija ove četiri vrste u Srbiji, kao i da se predvidi u kojim oblastima se ove vrste mogu očekivati, iako ne postoje konkretni podaci o njihovom rasprostranjenju u predviđenim oblastima. Geografske analize su obuhvatile horološke podatke (geografska širina, geografska dužina, nadmorska visina), dok su ekološke analize obuhvatile podatke o vegetaciji (pripadnost asocijaciji, svezi, redu, klasi) i podatke o osnovnim bioklimatskim parametrima staništa (srednja godišnja temperatura [1], srednji mesečni opseg temperature [2], izotermalnost $(2 / 7) (* 100)$ [3], sezonska temperatura (std * 100) [4], maksimalna temperatura najtoplijeg meseca [5], minimalna temperatura najhladnijeg meseca [6], godišnji opseg temperatura (5-6) [7], srednja temperatura najvlažnijeg kvartala [8], srednja temperatura najsuvljeg kvartala [9], srednja temperatura najtoplijeg kvartala [10], srednja temperatura najhladnijeg kvartala [11], godišnja količina padavina [12], padavine najvlažnijeg meseca [13], padavine najsuvljeg meseca [14], sezonske padavine (cv) [15], padavine najvlažnijeg kvartala [16], padavine najsuvljeg kvartala [17], padavine najtoplijeg kvartala [18], padavine najhladnijeg kvartala [19]). Svi horološki i ekološki podaci su georeferencirani, tako da su pored standardnih kartografskih, numeričkih i statističkih analiza, korišćeni i GIS alati za prostornu analizu podataka.

"Flora u okolini Beogradskoj"- 145 godina nakon Pančića

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Josif Pančić sredinom 19. veka započinje istraživanje biljnog sveta Beograda i njegove okoline. Prvo izdanje kapitalnog monografskog dela „Flora u okolini beogradskoj“ objavljuje daleke 1865. godine, beležeći 1057 taksona. Pančić, naravno, nastavlja i stalno dopunjuje svoja floristička istraživanja ovog prostora. Poslednje, šesto izdanje pomenutog dela štampano je posle Pančićeve smrti, 1892. godine, u kome se navodi prisustvo 1156 vrsta biljaka. Nakon Pančićevog perioda, podatke o flori Beograda nalazimo, najpre, kod Jurišića (1901) i Adamovića (1904), a kasnije i kod brojnih autora koji, naročito nakon drugog svetskog rata, objavljuju radove o flori i/ili vegetaciji pojedinih delova Beograda i okoline. Nakon 145 godina od Pančićevog prvog izdanja knjige „Flora u okolini beogradskoj“, sumirani su svi raspoloživi literaturni floristički podaci za područje grada Beograda i njegove okoline (3224 km²), kao i veliki broj neobjavljenih terenskih i herbarskih podataka. Na osnovu obimne sinteze koja je obuhvatila gotovo sve tipove staništa na području Beograda, od prirodi bliskih (Kosmaj, Bara Reva, Veliko Blato, Stepin lug), preko delimično uređenih (Avala, Ada Ciganlija, Veliko ratno ostrvo, Topčider, Košutnjak), čistih parkovskih struktura (Botanička bašta „Jevremovac“, Aboretum šumarskog fakulteta, Pionirski i Akademski park), sve do ruderalnih staništa Beograda, utvrđeno je prisustvo od ukupno 2010 vrsta autohtone i alohtone flore. Dobijeni podaci inkorporirani su u jedinstven Informacioni sistem Zavoda za zaštitu prirode Srbije, a analiza je urađena za 1927 taksona (izuzete su vrste sa parkovski uređenih površina). U radu se daje prikaz i analiza vrsta za koje se osnovano sumnja da su nakon Pančićevih istraživanja iščezle iz Beograda i okoline (*Achillea ptarmica*, *Aldrovanda vesiculosa*, *Pilularia globulifera*, *Cladium mariscus*, *Crepis pannonica*, *Caldesia parnassiifolia* i dr.); vrsta koje su zabeležene u istraživanjima nakon Pančića; kao i onih čiji su nalazi potvrđeni. Pored toga, biće prikazani i taksoni koje je Pančić registrovao u okolini Beograda, a čiji je taksonomski status još uvek diskutabilan (*Rosa baldensis*, *Rosa belgradensis*, *Chenopodium elibium*...).

Endemična flora visokoplaninskog grebena Kobilice na Šar-planini

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Endemična flora visokoplaninskog grebena Kobilice na Šar-planini Jedan od floristički najbogatijih i najvažnijih centara lokalno-regionalnog vegetacijskog, kao i florističkog diverziteta centralnog Balkana, nesumljivo je veliki planinski masiv Šar-planine. Svojim centralnobalkanskim položajem, visinom i prostranstvom, Šar-planina predstavlja i veliki refugijum glacijalne (kako arкто-tercijarne, tako i borealne) i endemične flore. Najveći deo šarplaninskog masiva sastavljen je od silikatnih stena. Karbonatna geološka podloga prisutna je samo na pojedinim delovima, u znatno manjem obimu. Upravo visokoplaninski greben Kobilice predstavlja deo šarplaninskog masiva koji je obrazovan od krečnjaka trijasko i jurske starosti. Krečnjački greben čini Kobilicu interesantnim za botanička istraživanja. Prvi zapisi o vaskularnoj flori grebena Kobilice potiču još iz XIX veka (A. Boue, Grisebach i Wettstein), koja se nastavlja i u XX veku (Bornmuller, Rohlena. Košanin, Rudski, Adamović, Horvat, Beck, Nikolić, Diklić). Međutim, bez obzira na brojne istraživače i velikog broja objavljenih podataka, greben Kobilice nije bio dovoljno proučen. Zato je Kobilica predhodnih (2002-2009) godina bila predmet naših istraživanja i interesovanja. U ovom radu dat je pregled endemičnih biljaka zastupljenih na planinskom grebenu Kobilice i predstavljeni su osnovni razlozi sa tako visok stepen endemizma (izuzetna geološka raznovrsnost, gromadnost, visina, relativno dobro izražena izolovanost ali, i povezanost sa drugim visokim planinama centralnog dela Balkanskog poluostrva). Za područje Kobilice, dominantan je visokoplaninski tip endemizma, koji je pod snažnim mediteranskim uticajem. Na visokoplaninskom grebenu Kobilica konstatovano je 140 endemičnih taksona (14,66%) u odnosu na ukupan broj taksona. Kao primer navodimo: *Achillea chrysocoma* Friv., *Alchemilla bulgarica* Rothm., *Alchemilla heterotricha* Rothm., *Alkanna scardica* Gris., *Androsace hedraeantha* Griseb., *Alyssum scardicum* Wettst., *Asperula aristata* L. fil. subsp. *condesata* (Heldr. ex Boiss.) Ehrend. & Krendl, *Asperula doerfleri* Wettst., *Barbarea balcana* Pančić, *Campanula alpina* Jacq. subsp. *orbatica* (Pančić) Urum., *Cerastium decalvans* Schlosser & Vuk., *Cirsium tymphaeum* Hausskn., *Crocus scardicus* Košanin, *Dianthus cruentus* Griseb. subsp. *cruentus*, *Dianthus scardicus* Wettst., *Schivereckia doerfleri* (Wettst.) Bornm., *Draba*

kuemmerlei (Kumm. & Jav.) V. Stevanović & D. Lakušić, *Draba korabensis* Kümmerle & Degen ex Jáv., *Draba scardica* (Griseb.) Degen & Dörfler, *Festuca adamovicii* (St.-Yves) Markg.-Danenb., *Gentiana bulgarica* (Velen.) J. Holub, *Heliosperma nikolicii* (Seliger & T. Wraber) Niketić & Stevanović, *Hieracium markovanum* Arv.-Touv., *Hieracium scardicum* Bornm. & Zahn, *Knautia dinarica* (Murb.) Borbás, *Melampyrum heracleoticum* Boiss. & Orph., *Myosotis alpestris* F. W. Schmidt subsp. *sauveolens* (Waldst. & Kit.ex Willd.) Strid, *Narthecium scardicum* Košanin, *Onobrychis montana* DC. subsp. *scardica* (Griseb.) P. W. Ball., *Oxytropis dinarica* (Murb.) Wettst. subsp. *weberi* Chrtk & Chrtkova, *Pancicia serbica* Vis., *Pedicularis brachyodonta* Schlosser & Vuk., *Pinguicula balcanica* Casper, *Potentilla doerfleri* Wettst., *Potentilla montenegrina* Pant., *Potentilla speciosa* Willd., *Ramonda serbica* Pančić, *Saxifraga federici-augusti* Biasol., *Scrophularia aestivalis* Griseb., *Sempervivum kosaninii* Praeger, *Sesleria comosa* Velen, *Silene schmuckeri* Wettst., *Soldanella pindicola* Hausskn., *Stachys alpina* L. subsp. *dinarica* Murb., *Stachys scardica* (Griseb.) Hayek, *Tep hroseris papposa* (Reichenb.) Schur subsp. *wagneri* (Degen) B. Nord., *Trifolium pignatii* Fauché & Chaub., *Trifolium medium* L. subsp. *balcanicum* Velen., *Verbascum scardicola* Bornm., *Viola grisebachiana* Vis., *Viola latisejala* Wettst., *Viola macedonica* Boiss. & Heldr., *Viola orphanidis* Boiss., i druge. Visok procenat endemičnih biljnih vrsta ukazuje na geografsku, genetičku i ekološku izolovanost populacija koje su vezane za određene podloge, kao što su krečnjačke visokoplaninske kupe Kobilice okružene silikatima glavnog masiva Šar-planine.

Morfološke karakteristike epidermisa lista balkanske endemične vrste *Daphne malyana* Blečić (Thymeleaceae)

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Daphne malyana Blečić (Thymeleaceae) je endemoreliktna vrsta rasprostranjena u planinskim oblastima, kanjonima i klisurama severne Crne Gore, istočne Bosne i zapadne Srbije. Prisustvo ove vrste je nedavno potvrđeno za područje Srbije. Površinske strukture listova *Daphne malyana* sa planine Tare (Zaovine-Vranjak) su analizirane svetlosnim i skening elektronskim mikroskopom. Listovi ove vrste su mali, izduženi, sa kratkim šiljkom na vrhu i po ivici malo savijeni ka naličju. Dužina listova je $21 \pm 2,24$ mm, širina $6,45 \pm 0,81$ mm, a površina $76 \pm 14,95$ mm². Čelije epidermisa lista su nepravilnog oblika. Antiklinalni zidovi

epidermalnih ćelija lica i naličja su uglavnom ravni. Površina epidermskih ćelija lica lista je $1879,67 \pm 608,07 \mu\text{m}^2$, dok je površina ćelija epidermisa naličja $1046,11 \pm 339,42 \mu\text{m}^2$. Kutikula lista je dobro razvijena i na naličju je jako naborana. Listovi su hipostomatski sa anomocitnim stomama uvučenim ispod ćelija epidermisa. Broj stoma je $102,82 \pm 11,68$ po mm^2 , a površina stoma $1411,62 \pm 196,48 \mu\text{m}^2$. Na naličju lista se nalaze mehaničke, jednoćelijske dlake. Dlake su retke, $3,60 \pm 3,29$ po mm^2 . Analizirani parametri ukazuju na prisustvo kseromorfnih karakteristika lista vrste *Daphne malyana* sa planine Tare.

Phytogeographical and phytocoenological analysis of the endangered plant taxa in the flora of the Vlasina plateau (SE Serbia)

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In analysing the flora of the Vlasina plateau, it was determined that this area contains 956 species, 23 subspecies, 32 varieties and 28 forms of vascular plants. The data shows the exceptional floristic riches of this territory. Among these species, there are 91 species (9.52%) which may be categorized as under threat in the flora of Serbia. Critically endangered taxa (Cr) are especially interesting because their sanctuary in Serbia is only in the Vlasina plateau. This group includes the following species: *Betula pubescens*, *Elatine triandra*, *Utricularia minor*, *Cirsium helenioides* and *Carex limosa*. All these species have the boreal type of distribution and live in wetlands. The aim of this paper is to show the phytogeographical and phytocoenological affiliation of all the threatened taxa.

Population on edge: life history traits in a high altitude population of dog's mercury

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Dog's mercury, *Mercurialis perennis* L. (Euphorbiaceae), is a dioecious, rhizomatous, perennial species, widely distributed in temperate regions of Europe. Its altitudinal range extends from sea level to more than 1600m asl. *Mercurialis perennis* is considered an indicator of ancient woodland. Though described as very tolerant of low light, it can be found, though rarely, growing in full light; previous studies indicated that this could result in decreasing height and mass of shoots. The aim of this study was to examine variation in life history traits in a population of *M. perennis* from Mt Kopaonik, occupying an exposed grassland at the altitude of 1730m, near the upper boundary of its altitudinal range. Samples were taken in spring 2009, and the following traits were analysed in male and female individuals: plant size (above-ground height), shoot mass, number of flowers per plant, number of leaves per plant and the extent of reproductive allocation (RA). Female plants were higher than male plants, contrary to previously reported trend in other populations. Mean number of leaves did not differ between sexes. The estimated RA values were significantly greater in females than in males, showing that females invested more in reproduction. Both males and females from this population were significantly smaller compared to individuals from populations at lower altitudes (800 and 1540m asl) and different habitat (beechwood). However, female biased size dimorphism recorded in this sample should be taken with caution, since some issues (such as habitat heterogeneity and bimodal distribution of size of male plants) deserve further investigation.

Reproductive allocation along the altitudinal gradient in a dioecious plant

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In dioecious plant species, investment in reproduction differs between the sexes; typical situation is that reproductive allocation (RA) is significantly greater in females than in males, though in some studies different findings have been reported. Also, reproductive allocation can vary within species in response to environmental stress or decrease in habitat quality. The aim of this study was to examine variation in RA in populations of dog's mercury, *Mercurialis perennis* L. (Euphorbiaceae) between sexes and along the altitudinal gradient. Male and female plants were sampled during spring season from four populations on Mt. Kopaonik, representing altitudinal range from 710m to 1730m asl. RA was calculated as relative biomass allocated to reproductive organs. The obtained RA values were significantly greater in females than in males (average values: 0.057-0.109 vs. 0.026-0.031), confirming that females invested more in reproduction. In analysed populations, RA was on average 3 times greater in females than in males – this result is in accordance with previous studies and falls within the range of between-sex differences in RA found in dioecious plants. Altitudinal variation in RA showed prominent difference between sexes – RA decreased significantly with increasing altitude in females, but this trend was not observed in males. We discuss the obtained results in the context of putative underlying mechanisms.

Activities on creating bibliographies of botanical researches in Montenegro

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In Montenegro, for a long time, there have been realized activities on collecting literature and other botanical material and, till now, three publications have been elaborated and the fourth one is in preparation for printing. These publications refer to Bibliographies on flora and vegetation of Montenegro. The first and fundamental bibliography on flora and vegetation of Montenegro by dr Vukić Pulević appeared in 1980, published by Montenegrin Academy of Sciences and Arts and it includes 1055 bibliographical units. The second one by author Vukić Pulević,

representing addition of the first bibliography, was published in 1987 in Journal of the Republic Institute for the Protection of Nature of Montenegro (no18) and it includes 428 bibliographical units. Third bibliography, in other words, "Second supplement" (authors Vukić Pulević and Zlatko Bulić), is issued as a special edition of the Republic Institute for the Protection of Nature of Montenegro in 2004 containing 1357 bibliographical units and it includes not only botanical contributions published in the period from 1987-2003, but all texts that were missing in the previous bibliographies. And finally, fourth bibliography, in other words, „Third supplement" by authors Vukić Pulević and Zlatko Bulić is in preparation for printing as a special edition of the Institute for the Protection of Nature and it includes more than 650 bibliographical units. Therefore, by previous editions of "Bibliographies" it has been elaborated over 3.500 bibliographical units regarded to phanerogames, cryptogames and micro-flora, and vegetation cover of Montenegro as well. These four publications have covered entire research material since very former literature botanical sources from ancient 1822 year, till current days. In the work on "Bibliographies" from the beginning was adopted the principle for each bibliographical unit to be briefly commented, because in that way reader is offered with precious and abstracted information on the contents of each bibliographical unit. It gives special value to "Bibliographies", because for each bibliographical unit is given abstracted, essential review commenting its most important scientific contribution. Bibliographies include numerous titles of specialist's, Master dissertations and doctorates, as defended ones (and already represent fund već predstavljaju fondofsku documentation), as well as other ones whose realization is in the final phase. There have been registered important manuscripts and reports, as well some of smaller or bigger scope and botanical papers related to agriculture, forestry, fruit growing, viticulture, weeds flora, decorative and park's flora, and they can be important for total perception of botanical and ecological characteristics of some areas of Montenegro. An integral part of these publications is represented by big number of very important professional, scientifically-popular, popular, informative and newspaper articles, reviews of books, handbooks, guides, posters and similar ones, that are important for popularization and education in the sphere of botanical science. At the end of the paper, there were presented further plans for realization of the project of the research.

Vascular flora of Morača river basin in Montenegro

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Mountains of Morača and Prokletije, in the broad sense, as the part of high mountains of Balkans peninsula, represent one of the most representative centers of development of tertiary flora that remained till current days. Morača river basin as geographical area has a surface of 1060 km². This paper presents history of research on flora and vegetation of valley of canyon of the river Morače and its tributaries as well as review of flora by systematic categories (933 species have been registered in the canyon ecosystems and 1591 species in river basin, classified in 498 genera and 107 families), as well as register of plant species supposing that can be found in Morača river basin. It is underlined importance of Morača river basin as an area of exceptional and mostly preserved parts of nature. Morača river basin, as a whole, represents one of exceptional natural values in Montenegro and makes natural link between the most representative National Parks in our country. Therefore, it has to be protected to a great rational and real extent, in its original, autochthonous and untouched form and with interest for the present and future generations.

Aquatic flora and vegetation of rivers Beli and Svrljiški Timok (Eastern Serbia)

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Aquatic flora of rivers Beli and Svrljiški Timok in Eastern Serbia contains 26 vascular plants from 17 families and 21 genera. Family richest in species is *Polygonaceae*. Aquatic vegetation of investigated rivers differentiated in four formations: vegetation of submerged plants, vegetation of floating plants, vegetation of emerged plants and vegetation of occasional flooded areas. In phytocoenological sense, vegetation is represented by 5 associations: *Myriophyllo-Potametum*, *Potametum fluitantis*, *Scirpetum lacustris*, *Sparganietum erecti* and *Polygono-Bidentetum*.

Treća južnosrpska floristička – fitocenološka škola

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Početak botaničkih istraživanja područja južne i jugoistočne Srbije vezuje se za period nakon oslobođenja ovih krajeva od Turaka 1878. godine. U tom periodu floru ovog područja istražuju: Josif Pančić (1880, 1884, 1886, 1887), Lujo Adamović (1892, 1893, 1896, 1898, 1901, 1902, 1904), Sava Petrović (1882, 1883, 1885), Đorđe Ničić (1893, 1894, 1905), Jovan Cvijić (1896), Miloje Simić (1896, 1897), Živojin Jurišić (1889, 1905), Ljuba Davidović (1892), Obradović-Ličanin (1892), Nedeljko Košanin (1910, 1924, 1926, 1928, 1929), Danilo Katić (1910)- čime se završava prvi period u botaničkim istraživanjima pomenutih prostora.

Drugi period proučavanja ovih prostora započinje nakon drugog svetskog rata, a u tom periodu se ističu: P. Černjavski (1938), B. Jovanović (1967, 1969, 1972, 1985, 1999), V. Mišić (1957, 1970, 1985), R. Jovanović- Dunjić (1956, 1972), N. Diklić i V. Nikolić (1958, 1961), M. Gajić (1972), J. Blaženčić i Ž. Blaženčić (1991) i dr.

Sedamdesetih godina XX veka pojavljuju se mladi istraživači koji najpre individualno, a kasnije timski započinju detaljnu analizu biljnog pokrivača ovog dela Srbije, imenovani od kustosa Prirodnjačkog muzeja u Beogradu Nikole Diklića, jednog od najpoznatijih srpskih florista dvadesetog veka, kao „južnosrpska botanička škola.“ To se dogodilo nakon otkrića niza novih vrsta za floru Srbije i opisom više novih biljnih zajednica sa ovog područja. Ova neformalna grupa nastavlja da detaljno obrađuje ovaj prostor. Najpre su to bile planine: Seličevica, Kukavica, Pasjača i dolina Vlasine, a zatim Rodopske planine: Ostrožub, Čemernik, Vardenik, Besna Kobila, Radan, Majdan, Jablaničke planine, Krstilovica, Plačkovica, Vidijevica, Suva planina, Vlasinska visoravan, dolina Pčinje, Krajište, dolina Kosanice i dr.

Grupu su sačinjavali: Novica Randelović, nastavnik Osnovne škole u Doljevcu, Vidak Jovanović, savetnik u PPZ Leskovac, Miodrag Ružić inspektor u SO Prokuplje i Vlastimir Stamenković, profesor Mašinske škole u Leskovcu. Svi su oni radeći u svojim organizacijama u slobodno vreme, bez stipendija i državne pomoći odbranili najpre magistarske teze, a potom i doktorske disertacije i na kraju postali univerzitetski profesori sa više stotina napisanih naučnih radova i saopštenja. Uz svesrdnu pomoć dr Spasa Sotirova uspešno su organizovali i propagirali dalje proučavanje flore i vegetacije i taj posao preneli mlađim naslednicima: Vladimiru Randeloviću, Bojanu Zlatkoviću, Marini Jušković, Violeti Milosavljević i brojnim sledbenicima sa Katedre za biologiju sa ekologijom, tako da se danas izučava flora i

vegetacija u manje pristupačnim krajevima Jugoistočne Srbije. Južnosrpska botanička škola je iz godine u godinu sve brojnija, kako stasaju nove generacije diplomiranih biologa sa niškog Univerziteta.

Zeleniče – *Prunus laucerasus* L. var. *serbica* Panč.- cveta

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Zeleniče je tercijarni endemo-relikt, koji raste samo na nekoliko lokaliteta u svetu. Kod nas ono raste na planini Ostrozub kraj Vlasotinca u jugoistočnoj Srbiji, u blizini planinskog mesta Bistrica. Raste u bukovoj šumi *Laroceraso-Fagetum* B. Jov. na potezu zvanom Kačer Zeleničje, koje je zaštićeno kao strogi rezervat prirode I kategorije i povereno na upravljanje preduzeću „Srbija Šume“. Ukupna zaštićena površina je 41.70 ha. Biljku je pronašao na pomenutom lokalitetu J. Pančić, u društvu sa Đorđem Ničićem i Savom Petrovićem 1886. godine. Godinu dana kasnije opisao je kao var. *serbica* Panč., a od tada do danas mnogi su posećivali ovaj lokalitet i o njemu pisali: Adamović, L. (1908, 1909), Košanin (1913, 1923), Jovanović, B. (1967, 1969, 1972, 1985, 1999), Randelović, N. et al. (1983), Stamenković et Randelović (1990), Tomić (1990), Purić-Daskalović (1992) i dr.

Sve do 1983. godine nije se znalo da zeleniče cveta. Te godine N. Randelović sa studentima i saradnicima (S. Sotirov, Ž. Marković, V. Jovanović, M. Ružić, V. Stamenković, Ž. Krivošej, V. Randelović, D.A. Hill) otkriva cvetove na zeleničetu i od tada pa do danas grupa botaničara i šumara iz ovog dela Srbije stalno prati tu pojavu. Sam Pančić je uporno tražio i interesovao se da li zeleniče cveta i bio ubeđen da zeleniče nije sterilna vrsta. To se pokazalo najpre kod presađenih primeraka u Gornjoj Lopušnji, u botaničkoj bašti u Beogradu, a kasnije na Radan planini (preneo Vidak Jovanović) i Doljevcu (preneo N. Randelović). Svuda je cvetalo. Botaničari ovog dela Srbije okupljeni na Tehnološkom fakultetu, a kasnije na Odseku za biologiju PMF-a u Nišu pomno su pratili i prate život zeleničeta na Ostrozubu i u razgovoru sa starim meštanima Bistrice doznali su da je zeleniče ii ranije cvetalo. Najznačajnije je pitanje kada je zeleniče počelo da cveta? Kada se prvi put pojavljuju cvetovi kod zeleničeta? Tu postoje različita mišljenja kod botaničara. Kada je profesor M.M. Janković, poznati ekolog i fitocenolog, video herbarske uzorke cvetalog zeleničeta, rekao je: „To su uzorci iz parka“. Nikako nije verovao da su herbarski uzorci sa Ostrozuba, jer svi dotadašnji botanički autoriteti u Srbiji su „razbijali glavu“ zašto zeleniče ne cveta i kako preživljava i opstaje?

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**Nature Protection and Environment
Zaštita prirode i životne sredine**

Changes in qualitative composition of high vascular macrophytes from lake Ohrid

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In this paper the changes in qualitative composition of high vascular macrophytes from 11 localities of the littoral zone of the Lake Ohrid during a longer period of time are presented. The mentioned localities are: Radozda, Kalista, Struga, Grasnica, Caneo, Pristaniste, Mazija, St. Stephan, Pestani1, Pestani2 and St. Naum. In fact, a comparison has been made between our researches from the period 2006-2009, with the researches conducted by Jakovlevic in 1936. The results indicate that there are changes in qualitative composition of the macrophytes if compared to those obtained in 1936. The largest changes in qualitative composition of high vascular macrophytes have been evidenced in the locality of Grasnica (according to our researches 16 species, while according to Jakovlevic - 3 species). There are relatively large changes verified in the locality Pristaniste (our investigations yielded 12 species while according to Jakovlevic – 4 species), Radozda (according to our examinations 12 species and according to Jakovlevic - 5 species), St. Stephan (in accordance with our researches 6 species, while according to Jakovlevic there are not evidenced high vascular macrophytes), Caneo (in accordance with our researches 10 species while according to Jakovlevic - 6 species), and St. Naum (in accordance with our researches 12 species while according to Jakovlevic - 8 species). In the other researched localities the changes in qualitative composition of high vascular macrophytes are less expressed. The changes in the qualitative composition of the high vascular macrophytes are affected, above all, by the increased anthropogenic influence in the Lake Ohrid during the last seven decades.

Krčedinska ada - značajno područje u Podunavlju za očuvanje diverziteta flore i vegetacije

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Krčedinska ada se nalazi u plavnoj zoni reke Dunav uzvodno od Koviljskog rita (AP Vojvodina, Srbija). Od leve obale Dunava je odvojena Gardinovačkim dunavcem. Zbog povoljnog hidrološkog režima u nebranjenom pojasu obale i tradicionalnog oblika korišćenja prostora-pašarenja (krave, konji) na niskim

obalama, plitkim depresijama, barama dobro su očuvane vlažne livade i vegetacija niskih muljevutih obala i močvarna vegetacija (*Cypero-Limoselletum* (Oberd. 1957) Korneck 1960, *Eleocharitetum acicularis* W. Koch 1926 em. Oberd. 1957, *Acoretum calami* Knapp et Stoffers 1962). Floristička i fitocenološka istraživanja Krčedinske ade sprovedena tokom 2009. godine ukazuju na veće prisustvo retkih i značajnih biljnih taksona: *Limosella aquatica* L., *Marsilea quadrifolia* L., *Scirpus triqueter* L., *Cyperus glomeratus* L., *Acorus calamus* L., *Salvinia natans* (L.) All., dok se na osnovu očuvanosti staništa može očekivati i prisustvo vrste *Lindernia procumbens* (Krocker) Philcox. Rezultati istraživanja pokazuju da su poplavna područja u Srbiji još uvek nedovoljno istražena. Pašarenje se pokazalo kao odlučujući faktor za očuvanje populacija biljnih vrsta značajnih za očuvanje biodiverziteta (posebno *Marsilea quadrifolia* L.) i zajednica koje grade. Zbog očuvanosti prirodnih vrednosti i ekosistemskog i specijskog značaja, Krčedinska ada je predložena za zaštitu i obuhvaćena granicama proširenja Specijalnog rezervata prirode „Koviljsko-Petrovaradinski rit“ 2010. godine.

Populacijska vrijednost mekolisne veprine u NP Kozara

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Istraživano je stanje broja grmića i broja grančica po pojedinim grmićima na primjernim površinama za šumske zajednice na prostoru NP Kozara. Postoje značajne razlike između pojedinih šumskih zajednica a takođe i unutar dijelova većih kompleksa određenih šumskih zajednica: u šumi bukve i jele nalaze se velike površine bez prisustva mekolisne veprine. Istraživanja u toku 2009. godine su pokazala da je najveći broj grmića utvrđen u šumama kitnjaka (sa bukvom i jelom u trećem spratu) a najmanji u brdskim šumama kitnjaka. Takođe je najveći broj grančica po jednom grmiću u šumama kitnjaka sa bukvom i jelom u trećem spratu. U svim šumama preovladavaju grmići sa tri do pet grančica.

Ichthyological integral indices, the history of development and possibility of application on rivers in Serbia:

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Based on a literature review, the different approaches in the water quality assessment using fish communities in freshwaters are summarized. Fish assemblage indicators, developed throughout the world, were reviewed and the main differences in methodologies, number of metrics and values are summarized. We have drawn attention to the methods used for designing a fish-based index with a particular focus on original developments in North America and its adaptations in many different regions and habitat types. Gaps in ecological information and classification could be a serious problem to ecological assessments. The lack of knowledge is especially true for species assemblages in the relatively unexplored river basins of Europe, e.g. The Balkans peninsular.

Axenically culturing the bryophyte *Herzogiella seligeri* (Brid.) Z. Iwats.

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A moss genus *Herzogiella*, from the pleurocarpous family *Hypnaceae* contains only seven species world wide. It occurs in North, Central and South America, Europe and Asia. In Europe, only three species occurred, namely *H. seligeri*, *H. striatella* and *H. turfacea* of which, the last one is threatened. With aim to develop the methodology for protection, conservation and active propagation of *H. turfacea*, more commonly distributed counterpart, *H. seligeri*, were taken from the National Park Fruška Gora and axenically culture were established. The study gives overview into the problems of sterilization, in vitro establishing, development, propagation and biology of species, as well as indices applicable to threatened counterpart.

Rarely, threatened and relict species in flora NPA "Zasavica"

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For the past 12 years research of flora in the Reserve Zasavica has recorded over 700 species of plants. Among the species noted has the relic, endemic and endangered. The most important finding in the flora of the reserve is insectivore globally endangered species *Aldrovanda vesiculosa* which is the habitat of rare, endemic only in Serbia.

As a tertiary relics of the Zasavica *Stratiotes aloides*, *Trapa natans* agg., *Aldrovanda vesiculosa*, *Hippuris vulgaris*, *Hottonia palustris* and *Ranunculus lingua*, which grew on the shores of tropical wetlands around the Pannonian Sea. Cane zone along the coast and floating islands inhabited by glacial relics *Urtica kioviensis* and *Schaenoplectus triqueter* for which the Peri Serbian southern border area, while *Achillea asplenifolia*, Pannonian subendem found on meadow and is located on the southern border of its range. Tertiary relics are the remains of once widely spread marsh vegetation in Central and Southern Europe. As a tertiary relict Turrill (1929) singled out *Butomus umbellatus*, *Hydrocharis morsus-ranae* and *Stratiotes aloides*. Some species such as *Nymphaea alba*, *Nuphar luteum*, *Salvinia natans* and *Nymphoides peltata* were settled tertiary wetlands in Southern Europe indicate when hay analysis of peat and are not classified as a relic in today widespread in holoarctics. Since the Ice Age is characterized more and interglacial periods glacial note that they occurred simultaneously very complex migration of plants. According to Engler (1905) after the first glaciation formed the steppe interglacial stages, where in Central Europe, instead established steppe tundra vegetation and some of those plants in postglacial age endene steppe periods. During the upcoming II glaciation in the Central and Southern Europe are retained as part of the glacial and partly as interglacial species *Ceratophyllum demersum* (Gajic, 1984). Four types of relicts growing on Zasavica are critically endangered species in the flora of Serbia.

The present flora of the reserve, five from six critically endangered species and *Hippuris vulgaris*, *Hottonia palustris*, *Ranunculus lingua*, *Aldrovanda vesiculosa* and *Lindernia procumbens*, and the last one listed are suggested for the second edition of the "Red book of flora of Serbia". *Groenlandia densa* kind of dance Jurisic (1901) states for the flora and Zasavica bollard, but unfortunately in modern research has not found its presence (Randjelovic, 1999). The status of endangered species (EN-VU) are present *Callitricha verna*, *Callitricha stagnalis*, *Utricularia australis*, *Urtica kioviensis* and *Schaenoplectus triqueter*, while the

status of vulnerable species (VU) have *Achillea asplenifolia*, *Ranunculus aquatilis*, *Dryopteris carthusiana*, *Hesperis silvestris*, *Leucjum aestivalis*, *Salix petrandra*, *Stratiotes aloides*, *Thelypteris palustris* and *Zanichellia palustris*.

Of the rare species in the water current increases *Zasavica Stratiotes aloides*, while the peat-mud habitats grow *Cyperus michelianus subsp michelianus* and *Utricularia australis*. Mediterranean species *Capsella rubella* and *Acanthus balcanicus*.

The present flora of the reserve are the two species (*Viola elatior* and *Urtica kioviensis*) located on the European red list of species in danger.

The national law distinguish two groups of protected species and strictly protected species of wild plants and protected wild plant species. From the category of strictly protected species in the flora of the reserve is present and 13 species: *Thelypteris palustris*, *Schaenoplectus triqueter*, *Potamogeton pusillus*, *Hippuris vulgaris*, *Hottonia palustris*, *Nuphar luteum*, *Nymphaea alba*, *Ranunculus aquatilis*, *Ranunculus lingua*, *Aldrovanda vesiculosa*, *Callitriche palustris* and *Urtica kioviensis*, while 47 species with status protected species, and the 47 protected species on the list of 26 species under the control of traffic.

Sadržaj teških metala u biljkama porodice Lamiacea i zemljištu sa požarišta i van njega na planini Vidlič

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Biljne vrste iz porodice Lamiacea imaju lekovita svojstva i kao takve se primenjuju u tradicionalnoj medicini. Njihova primena može biti ograničena zbog prisustva povećane količine teških metala, što je jedna od mogućih posledica šumskog požara na planini Vidlič. U ovom radu je određen sadržaj Cu, Zn, Pb, Cd i Fe u uzorcima zemljišta sa staništa (požarište, van požarišta) biljaka *Lamium luteum*, *Teucrium chamaedrys*, *Ajuga genevensis* i *Acinos alpinos*, kao i njihov sadržaj u podzemnom i nadzemnom delu biljaka primenom metode AAS. Izračunati su bioakumulacioni faktori za svaku biljnu vrstu (koeficijent transfera zemljište-biljka i koeficijent transfera nadzemni-podzemni deo). Uzorci zemljišta sa staništa navedenih biljaka podvrgnuti su trostepenoj sekvencijalnoj ekstrakciji (biodosupni, ekstraktibilni, totalni. Za sve analizirane uzorke, cink je prisutan u višim koncentracijama na požarištu. Najvišu vrednost sadržaja cinka pokazuje zemljište sa staništa *Ajuga genevensis* (oko 130 ppm) sa požarišta. Sadržaja Cu se nalazi u

prosečnom intervalu rasprostranjenosti u Zemljinoj kori. Najveći sadržaj Cu imaju uzorci zemljišta van požarišta sa staništa *Teucrium chamaedrys* (oko 27 ppm). Sadržaj Cu van požarišta je manji nego na požarištu. Za sva staništa biljaka osim za *Teucrium chamaedrys*, frakcija biodostupnih i ekstraktibilnih katjona sadrži bakar u koncentracijama koje su manje od granice detekcije AAS metode. Sadržaj olova je znatno viši u svim analiziranim uzorcima zemljišta sa požarišta i najveći je na staništu biljne vrste *Ajuga genevensis* (oko 166 ppm). Van požarišta, najveći sadržaj Pb nađen je na staništu *Teucrium chamaedrys* (oko 40 ppm). Cd je u višim koncentracijama prisutan u zemljištu koje nije bilo zahvaćeno požarom (osim za zemljište sa staništa *Teucrium chamaedrys*). Najveći sadržaj Cd je nađen u zemljištu sa staništa *Acinos alpinos* van požarišta i iznosi oko 3 ppm. Zemljište sa staništa *Teucrium chamaedrys* sa požarišta sadrži oko 6 ppm Cd, dok je u zemljištima sa staništa ostalih biljaka njegov sadržaj ispod granica detekcije metode. U nadzemnim i podzemnim delovima svih biljaka, bez obzira na stanište sadržaj Zn je u intervalu od 1-400 ppm, što odgovara normalnom sadržaju Zn u biljnom materijalu. Bakra ima više u podzemnom nego u nadzemnom delu, sem kod *Teucrium chamaedrys* gde su Cu i Pb određeni u nadzemnom delu dok su podzemnom ispod granice detekcije AAS. Prirodne koncentracije olova u biljkama kreću od 5-10 ppm. Kod skoro svih analiziranih biljaka sadržaj olova je ili ispod donje granice navedenog intervala, ili je neznatno povećan, što je opet pokazatelj prilično nezagađene životne sredine kako na požarištu, tako i van njega. Normalan sadržaj kadmijuma u biljkama kreće se u intervalu od 0,1- 2,4 ppm, dok je kritična granica od 5-30 ppm. Najveći sadržaj Cd nađen je u podzemnom delu biljne vrste *Teucrium montanum* oko 2,5 ppm, što odgovara normalnom sadržaju.

Fizičko-hemijski i lišajski monitoring kvaliteta vazduha na urbanoj teritoriji grada Leskovca (Južna Srbija) 2002-2008.

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Fizičko-hemijskim monitoringom praćena je količina i koncentracija nekih vazdušnih polutanata: sumpordioksid, čađ, aerosedimenti, olovo, kadmijum i cink u taložnim materijama, olovo, kadmijum i mangan u suspendovanim česticama. Rezultati fizičko-hemijskog monitoringa pokazuju da svi razmatrani polutanti osim teških metala u taložnim materijama imaju opadajući trend srednjih godišnjih koncentracija. Rezultati lišajskog monitoringa ukazuju na neznatno smanjenje

površine Leskovca sa najnižim stepenom kvaliteta vazduha ("lišajska pustinja") u posmatranom vremenskom periodu, a takođe i smanjenje ukupnog broja registrovanih taksona lišaja u odnosu na 2002. godinu. Dobijeni rezultati sugerišu potrebu daljeg sprovođenja i proširivanja fizičko-hemijskog i lišajskog monitoringa kvaliteta vazduha u Leskovcu.

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**Genetics, Selection and Biotechnology
Genetika, selekcija i biotehnologija**

Uticaj benzenskog ekstrakta sene (*Cassia angustifolia* Vahl.) na vijabilnost ćelija kostne srži miša

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Sena (*Cassia angustifolia* Vahl.) je biljka iz roda *Cassia* rasprostranjena u tropskim područjima istočne Afrike, Arabije i Indije. U tradicionalnoj medicini Azije koriste list i plod biljke kao laksativ. Ekstrakcijom lista sene po Soxhlet-u dobijen je benzenski ekstrakt. U ovom radu ispitivan je uticaj različitih koncentracija (10 mg/ml, 7.5 mg/ml, 5 mg/ml, 2.5 mg/ml i 1.5 mg/ml) benzenskog ekstrakta lista sene na vijabilnost ćelija kostne srži miša. Procena vijabilnosti vršena je Trypan blue testom na 2, 4, 6 i 24 sata. Kao negativna kontrola korišćene su ćelije koje su inkubirane u RPMI-u. Najveći uticaj ima koncentracija od 10 mg/ml, dok najmanja koncentracija od 1.5 mg/ml pokazuje najmanji uticaj na vijabilnost ćelija kostne srži.

Ispitivanje uticaja metanolskog ekstrakta tri vrste roda *Cassia* (*Cassia angustifolia*, *Cassia tora*, *Cassia siamea*) na vijabilnost HeLa ćelija

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Listovi biljaka iz roda *Cassia* se koristi kao oficijalna droga i prirodni laksativ u svetskim farmakopejama. Ekstrakcijom listova tri vrste sene (*Cassia angustifolia*, *Cassia tora*, *Cassia siamea*) sa Soxhlet-ovim ekstraktorom dobijen je metanolski ekstrakt, koji je korišćen za ispitivanje citotoksične aktivnosti.

Citotoksični efekt različitih koncentracija (1,25mg/ml, 2,5mg/ml, 5mg/ml, 7,5mg/ml i 10mg/ml) ekstrakata ispitivan je MTT testom na *HeLa S3* ćelijama u *in vitro* uslovima. MTT test pokazuje smanjenje ćelijske vijabilnosti za sve ispitivane ekstrakte. Smanjenje ćelijske vijabilnosti ispod 50% pokazuju MeOH ekstrakti: *Cassia siamea* svih testiranih koncentracija, *Cassia tore* koncentracija većih od 5mg/ml, a *Cassia angustifolia* koncentracija većih od 7,5 mg/ml.

Examination of different raspberry leaves (*Rubus idaeus* L.) ethanol extracts on HeLa cells viability and proliferation

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The results of various phytochemical investigations show that raspberry leaves (*Rubus idaeus* L.) is rich source of flavonoids, ellagic acid and tannins. Experiments proved that the individual compounds belonging to these groups have antioxidant, antimicrobial, anti-inflammatory, antiviral and anticarcinogen activity. The aim of our study was examination of different raspberry leaves ethanol extracts on HeLa S3 cells viability and proliferation. Different ethanol extracts were prepared by maceration in absolute ethanol, ultrasound extraction in absolute ethanol, maceration in 70% ethanol and ultrasound extraction in 70% ethanol. Effective extracts concentrations were 0.0001mg/ml, 0.001mg/ml, 0.01mg/ml, 0.1mg/ml, 1mg/ml. Cell viability and proliferation was examined due to tetrazolium salt reduction ability (MTT test) and HeLa cells morphological characteristics after 24h and 72h incubation with extracts. The results of this investigation show that all investigated ethanol extracts in these concentrations showed a mild impact on the viability of treated HeLa cells in comparison to the control group.

In vitro culture of several endemic species of genus *Dianthus* from Serbia and neighboring regions

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The aim of this study is to highlight of "in vitro" plant regeneration for the diversity protection and conservation of endemic species of the genus *Dianthus*, with special focus on them as important resources for horticultural use and "in situ" propagation. *Dianthus giganteus* subsp. *croaticus* is subendemic species distributed in the western part of the Balkan peninsula (from Slovenia eastward to Serbia). It is perennial herb. *D. ciliatus* subsp. *dalmaticus* is endemic species growing in Mediterranean and submediterranean zone of the Adriatic coast in Dalmatia (Croatia) and Montenegro. It is the semi-woody shrublet. *D. petreus* subsp. *noeanus* subendemic species distributed in the Carpathians and the Balkan peninsula. It is perennial herb forming loose cushions. Multiplication of these species was achieved through micropropagation from meristem and/or stem segments culture of seedlings. Plant regeneration of *D. petreus* was obtained from meristem culture (clone "A") and from adventitious buds (AB) from organogenic calli (OC) in stem segments culture (clone "B"). Meristems consisting of two leaf primordia formed numerous leaf rosettes on MS1= MS + IBA (0.02 mg L⁻¹) + NAA (0.2 mg L⁻¹) + Kin (1.0 mg L⁻¹). Multiplication of shoots of clone "A" and "B" were achieved on media MS1 or MS2 = IBA (0.02 mg L⁻¹) + NAA (0.2 mg L⁻¹) + BAP (1.0 mg L⁻¹). Multiplication index (MI) of shoots was better for clone "B" (MI = 4,93 ± 0,63) than the clone "A" (MI = 2,95 ± 0,07). Stem segments were cultivated on MS3= 2,4-D + Kin (1.0 mg L⁻¹, each) + l-proline (250 mg L⁻¹) on which they subsequently formed the OC. After transfer of the OC on MS1 medium, the AB were observed. Shoots of both clone were rooted on media MS4 and MS5 =MS + IBA (0.5-1.0 mg L⁻¹). Rooting for clone "A" (7 and 27%) and "B" (70 and 91%) depended on the concentration of IBA (0.5-1.0 mg L⁻¹, respectively). Culture initiation from apical, nodal and basal stem segments of *D. ciliatus* and *D. croaticus* was achieved on medium MS6 = MS+ NAA (1.0 mg L⁻¹) + BAP (1.0 mg L⁻¹) + IBA (0.5 mg L⁻¹). Shoots multiplication was successful on the same medium via axillary buds. There were differences between (MI) of shoots originated from apical, nodal and basal stem segments. Nodal segment shoots had the best MI (*D. ciliatus* = 18,34 ± 2.62; *D. giganteus* = 3,91 ± 0,44). The same rooting protocol used for these species. Thereafter, the

carantion plantlets were left to grow in natural places where they bloomed. In future, these "in vitro" carnation plantlets will be reintroduced in nautural enviroment.

Important of *in vitro* horse chestnut androgenic embryos production

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The aim of this research was to study influence of activated charcoal (AC), abscisic acid (ABA) and polyethylene glycol (PEG) on the maturation and conversion of horse chestnut androgenic embryo for the diversity protection and conservation of horse chestnut. Horse chestnut (*Aesculus hippocastanum* L., Hippocastanaceae) represent a relict species of the tertiary flora and endemit of Balkan peninsula. The common name horse chestnut is reported as having originated from the erroneous belief that the tree was a kind of chestnut, together with the observation that eating them cured horses of chest complaints. Horse chestnut trees are native to the Balkan peninsula, but grow as ornamental trees in parks and avenues throughout the Northern Hemisphere. Because of the slow and difficult reproduction of great importance to be fast and cheap in vitro multiplication. Possible solution is regenerated by androgenesis. Anther culture has been used in recent years as a tool for producing haploid plants in a varyety of higher plants, but the low frequencies of microspore-derived plants restrict the use of the technique in plant breeding. There are several factors affecting androgenesis in horse chestnut, such as genotypes, growth of donor plants, pretreatments of anthers, composition of medium and culture conditions. Androgenic embryos originating from microspores and anther culture were matured over 90 days. Androgenic embryos on media containing PEG (50 g l⁻¹), in combination with AC (1 g l⁻¹) showed a rapid development of embryos in the cotyledonary stage and lowered percentage of abnormal structures. The best results of androgenic microspore embryo germination was observed on media supplemented with AC alone (99%), and in combination with PEG (100%). Also, the greatest number of androgenic microspore plants (18%) and androgenic anther plants (12%) were formed on media enriched with 1 % AC. Lowest germination percentages, 37 % and 39 % in microspore culture and 33 % and 38 % in anther culture were obtained on maturation media with ABA 20 mg l⁻¹ alone and in combination with AC 1g l⁻¹. Flow cytometric analysis showed that most of the androgenic embryos were haploid, corresponding to their microspore origin, while half of these became diploid, after maturation for 90 days. All regenerants originating from microspore culture were haploid immediately after

germination, but only 10 % embryos retained haploidy after 3 years subculturing, while 10.5 % were diploid, 73.5 % tetraploid and 6 % octaploid on hormone-free medium. Unlike those from anther culture, after 3 years of subculturing on hormone-free medium, there were no haploid regenerant from anther culture, while 8.5 % were diploid, 81 % tetraploid and 10.5 % octaploid. Since the zygotic embryo cotyledons accumulate the highest amount of aescin, it is currently extracted from the seeds of horse on a large scale. As this material is available during only short period of the year, we studied the possibility of using plant tissue culture to obtain aescin. For this purpose, the content of aescin in horse chestnut androgenic embryos was studied. Aescin content was found to be dependent on the stage of androgenic embryo development and the type of the phytohormone supplemented to the nutritive medium. In the absence of the phytohormones, androgenic embryos at the globular stage of development contained approximately four times less aescin than those at the cotyledonary stage. In conclusion, horse chestnut androgenic embryos produce high amount of aescin, which can be manipulated by the addition of phytohormones. We find this approach promising for resolving the problems associated with commercial production of aescin. This method enables high biomass production, even availability of the phytochemical all the year round, simplification of the extraction procedure and manipulation of the factors affecting secondary metabolite biosynthesis.

***Chenopodium rubrum* L. , a short-day plant, as a model plant for physiological and biochemical investigations of ontogenesis in vitro**

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Chenopodium rubrum L. belongs to the family Chenopodiaceae, genus *Chenopodium*. This is a short-day weedy annual, distributed in Europe, Asia and Northern America. Ecotypes of this species differ in their photoperiodic characteristics. Sel. 184 is a qualitative short day plant, with defined critical night length of 8h. As an early flowering species, it is a suitable model plant for studying ontogenesis in vitro. Culture of intact plants in vitro and antioxidative enzymes detection were used. We showed sequential expression of antioxidative enzymes during seed germination. Prior to radicle protrusion, catalase (CAT) and superoxide dismutase (SOD) showed maximal activity. Peroxidase (POD) activity appeared and increased after radicle protrusion. Seed ageing affected changes in antioxidative

status of seeds and lowered germination percentage, growth and flowering. In old seeds, CAT and SOD activity, were significantly lower, and de novo protein synthesis started later during imbibition. Under the suitable photoperiodic conditions in vitro, plant flowers in 15 days, and produces seeds in 10 weeks. *C. rubrum* plants modify their growth and development in accordance with photoperiod. We showed that the growth pattern to the end of ontogenesis, the flowering and the seed development, are all determined by the photoperiod the seedlings experience during early phases of reproductive development - induction and evocation of flowering. We showed changes in antioxidative enzymes activities in different phases of vegetative and reproductive development. The highest CAT activity was measured at the time of flowering, PODs are involved in determination of *C. rubrum* growth and development in accordance with the environment and the absence of some SOD isoforms could be the indicator of *C. rubrum* senescence.

Diaporthe eres complex – Novi patogen Kantariona u Srbiji

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Kantarion (*Hypericum perforatum* L.) je višegodišnja lekovita biljka koja se plantažno gaji u Srbij poslednjih sedam godina i na kojoj su do sada opisane četiri vrste patogenih gljiva iz roda *Fusarium* i *Colletotrichum* gleosporoides (Pavlović et al, 2000; Ivanović i sar.,2000). Tokom 2008. godine zapaženo je novo oboljenje na plantažnim zasadima kantariona u lokalitetu Pančevo. Karakteristični simptomi se javljaju na osušenom stablu u drugoj godini gajenja u vidu nekrotičnih pega na kojima se formira masa pojedinačnih piknida koji su u vlažnoj sredini proizvodili α i β konidije. α konidije su jednočelične, ovalne sa zaobljenim krajevima, hialinske i imaju dve uljane kapi karakteristične za rod *Phomopsis* a β konidije su jednočelijske, hialinske, končaste izdužene. Korišćenjem standardnog fitopatološkog metoda nanošenjem fragmenta tkiva sa granice zdrave i obolele kore na hranljivu podlogu od krompira (PDA) izvršena je izolacija patogena (Dhingra and Sinclair 1986). Porast patogena ispitivan je na PDA podlozi na temperaturi 25°C u uslovima naizmeničnog osvetljenja (12/12 h svetlo/mrak). U ovakvim uslovim patogen razvija retku belu, vunastu, ili pamučnu vazдушnu miceliju koja kasnije poprima nijanse prljavo bele boje. Nakon deset dana stvaraju se stromatične tvorevine u okviru kojih se obrazuju pojedinačne, ili u grupama razbacane tamne piknidije srednje veličine (1-3 mm). Identifikacija do roda vršena je na osnovu makroskopskih i odgajivačkih odlika patogena, a identifikacija vrste u Institute of Royal Netherlands Academy of

Arts and Sciences, Fungal Biodiversity Centre, 2008. Ovo je prvi nalaz ove gljive na obolelim biljkama kantariona. Figure 3. Colony of *Diaporthe eres* complex Figure 4: Cirrus, containing spores of *Diaporthe eres* complex Figure 5a: Lesion on St'Johans worth stem two weeks after inoculation Figure 5b: Cirrhi of *Diaporthe eres* complex on St'Johans worth stem three weeks after inoculation.

Somatic embryogenesis and in vitro plantlet regeneration of *Lilium martagon* L. var. *cattaniae* Vis.

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In this study we examined organogenic capacity of leaves and bulbs explants of *Lilium martagon* L. var. *cattaniae* Vis. For induction of in vitro somatic embryogenesis and adventitive regeneration from those explants, different concentrations of 2,4-dichlorophenoxyacetic acid and 6-benzilaminopurine (from 0,25 mg/l to 8,00 mg/l) added to MS basal medium were used. Our results indicate that concentration of 0,5 mg/l 2,4-dichlorophenoxyacetic acid and 4 mg/l 6-benzilaminopurine promoted somatic embryogenesis from leaves of *Lilium martagon* var. *cattaniae*, while all other concentrations promoted direct shoot regeneration from bulb explants. Root formation was induced on MS basal medium with 0,2 mg/l indole butyric acid. These plantlets were acclimatized well in a greenhouse conditions.

Role of antioxidant enzymes in the seasonal adaptation of *Picea omorika* (Pančić) Purkyne

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We studied seasonal variation in the activity and isoenzyme pattern of peroxidase, catalase, catechol oxidase and superoxid-dismutase in the needles of *Picea omorika* (Pančić) Purkyne trees. The samples were collected from the natural habitat of the species, Mt. Tara. This endemic coniferous species is exposed to subfreezing temperatures that range from -10 to -30°C during the autumn/winter and high temperatures exceeding 30°C during the summer. Characteristic EPR signal of free or weakly bound Mn²⁺ was used as an indicator of oxidative status of needles,

since cold-related oxidative damage leads to Mn²⁺ release from photosystem II. Seasonal changes were found to affect enzymatic activities and isoenzyme profiles. Several isoforms of peroxidase, catechol oxidase and superoxide dismutase, as well as two catalase isoenzymes were detected. The number of peroxidase isoenzymes was greatest during the vegetative season. The results obtained show that there are two groups of antioxidant enzymes in *P. omorika* needles that change levels of activities in the spring/summer and autumn/winter seasons. Catalase and catechol oxidase peaked in summer and spring, respectively. During the autumn/winter season, however, both total SOD and Mn-SOD showed maximum activity. It was observed that prooxidative conditions developed in the autumn, at the beginning of cold season, which corresponded to significant increase of MnSOD activity. This suggests a complementary action of these enzymes in reaction to external changes.

***Chenopodium murale* L., a long-day plant, as a model plant for physiological and biochemical research**

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Chenopodium murale L. plant belongs to the family Chenopodiaceae, genus *Chenopodium* which is widely distributed in Serbia as long-day weedy annual plant. *Chenopodium murale* is also a facultative long-day plant, and an early flowering species. Experiments were performed on *in vitro* cultured *Chenopodium murale* L. plants grown on optimal culture medium and exposed to adequate photoperiodic regime. The effects of glucose and GA₃ on flowering under inductive photoperiodic conditions were tested. Glucose and GA₃ stimulated the flowering of *C. murale*. We showed that exposure of aged vegetative plants to continuous darkness led to flowering, as transferring to darkness cancelled photoperiodic control in *C. murale* and flowering occurred under autonomous mechanism. The seeds were produced *in vitro* within 18 weeks and the antioxidative enzymes were analysed during seed germination. The results presented indicate a sequential expression of the antioxidative enzymes and their importance in seed germination. Changes in catalase (CAT), superoxide dismutase (SOD) and peroxidase (POD) activities could be related to different phases of seed germination. Decrease in SOD activity, increase in CAT and appearance of POD activity coincide with early seedling development in *C. murale*. Gibberellic acid (GA₃) delayed and synchronized *C. murale* germination.

Thus we suggest to use *C.murale* as a suitable model plant for investigation of physiological and biochemical mechanisms of growth and developmental processes.

Dynamics of sexually dimorphic traits in *Mercurialis perennis* L. (Euphorbiaceae) from Suva planina

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Sexual dimorphism (SD) is a common phenomenon that has attracted much research interest, but it has been far less studied in plants. In addition, although SD affects many aspects of phenotype, previous studies on plant species tended to leave some issues, like overall plant size or temporal patterns of variation in SD, out of focus. The aim of this study was to examine interannual variation in sexually dimorphic traits in male and female individuals of *Mercurialis perennis* L. (Euphorbiaceae), a dioecious anemophilous species with wide geographic and altitudinal distribution in Europe. During a 3-year period (2007–2009), we investigated a population of *M. perennis* from Suva planina (at the altitude of 1100 m asl) and analyzed the following traits: plant size (above-ground height), number of flowers per plant and the extent of reproductive allocation (RA). We found moderate values of male-biased size dimorphism and a decreasing trend in absolute values of sexual dimorphic index (SDI), from 0,087 in 2007 to 0,030 in 2009; intersexual size difference was significant only in 2007 sample. Both sexes flowered at smaller sizes in 2009 compared to previous years, but no trend was observed for the number of flowers per plant. Female plants invested more in reproduction; difference in RA was significant not only between sexes, but between years as well – the estimated RA values were significantly greater in 2009 than in 2008 in both sexes. We discuss the obtained results in the context of current hypotheses concerning size dimorphism and differences in resource investment.

Effect of IBA on root formation in *Beta vulgaris* L.

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Sugar beet is the major sucrose-producing crop grown in temperate zones. The aim of this study was to investigate the effect of different concentrations of IBA on root formation in few cultivars of *Beta vulgaris* L. After micropropagation, shoots of few cultivars of *B. vulgaris* L. were rooted on Gamborg media containing 0.1, 0.5, 1.0 and 2.0 mg/l indole-3-butyric acid (IBA). The number of rooted plantlets and roots length were recorded at three DAIs (25, 25-44 and 44-45). The time of cultivation was also studied factor. Different concentrations of IBA had significant effects on the examined parameters. The rooting ability increased with concentrations of IBA. IBA at level 1.0 mg/l and 2.0 mg/l were found to be the best treatment for rooting of micropropagated shoots. The percentage of rooted plantlets is higher for longer duration of treatment in culture. Key words: In vitro root formation, *Beta vulgaris* L. IBA.

Effect of IBA on root formation in *Beta vulgaris* L.

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Sugar beet is the major sucrose-producing crop grown in temperate zones. The aim of this study was to investigate the effect of different concentrations of IBA on root formation in few cultivars of *Beta vulgaris* L. After micropropagation, shoots of few cultivars of *B. vulgaris* L. were rooted on Gamborg media containing 0.1, 0.5, 1.0 and 2.0 mg/l indole-3-butyric acid (IBA). The number of rooted plantlets and roots length were recorded at three DAIs (25, 25-44 and 44-45). The time of cultivation was also studied factor. Different concentrations of IBA had significant effects on the examined parameters. The rooting ability increased with concentrations of IBA. IBA at level 1.0 mg/l and 2.0 mg/l were found to be the best treatment for rooting of micropropagated shoots. The percentage of rooted plantlets is higher for longer duration of treatment in culture. Key words: In vitro root formation, *Beta vulgaris* L. IBA.

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**Phytochemistry and Phytotherapy
Fitohemija i fitoterapija**

Antiinflamatorna, antimikrobna i antioksidativna aktivnost trihloretilenskog ekstrakta zečje lobode (*Hieracium pilosella* L.)

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U radu je ispitivana antiinflamatorna, antimikrobna i antioksidativna aktivnost trihloretilenskog ekstrakta zečje lobode (*Hieracium pilosella* L). Ekstrakt je dobijen Soxhlet ekstrakcijom, na temperaturi ključanja rastvarača, pri odnosu biljni materijal/rastvarač 1/20 m/v, za vreme od 240 minuta. Identifikacija umbeliferona, luteolin-7-O-glukozida i apigenin-7-O-glukozida u ekstraktu izvršena je HPLC analizom. Sadržaj ukupnih fenola određen je Folin-Ciocalteu metodom, a sadržaj ukupnih flavonoida spektrofotometrijski primenom AlCl₃. Antiinflamatorna aktivnost ispitana je merenjem inhibicije ciklooksigenaze 1 i 2 (COX1 i COX2), pomoću RP-HPLC/MS/MS tehnike. Za određivanje antimikrobne aktivnosti korišćena je disk difuziona metoda. Testirano je sedam standardnih sojeva bakterija i dva standardna soja gljiva. Antioksidativna aktivnost trihloretilenskog ekstrakta na stabilni 1,1-difenil-2-pikril hidrazil (DPPH) radikal određena je spektrofotometrijski. Sadržaj fenola u suvom ekstraktu iznosi 93,50 mg GKE/1g suvog ekstrakta. Sadržaj flavonoida u suvom ekstraktu iznosi 40,83 mg RE/1g suvog ekstrakta. Sa koncentracijom trihloretilenskog ekstrakta od 2,5 mg/cm³ postiže se stepen neutralisanja DPPH radikala od 56,8 %. Stepen neutralisanja COX1 i COX2 trihloretilenskim ekstraktom u koncentraciji 20 µg/cm³ iznosi 84,0 i 59,0 %, respektivno. Ispitivani ekstrakt ispoljio je najveću antimikrobnu aktivnost na bakteriju *Bacillus subtilis*.

Antimikrobna aktivnost etarskih ulja nekih vrsta roda *Satureja* L. protiv fitopatogene bakterije *Erwinia amylovora*

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U ovom radu je ispitivana antimikrobna aktivnost etarskih ulja biljnih vrsta *S. kitaibelii* Wierzb. ex Heuff., *S. montana* ssp. *montana* L., *S. adamovicii* Čilić i *S. fukarekii* Čilić protiv fitopatogene bakterije *Erwinia amylovora* za koju se veruje da se je iz Severne Amerike raširila po celom svetu (osim Australije i Japana). Ona izaziva sistemsku infekciju jabuka i drugih *Rosaceae* koja je poznata kao "plamenjača" (fireblight). Ispitivanje je vršeno uz pomoć dve metode: disk-difuzione i mikrodilucione. Rezultati su pokazali da je ova bakterija veoma osetljiva na delovanje ispitivanih ulja. Najveće zone inhibicije su izmerene kod etarskog ulja vrste *S. montana* ssp. *montana* (25 mm), a najniže vrednosti za minimalnu inhibitornu i baktericidnu koncentraciju su dobijene za ulje vrste *S. adamovicii* (MIC=MBC=0,09 g/ml). Kod svih ispitivanih ulja vrednosti za MIC su bile jednake vrednostima za MBC, što znači da ulja, u veoma niskim koncentracijama, deluju baktericidno i mogu predstavljati prirodni izvor neškodljivih herbicida.

Stability of flavonoids toward UV-irradiation and inhibition of lipid peroxidation: correlation of structure and function

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Stability of flavonoids toward UV-irradiation and inhibition of lipid peroxidation: correlation of structure and function Dragan Cvetković and Dejan Marković University of Nish, Faculty of Technology, Leskovac, Serbia Flavonoids make big class of natural polyphenol compounds of low molecular mass. They are widely distributed in plant world, mostly in plants leaves (epidermal layer), seeds and flowers; so far about 4000 flavonoids have been isolated. Flavonoids act in biological systems as antioxidants, enzyme inhibitors, photosensitizers, energy

transducers, expressing notable anti-cancer behaviour. The updated studies connected flavonoids antioxidant activity with presence (or absence) of OH-group at C-ring 3-position, in combination with catechol B-ring structures. The importance of this position (wherever exists, like in flavonols – represented by quercetin) may be estimated – among other ways – by comparing stabilities of quercetin and rutin (flavon representative – not having 3-OH group) toward an externally induced stress, like UV-irradiation. The plant answer on the increased presence of highly-energetic UV-B fraction in sunlight spectrum is, among others, an increased synthesis of UV-B absorbing pigments, mostly flavonoids (flavonoids screening effect). The last fact was exploited in this work. Their chemical structures permit them to be excellent UV-absorbers which enables them to be (a) efficient preventive antioxidants, because they reduce initiation, e.g. decrease production of free radicals (which is one of the main consequences of continuous UV-irradiation). But, in the same time they are (b) very effective chain-breaking antioxidants, acting as scavengers of the created radical species. Both (a) and (b) are especially important for inhibition of lipid peroxidation (LP) process. There is undoubted correlation between stability of flavonoids toward UV-irradiation and degree of LP suppression (case (a)). This contribution deals with studies of two selected flavonoids, quercetin and rutin, subjected to continuous, prolonged irradiation from three UV-sub-ranges: UV-A, 320-400 nm; UV-B, 290-320 nm; UV-C, 200-280 nm), in solution, in the presence or in the absence of „protective target“ soy bean lecithin. The change of the flavonoids stability was related to degree of the (UV-) induced lecithin peroxidation, under the same irradiation regime. The 3-OH group was found to play the crucial role concerning the flavonoids photostability: the flavonoids with 3-OH in the structure are less resistant toward UV-irradiation – in this case quercetin undergoes to faster destruction (bleaching) than rutin, and the bleaching is energetically-dependent (following UV-C > UV-B > UV-A order). TBA-MDA test used to follow changes in the two flavonoids antioxidant activities – toward lecithin as the protective target – also expressed the same UV-energy-dependent order as the outcome. It was also found that rutin antioxidant activity is more influenced by UV-effect than quercetin's.

Antioxidant activity of *Satureja kitaibelii* Wierzb. ex Heuff., *Lamiaceae*

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The aerial parts of *Satureja kitaibelii* were used in serbian traditional medicine as herbal remedy for respiratory, digestive and urinary tract diseases, as well for inflammation of skin and mucous membranes. The plant material was collected in July 2008 on mountain Rtanj (Serbia) and extracted with cyclohexane and 70% methanol (V/V). DPPH radical scavenging activity and inhibitory effect of MeOH extract on lipid peroxidation (LP) in liposomes of methanol extract were measured according to the modified methods described previously by Kundaković et al. (2006) and Kukić et al. (2006). Fifty percent of radical scavenging activity in DPPH test was obtained with $34,5 \pm 2,1$ µg/ml of methanol extract, while IC₅₀ of LP inhibition in liposomes was $204 \pm 2,99$ µg/ml.

Komparacija stabilnosti flavonola i flavona prema dejstvu UV-zračenja: slučaj kvercetina, morina i rutina

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Komparacija stabilnosti flavonola i flavona prema dejstvu UV-zračenja: slučaj kvercetina, morina i rutina Jelena Zvezdanović¹, Dejan Marković¹, Blaga Radovanović² 1 Tehnološki fakultet, Leskovac 2 Prirodno-matematički fakultet, Niš, Odsjek za hemiju Flavonoidi čine veliku klasu prirodnih polifenolnih jedinjenja male molekulske mase i široko su rasprostranjeni u biljnom svetu. Najviše ih ima u listovima, semenu, kori i cvetovima biljaka, a do sada je izolovano više od 4,000 različitih flavonoida. Nađeno je da se ova jedinjenja u biološkim sistemima mogu ponašati kao antioksidansi, enzimski inhibitori, fotosenzibilizatori, prenosioci

energije, respiratori u biosintezi, a imaju i antikancerogene osobine. Za antioksidacionu aktivnost posebno je važna 3-OH grupa (C-prstena – Slika 1) u kombinaciji sa kateholnom strukturom B-prstena. Značaj ove pozicije (tamo gde je ima, kao što je to slučaj sa flavonolima čiji je predstavnik kvercetin) se između ostalog može oceniti kompariranjem stabilnosti kvercetina i rutina (predstavnik flavona koji nema 3-OH grupu) u odnosu na spolja indukovani stres, kao što je npr. UV zračenje. Ali i različit položaj istih supstituenata na B-prstenu (meta- i orto-položaj OH-grupa, u slučaju morina i kvercetina, respektivno) može uticati na stabilnost flavonoida. Odgovor biljaka na povećano prisustvo visoko-energetične UV-B frakcije u spektru sunčevog zračenja jeste između ostalog i povećana sinteza UV-B apsorbujućih pigmenta, i to flavonoida pre svega ("screening" efekat flavonoida). Ovaj rad se bavi pitanjem stabilnosti kvercetina, morina i rutina na dejstvo zračenja iz tri UV-podopsega (UV-A, 320-400 nm; UV-B, 290-320 nm; UV-C, 200-280 nm) u rastvoru metanola. Pokazano je najpre da 3-OH grupa ima presudan uticaj na fotostabilnost flavonoida – jedinjenja koja imaju ovu grupu su mnogo manje otporna na zračenje UV-svetlošću: u ovom slučaju kvercetin podleže bržoj destrukciji (bleaching-u) od rutina, pri čemu je bleaching energetski zavistan (opada po redosledu UV-C > UV-B > UV-A). Ali, takodje je pokazano da je detektovani UV-efekat različit za dva flavonola (kvercetin i morin); morin podleže bržoj destrukciji, a u njegovom apsorpcionom spektru detektovana je i potpuno nova traka što ukazuje na značajne promene u njegovoj strukturi.

Essential Oil Composition of *Stachys menthifolia* Vis.

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Stachys menthifolia Vis. (*Lamiaceae*) is an endemic species from the Balkan Peninsula spread throughout Albania, Greece, Montenegro, and Croatia. Aerial parts of the plant were collected from its natural habitat near Dubrovnik. Hydrodistilled volatile oil obtained from the plant material of *S. menthifolia* was subjected to gas chromatographic analysis coupled to mass spectrometry. More than 70 compounds were identified, representing 94.5% of the total oil. The major constituents of oil were diterpenoid abietatriene (11.7%), and sesquiterpene hydrocarbons alpha-bisabolene (8.4%), and beta-caryophyllene (7.4%). Presented results are comparable to our previous findings on essential oil composition of the same species from Biokovo Mountain, with small differences in quantitative and qualitative constitution of oil. Although plants belonging to the *Stachys* genus show significant variability in their chemical compositions depending on the location and stage of

plant development, this work indicates that chemical polymorphism of endemic *S. menthifolia* does not manifest in the region of Croatian Mediterranean area.

Volatile Constituents of *Satureja cuneifolia* Ten. from Biokovo Mountain

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Satureja cuneifolia Ten. is well known aromatic plant growing wild in Mediterranean area. Volatile profile of odorous parts of *S. cuneifolia*, collected from the natural habitat at Biokovo Mountain, was analyzed by capillary GC-MS analysis. The identification of the volatiles was accomplished by computer library search, retention indices RI, and the visual comparison of mass spectra with those found in the literature and in the laboratory own database. This work presents the comparison on volatile chemical composition of *S. cuneifolia* obtained by hydrodistillation and headspace technique. Exactly seventy components were identified in both samples, representing 82.4% and 97.7% in total, for hydrodistilled oil and headspace, respectively. The most abundant compounds in essential oil were carvacrol (16.8%), and oxygenated sesquiterpenes spathulenol (12.7%), caryophyllene oxide (9.0%), amorpho-4,9-dien-2-ol (6.4%), and alpha-cadinol (4.5%). In contrast to essential oil composition, the main constituents of headspace sample were p-cymene (22.6%), linalool (20.1%), limonene (9.3%), and carvacrol methyl ether (5.2%) that all were not found in hydrodistilled oil. Presented results significantly differ from data published earlier. Essential oil of the same species from Croatia showed variations in quantitative and qualitative chemical composition, depending on the locality and environmental conditions. However, essential oil of *S. cuneifolia* from Turkey had similarity in qualitative, but not in quantitative chemical composition with our results. These findings are in agreement with the fact of complex chemical polymorphism of *Satureja* genus.

Antioksidativna i antimikrobna aktivnost metanolnog ekstrakta biljke *Acinos alpinus*

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Ispitivana je antioksidativna i antimikrobna aktivnost metanolnog ekstrakta biljke *Acinos alpinus* sa požarišta na planini Vidlič, dve godine nakon požara. S obzirom da u mnogim slučajevima ne postoji linearna zavisnost između koncentracije ekstrakta i antioksidativne aktivnosti, u ovom radu je ispitivana zavisnost antioksidativne aktivnosti od polazne koncentracije metanolnih ekstrakta biljke *Acinos alpinus* (Lamiacea). Ukupan sadržaj fenolnih jedinjenja u metanolnom ekstraktu, određen spektrofotometrijskom metodom po Folin-Ciocalteu, iznosio je 1,279 mg/ml ekvivalenata galne kiseline po mg suvog ekstrakta. Određivanje "scavenging" antioksidativnog slobodno-radikalnog kapaciteta prema 2, 2-difenil-1-pikrilhidrazil radikal (DPPH) je vršeno za različite koncentracije ekstrakta biljke, a zatim su dobijene vrednosti upoređivane sa rezultatima dobijenim za standardne antioksidanse, kao što su butil- hidroksitoluen (BHT) i rutin. DPPH testom je utvrđeno da sa porastom koncentracije ispitivanog rastvora, rutina i BHT u intervalu 0,00625-0,125 mg/ml, raste i procenat inhibicije DPPH, pri čemu ta zavisnost nije linearna. Ukupna redukciona moć ekstrakta i standardnih rastvora različitih polaznih koncentracija direktno je proporcionalna polaznim koncentracijama, pri čemu zavisnot u ispitivanom intervalu koncentracija nije linearna za sve tri ispitivane serije rastvora. Najveću ukupnu redukcionu moć pokazuje BHT, a najmanju metanoni ekstrakt biljke. Antimikrobna aktivnost metanolnog ekstrakta biljke *Acinos alpinus*, ispitivana je na sledeće vrste mikroorganizama: *Salmonella abony* NCTC 6017, *Pseudomonas aeruginosa* ATCC 9027, *Bacillus subtilis* ATCC 6633, *Staphylococcus aureus* ATCC 6538, *Escherichia coli* ATCC 8739, *Candida albicans* ATCC 10231, kao i *Aspergillus niger* ATCC 16404 primenom disk difuzione metode, pri čemu je ekstrakt pokazao aktivnost na *C. albicans* i *E. coli* u koncentraciji od 240 µg/disku.

Antioksidaciona aktivnost metanolnih ekstrakata maline, kupine, višnje i ribizle

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U ljudskoj ishrani veoma značajno mesto zauzimaju pojedine voćne vrste, kako zbog svojih hranljivih komponenata tako i zbog posedovanja lekovitih karakteristika. Cilj ovog rada bilo je ispitivanje antioksidacione aktivnosti plodova maline (*Rubus idaeus*, fam. Rosaceae), kupine (*Rubus fruticosus* fam. Rosaceae), višnje (*Prunus cerasus*, fam. Rosaceae) i ribizle (*Ribes rubrum*, fam. Grossulariaceae), zbog velike zastupljenosti u ishrani kako u svežem stanju, tako i u prerađenom obliku. Određivana je ukupna antioksidaciona aktivnost metanolnih ekstrakata navedenog voća lokalnog porekla, koje je čuvano zamrznuto u trajanju od 3 meseca na temperaturi od -180C. Najpre su testirane antioksidacione osobine metanolnih ekstrakata primenjujući metodu koja se zasniva na reakciji antioksidanasa sa 2,2-difenil-1-pikril hidrazil radikalom (DPPH), spektrofotometrijski na $\lambda=515$ nm i rezultati su prikazani kao EC50. Najveću ukupnu antioksidacionu sposobnost pokazuje kupina (EC50=24,81 mg/ml), pa malina (EC50=26,40 mg/ml) i ribizla (EC50=34,29 mg/ml), dok višnja (EC50=40,07 mg/ml) ima najmanju antioksidacionu moć. U svrhu sagledavanja koja vrsta jedinjenja dominantno doprinosi antioksidacionoj aktivnosti izabranog voća, pripremljena su dva ekstrakta (1 i 2), od kojih je jedan sadržao fenolne kiseline i flavonole, a drugi antocijane. Određivana je antioksidaciona sposobnost primenom DPPH metode praćenjem koncentracije DPPH koji je preostao u reakcionoj smesi sa protokom vremena, za različite polazne koncentracije ekstrakata. Polazna koncentracija svih voćnih ekstrakata je u obrnutoj srazmeri sa koncentracijom preostalog DPPH radikala, odnosno direktno je proporcionalna antioksidacionoj aktivnosti. Ekstrakt koji sadrži flavonole i fenolne kiseline (ekstrakt 1) ima manju sposobnost „hvatanja“ DPPH radikala od ekstrakta koji sadrži antocijane (ekstrakt 2).

Antioksidativne osobine nekih biljnih vrsta sa požarišta na planini Vidlič

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U cilju sagledavanja uticaja požara koji se dogodio 2007. godine na planini Vidlič, na antioksidativne osobine biljaka, pripremljeni su metanolni ekstrakti sledećih biljnih vrsta: *Ajuga chamaepitys* (Lamiaceae), *Glechoma hirsuta* (Lamiaceae), *Satureja montana* (Lamiaceae), *Calamintha nepeta* (Lamiaceae), *Artemisia lobelii* (Asteraceae), *Hypericum perforatum* (Clusiaceae), *Geranium macrorrhizum* (Geraniaceae). Kontrolnu grupu su činile iste biljne vrste sa sličnih staništa koja nisu bila zahvaćena požarom. Antioksidativne osobine su procenjivane primenom sledećih metoda: određivanje ukupne redukcionne moći, Folin-Ciocalteu metoda za određivanje sadržaja ukupnih fenola, određivanje ukupnog sadržaja flavonoida i "scavenging" antioksidacioni slobodno radikalski kapacitet prema 2,2-difenil-1-pikrilhidrazil (DPPH) radikal. Metanolni ekstrakti biljnih vrsta *Ajuga chamaepitys*, *Glechoma hirsuta* i *Hypericum perforatum* sa lokacije van požarišta, imaju veće vrednosti antioksidacionih osobina primenom sve četiri metode u odnosu na ekstrakte istih biljnih vrsta sa lokacije na kojoj je bio požar. Biljke sa lokacije van požarišta uglavnom pokazuju veće vrednosti ukupne redukcionne moći. Najveću aktivnost pokazuje biljka *Geranium macrorrhizum* (23,24 mg/mL ekvivalenata askorbinske kiseline) a najmanju *Ajuga chamaepitys* (3,19 mg/mL ekvivalenata askorbinske kiseline). Veći sadržaj flavonoida imaju ekstrakti biljaka van požarišta i tu se izdvaja *Ajuga chamaepitys* sa najvećim sadržajem flavonoida (539,88 µg/ml ekvivalenata rutina) a *Artemisia lobelii* (137,25 µg/ml ekvivalenata rutina) ima najmanji sadržaj flavonoida. Ukupan sadržaj polifenola generalno je veći kod ekstrakata biljaka van požarišta. Sa najvećom vrednošću se izdvaja ekstrakt biljne vrste *Geranium macrorrhizum* (23,239 mg/ml ekvivalenata galne kiseline) a najmanji sadržaj je uočen kod ekstrakta vrste *Artemisia lobelii* (3,189 mg/ml ekvivalenata galne kiseline). Rezultati za prikazane tri metode se odnose na 1 mg suvog ekstrakta. DPPH test pokazuje da biljke van požarišta pokazuju veći antioksidativni kapacitet prema „hvatanju“ DPPH radikala. Najveći antioksidativni kapacitet ima *Satureja montana* (EC50= 4,07 mg/ml), a najmanju *Hypericum perforatum* (EC50=10,48mg/ml). investigation pointed on similar protective activity of both investigated species.

Antimicrobial and antioxidant activity of *Alnus glutinosa* (L.) Gaertn., *A. incana* (L.) Moench and *A. viridis* (Chaix) DC. Extracts

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This study was undertaken in order to evaluate antimicrobial and antioxidant activity of three *Alnus* species. Methanol and water extracts obtained from dry leaves and bark of the plants was screened against six Gram-negative and Gram-positive bacteria as well as two fungal strains using disc diffusion method. All extracts of three *Alnus* species showed high antibacterial activity against *Escherichia coli*. Methanolic extract of leaves of *A. viridis* was the only one that showed significant antibacterial activity against all six bacterial species (*Bacillus subtilis*, *Staphylococcus aureus*, *Micrococcus luteus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella abony*) including antifungal activity against *Candida albicans* and *Aspergillus brasiliensis*. Antioxidant activity of methanolic extracts was determined by 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging test. All samples showed activity higher than thymol, which was used as a positive probe.

Leaf Aroma Volatiles of Some Representatives of the *Cinnamomum* Genus are cultivated in Hothouse Conditions of Belarus

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Analysis of dried leaf aroma volatiles of the *Cinnamomum camfora*, *C. glanduliferum* and *C. tamala* was undertaken by using of a Hewlett Packard gas chromatograph Model 5090. As things turned out species differed in percentage proportions of the camphor, eugenol, limonene, pinene, linalool and others.

Percentage proportion of camphor in leaves of these plants may be significant chemosystematic delineation.

Health properties of extracts of two wild garlic taxa (*Allium vineale*, Alliaceae)

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Although the health benefits of different garlic preparations (*Allium sativum*, Alliaceae) are well documented, there is very few data on chemistry and health properties of different taxa of wild garlic, *A. vineale*. With respect to this, in the present study wide array of biological and pharmacological properties of two varieties of *A. vineale* (*A. vineale* subsp. *vineale* and *A. vineale* subsp. *compactum*) comparing to *A. sativum* extracts are presented. Antioxidant activity was evaluated as free radical-scavenging capacity (RSC), together with the effect on lipid peroxidation (LP). RSC was assessed by measuring the scavenging activity of garlic extracts on 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical and hydrogen peroxide. Effects on LP were evaluated by following the activities of examined garlic extracts in Fe²⁺/ascorbate and Fe²⁺/H₂O₂ systems of induction. Antimicrobial activity was tested against several bacterial strains and fungi. Furthermore, the influence of examined extracts on gut microflora was evaluated. Furthermore, the effects of the extracts on different liver enzymes after intoxication with carbon tetrachloride were assayed. In all of the examined model systems extracts of *A. vineale* exhibited stronger antioxidant effects comparing to garlic. Similar results were obtained for antimicrobial activities and effects on gut microflora. In vivo investigation pointed on similar protective activity of both investigated species.

Antioksidativne osobine pojedinih vrsta povrća

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Značaj povrću u ishrani daju hranljive i biološki aktivne supstance koje mogu smanjivati rizik od malignih oboljenja, oboljenja krvnih sudova, srca, zbog čega se povrće sve više smatra i pomoćnim lekovitim sredstvom. Zato je za cilj našeg rada postavljeno ispitivanje antioksidacione aktivnosti nekih vrsta povrća koje se koriste u ishrani. Ispitivana je antioksidativna sposobnost sledećih vrsta povrća: celer (*Apium graveolens*, fam. Apiaceae), peršun (*Petroselinum crispum*, fam. Apiaceae), šargarepa (*Daucus carota* fam. Apiaceae), paškanat (*Pastinaca sativa* fam. Apiaceae), kupus (*Brassica oleracea* fam. Brassicaceae), cvekla (*Beta vulgaris* fam. Amaranthaceae) i spanać (*Spinacia oleracea* fam. Amaranthaceae). Biljke su lokalnog porekla. Merenjima ukupne redukcionne moći, izražene preko ekvivalenta askorbinske kiseline, najveću antioksidativnu aktivnost pokazuje spanać (13,753 mg/ml), dok najnižu pokazuju list peršuna (0.499 mg/ml) i koren celera (0.5244 mg/ml). Ukupan sadržaj flavonoida izražen je u odnosu na rutin kao standard, pri čemu maksimalan sadržaj flavonoida ima spanać (476.39 µg/ml), a minimalan celer (5.09 µg/ml). Za određivanje ukupnih polifenola primenjena je metoda prema Folin-Ciocalteu, a rezultati pokazuju da je najveći sadržaj polifenolnih jedinjenja prisutan u spanaću (5,847 mg/ml) a najmanji u celeru (0,031 mg/ml). Svi rezultati za prethodno primenjene tri metode se odnose na 1 mg suvog ekstrakta. Odredjivanje „scavenging” antioksidantnog slobodno-radikalskog kapaciteta vršeno je prema 2,2-difenil-1-pikrilhidrazil (DPPH) radikal. Najveću antioksidativnu aktivnost pokazuje spanać (EC50 4,68 mg/ml), dok najmanju sposobnost kao antioksidans ima list peršuna (EC50 860,56 mg/ml).

Antioxidant activity of extracts of *Helleborus odorus* Waldst. & Kit, *H. multifidus* Vis. and *H. hercegovinus* Martinis.

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This study was undertaken in order to evaluate possible antioxidative activity of three *Helleborus* taxa. Dry leaves and root of three *Heleborus* taxa were extracted with ethanol and water. Phytochemical evaluation of selected extracts was done using spectrophotometric methods and 1,1-Diphenyl-2-picrylhydrazyl radical – scavenging activity (DPPH) assay was used for measuring antioxidative activity of extracts. Phytochemical evaluation showed that leaves contain high level of total phenolic and flavonoid content. Results from the DPPH assay indicated that the activity of ethanol and water extract of leaves was higher than that of positive control (thymol). Extracts from roots of *H. odorus* also displayed higher antioxidant activity than positive probe, while *H. mulifidus* and *H. hercegovinus* roots extracts were less effective. The IC₅₀ values varied from 0.25 mg/mL to 6.18 mg/mL. Statistically significant correlation between total phenolic content and antioxidative pr operties indicates that these compounds contributed to antioxidant activity.

Antimikrobna aktivnost metanolnih ekstrakata odabranih vrsta lišajeva familije Parmeliaceae

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Lichens have been used in folk medicine as astringents, tonics and for pulmonary disease. Scientific researches justified antibiotic, antiviral, antitumor, analgesic, and antipyretic properties of lichen's extracts. In this work the antimicrobial activity of methanol extracts of four Parmeliaceae species: *Hypogymnia physodes* (L.) Nyl., *Evernia prunastri* (L.) Ach., *Flavoparmelia caperata* (L.) Hale and *Parmelia sulcata* Taylor were determined. Material and methods: Extracts were prepared by extraction of dry and ground lichens with methanol on ambient temperature without exposure to direct sunlight (24 h). The antimicrobial assay were performed using the disc diffusion technique placing 40 µL of methanol solution of extract concentration of 25mg/mL on discs (12.7 mm diameter). Followed microorganisms were used: Gram positive bacteria (*Enterococcus* sp, *B. subtilis*, *Sarcina lutea*, *Micrococcus flavus*, *S. aureus*, *Cl. piogenus*), Gram negative bacteria (*E. coli*, *P. vulgaris*, *S. enteritidis*, *P. aeruginosa*, *K. pneumoniae*) and fungi (*A. niger* and *C. albicans*). Results: Agglomerative cluster analysis (AHC) of obtained results can be summarized in the following : • *H. physodes* and *E. prunastri* extracts manifested strongest activity (diameter of inhibition zones ranged from 17 to 26 mm) than *F. caperata* and *P. sulcata* extracts (diameter of inhibition zones ranged from 15 to 22 mm). • Based on microorganisms' susceptibility towards extracts two groups were distinguished: the first consisting of Gram negative bacteria (*P. vulgaris* and *K. pneumoniae*) and fungi (*A. niger* and *C. albicans*) and the second group including all Gram positive bacteria and three Gram negative bacteria (*E. coli*, *S. enteritidis* and *P. aeruginosa*). Conclusion: The examined extracts showed moderate and nonselective antibacterial activity a bit lower than activity of tetracycline standard. It is worthy of mentioning that *H. physodes* and *E. prunastri* extracts inhibited *A. niger* and *C. albicans* more than nistatine standard which suggests their possible use as active ingredients in phyto-therapeutics.

Lichens As Source of Versatile Bioactive Compounds

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Lichens represent unique symbiosis of fungi (mycobionts) and algae (photobionts). Living in extreme conditions they developed various compounds to survive. Many of these original compounds have proven biological activities (antibiotic, antimycotic, antiviral, antitumor, antioxidant, etc) . This paper is synthesis of currently known data about lichens extracts and their potential use in pharmaceuticals and medicine.

Uticaj nekontrolisanog požara na antioksidantnu i antimikrobnu aktivnost nekih biljnih vrsta iz familije Lamiaceae

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Biljne vrste iz familije Lamiaceae imaju lekovita svojstva i primenjuju se u tradicionalnoj medicini. Na planini Vidlič zabeležen je požar u leto 2007. godine koji je bio velikih razmera i trajao je dugo, te je bilo je potrebno sagledati neke od mogućih promena u antioksidativnim i antimikrobnim karakteristikama biljaka iz navedene familije. Shodno tome vršeno je ispitivanje antioksidativne aktivnosti metanolnih ekstrakata biljnih vrsta *Ajuga genevensis*, *Lamium galeobdolon*, *Teucrium chamaedrys*, *Acinos alpinus*, *Calamintha nepeta*, *Teucrium montanum*, *Satureja montana* i *Salvia austriaca*, sa i van opožarenog područja, kvantifikacijom sledećih parametara antioksidativnosti: određivanje sadržaja ukupnih fenola (Folin-Ciocalteu metodom u odnosu na galnu kiselinu), određivanje sadržaja flavonoida (u odnosu na rutin), određivanje ukupne redukcionne moći (prema askorbinskoj kiselini) i određivanje "scavenging" antioksidacionog slobodno-radikalskog kapaciteta (prema 2,2-difenil-1-pikrilhidrazil (DPPH) radikal).

Najveći sadržaj fenola ima biljka *Teucrium chamaedrys* sa lokaliteta van požarišta (145,73 µg/ml ekvivalenta galne kiseline), dok je najveći sadržaj flavonoida određen u biljci *Satureja montana* sa lokaliteta požarišta (6,14 µg/ml

ekvivalenta rutina). Kod biljne vrste *Teucrium montanum*, van požarišta, detektovana je najveća redukciona moć (59,30 µg/ml ekvivalenta askorbinske kiseline). Najveću vrednost „scavenging“ antioksidantnog slobodno-radikalskog kapaciteta prema DPPH radikalu pokazuje ekstrakt biljke *Satureja montana* sa opožarenog područja (15,42 %). Svi rezultati su prikazani za metanolne ekstrakte koncentracije 1 mg/ml.

Antimikrobna aktivnost metanolnih ekstrakata navedenih biljnih vrsta ispitivana je disk difuzionom metodom na sedam vrsta mikroorganizama: *Salmonella abony* NCTC 6017, *Pseudomonas aeruginosa* ATCC 9027, *Bacillus subtilis* ATCC 6633, *Staphylococcus aureus* ATCC 6538, *Escherichia coli* ATCC 8739, *Candida albicans* ATCC 10231 i *Aspergillus niger* ATCC 16404. Ekstrakt biljke *Satureja montana*, van požarišta, (246 µg po disku), pokazao je aktivnost na sve mikroorganizme, osim na *B. subtilis* i *A. niger*. Najbolje dejstvo pokazao je na *S. abony* (zona inhibicije 20 mm) i *C. albicans* (zona inhibicije 20 mm). Ekstrakt *Acinos alpinus*, sa lokaliteta požarišta, bio je aktivan na tri mikroorganizma (936 µg po disku): *S. abony*, *S. aureus* i *C. albicans*, sa najboljim dejstvom na *C. albicans* (zona inhibicije 21 mm).

Biological effects of rosemary essential oil (*Rosmarinus officinalis* L.)

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Rosemary is well known as a spice and widely used plant in ethnomedicine worldwide. In this paper, commercial essential oil of rosemary was tested for antimicrobial, cytotoxic activity together with its effect on germination. Antimicrobial activity testing showed moderate effect to both G-positive and G-negative bacteria. In order to determine its effect to the cell wall, spectrophotometric analysis was performed. It was determined that rosemary affects the cell wall of bacterial cell.

Cytotoxic activity of *Rosmarinus officinalis* essential oil had been evaluated. As a plant object, germinative bulbs of *Allium cepa* were used. Cytotoxic activity that corresponded to the concentration of essential oil was determined. It had been noticed that rosemary essential oil affected mitotic phase i.e. it significantly slowed down the mitosis. Also, investigation of rosemary essential oil's activity to

germination was performed. It was determined that it had high effect to the germination. Concentration of 5 mg/ml completely inhibited the germination of *Triticum vulgare* and *Lactuce sp.*

Content of totally organic acids in plants from fire affected forest

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In 2007 it had been catastrophic fire on Vidlic mountain. It had been burned down nearly 1000 hectares of forest. That year vegetation was totally destroyed. Ecosystems affected by fire are ecosystems with great changes in every ecological parameter. Such ecosystems can recover by natural succession. Places like that are occupied by pioneer plants which start one natural cycle. In these paper it has been monitored content of totally organic acids in plants from fire affected forest. As a control it has been used same species plants from forest which had not been affected by fire. Results indicate that content of totally organic acids from plants from affected forest was higher then those in plants from no affected forest. Only in one case, in one species (*Aegopodium podagraria*), it was vice versa.

Activity of catalase on *Geranium macrorrhizum* L. caused by fire on habitats of Vidlič Mountain

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In this comparative study were determined the activity of catalase (EC 1.11.1.6, H₂O₂:H₂O₂ oxidoreductase) enzyme on different parts of plant species *Geranium macrorrhizum* L. (Geraniaceae) from two habitats on Vidlic Mt. on Eastern Serbia. The first group of plant samples used for determination, were obtained from the habitat that is affected by fire two years ago. Measuring were carried out simultaneously in samples of the control group of plants from habitat nonaffected by fire. Determination of enzyme activity was carried out at the root, leaves and flowers of plant species *G. macrorrhizum*. Catalase activity was measured using the gasometric method and the values obtained for the activity were expressed as ml of O₂ for 3 minutes. Values obtained for the catalase activity on parts of plants from the habitat affected by fire ranged from 11.36 to 17.17 ml O₂/3min. Values for activity in plant parts of the control group of plant ranged from 8.56 to 12.12 ml O₂/3min. Presented results show a significant increase in catalase activity in individuals from habitats affected by fire in relation to the control group. Increased catalase activity is a consequence of oxidative stress caused by chemical changes in soil that generated by fire.

Biljarski kalendar subregiona Pirot

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Za pravilnu upotrebu i dejstvo lekovitog bilja neophodno je da se precizno odredi kalendar njegovog branja. U ovom radu su dati rezultati istraživanja lekovitih biljaka subregiona Pirot sa pregledom korišćenja biljnih vrsta po mesecima. Dokazano je prisustvo 324 biljnih vrsta koje se smatraju oficinalnim ili se koriste u narodnoj medicini. Najveći broj lekovitih biljaka subregiona se sakuplja u junu mesecu. Od lekovitih delova najviše se koristi herba, odnosno nadzemni deo biljke u cvetu (120 biljaka). Kod 91 biljke se u lekovite svrhe koriste listovi, kod 43 plod, a kod 28 biljaka kora sa stabla. Kod 44 predstavnika vadi se koren, a kod 26 vrsta lekovite materije su smeštene u rizomu. Za svaku vrstu dat je prikaz staništa, kao i pregled osnovnih aktivnih materija koje ulaze u njen hemijski sastav. Najveći broj lekovitih biljaka subregiona sadrži tanine (153 biljke), slede biljke sa sadržajem flavonoida (86), biljke sa visokim sadržajem etarskog ulja (72), zatim saponozidne biljke (53), one koje sadrže sluzi (41), i alkaloidne biljke (35). Naglašeno je i prisustvo otrovnih biljnih vrsta u subregionu. Posebno su izdvojeni predstavnici retkih lekovitih vrsta, što je od značaja za njihovu zaštitu i menadžment resursom lekovitog bilja na istraži vanom području. Pojedini lekoviti predstavnici su zaštićeni kao prirodne retkosti ili se nalaze pod kontrolom korišćenja i prometa na tržištu. Određene lekovite vrste, kao što su venerina vlas (*Adiantum capillus-veneris*), pikobojka (*Swertia punctata*) i zelena jova (*Alnus viridis*) smatraju se krajnje ugroženim taksonima flore Srbije, te se ne mogu sakupljati i koristiti u lekovite svrhe.

Mediterranean phytochemical plant diversity. The case of calabrian flora

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The Mediterranean is one of a major world centre of plant diversity, housing some 25-30 000 species, up to 50% of which are endemic to the region. Mediterranean basin is also one of a key centre of crop origins and diversity and the area is also one of the world wide well known source of medical and aromatic plants. The repertory of plant and uses can be find within the written medieval traditions. The folk medicine in the area has been preserved through the oral transmission of information and adapted on the base of direct experience of the different pathologies and remedies. The use of plants as food and medicines in Mediterranean Calabria is relevant in the local traditional health care system, since about 25% of the local flora are used. Many studies on the phytochemical compounds and biological activities of this rich heritage, in last decades were carried out by Phytochemical Laboratory (University of Calabria). The recent studies are focused mainly on antioxidant molecules and phytocomplex because the etiology of many diseases is based on the uncontrolled production of free radicals. The participation of free radicals as mediators of tissue damage has been, in fact, recognized in many pathophysiological processes such as inflammation, cancer, neurodegenerative diseases, etc.

The chemical composition of biologically active compounds and their quantitative characteristics depends from genotypic and phenotypic factors. In this sense it is necessary to organise a study at large scale for testing as more as possible species and populations for their chemistry, pharmaceutical and nutraceutic value. This requires a cooperation and collaboration of different research centres on the one hand and the optimisation of procedures for phytochemical and biological analysis on the other.

Efekat različitih metoda sušenja na hemijski sastav i prinos etarskog ulja biljke *Mentha longifolia* L.

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Metoda sušenja obično ima značajan uticaj na kvalitet i količinu etarskih ulja iz biljke. U ovom radu razmatran je uticaj različitih metoda sušenja na kvantitet i hemijski sastav etarskog ulja biljke *Mentha longifolia* L. Biljni materijal je sakupljan u fenološkoj fazi cvetanja 2009. godine sa područja opštine Prokuplje. Jedan deo prikupljenog biljnog materijala sušen je 15 dana u hladu na promajnom mestu, a drugi deo u laboratorijskoj sušnici na temperaturi 50°C. Osim navedenih načina sušenja *Mentha longifolia* L. je sušena i primenom savremene absorbcione sušare. Hemijski sastav etarskih ulja ispitan je metodom (GC FID i GC-MS). Na osnovu određenih parametara uočava se uticaj vrste sušenja na kvalitet ispitanog biljnog materijala. Po prinosu ulja ističe se materijal sušen u niskotemperaturnoj kondenzacionoj sušari NTKS (1,1%), a najmanji prinos zabeležen je kod materijala sušenog u laboratorijskoj sušnici (0,6%). Dominantna komponenta kod nane sušene na sva tri načina je piperiton sa različitim procentom zastupljenosti. Najveći sadržaj zabeležen je kod *Mentha longifolia* L sušene u NTKS (71,47%) dok je kod materijala sušenog na promajnom mestu i u laboratorijskoj sušnici sadržaj niži i iznosi 50,84 % i 43,05 %, respektivno.

In vitro antioxidant activity, total phenol and flavonoid contents of different *Origanum vulgare* L. extracts

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In this study were determined the concentration of phenolic compounds, flavonoids and in vitro antioxidant activity of different extracts, from the whole herb of *Origanum vulgare* L. using spectrophotometric methods. Oregano (*Origanum vulgare*, Lamiaceae) is a perennial herbaceous species that inhabit dry rocky

meadows and edge of bright deciduous forests of western and southwestern Eurasia and the Mediterranean region. It is known as aromatic plant and widely used in traditional medicine and pharmacy. Plant material was collected from the Pčinja river gorge, around Trgovište in south Serbia. The total phenolic content of the extracts ranged from 46.71 mg/g to 275.12 mg/g dry weight of extract, expressed as gallic acid equivalents. The total flavonoid concentrations varied from 22.85 mg/g to 136.59 mg/g, expressed as rutin equivalents. Antioxidant activity of extracts were expressed as IC50 values ($\mu\text{g}/\text{ml}$) and ranged from 786.19 $\mu\text{g}/\text{mL}$ to 28.82 $\mu\text{g}/\text{mL}$. Methanolic extract had the highest phenol concentration of 275.12 mg/g and strong antioxidant activity of 28.82 $\mu\text{g}/\text{mL}$. The significant linear correlation was confirmed between the values for the concentration of phenolic compounds and antioxidant activity of plant extracts. The high contents of phenolic compounds and flavonoids indicated that these compounds contribute to the strong antioxidant activity. Based on these results, *Origanum vulgare* is a potential source of phenols as a natural antioxidant substances of high value.

Prisustvo teških metala iz aerogađenja u lekovitim biljkama Avale

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Avala pripada grupi Šumadijskih planina, koje se razlikuju po mnogim karakteristikama od susednih Rodopskih i Dinarskih planina. Ističe se kao nepravilna kupa i nadvišuje ostalo pobrđe južno od Beograda, sa nadmorskom visinom od 511 m. Geološki sastav Avalu odvaja od susednih planina. Geološku građu čine sedimenti donje krede, serpentini i eruptivne naslage.

I zemljište Avale vrlo je struktuirano i pripada tipovima: smeđe lesivirano, pseudoglejno, kiselo smeđe, eutrično smeđe i gajnjače.

Ovakvi prirodni uslovi u kombinaciji sa klimatskim faktorima usloveli su pojavu raznovrsne flore. Dosadašnjim istraživanjima konstatovano je oko 600 biljnih vrsta, svrstanih u 86 familija, i 317 rodova, od čega lekovitoj flori pripada oko 150 vrsta.

S obzirom da se Avala nalazi na južnom rubu Beograda, da se na njoj nalazi toranj koji je jako posećen, to je ovo područje kontaminirano putem aerogađenja. Istraživali smo prisustvo teških metala akumuliranih u biljnim tkivima lekovitih

biljaka. U radu će biti prikazani podaci o prisustvu teških metala u vrstama *Tilia tomentosa*, *Hedera helix*, *Viola hirta* i *Ruscus aculeatus*.

Svi uzorci lekovitih biljaka u podnožju Avale imaju istu količinu akumuliranog olova 2.0. Na nadmorskoj visini od 500 m količina akumuliranog olova se znatno povećava, a najviše kod ljubičice, a najmanje kod bršljana (Tab.1).

Količina akumuliranog kadmijuma (Cd) u podnožju je neznatna, a kreće se u rasponu od 0,10-1,42, dok je na vrhu mnogo veća, od 0,27-6,98.

Iz prethodnih analiza se da primetiti da su sve lekovite biljne vrste kontaminirane olovom i kadmijumom, da je koncentracija ovih elemenata kod lekovitih biljaka u nižim predelima manja, a u višim veća, i da ovo lekovito bilje ne bi trebalo konzumirati.

***10th Symposium on the Flora of
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and Neighbouring regions,
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**Agriculture, Forestry and Landscape
Architecture
Poljoprivreda, šumarstvo i pejzažna
arhitektura**

Possibilities for production and application of native *Cyclamen neapolitanum* in landscape architecture and horticulture

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Cyclamen neapolitanum Ten is autochthonous in Montenegro and Serbia on wide range of habitats, from Mediterranean-seaside, to sub Mediterranean and mountain ones, where it grows on fresh, porous soils, rich in humus and carbonates. It is perennial hardy herbaceous plant with underground tuber, which goes in dormancy trough the period of physical drought. *C. neapolitanum* flourishes during the autumn, forming after that near ground rosette of leaves, which lasts to the next summer, so it is extraordinary suitable for perennials, especially alpinums, on individual green areas and also for vertical greening of buildings (balconies, terraces). Reproduction is generative. Generative reproduction of *C. neapolitanum* was examined with seed collected in Gorica (Podgorica, MNE), Petrovac (MNE), and Palojce (Grdelicka George, Serbia). Two different artificial substrates were used and classical technologies of plant production with single seed sowing in tresset pots, which were later used to transplantation. Seed germination was high (more than 85%), for the seeds originated from all three localities, and also in both of substrates. Further loses in plant production were not evident, and development of seedlings as well as transplanted plants, was good. Based on conducted experiments, here are given the proposals for economical commercial production, and also for cultivation of plants on green areas.

Varijabilnost fenotipskih i stanišnih karakteristika i selekcija *Castanea sativa* Mill. na području Vranja

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Najveća nalazišta autohtonog pitomog kestena u Srbiji nalaze se u okolini Vranja, u šumskim zajednicama reliktnog karaktera, jedina na južnim ograncima planinskih masiva (Glišić, 1975). Sva prirodna nalazišta su na škriljcima, na plitkom, kiselo smeđem zemljištu. Izdvojili smo grupe stabala iz nekoliko prirodnih

populacija: 1) Sobinski Koštani, 2) Sobina, 3) Čoška, 4) Gornje Balinovce i 5) Mahala Đelinci, kao i manjih, veštački podignutih sastojina: 6) Slivnica, 7) Milivojski Koštani i 8) Milivojce. Selekcionisane prirodne populacije pitomog kestena su raznodobne i nalaze se na nadmorskoj visini od 500-600 m, izuzetno do 700 m (pojedinačna stabla). Podignute veštačke kulture pitomog kestena su jednodobne, nalaze se ponekad i na staništima većih nadmorskih visina (Slivnica, 990 m.n.m.) ili na granodioritima i silikatno karbonatnim zemljištima (Milivojski Koštani i Milivojce) i u proseku su manje starosti, dimenzija stabala (prsnog prečnika i visina), slabijeg uroda i lošijeg zdravstvenog stanja. Nasuprot tome, u prirodnim populacijama je uočena velika varijabilnost u pogledu veličine i boje lista, kao i u masi i dimenzijama ploda i semena, što je najdetaljnije proučeno na lokalitetu Sobina. Seme sa stabla sa zeleno-žutim listovima bilo je kraće ali teže i dalo je sadnice većih dimenzija u odnosu na stablo sa tamnozelenim listovima..

Varijabilnost i selekcija *Prunus cerasifera* Ehrh. na području Vranja

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Džanarika je samonikla šumska voćna vrsta, stablimično primešana u hrastovim i bukovim šumama, sa velikom ekološkom amplitudom, varijabilna po osobinama krune, listova i plodova, jake izdanačke snage, značajna kao podloga za kalemljenje koštičavog voća, medonosna, ukusnog i lekovitog ploda. Mada je u Srbiji jako rasprostranjena, njena genetička raznolikost je ugrožena, što se vizuelno najviše uočava u boji, vremenu sazrevanja i veličini ploda. Na području ŠG Vranje, u Gazdinskoj jedinici "Granična šuma", selekcionisali smo stabla na dva lokaliteta: 1) "Široka livada" i 2) "Beli Kamen". Oba lokaliteta su na staništu planinske bukove šume, na geološkoj podlozi koju čine granodioriti u raspadanju, na distričnom smeđem zemljištu, na oko 1100 m nadmorske visine. Na lokalitetu "Široka livada" uočili smo veliku varijabilnost u boji plodova džanarike, od zeleno-žute do narandžaste i od svetlo do tamno-crvene, često i na istom stablu. Upo ređujući karakteristike plodova (masa, dužina i širina) i semena (masa, dužina, širina i debljina) između fenotipova različitih po boji ploda, došli smo do zaključka da je fenotip sa tamnocrvenim plodovima imao veće dimenzije i masu, a fenotip sa žutim plodom teže i krupnije seme. Od stabla sa tamnocrvenim plodovima dobijene su u proseku krupnije sadnice.

Osobine ontogeneze hrasta crnike (*Q. ilex* L.) u sastojinskim uslovima u prvom vegetacionom periodu

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Za razumevanje uticaja klimatskih promena za koje se pretpostavlja da će u budućnosti predstavljati globalnu pretnju za opstanak i razvoj šuma u Južnoj Evropi i Mediteranu potrebno je komparativno proučavati zakonomernosti funkcionisanja glavnih vrsta u šumskim ekosistemima. Na osnovu divergencije u veličinama bioloških osobina hrasta crnike (*Quercus ilex* L.) u identičnim stanišnim, a različitim sredinskim uslovima, proučene su osobine juvenilne etape ontogeneze. Morfometrijski su analizirane biološke osobine prirodnog podmladka u sklopljenom i proređenom delu sastojine, kao i na uskoj pruzi na kojoj su posečena sva stabla. Prirodni podmladak iz sklopljenog dela sastojine formira fenotip skiomorfnog strukturnog oblika koji karakteriše dužina nadkotiledone ose 8,5-20,5 cm, sa prečnikom epikotila 0,58-1,21 mm, a prirodni pomladak koje se razvija u proređenom delu sastojine formira fenotip heliomorfnog strukturnog oblika koji karakteriše dužina nadkotiledone ose 4,5-13,5 cm, sa prečnikom epikotila 0,77-1,43 mm. U uslovima uske pruge na kojoj su posečena sva stabla dužina nadkotiledone ose iznosi 8,0-16,0 cm, a prečnik epikotila 1,32-2,95 mm. Rezultati istraživanja ukazuju na sposobnost ontogenetskog prilagođavanja hrasta crnike na različite sredinske uslove.

Nalaz stogodišnjih stabala divljeg kestena (*Aesculus hippocastanum* L., var. *Baumannii* Schn.) u Srbiji u uličnim drvodredima u Erdeviku i Šidu

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Divlji kesten (*Aesculus hippocastanum* L.) je arktotercujerni endemit južog dela Balkanskog poluostrva sa čestom primenom u Evropi u parkovima i drvodredima. Prema mišljenju većeg broja autora divlji kesten je najlepša liščarska vrsta u Evropi. Poseban značaj za urbane zone ima varijetet *Baumannii* Schn., sa punim (Flore pleno), sterilnim cvetovima, jer ne donosi plod. Varijetet *Baumannii* Schn. otkriven je 1819. godine u parku u Ženevi, kao mutacija na osnovnoj vrsti. U

uličnim drvodredima u Erdeviku i Šidu evidentirana su odrasla stabla *Aesculus hippocastanum* var. *Baumannii* Schn., čija se starost procenjuje na preko 100 godina, što je prvi nalaz ovog gajenog varijeteta takve starosti u Srbiji. Imajući u vidu značajno veće dimenzije stabla u uličnom drvodu u Erdeviku (prečnik na prsnoj visini $d_{1,30}=100$ cm i visina stabla $h=19,0$ m), u odnosu na dva stabla u Šidu (prečnik na prsnoj visini $d_{1,30}=57$ cm i 72 cm i visina stabla $h=16,2$ m i 16,4 m), može se pretpostaviti veća starost stabla u Erdeviku. Nalaz stogodišnjih stabala divljeg kestena (*Aesculus hippocastanum* L., var. *Baumannii* Schn.), imponantnih dimenzija u uličnim drvodredima u Erdeviku i Šidu, ukazuje na razvijen kolekcionarski rad pre više od jednog veka na ovom području. Primeri starih stabala ovog varijeteta divljeg kestena u uličnim drvodredima u Erdeviku i Šidu predstavljaju kulturno dobro jer, pored dekorativne vrednosti sa kulturološkog i istorijskog aspekta ukazuju na značaj ovih mesta u prošlosti.

Sudbina terazijskog parka u Beogradu

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U najstrožem centru Beograda decenijama je u veoma lošem stanju verovatno najbolje locirana zelena površina grada, degradirana dugogodišnjim zapuštanjem i u biološkom i u estetskom (vizuelnom) pogledu. Povremene površne popravke i delimične rekonstrukcije nisu ozbiljnije popravljale vrednost ovog atraktivnog područja, pa je njegov izuzetno vredan vizuelni potencijal sa pogledom na panonsku ravnicu gotovo sasvim neiskorišćen. Iako je po položaju jednak čuvenoj promenadi na Kalemegdanu, ovaj atraktivni prostor na samoj ivici savskog amfiteatra, u geografskom i urbanom središtu Beograda, o čemu svedoči i njegovo ime, ovaj park je primer neiskorišćenog prirodnog potencijala prestonice. Stalni pritisak investitora na ovaj atraktivni prostor doprineo je da se biološke mere negovanja zelenila gotovo potpuno zanemare, a to je kao rezultat imalo smanjivanje biološke, sanitarno-higijenske, estetske i kulturološke vrednosti ove zelene površine. Analiza s tanja biljnog materijala u parku, izvedena prema metodici izrade bioekološke osnove zelene površine, pokazuje da je potrebno hitno, stručno i odgovorno sanirati najvrednije individue drveća, a tek potom temeljno rekonstruisati ovu dragocenu površinu, o čemu se u radu izlažu i osnovna pejzažnoarhitektonska uputstva i smernice.

Privatno zelenilo kao izvor brže revitalizacije Beogradskog središta

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Na primeru jednog karakterističnog kvarta u središtu Beograda, u kome su i danas preovlađujući oblik stanovanja privatne porodične kuće, bogate manjim ili većim zelenim površinama na okućnicama, definisana je i kvantifikovana vrednost privatnih urbanih okućnica u ukupnoj zelenoj matrici velikog grada. Analizom postojećeg biljnog materijala na ovim površinama i njegovim kvalitativnim i kvantitativnim definisanjem, pokazane su prednosti uključivanja svih zelenih prostora u gradskom tkivu u stvaranju mreže estetskih i urbanističkih preduslova za popravljanje slike beogradskog središta. Izloženi su, takođe, i metodi i tehnike funkcionalnog povezivanja privatnog i javnog zelenila u lokalni zeleni sistem velike ekološke, estetske, psihološke i kulturne vrednosti. Privatne zelene površine jednog realtivno malo atraktivnog prostora ocenjene su kao jedan od okvira u kojem se može sprovesti borba za bolje uslove života u zoni koja inače važi kao je dan od najzađenijih delova gradskog jezgra Beograda.

Zelena infrastruktura središta Beograda

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U radu se iznose rezultati istraživanja prostornih i biološko-ekoloških potencijala malih slobodnih površina u središnjem delu Beograda kao budućih zelenih površina koje se mogu uspešno povezati u savremenu mrežu urbanog zelenila zvanu zelena infrastruktura. Izloženi su principi rekognosciranja, vrednovanja i klasifikovanja postojećih slobodnih površina u središtu Beograda, njihova ekološka vrednost sa gledišta delovanja na neposrednu okolinu, kao i kvalitet i kvantitet uticaja na ukupnu bioekološku vrednost zelenila središta grada. Takođe, izloženi su na terenu konstatovani ekološki činioci (površina, položaj, ekspozicija, kvalitet podloge, stepen iskoristivosti) koji utiču na kapacitet ovakvih površina u popravljaju mikroklimatskih i životnih uslova Beograda. Na osnovu pregleda postojećeg biljnog materijala u okolini utvrđen je spisak drvenastih biljnih vrsta koje imaju najviši ekološki i psihološki potencijal u datim uslovima.

Potencijal novih drvoreda u ekološkoj sanaciji najzagađenijih ulica Beograda

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Zamena starih drvodrednih stabala i drvoreda u Beogradu dobija široke razmere, neuobičajene poslednjih decenija u gradu. Stare velike biljke, bogate krošnje i uglavnom gusto posađene na trotoarima zamenjuju se vrlo mladim sadnicama, individuama visokim tri ili četiri metra, neznatne krošnje i veoma male ukupne lisne mase. Uvezene iz različitih rasadnika u inostranstvu, ove biljke dugo se privikavaju na beogradske uslove i nekoliko godina gotovo neznatno utiču na saniranje osnovnih nepovoljnih uslova u uličnim ekosistemima u kojima egzistiraju. Njihova ekološka vrednost u tom periodu veoma je mala, dok je njihova estetska vrednost na ulici neznatna. Istovremeno, nije izvesno da će se one i u budućnosti izjednačiti po efikasnosti sa nekadašnjim drvodredima sastavljenim od autohtonih vrsta drveća, proizvedenih u domaćim rasadnicima. U radu iznesena procena njihove realne vrednosti na ulicama Beograda izvršena je prema standardnoj metodici korišćenoj u ovoj vrsti istraživanja.

Procena estetskih vrednosti gradskih drvoreda

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Postoji mnoštvo metoda procenjivanja i izražavanja estetskih vrednosti biljnog materijala u pejzažnoj umetnosti i u profesiji pejzažne arhitekture. Svi se oni zasnivaju pre svega na individualnim procenama ocenjivača, koje najviše zavise od njegove lične kulture i subjektivnih stavova. Stoga su i upoređivanja različitih objekata pod zelenilom, parkova, izletišta, skverova ili rekreativnih centara, prilično teška ili nedovoljno funkcionalna. Isto važi i za izražavanje estetske vrednosti pojedinačnih ukrasnih biljaka, što je posebno važno kad se radi o drvodrednim stablima, individuama najviše izloženim pogledu i oceni prolaznika. Metodski pristup u vrednovanju ovih specifičnih osobina drveća kao gradivnog elementa uličnog pejzaža koji se decenijama razrađuje u jedinoj domaćoj visokoj školi za pejzažnu arhitekturu pokazuje relativno dobre rezultate i omogućuje realno estetsko upoređivanje različitih biljaka pa i različitih drvoreda. Na primeru dva najvažnija drvoreda Beograda, jednog starog, sada već u nestajanju (Bulevar kralja Aleksandra)

i novom (Kralja Milana), u radu se demonstrira ovaj metod ocenjivanja i preporučuje se kao instrument univerzalnog vrednovanja estetskih kvaliteta drvoreda kao jedne od najvažnijih kategorija urbanog zelenila.

Istorija i tradicija u srpskoj pejzažnoj arhitekturi

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Stari parkovi svakako su najbolji pokazatelji istorije i tradicije u pejzažnom delovanju jednog naroda. U Beogradu su Kalemegdan, Pionirski park i Topčider prema vremenu nastajanja, značaju koji imaju za građane i svom biološkom, florističkom sastavu ne samo najpoznatije gradske zelene površine, nego i izraziti predstavnici tzv. istorijskih parkova. Zato oni imaju vrlo specifične funkcije, koje su posebno značajne jer u delatnosti pejzažne arhitekture u Srbiji teško može biti reči o tradiciji u pravom smislu reči Razloga za to ima mnogo, ali je najvažniji vrlo formalan. Dok u Evropi ovaj posao postoji kao samostalna delatnost vekovima, zbog čega se u evropskim zemljama razvila i posebna, prepoznatljiva tradicija, u Srbiji je, čak i ako je za to bilo dovoljno vremena (podizanje parkova datira još iz sredine 19.og veka), stvaranje zelenih površina bilo poveravano stranim vrtlarima, majstorima koji su direktno prenosili stil građenja primenjivan u njihovim zemljama. To je možda najvažniji uzrok što se pitanje tradicije u ozelenjavanju u Srbiji danas smatra čak i nevažnim. Mnogi savremeni stvaraoci u ovoj oblasti ocenjuju funkcionalnost parka na opštem nivou, odužujući se samo površno ili formalno nasleđu koje bi u njemu trebalo da preovlađuje. Zbog toga se u domaće zelene površine nekritički unose bezbrojni elementi tuđe tradicije i kulture. Analiza nekih specifičnih vrednosti istorijskih zelenih površina Beograda pokazuje u radu neke od mogućih pravaca za uspostavljanje domaće, izvorne, kulturno i civilizacijski utemeljene tradicije u pejzažnom uređivanju urbanog prostora Srbije. U radu se ova analiza temelji na istorijskim vrednostima Kalemegdana, Topčidera i Pionirskog parka, najvažnijih parkova Beograda, uz njihove ostale, uobičajene parkovske vrednosti i funkcije, biološku, ekološko-sanitarnu i rekreativnu, a izložena je kao prilog objektivnoj analizi kulturno-prosvetnih vrednosti urbanog zelenila i njihovom daljem proučavanju, razvoju i unapređivanju.

Alohtone drvenaste vrste u ekosistemu SRP Zasavica

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Specijalni rezervat prirode Zasavica je značajan vlažni ekosistem Srbije, i kao takav je 2006. godine ušao u Ramsarsku listu vetlanda od međunarodnog značaja. Imajući u vidu kategorizaciju SRP Zasavica, kao i činjenicu, da se introdukovanjem alohtonih drvenastih vrsta u vlažne ekosisteme narušava njihova stabilnost u radu su analizirane alohtone drvenaste vrste na 1150 ha u prvoj zoni zaštite i na 671 ha u drugoj zoni zaštite. Istraživanjem lokaliteta na ukupnoj površini od 1821 ha evidentiran je 21 alohtoni drvenasti takson sa prosečnom pokrovnošću koja je određena prema metodi Braun-Blanquet u iznosu od 1,72. Najveći broj ovih individua raste u prvoj zoni zaštite, a sve pripadaju pododeljku Magnoliophyta. Analizirani drvenasti taksoni predstavljaju uzorke na osnovu kojih se mogu upoznati njihove ekofiziološke karakteristike kao i njihov uticaj na stabilnost vlažnog ekosistema Zasavica. Dosadašnja istraživanja ukazuju na potrebu daljih istraživanja u cilju provere uticaja alohtonih drvenastih taksona na stabilnost ekosistema kroz dugoročna proučavanja.

Alelopatski efekat ekstrakta rizoma *Aster lanceolatus* L. i *Equisetum arvense* L.

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Na osnovu istraživanja rasprostranjenja invazivne vrste *Aster lanceolatus* na teritoriji Beograda, izdvojena su staništa na kojima je primećena snažna kompeticija vrsta *Aster lanceolatus* i *Equisetum arvense*. Obe vrste odlikuje sposobnost širenja rizomom, za koje je karakteristično izlučivanje određenih alelohemikalija. Cilj našeg istraživanja je bio utvrđivanje biološke aktivnosti, odnosno alelopatskog efekta ekstrakta rizoma ove dve vrste. Za utvrđivanje biološke aktivnosti ekstrakta rizoma je korišćen *Lactuca test* (*Lactuca bioassay*). Semena *Lactuca sativa* su 24 h inkubirana u ekstraktima rizoma odnosno destilovanoj vodi (za kontrolne uzorke). Posle ovog tretmana semena su stavljena na klijanje. Na osnovu procenta prokljalih semena, dužine radikule, dužina hipokotila i odnosa korena i nadzemnog dela komentarisana je biološka aktivnost ekstrakta rizoma ovih vrsta. Utvrđeno je da

ekstrakti rizoma *Aster lanceolatus* značajno inhibiraju klijanje semena i izduživanje hipokotila i radikule *Lactuca sativa*, dok ekstrakt rizoma *Equisetum arvense* inhibiraju klijanje semena i izduživanje hipokotila.

Prinos i morfolške karakteristike nekih CMS hibrida duvana tipa Prilep

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U radu su izneti rezultati ispitivanja četiri novostvorena hibrida duvana sorte Prilep i izvršeno njihovo međusobno upoređivanje. Ispitivanje je obavljeno u period 2005-2006. godine na ogleđnom polju AD "Selekcije" u Aleksincu. Izvršeno je merenje prinosa suvog lista (kg/ha) i izračunavanje procentualne zastupljenosti visokih klasa (I i II). Ispitivanje morfolških karakteristike obuhvatilo je merenje visine biljaka sa cvetom, broja listova po biljci, dužine internodija, dimenzija lista i odnosa dužine i širine lista. Ispitivani hibridi su pokazali statistički visoku značajnost za ispitivana svojstva. U pogledu prinosa suvog lista hibrid P-3 je ostvario visoko značajno veći prinos u odnosu na ispitivane hibride P-2 i P-4. Isti hibrid je u pogledu procentualne zastupljenosti visokih klasa ostvario značajno bolji rezultat u odnosu na hibrid P-2. Kod ispitivanja morfolških karakteristika svi ispitivani hibridi su pokazali rezultate karakteristične za orijentalne duvane sorte Prilep. Nešto veću visinu biljke sa cvetom imao je hibrid P-3. Najveći broj listova po biljci ostvario je hibrid P-2, dok je nešto veće dimenzije najvećeg lista i dužinu internodija ostvario hibrid P-4.

Analiza klijavosti semena *Paulownia tomentosa* (Thunb.) Steud. u cilju oplemenjivanja vrste

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U radu se analizira klijavost semena 14 stabala vrste *Paulownia tomentosa* (Thunb.) Steud. na četiri lokaliteta u Beogradu. Na Banovom brdu i u Zemunu seme je sakupljeno sa po pet stabala dok je sa lokaliteta Dorćol i Novi Beograd sakupljano sa po dva stabla. Na osnovu rezultata kvantitativnih i kvalitativnih parametara koji izražavaju dinamiku klijanja kod 14 stabala sa četiri lokaliteta, može se zaključiti da

je seme vrste *Paulownia tomentosa* (Thunb.) Steud. pozitivno fotoblastično. Naime svetlost stimuliše klijanje semena što je potvrđeno velikom osetljivošću semena na uticaj belog svetla. Komparativnom analizom istraženih parametara klijavosti izdvajaju se: stablo broj 17 (sa najboljom tehničkom klijavašću), stablo broj 4 (sa najvećom energijom klijanja), stablo broj 22 (sa najkraćim srednjim vremenom trajanja klijanja) i stablo broj 25 (sa najvećim intenzitetom klijavosti); dok se na osnovu svih izvršenih analiza kao plus stabla izdvaja šest stabla (21, 22, 23, 25, 4 i 17) koja se predlažu kao semenska stabla za buduću proizvodnju sadnica i oplemenjivanje. Obavljena istraživanja potvrđuju da vrsta *Paulownia tomentosa* (Thunb.) Steud. ima dobru klijavost (što je u saglasnosti sa literaturnim podacima), kao i da se dobro adaptirala na uslove umereno-kontinentalne klime.

**10th Symposium on the Flora of
Southeastern Serbia
and Neighbouring regions,
Vlasina 17 to 20 June 2010**

**Zoology (Animal and Plant Interactions)
Zoologija (Međusobni odnosi biljaka i
životinja)**

Karakteristike faune insekata Prokletija

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Fauna insekata Prokletija je heterogena, Tokom dosadašnjih istraživanja faune insekata Prokletija u periodu od 2006-2009 godine, radilo se na sledećim ekološkim kategorijama bitnim za opstanak i život pojedinih grupa faune insekata : 1.uslovi za život insekata: klima, konfiguracija, vode, vegetacijsko-floristička osnova. 2.fenološka opažanja 3.najvažnije životne sredine insekata 4.zoogeografsko rasprostranjenje konstatovanih vrsta 5.utvrđivanje visinskog rasporeda vrsta i subspecijacija Istraživanja u prethodnih dve-tri godine započeta s ciljem da se obuhvate sledeće kategorije insekata: 1. Vrste raširene u Evropi i Srednjoj Evropi, 2. Endemične vrste 3. Endemiti Prokletija 4. IUCN kategorizacija prisutnih elemenata 5. Istovremeno sa prirodno-naučnim istraživanjem i biološko ekološkom valorizacijom sveta insekata radi se i na utvrđivanju statusu njihove ugroženosti i zaštiti diverziteta koja podrazumeva: a) zaštitu i očuvanje vrsta i podvrsta, b) zaštitu i očuvanje entomološki značajnih staništa i ekosistema nakon izvršenih kompletnih istraživanja i c) mere zaštite i korišćenja faune insekata kao ekološkog resursa. Prema dosadašnjim istraživanjima faunu insekata ovog područja sačinjavaju sledeći faunistički elementi: srednjeevropsko-sibirski, orijentalni (pontijski), i mediteranski. U raznim insekatskim redovima ova tri faunistička elementa različito su zastupljena: srednjeevropskih vrsta ima najviše (60%). Iza njih dolaze pontijske vrste sa oko 30% zastupljenosti, mediteranskih vrsta ima 10%. Enedemična fauna Orthoptera: Od preko 200 vrsta Orthoptera na teritoriji bivše SRJ lokalna odnosno endemična i subendemična fauna obuhvata preko 20 fanerobiontnih vrsta u okviru 12 rodova i 5 porodica. Ova grupa je prilično raznorodna u pogledu tipa staništa (od mediteranskih i submediteranskih, preko nizijskih higrofilnih do montanih i subalpijskih formacija) odnosno opsega različitih tipova staništa (i visinskih zona) u kojima se pojedine vrste javljaju. U pogledu visinskog rasprostranjenja izdvojene su tokom prethodnih preliminarnih istraživanja tri grupe: 1. – Vrste koje se u istraživanoj oblasti nalaze samo iznad 1500 mnv: *Psorodonotus fieberi*, *Gomphocerus sibiricus*. 2. Vrste koje se pored visokih planina nalaze još i u brdskom pojasu, ispod 1500 mnv, ali koje u dolinama izostaju (rodovi *Arcyptera*, *Pholidoptera*, *Podisma*). 3. Orthoptere sa širokom visinskom amplitudom rasprostranjenja koje nalazimo u oblasti od potolina pa skoro do vrhova visokih planina. U ovu grupu spadaju i balkansko-karpatiski endemita iz rodova *Poecilimon* i *Isophya*. 4. Vrste vodenih i močvarnih staništa Značajna karakteristika ove faune je predstavljena velikim učešćem mediteranskih vrsta. Od 48 vrsta koje su zabeležene na visinama preko 1500 mnv 23 vrste imaju

izrazit sredozemnomorski areal ili su poreklom iz Mediterana (kao rodovi *Poecilimon* i *Isophya*). Entomofauna Prokletija ukazuje na bogatstvo, jedinstvenost i zastupljenost značajnih vrsta, te na taj način predstavlja značajan centar diverziteta na Balkanu i Evropi, te tako s ovog aspekta zaslužuje da se uvrsti u kategoriju teritorije sa velikim biodiverzitetom.

Cerambycidae of South-east Serbia (Coleoptera, Cerambycidae)

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Cerambycids are known as very attractive insects, as well as forest pests. Investigation and collecting the specimens of the family Cerambycidae in Serbia started in the middle of the nineteenth century. Up today, 242 species are registered in the fauna of Serbia (Ilić 2005). The first information about Cerambycids in Serbia was published by Bobić (1871). In his publication 'Coleoptera of Kruševac and the neighbouring areas' [in Serbian]. Significant contribution in researching of the family Cerambycidae was given by Professor Nedeljko Košanin 1904, 'Checklist of Coleoptera in the Museum of Srpske zemlje' [in Serbian]. He noted 72 species from various localities in Serbia. After that, there were several authors who were occupied by longhorn beetles: Adamović (1950), Mikšić (1963), Ćurčić et al. (2003), and Ilić (2005). In our work we have presented forty-nine species reviewed from 34 genera which belong to five subfamilies: Prioninae, Lepturinae, Spondylidinae, Cerambycinae and Lamiinae. All material has been collected from the south-eastern Serbia. The most numerous was the subfamily Cerambycinae comprising 18 species from 15 genera.

***Betula alba* and *B. pubescens* as host plants for various insects parasitized by braconids (Hymenoptera: Braconidae) in Serbia**

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This work presents braconid wasps which can be found on insects attacking two species of birch (*Betula*) in Serbia. We have found 28 braconid species from 18 genera on 21 phytophagous insects from 4 orders: Coleoptera, Homoptera, Hymenoptera and Lepidoptera. Registered braconid species belong to: Aphidiinae, Braconinae, Doryctinae, Euphorinae, Histeromerinae, Microgastrinae, Orgilinae and Rhogadinae. Although most of the registered phytophagous insects pose a significant threat to *Betula* species, the two species: *Epirrita autumnata* and *Lymantria dispar* are the most important because they can defoliate entire forests when their populations are in gradation. There are two buprestid pests *Agilus anxius* native to North America and *A. planipennis* from Central Asia which are considered as potentially invasive species.

Trofičke asocijacije insekata štetočina na topolama (*Populus* spp.) i brakonidnih parazitoida (Hymenoptera: Braconidae) na teritoriji Srbije i jugoistočne Evrope

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Za ovo istraživanje izabrali smo topole (pre svega vrste *Populus tremula* i *P. alba*, zbog toga što su one autohtone za područje Vlasine) kao biljke hraniteljke za mnoge fitofagne insekte. Brojnost ovih štetočina kontrolišu ose iz familije Braconidae. Registrovano je 14 brakonidnih vrsta za teritoriju Srbije i jugoistočne Evrope iz 13 rodova koji su svrstani u 8 potfamilija: Agathidinae (1), Alysinae (1), Aphidiinae (2), Braconinae (2), Euphorinae (1), Exothecinae (1), Macrocentrinae (1) i Microgastrinae (3). Štetočine koje napadaju topole pripadaju sledećim redovima: Coleoptera, Diptera, Hemiptera, Hymenoptera i Lepidoptera. Pored autohtonih vrsta topola (*Populus alba*, *P. nigra* i *P. tremula*) za Srbiju, prikazane su trofičke asocijacije i na vrstama *Populus euphratica*, *P. deltoides* i gajene vrste *Populus x*

euramericana iz sveta na kojima su pronađene štetočine i njihovi parazitoidi. Iako za Srbiju postoji podatak o samo jednoj registrovanoj vrsti iz ro da Apanteles koja parazitira štetočine na topolama, podaci iz sveta ukazuju na to da je baš ovaj rod najzastupljeniji vrstama u odnosu na sve druge identifikovane brakonide.

Polni dimorfizam u veličini i obliku pileusa kod zidnog guštera *Podarcis muralis* (Laurenti, 1768)

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U ovom radu analizirano je postojanje polnog dimorfizma u veličini i obliku pileusa kod zidnog guštera [*Podarcis muralis* (Laurenti, 1768)] kao i utvrđivanje postojanja i nivoa interpopulacione varijabilnosti ovih karakteristika. Za analizu su korišćene metode geometrijske morfometrije. Nakon postavljanja 14 specifičnih tačaka na pileusu, urađena je Prokrustasova superimpozicija i određena veličina centroida, čija je međupopulaciona varijabilnost testirana dvofaktorskom analizom varijanse (ANOVA). Varijabilnost oblika pileusa u okviru posmatranog uzorka utvrđena je multivarijantnom analizom varijanse (MANOVA) sa varijablama oblika kao zavisno promenljivim. Nivo razlika između polova unutar populacije kao i između populacija određena je izračunavanjem Prokrustasovih distanci, dok je značajnost razlika u obliku između poređenih grupa testirana primenom Goodall-ovog F testa. Takođe, urađena je i kanonijska diskriminantna analiza (CVA) kojom se sumirizuje varijabilnost između grupa koje su jasno definisane unutar uzorka kao i analiza glavnih komponenti (PCA).

Checklist of subfamily Chironominae (Diptera:Chironomidae) of Serbia

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This paper presents the first checklist of the subfamily Chironominae (Diptera: Chironomidae) in Serbia, based on literature citations, in period from 1971. to 2006. and unpublished data as well as material examined by the author. All

taxa are identified only by larvae. This checklist should contribute in research on this unexplored group of insects in Serbia which have often proved useful in the assessment of water quality. Of the three tribes recognized in the subfamily Chironominae, all three occur in Serbia. The fauna of subfamily Chironominae currently consists of described 63 genera and described 445 (sub)species. We have listed 30 genera (19 in tribe Chironomini, 1 in tribe Pseudochironomini and 9 in tribe Tanytarsini) and 77 species.

Contribution to understanding the origin and the genesis of Nisava's riverside fauna

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The fact that very early biologist registered an extraordinary faunistic richness in the greater area of Niš (Nišava's riverside) is pointed out. The conditions that contributed to this variety are analyzed. The importance of geological history of this region is explained, from the ancient lake phase through the glacial epochs including the present state. The dilemma about lake terraces and the water level of the Neogene lake system is discussed. A list of gorges, speleological objects, springs, mountain tops as habitats of endemic and relict species are given. All the endemic and relict species in these habitats are listed.

Simplified way of appropriating habitats for fanerobiotic insects

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Using EUNIS, PALAEARCTIC and CORINE systems of habitats classification, the knowledge of habitats and typical plant communities in them for Europe is summarized. The link between habitats and biogeographic regions of Balkan Peninsula is made, by composing a list of habitats for every biogeographical region. Lists of habitats are presented for Balkan Peninsula according to those

regions. In this paper an effort is made to simplify the existing system, voluminous for entomologists that specialize in fanerobiotic groups of insects (Odonata, Orthoptera, Heteroptera, Homoptera, Trichoptera, Lepidoptera, Diptera, Hymenoptera, Coleoptera ect.). As a basis of suggested classification the vegetation map of Balkan Peninsula is used (Glavač et al.,1972). The existing vegetation units in the map are in relation with CORINE system of classification by ecoregions of Balkan Peninsula.

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