

FLORA LICHEN WESTERN MOUNTAINS VRANJE PLACE

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Apstrakt: Lichen is a symbiotic plant built by the cells of algae and fungi hyphae. Algae are usually presented - green (*Chlorophyta*) or blue green (*Cyanophyta*), a mushroom commonly found is *ascomycetae* and sometimes *basidiomycetae*.

Mushrooms receive oxygen and carbohydrates from algae, and they in turn provide water, CO₂ and mineral salts. Lichens are often found on trees and rocks in unpolluted environments and can be used as a bioindicator species.

In during 2015-2016. was realized a survey of epiphytic lichen flora of the western mountains in environment of Vranje. Sampling was carried out at 4 locations: Borino brdo, Krstilovica, Markovo Kale and Pljačkovica.

Based on the collected and determined samples can be concluded that the study implemented of the area of 25 species of lichens of which: 8 as crust, leafy 12 and 5 shrub.

The research results indicate that the lichen flora of the western mountains environments Vranje of a rich and diverse as a result of favorable geographic position, geological and soil composition, climate and plant cover that provide opportunities for the development and survival of lichens.

Key words: lichens, symbiosis, epiphyte, liheno-flora.

1. Introduction

The lichen covers about 20 000 species. This is a group of plants specific nature: performing photosynthesis produce organic matter, are extremely sensitive to the presence of sulfur dioxide and pH change on different substrates on which survive (air pollution on lichens

manifested by reducing the density of the population or its complete disappearance); contain lichen acid - necessary for the production of medicinal products in medicine; have antibiotic properties, in their composition are essential oils, which have a pleasant odor and can be used for the production of fragrances; a source of natural colors - Litmus was first extracted from the lichen from which can be obtained and other natural colors.

On the basis of a wide variety of morphological features of lichens are divided into: crusty, leafy and bushy. Crusty lichens are the most common. Of the total number of known lichen 80% belongs crusty.

These lichens covering most of the trees, the tree from which the bark peeled and grow on a variety of substrates.

The body leafy lichen is in the form of a leaf surface with lobes and slots. Growing laid on the substrate, but is not related throughout its surface. It is always smaller or larger part of the free. Leafy lichens are grouped filaments that stand away to the substrate or individual filaments that stand away.

Bushy lichens represent the highest level of morphological differentiation. They consist of a thicker or thinner almost filar part. They grow on the branches of trees and there are on earth. To the substrate stand upright or hanging from it in the form of longer and shorter bushes.

In Vlasotince, Stamenkovic is studied biological indications of air pollution with the wood decaying lichens at 16 locations in the municipality Vlasotince. It was determined the presence of 33 species of lichens from 15 rows. The most common species were determined: *Phaeophyscia orbicularis*, *Xanthoria parietina*, *Parmelia sulcata*, *Physcia adscedens*, (Stamenković, 1998).

Lichen flora Šar planina - mountain range ie. mountain: Popovu šapku, Cerepašinu, Jelak, Lisac and footer Ljuboten, studied Pavletić and Murati, (1977).

The study involved expanse Šar planina - mountains of 36°07' 410 and 420 16°00' north latitude and 20 036°07' 15°00' and 200 east longitude.

In the study area was discovered 90 species of lichens from two classes: *Ascolichens* (with 88 species) and *Lichenes imperfecti* (With a total of 2 species) and established the representation of 17 families and 33 genera.

The most common is *Usneacea* with 6 genera, a family with three genera are: *Peltigeraceae*, *Lecideaceae*, *Cladoniaceae* and *Lecanoraceae*.

The most common genera by number of species are: *Parmelia* (10), *Cladonia* (9), *Peltigera*, *Umbilicaria* with five species. They found nine new species of lichens "new for the lichen flora" Yugoslavia: *Psoroma hypnorum* (Vahl.)S.Gray., *Solorina spongiosa* (Sm.)Anzi, *Stereocaulon paschale* (L.) Hoffman., *Umbilicaria vellea* Ach., *Usnea cavernosa* Tuck., *Letharia vulpina* (L.) Wain., i *Lepraria crassissima* (Hue.) Leth.

Lichen flora of the mountain Kozjak has researched Murati, on two sites, at the bridge on the river's Pčinja, into the vicinity of the monastery Prohor Pčinjski and beech and oak forest above the monastery Prohor Pčinjski. All found and determined varieties are new for the

mountain Kozjak. At the location,, bridge at the monastery Prohor Pčinjski " (found 44 species) were observed lichen genus *Rhizocarpon*, and species *Neofuscellia pulla*, *Xanthoparmelia conspersa*, *Parmelia sulcata* etc. In beech forest and oak forest just below the bridge (collected are 60 species) was found *Cetrelia olivetorum*, in the heart of the forest have been discovered *Baeomyces rufus*, *Peltigera venosa*, *Leprocaulon microscopicum*, *Lasallia pustulata* etc. On that occasion found is species *Leprocaulon microscopicum* until then unknown for the Balkans and very interesting species genera *Lepraria*, species *Haematomma ochroleucum* which is very rare. Wealth lichen flora, particularly in beech and oak forest, the result is forest biocenosis and climate (Murati, 1992).

Locations Popova šapka, Jelak, Mavrovo, Brezovica and Crn kamen on Šar planina - mountain explored the Murati and Pavletić (1978). On them are disclosed lichens which belong to classes: *Ascolichenes* i *Lichenes imperfecti*. Was determined by the presence of 23 families and 48 genera. The most common family is *Usneacea* with 7 genera, then *Lecanoraceae*, *Lecidaceae* with per 4 genera.

The recently are published several works of research projects. Borka Todorović (1998), "Bioindikacija aerogagađenja na području Malog Zvornika uz pomoć lišajeva kao bioindikatora" " , Slaviša Stamenković (1998), "Bioindikacija aerogagađenja u Vlasotincu korišćenjem lignokolnih lišajeva", Milić M. i Blaženčić, J. (1993), "Epifitski lišajevi grada Beograda", Savić, S.(1996), "Istraživanja lišajeva Kopaonika", Cvijan, M., Savić, S., Sabadoš (1997), "Lišajevi kao indikatori aerogagađenja na području Beograda".

2. MATERIAL AND WORKING METHODS

During 2015/2016. was realized a research of epiphytic lichen flora of the western mountains near Vranje. Sampling was carried out at 4 locations: Borino brdo, Krstilovica, Markovo Kale and Pljačkovica. We used the method of determining the lichen species present, their number and method of determining the percent distribution and abundance of species of lichens.

Lichens were collected when the time was important because of their fragility, dustiness and attachment to the substrate. With knife were collected crusty lichens that grow on trees; hammer and chisel crusty lichens that grow on a variety of substrates, a leafy and bushy material with knife. The collected material was placed between news papers to be dried. After drying lichens were placed in paper herbarium envelopes.

Determination collected lichen was conducted using the key Murati 1992, 1993, instruments (binoculars, microscopes, slides concerned, microscopic glass cover, eyepiece, micrometer, razor blade, microtome, spirit lamp) and reagents $Ba(OH)_2$, $CaCl_2O_2$, J+KJ, KOH (20 - 50%), and others.

Determined lichen are listed in envelopes with a label that reads: species, collection point, substrate, altitude and name of the person who found and specified. So determined lichens are kept in the herbarium.

3. RESULTS OF WORK

Survival, diversity, incidence of certain types of lichen is caused by a combination of climatic factors (insolation, air temperature, humidity, precipitation, wind, geomorphological and pedagogical soil composition, terrain factors),

physiological factors (specifics of lichen, the mode of operation, the chemical composition of lichen, the intensity performing photosynthesis and material exchanges lichens) as well as numerous more or less controlled factors (level of emissions of air pollutants, the level of air pollution, etc.). Lichen variability depends on a wide range of factors. Each factor has a significant impact on the incidence, specificity internal structure and external appearance, the diversity of impressions, a way of existence and duration of lichens. The combination of these factors during each specific research is different.

Quantitative differences among the lichen are based on the number of these species, the number of identified species within the epiphytic community, density representation type. Quality lichen is inextricably linked to their quantity. From the qualitative composition depends on the quantitative status because the quality is based on the production of which is determined by the quantity. From the quantitative characteristics, abiotic, physiological and systemic factors depend on qualitative changes in lichen. These qualitative changes and differences among the lichen are not readily visible, so that they can be determined only by determining the constituent elements.

Murati (1991) is the sampling lichens from the locations: Ibarska klisura – Ušće, mountain Goč, Jošanička Banja, Samokovska reka, Brus, Pančičev vrh, determined the 83 species. All found species were new for tested terrain. Found the new species (42) for lichen flora of Serbia and Yugoslavia (8) and (50) for new lichen flora of Serbia. Other (33) species were already known. The researcher is of the opinion that the lichen flora of the test field is rich and varied a lot of leaf and bearded lichen, indicates that the area tested more clean air, which is one of the preconditions for the development of tourism.

Ibarska klisura - Ušće, mountain Goč, Ješevac, Kopaonik and other localities were also in the focus of research Murati, (1991). During the research it was discovered 59 species, of which 23 new lichen flora of Serbia, 10 for Yugoslavia, making a total of 33 new species. Other 26 species were already well known.

The results of sampling and research epiphytic lichen flora of the western mountains near Vranje completed is 2015/2016. at the 4 locations (Borino brdo, Krstilovica, Markovo Kale and Pljačkovica) are shown in Table 1.

Tab.1. Viewing representation of different life forms of lichens with research sites of the western mountains near Vranje

Serial number	Locality	Crusty lichens	Leafy lichens	Shrubby lichens
1.	Borino brdo	<i>Lecanora argentata</i> , <i>Lecidela elaeochroma</i>	<i>Parmelia sulcata</i> , <i>Parmelia caperata</i> , <i>Phaeophyscia orbicularis</i> , <i>Physcia adscedens</i> , <i>Xanthoria parietina</i> ,	<i>Evernia prunastri</i>
2.	Krstilovica	<i>Lecanora argentata</i>	<i>Xanthoria parietina</i> , <i>Parmelia caperata</i> , <i>Parmelia sulcata</i>	<i>Evernia prunastri</i>
3.	Markovo Kale	<i>Diploschistes scruposus</i> , <i>Candelariella aurella</i> , <i>Lecanora muralis</i> , <i>Aspicilia calcarea</i> , <i>Rhizocarpon geographicum</i> , <i>Tephromela atra</i>	<i>Parmelia pastillifera</i> , <i>Physcia caesia</i> , <i>Umbilicaria deusta</i> , <i>Parmelia conspersa</i>	-
4.	Pljačkovica	<i>Lecanora argentata</i>	<i>Xanthoria parietina</i> , <i>Physcia adscedens</i> , <i>Parmelia sulcata</i> , <i>Parmelia pastillifera</i> , <i>Parmelia acetabulum</i> , <i>Hypogymnia tubulosa</i> , <i>Pseudevernia furfuracea</i>	<i>Cladonia convoluta</i> , <i>Cladonia pyxidata</i> , <i>Evernia prunastri</i> , <i>Anaptychia ciliaris</i> , <i>Ramalina fraxinea</i>

With sites Borino brdo sampled the 8 species of lichens: *Lecanora argentata* (Ach.) Malme, *Lecidella elaeochroma* (Ach.) Choisy, *Parmelia sulcata* Taylor., *Parmelia caperata* (L.) Ach., *Phaeophyscia orbicularis* (Neck.) Moberg., *Physcia adscedens* (Fr.) Oliv., *Xanthoria parietina* (L.) Th. Fr., i *Evernia prunastri* (L.) Ach.;

Causes collected from the locations Krstilovica point to the diversity of vegetation and lichens. Is determined by the 5 species of lichens: *Lecanora argentata* (Ach.) Malme, *Xanthoria parietina* (L.) Th. Fr., *Parmelia sulcata* Taylor., *Parmelia caperata* (L.) Ach. i *Evernia prunastri* (L.) Ach.;

Samples from the locality Markovo Kale demonstrate the presence of 10 species of lichens and six crusty and four leaf.

Locality is characterized by the presence of the following types: *Diploschistes scruposus* (Schreber) Norm., *Lecanora muralis* (Schreb.) Rabenh., *Aspicilia calcarea* (L.) Mudd., *Rhizocarpon geographicum* (L.) DC., *Tephromela atra* (Hudson) Haffellner., *Parmelia pastillifera* Harm., *Hypogymnia physodes* (L.) Nyl., *Physcia caesia* (Hoffm.) Furnr., *Umbilicaria deusta* (L.) Baumg., i *Parmelia conspersa* (Ehr.) Ach. All lichens were found on the walls of Markovo Kale. On the base of the study area, climatic factors, the characteristics of certain types of lichen, and geomorphological and pedological soil characteristics, we can say that the location has a diverse lichen flora;

At the locality Pljačkovica sampled 13 species of lichens. Were determined: *Lecanora argentata* (Ach.) Malme., *Xanthoria parietina* (L.) Th. Fr., *Physcia adscedens* (Fr.) Oliv., *Parmelia sulcata* Taylor., *Parmelia pastillifera* Harm., *Parmelia acetabulum* (Neck.) Duby,

Hypogymnia tubulosa (Schaerer) Havass., *Pseudevernia furfuracea* (L.) Zopf., *Cladonia convoluta* (Lam.) P. Cout., *Cladonia pyxidata* (L.) Hoffm., *Evernia prunastri* (L.) Ach., *Anaptychia ciliaris* (L.) Koerber, *Ramalina fraxinea* (L.) Ach. Based on the cover of the study area, climatic factors, the characteristics of certain types of lichen, and geomorphological and pedological soil characteristics, we can say that the locality has a diverse and rich lichen flora.

Based on the collected and determined samples can be concluded that the study area was already 25 species of lichens from it: crusty 8, 12 leaf and 5 bush (table 1).

Each of these species is housed in one, two or more localities making special populations. Most species makes up only one population of some localities and she was once more numerous, and sometimes poorer, depending on the living conditions of the environment.

4. CONCLUSION

During 2015/2016. was realized a survey of epiphytic lichen flora of the western mountains near Vranje. Sampling was carried out at 4 locations: Borino brdo, Krstilovica, Markovo Kale and Pljačkovica.

Based on the collected and determinate samples can be concluded that the study area was already present 25 species of lichen that: crust 8, 12 leafy and 5 bush.

Each of these species is housed in one, two or more localities making special population. Most species makes up only a population of some localities and she was once more numerous, and sometimes poorer, depending on the living conditions of the environment.

The research results indicate that the lichen flora of the western mountains near Vranje rich and diverse as a result of favorable geographic position, geological and soil composition, climate and plant cover that provide opportunities for the development and survival of lichens.

Further studies of lichen flora of the rural area of the City of Vranje will be directed in order to the comparative comparison of the results, which could be of importance for science.

5. LITERATURE

1. Bogdanović, G. (2001): Kvalitativni i kvantitativni sastav lišajeva na području Vranja i uže okoline, Magistarski rad, Prirodno-matematički fakultet, Priština, Univerzitet u Prištini, 153-190.
2. Cvijan., M., Savić S., Sabadoš K., (1997): „Lišajevi kao bioindikatori aerzagadenja na području Beograda“, Institut za botaniku i Botanička bašta „Jevremovac“, Univerzitet u Beogradu, Prirodnjački muzej, Ekološko društvo „Rihard Čornai“, Ekologija, ACTA BIOLOGICA YUGOSLAVIA, Unija bioloških naučnih društava Jugoslavije, Beograd, str.99 – 107.
3. Milić, M., Blaženčić, J. (1993): Epifitski lišajevi grada Beograda, Glasnik Instituta za botaniku i botaničke bašte, Univerziteta u Beogradu, Beograd, str. 24 - 25, 83 - 96.
4. Murati M., (1992): „Prilog poznavanju lišajne flore planine Kozjak“ Zbornik naučnih radova , Treći simpozijum o flori Srbije, str. 220 – 228.
5. Murati, M (1991): Prilog poznavanju lihenoflore Srbije I, Zbornik radova sa Simpozijuma „ Nedeljko Košanin i botaničke nauke“, Srpska akademija nauka i umetnosti, Institut za botaniku i botanička bašta PMF, JI za gazdovanje šumama „Golija“ Ivanjica, Beograd – Ivanjica, str. 47 - 52.
6. Murati, M (1991): Prilog poznavanju lihenoflore Srbije II, Zbornik radova sa Simpozijuma „Nedeljko Košanin i botaničke nauke“, Srpska akademija nauka i umetnosti, Institut za botaniku i botanička bašta PMF, JI za gazdovanje šumama „Golija“ Ivanjica, Beograd – Ivanjica, str. 64 - 68.
7. Murati, M. (1992): Flora lišajeva, Viša pedagoška škola „Bajram Ćurri“ Đakovica, „Ramiz Sadiku“ Prizren.
8. Murati, M. (1993): Flora na lišajite, Unijata na Albanskota inteligencija vo Makedonija, „Prosveta“ Kumanovo.
9. Novković, V. (2013.): Lišaji kao pokazatelji kvaliteta vazduha u Lebanu, Univerzitet u Nišu Prirodno matematički fakultet Departman za biologiju i ekologiju, MR.
10. Pavletić, Z., Murati, M.,(1978): „Karakteristike lišajne flore Šar-planine“, Biosistematika, Separat, Acta Biologica Jugoslavica, Beograd. str. 247 - 253.
11. Pavletić,Z., Murati, M., (1977): Prilog poznavanju lišajeva Šar - planine, Acta Bot. Croat, Zagreb. str. 175 - 171.
12. Savić, S. (1996): Istraživanje lišajeva Kopaonika (1892-1993), Ekologija, Acta biologica Jugoslavica, Unija bioloških naučnih društava Jugoslavije, Beograd.
13. Stamenković, S. (1998): Biološka indikacija aerzagadenja u Vlasotincu korišćenjem lignikolnih lišajeva, Ekologija, Acta biologica Jugoslavica, Unija bioloških naučnih društava Jugoslavije, Beograd.
14. Todorović, B., (1998): Bioindikacija aerzagadenja na području Zvornika uz pomoć lišajeva kao bioindikatora, Ekologija, Acta biologica Jugoslavica, Unija bioloških naučnih društava Jugoslavije, Beograd.