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"HASAN PRISHTINA"
FAKULTETIT TË SHKENCAVE MATEMATIKE – NATYRORE

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Për: **Këshillin Mësimor të Departamentit të Biologjisë**
Këshillin e Studimeve të Doktoratës-FSHMN
Këshillin e Fakultetit të Shkencave Matematike-Natyrore

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Kërkesës i bashkëngjes:

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- Pëlqimin për dorëzimin e dorëshkrimit nga Mentori i temës
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- Dëshmitë për pjesëmarrje në konferenca

Shpresoj që kërkesa ime do të merret parasysh.

Prishtinë,
21.12.2022

Kandidat:
Msc. Ismet Ahmeti

E-Mail: ismet.ahmeti@yahoo.com

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Lënda: Pëlqim nga Mentori për dorëzimin e doreshkrimit të temës së doktoratës me titull: :**"Diversiteti i florës vaskulare në serpentinet e Malësisë së Gjakovës (sektori Qafë e Morinës-Qafë e Prushit)"** për kadnidatin **Msc. Ismet Ahmeti**

Mendim:

Ky hulumtim, i realizuar dhe i paraqitur në doreshkrim si dokument, përmban rezultatet për florën vaskulare në terrenet serpentine në Malësinë e Gjakovës (sektori Qafë e Morinës-Qafë e Prushit). Hulumtimi është realizuar duke përdorur metodat standarde për përcaktimin e florës vaskulare.

Për pëcaktimin materialit floristik janë përdorur tekste respektivisht përcaktues adekuat. Taksonomia dhe nomenklatura është realizuar bazuar kryesisht në "Flora Europaea 1-5" (Tutin, T. G. et al. 1964-1980), ndërsa është potësuar edhe me informatat më të reja kryesisht nga baza e të dhënave bashkëkohore për taksonominë e bimëve (Euro+Med 2006+ (2006-2022)).

Pjesë të hulumtimit të botuara në formë punimi shkencor:

1. **Ismet Ahmeti**, Elez Krasniqi, Fadil Millaku, Mitko Kostadinovski, Arben Mehmeti, Marash Rakaj (2021): **Data on Some Parasitic and Semi - parasitic Plant Species from Serpentines of Kosovo.** Ecologia Balcanica 13 (1): 1-7. http://web.uni-plovdiv.bg/mollov/EB/2021_vol13_iss1/001-007_eb.21101.pdf

Pjesë të hulumtimit të botuara në formë kumtese:

1. **Ismet Ahmeti**, Elez Krasniqi, Fadil Millaku, Mitko Kostadinovski, Arben Mehmeti, Marash Rakaj (2020): **Some parasitic and semiparasitic plant species in the serpentine terrains of Malësia e Gjakovës (section Qafë e Morinës-Qafë e Prushit), the Republic of Kosovo.** Prezentuar në International Conference of Ecosystems (ICE 2020), Tirana, Albania, June 25-26, 2020. Prezantim oral. Abstract Book 2020: 51.
2. **Ismet Ahmeti**, Naim Berisha, Elez Krasniqi (2021): **The presence of the plant species: *Hemerocallis lilioasphodelus* L. in the Malësia e Gjakovës, an added value to the flora and vegetation of Kosovo.** Prezentuar në 4th International Congress of Plant Science and Technology (IPSAT-2021), online, Prezantim oral. October 30th, 2021, Istambul. Abstract Book 2021: 25.

Duke u bazuar në punën e kandidatit, respektivish në rezultatet e arritura gjatë këtij hulumtimi, në cilësinë e mentorit mendoj se hulumtimi i plotëson kriteret e punimit të doktoratës, njëherit paraqet kontribut domethënës për florën e Kosovës. Prandaj, punimi si i tillë i plotëson kriteret të procedohet sipas Rregullores së studimeve të doktoratës në Universitetin e Prishtinës "Hasan Prishtina".

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Prishtinë,
21.12.2022

Mentori:
Prof. Dr. Elez Krasniqi

PARAQITJA E PUNIMIT TË DOKTORATËS [1]

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Udhëheqësi i studimit:	Universiteti i Prishtinës "Hasan Prishtina", Prishtinë

TË DHËNAT PËR PUNIMIN E DOKTORATËS

Titulli në gjuhën shqipe	Diversiteti i florës vaskulare në serpentinet e Malësisë së Gjakovës (sektori Qafë e Morinës-Qafë e Prushit)
Titulli në gjuhën angleze	Diversity of vascular flora in serpentines of the Malësia e Gjakovës (section Qafë e Morinës-Qafë e Prushit)
Fusha e hulumtimit	Biologji

DEKLARATA E MENTORIT/BASHKËMENTORIT

Ky hulumtim, i realizuar dhe i paraqitur në doreshkrim si dokument, përmban rezultatet për florën vaskulare në terrenet serpentine në Malësinë e Gjakovës (sektori Qafë e Morinës-Qafë e Prushit). Hulumtimi është realizuar duke përdorur metodat standarde për përcaktimin e florës vaskulare.
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[1] Luteni që ta plotësoni formularin dhe ta dërgoni të nënshkruar me postë elektronike.

Vendi, data dhe nënshkrimi

Në Prishtinë, 21.12.2022 Nënshkrimi _____

Prof. Dr. Elez Krasniqi

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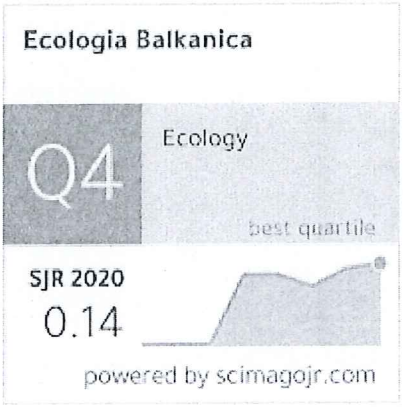

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Data on Some Parasitic and Semi-parasitic Plant Species from Serpentines of Kosovo

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Abstract. From the richness of the vascular flora of Kosovo, the flowering plants predominate. Within this group of plants, most of them are typical autotrophic plants. In contrast, a very small group of plants consists of parasitic and semi-parasitic life. Semi-parasitic plants are able to perform the process of photosynthesis throughout their life cycle and mainly take up water and mineral salts dissolved by the host plant. In our study, we focus on the presence of certain confirmed parasitic and semi-parasitic plant species in the serpentines of Kosovo, with additional evadence of their occurrence in other parts of the country as well. Here, as a result of intensive two-year field work, we provide details on the presence of the following four species, two of them semi-parasitic: *Arceuthobium oxycedri* (DC.) M. Bieb. and *Loranthus europaeus* Jacq., and two parasitic: *Lathraea squamaria* L. and *Orobanche alba* Willd. For each species, the host plant(s), status as parasitic or semi-parasitic, and data on distribution in the region studied are given, along with a broad discussion of distribution at the state level.

Key words: natural ecosystems, serpentine flora, parasitic plants, Kosovo.

Introduction

Kosovo is located in the central part of the Balkan Peninsula. Its geographical location is defined as the country of Western Balkans, SE Europe (Pllana, 2015). Based on the geological data of Kosovo (Korolija et al., 1976), all the serpentine areas of the country (e.g. the regions of Brezovica, Gjakova, Golesh, Koznicë, Gubavc, Strofc, Rahovec, etc.) belong to the Jurassic ophiolitic complexes, which makes them characterized by their diversity and specific flora. Within the territory of Kosovo, based on its geomorphology, there is a considerable area of serpentine substrates (Pavičević et al., 1974). Serpentine substrates of Kosovo represent dry and rather slightly warmed soils with additional alkaline reaction. They

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are particularly poor in potassium and sodium content, and deficient in nitrates, phosphates, chlorides and sulfates. These soils are also poor in terms of water capacity, although there are some exceptions. In terms of altitude and horizontal extent, serpentine substrates in Kosovo are present within mountain massifs, ranging in altitude from about 300 - 2000 m. Based on various studies conducted by other authors (Slomka et al., 2016) in these substrates have been shown to be habitats with high floristic diversity and with increased presence of endemic plant taxa (Rexhepi, 1979; Millaku et al., 2008; Millaku, 2013; Berisha et al., 2014; Krasniqi et al., 2015; 2019; Prodanovic et al., 2020) and very diverse and interesting vegetation composition (Rexhepi, 1994; Krasniqi & Millaku, 2007; Millaku et al., 2011; 2017; Shuka et al., 2012; 2020; Stevanovic et al., 2003; Shuka, 2008).

On the territory of the Republic of Kosovo there are significant areas covered with serpentine substrate. They are located in the northern part of Kosovo (Kopaonik, the banks of the river Ibër), Malësia e Gjakovës (sector-Qafë e Morinë-Qafë e Prush), Badovc (near the capital Prishtina), Gurana (near Hani i Elezit), Golesh Mt., Sharr Mts. (Peak of Pashallarëve, or Peak of Ostrovica), Mushtisht district, some small fragments in Albanian Alps of Kosovo ("Bjeshkët e Nemuna" National Park), Koznik Mountains (Rahovec and Mirusha sector), Koznica, some fragments in Drenica Mt., (Llapushnik-Carralevë sector) as well as some other smaller fragments (Fig. 1).

Kosovo is characterized by a typical continental climate, with an annual average temperature of 10°C and an average annual rainfall of 784.7 mm (Çavolli, 1997; Pllana, 2015). In terms of flora and vegetation, the serpentine substrates of Kosovo are covered with forests, shrubs, pastures and dry rocky grasslands with a rather rich floristic diversity. Deciduous forests and shrub formations are dominated by oaks and above 800 m by beech forests. The typical grasslands are dry due to the serpentine substrate characteristics. The pastures and rocky grasslands are rich in plant species, some of which are characteristic of serpentine substrates.

Although the influence of the anthropogenic factor is evident, there are also a considerable number of endemic plant taxa in these areas and those that are also protected by law and evaluated accordingly, in accordance with IUCN rules and criteria (Millaku, 2013). Within the richness of the vascular flora of these substrates, there are also some parasitic and semi-parasitic species, confirmed both during field surveys and from literature sources, which are the subject of study in this paper. In particular, we studied the parasitic species during field observations in 2018-2020. Here we will present the results of two semi-parasitic plant species from the family *Loranthaceae* [*Arceuthobium oxycedri* (DC.) M. Bieb. and *Loranthus europaeus* Jacq.] and those of two parasitic plant species from the family *Orobanchaceae* [*Lathraea squamaria* L. and *Orobanche alba* Willd].

Material and Methods

The floristic material was collected during research conducted mainly in the period 2018-2020. In order to expand the knowledge about parasitic and semi-parasitic plant species in serpentine substrates of Kosovo, research expeditions were carried out in other areas with serpentine substrates in Kosovo. For this purpose, about 56 research expeditions were conducted during these two years. All studied plant taxa were photographed, data on habitat types, floristic composition and plant communities, threats and human impacts were recorded. Samples were dried and herbarised according to known standards (Bridson & Forman, 1998) and their habitat and GPS data collected. For the parasitic and semi-parasitic plant species, their presence was confirmed in some other serpentine localities of Kosovo.

For taxonomic identification of plant species, we relied on the Flora Europaea

volumes (Tutin et al., 1964; 1972), and in addition, local and regional floras and taxonomic keys were also consulted for certain taxa (Pajazitaj, 2017; Qosja et al., 1996; Paparisto et al., 1988; Demiri, 1983; Josifovic et al., 1970 - 1977). The taxa nomenclature was updated accordingly, based on the Euro-Med Plant Database (Euro+Med, 2006-2021).

Results and Discussion

As part of our study, mainly in the period 2018-2020, we conducted research expeditions in the serpentines of Malësia e Gjakovës, specifically in the sector Qafë e Morinës-Qafë e Prushit (on the territory of Kosovo). This research has led to the identification and documentation of plant species of the vascular flora, including parasitic and semi-parasitic species. The parasitic and semi-parasitic plant species enrich the floristic diversity of the space studied in this case, but also the flora and vegetation of Kosovo in general. From parasitic and semi-parasitic plants we present in this paper the results for these species: *Arceuthobium oxycedri* (DC.) M. Bieb., *Loranthus europaeus* Jacq., *Lathraea squamaria* L. and *Orobanche alba* Willd. The presence of these plant species has been confirmed in some additional serpentine localities of Kosovo (Table 1).

Fam. Loranthaceae Juss.

Arceuthobium oxycedri (DC.) M. Bieb.

Small shrub up to 20 cm, green to yellow. Articulated, often dichotomous stem. Semiparasitic plant, usually on *Prickly Juniper* (*Juniperus oxycedrus*). I-VII. Figure 2 – 1. (Pajazitaj, 2017; Tutin et al., 1964). From the syntaxonomic point of view, the species was recorded on plant communities belonging to the Association: *Astero-Juniperetum oxycedri* Rexhepi 1990, respectivelly within the Alliance: *Pruno tenellae-Syringion* Jov 1979, Order: *Quercetalia pubescentis* Br. Bl. 1932 and Class: *Querco-Fagetea* Br. Bl. et Vlieger 1937. (Rexhepi, 1994).

Table 1. Some parasitic and semi-parasitic plant species in the serpentine terrains of the Republic of Kosovo.

Nr.	Family / Plant species	Habitat	Host plants	Parasitic / Semi-parasitic	Locality
	Loranthaceae				
1.	*Arceuthobium oxycedri* (DC.) M. Bieb.	Rocky habitats, nearby the bushes	*Juniperus oxycedrus* L.	Semi-parasitic	Malësia e Gjakovës, Rajoni i Mirushës, Mali Drenicë, Zatriq-Koznik, Mushtisht
2.	*Loranthus europaeus* Jacq.	Oak forests	*Quercus petraea* (Matt.) Liebl.	Semi-parasitic	Malësia e Gjakovës
	Orobanchaceae				
3.	*Lathraea squamaria* Jacq.	Beech forest	*Fagus sylvatica* L.	Parasitic	Malësia e Gjakovës Zatriq-Koznik, Rajoni i Mirushës, Mali Drenicë
4.	*Orobanche alba* Wild.	Grasslands and rocky places	*Lamiaceae (Thymus sp.)*	Parasitic	Malësia e Gjakovës, Guriq, Golesh

Fig. 1. Plant species localities on the map of Kosovo serpentines. Serpentine areas (colored in green). *Arceuthobium oxycedri* (DC.) M. Bieb. [■], *Loranthus europaeus* Jacq. [▲], *Lathraea squamaria* Jacq. [□] and *Orobanche alba* Wild. [○].

Loranthus europaeus Jacq.

Small shrub, 5-15 (-30) cm, leaves obovate-oblong, obtuse, dull green, 1-5 cm. Stamen 4-6, embedded in the base of the petals. Semiparasitic plant on *Oak, Chestnut, Pine* etc. V-VI. Figure 2 – 2. (Pajazitaj, 2017; Tutin et al., 1964). From the syntaxonomic point of view, the species was recorded on plant communities belonging to the Association: *Erico-Quercetum petraeae serpentinicum* Rexhepi 1988, respectivelly within the Alliance: *Orno-Ostryon* Tomazic 1940, Order: *Erico-Pinetalia* Oberd. 1949 emend. Ht. 1959 and Class: *Erico-Pinetea* Ht. 1959 (Rexhepi, 1994).

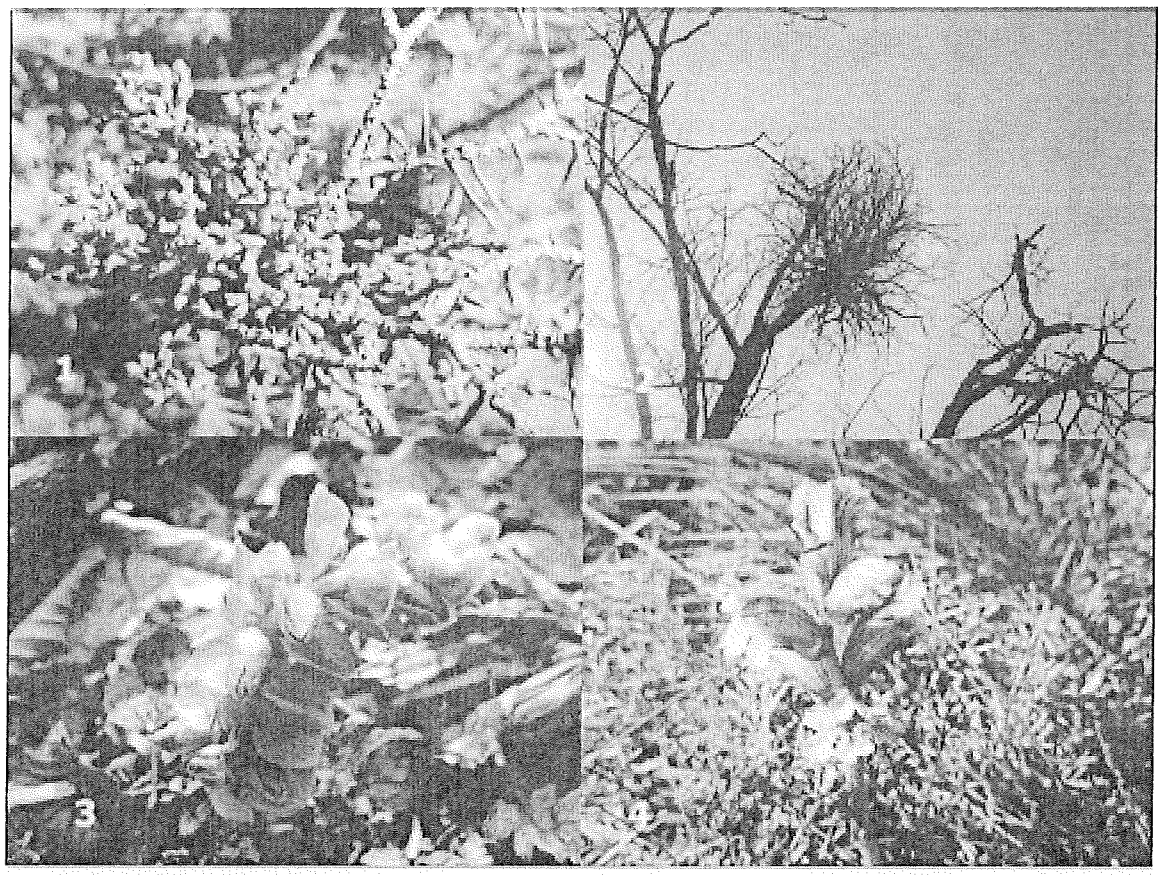

Fig. 2. Habitus of four surveyed plant species. 1. *Arceuthobium oxycedri* (DC.) M. Bieb., 2. *Loranthus europaeus* Jacq., 3. *Lathraea squamaria* Jacq. and 4. *Orobanche alba* Wild.

Fam. Orobanchaceae Vent.

Lathraea squamaria L.

The common toothwort (*L. squamaria*) have been wrongly included in the *Scrophulariaceae* family by various authors (Tutin et al., 1972; Weber, 1976). Perennial plant, 10-25 cm, with fleshy steam, reddish to pink color. Flowers in dense unilateral clusters, with red upper lip, the lower lip is white. In moist forests, as parasites on beech and oak trunks. IV-V. Fig. 2 – 3. (Pajazitaj, 2017; Tutin et al., 1972). From the syntaxonomic point of view, the species was recorded on plant communities belonging to the Association: *Fagetum mesiacae montanum* Blec. et Lakusic 1970, respectivelly within the Alliance: *Fagion mesiacae* Blec. et Lakusic 1970, Order: *Fagetalia sylvaticae* Pawl. 1928 and Class: *Querco-Fagetea* Br. Bl. et Vlieger 1937. (Rexhepi, 1994).

Orobanche alba Wild.

The upper edge of the corona is full, lower lip glandular ciliate. The edges of the stamens at the base with dense hairs, 35-70 cm. The species parasites in the roots of *Lamiaceae* species. VI-VII. Figure 2 – 4. (Pajazitaj, 2017; Tutin et al., 1972). From the syntaxonomic point of view, the species was recorded on plant communities belonging to the Association: *Polygalo-Genistetum hassertianae* Blec. et al. (1969), respectivelly within the Alliance: *Centaureo-Bromion fibrosi* Blec. et al. 1969, Order: *Halacsyetalia sendtneri* H. Ritter-Studnicka 1970 and Class: *Festuco vaginatae* Soo'1968 emend. Vicherek 1972.

Conclusions

In the research that we conducted in the vascular flora of Malësia e Gjakovës (territories between Qafë Morinë to Qafë e

Prushit), as well as in some other serpentine substrates on the territory of the Republic of Kosovo, we identified parasitic and semi-parasitic plant species among many plant species. From 2018 until now, we have identified and documented 4 plant species from this group of plants, grouped in two families of vascular plants. For these plant species, their occurrence was confirmed in some other serpentine localities in Kosovo, such as in Mirusha Region, Drenica Mountain, Zatriq-Koznik, Guriq, Mushtisht and Golesh. From the family *Loranthaceae*, we identified the semi-parasitic species *A. oxycedrus* occurring on Prickly Juniper (*J. oxycedrus*) and *L. europaeus* occurring on Sessile Oak (*Q. petraea*). From the family *Orobanchaceae*, we identified the parasitic species *L. squamaria*, which parasitizes on beech trunks (*F. sylvatica*) and *Orobanche alba*, which parasitizes mainly on plant roots of species belonging to the family *Lamiaceae*. For each plant species, we have also provided its phytosociological data and vegetation classification. The presence of these plant species not only enriches the floristic diversity of the studied area, but also contributes to the general knowledge about the flora of Kosovo.

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PAPER 069

SOME PARASITIC AND SEMIPARASITIC PLANT SPECIES IN THE SERPENTINE TERRAINS OF THE MALËSIA E GJAKOVËS (SECTION QAFË E MORINËS-QAFË E PRUSHIT), THE REPUBLIC OF KOSOVO

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ABSTRACT

Within the vascular flora, seeded plants predominate. Most of them are typical autotrophic plants. Exceptions are parasitic and semi-parasitic plants. Parasitic plants differ from autotrophic plants in that they do not perform the process of photosynthesis. Semi-parasitic plants can perform the process of photosynthesis throughout their life cycle and mainly they receive water and mineral salts dissolved by the host plant. The parasitic and semi-parasitic plant species are present within the floristic diversity of the Republic of Kosovo. They have also been mentioned in papers by various researchers. Our research, during the doctoral dissertation, in the period 2018-2020 in the serpentine terrains of the Malësia e Gjakovës resulted in the ascertainment of many species from the vascular flora. Within these researches, some parasitic and semi-parasitic plant species have been ascertained.

Key words: Natural ecosystems, Serpentine terrains, Vascular flora, Parasitic plants, Republic of Kosovo.

INTRODUCTION

The Malësia e Gjakovës (section Qafë e Morinës-Qafë e Prushit) is located in the western part of the territory of the Municipality of Gjakova. Based on the altitude, it belongs to the hilly-mountainous area. The territory in which we conducted the research has serpentine substrate (Pavicevic, N. et al. 1974). Based on ISMM&Beak Consultants GMBH 2006, in the Geological Map of Kosovo 1: 200000, these terrains belongs to the JGJ (Gjakovë Jurassic peridotite complex). The climate is continental. The annual temperature is 12-10 °C (from Gjakova to the top of malësia e Gjakovës). Annual rainfall of some more than 800 up to more than1000 mm (Instituti për Hidroekonomi "Jeroslav Cerni" 1981, Pllana, R. 2015).

These area are characterized by serpentine substrates, while they are covered with forests, shrubs, pastures and dry rocky places with quite rich floristic diversity. Forest and shrub formations are deciduous where dominate by *oak* and less *beech*. The pastures are dry due to the serpentine substrate. The pastures and rocky places are rich in plant species, many of them characteristic of serpentine substrates.

Although the anthropogenic factor acts, in these areas there are a considerable number of endemic species but also protected by law and evaluated according to IUCN criteria (Millaku, F. et al. 2013).

Within the vascular flora, several parasitic and semi-parasitic species have been confirmed, which we will present in this paper. We analyzed the parasitic species in particular during the research expeditions realized out in the period 2018-2020. In this paper we will present results for two semi-parasitic plant species from the family *Loranthaceae* and for two other plant species from the family *Orobanchaceae*.

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SOME PARASITIC AND SEMIPARASITIC PLANT SPECIES IN THE SERPENTINE TERRAINS OF THE MALËSIA E GJAKOVËS (SECTION QAFË E MORINËS-QAFË E PRUSHIT), THE REPUBLIC OF KOSOVO

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ABSTRACT

Within the vascular flora, seeded plants predominate. Most of them are typical autotrophic plants. Exceptions are parasitic and semi-parasitic plants. Parasitic plants differ from autotrophic plants in that they do not perform the process of photosynthesis. Semi-parasitic plants can perform the process of photosynthesis throughout their life cycle and mainly they receive water and mineral salts dissolved by the host plant. The parasitic and semi-parasitic plant species are present within the floristic diversity of the Republic of Kosovo. They have also been mentioned in papers by various researchers. Our research, during the doctoral dissertation, in the period 2018-2020 in the serpentine terrains of the Malësia e Gjakovës resulted in the ascertainment of many species from the vascular flora. Within these researches, some parasitic and semi-parasitic plant species have been ascertained.

Key words: Natural ecosystems, Serpentine terrains, Vascular flora, Parasitic plants, Republic of Kosovo.

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10th INTERNATIONAL CONFERENCE OF ECOSYSTEMS

June 25-26, 2020

IJEES journal organized the *10th International Conference of Ecosystem* online, jointly with the University of Maryland, College Park, ESSIC, MD, USA, Environmental Engineering Department, Engineering and Natural Science Faculty, Konya Technical University, Konya, Turkey; Department of Biology, Faculty of Natural Sciences, University of Tirana, Albania; Polytechnic University of Torino, Italy; Department of Energy Systems Engineering, Faculty of Technology, Kocaeli University, Kocaeli, Turkey; Department of Energy, Polytechnic University of Tirana, Albania; Necmettin Erbakan University, Faculty of Engineering and Architecture, Department of Environmental Engineering, Konya, Turkey; Faculty of Life Sciences and Environment University "Ukshin Hoti", Prizren, Kosovo; Environment and Health Association, Tirana , Albania; IJEAS, Konya Technical University, Konya, Turkey, June 25-26, 2020 in Tirana, Albania.

CERTIFICATE

This is to certify that **Ismet Ahmeti**

Has attended the 10th INTERNATIONAL CONFERENCE OF ECOSYSTEMS

Held on June 25-26, 2020

10th International Conference of Ecosystems
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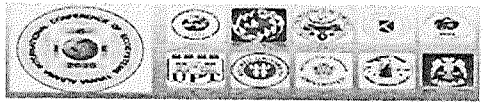
Health and Environment Association, Tirana, Albania

In collaborations:



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IPSAT

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30 October, 2021, Online

Oral Presentation

The Presence of the Plant Species: *Hemerocallis Lilioasphodelus* L. In the Malësia E Gjakovës, An Added Value to the Flora and Vegetation of Kosovo

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Abstract

During a detailed floristic survey carried out in the Malësia e Gjakovës region, between 2019-2021, there were cases where very specific plant species were recorded. It is particularly important in those serpentine terrains, which are among the most interesting natural ecosystems on the territory of Kosovo. We recorded a significant number of plant taxa from the vascular flora of Kosovo. Of particular interest certainly remain the endemic taxa as well as those additional taxa classified as threatened. Based on available sources we noted that for *Hemerocallis lilioasphodelus* L., there is no data on its occurrence or natural distribution in Kosovo. It belongs to European Endemic floral element, while it was reported for Kosovo as a naturalized plant, without having accurate data. It was found in the hilly-mountainous area in the Malësia e Gjakovës, in considerable areas in natural habitats, mainly in forest clearings under the northern and northeastern slopes. The species had stable populations, with large numbers of mature individuals. Based on our initial studies, the species grows in two main plant communities, which syntaxonomically, according to the Vegetation of Europe, belong to two alternate vegetation classes: *Quercetea pubescentis* Doing-Kraft ex Scamoni et Passarge 1959 and *Crataego-Prunetea* Tüxen 1962.

Keywords: natural ecosystems, serpentine flora, Malësia e Gjakovës, *Xanthorrhoeaceae*

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FAKULTETI I SHKENCAVE MATEMATIKE-NATYRORE
DEPARTAMENTI I BIOLOGJISË

Msc. Ismet H. Ahmeti

DIVERSITETI I FLORËS VASKULARE NË SERPENTINET E MALËSISË SË GJAKOVËS (SEKTORI QAFË E MORINËS – QAFË E PRUSHIT)

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REZYMEJA

Republika e Kosovës gjendet në pjesën qendrore të Gadishullit Ballkanik përkatësisht në pjesën jug-lindore të Evropës (Cërabregu 1977). Zona e hulumtimit ishte Malësia e Gjakovës (sektori Qafë e Morinës – Qafë e Prushit), e cila zonë gjendet në pjesën jug-perëndimore të Kosovës. Natyra e Kosovës është e pasur me lloje bimore. Bimët janë pjesë e rëndësishme e biodiversitetit tonë floristik kombëtar. Tokat serpentine paraqesin terrene me interes të veçantë edhe për studime floristike. Këto terrene kanë shpërndarje fragmentare në Kosovë, në zona të mëdha ose të vogla. Malësia e Gjakovës (sektori Qafë e Morinës – Qafë e Prushit) ishte zona jonë e hulumtimit në terren për tri vite me radhë (2018 – 2021), përfshinë një sipërfaqe prej 92 km^2, duke filluar nga lartësia më e ulët mbidetare rreth 380 m deri te ajo më e lartë (1170 m) mbi nivelin e detit (http://geoportal.rks-gov.net/ search 2022).

Nga aspekti floristik, në zonën e hulumtuar gjenden lloje drunore të larta, si *Ahu* (*Fagus sylvatica*), *Bungu* (*Quercus petraea*), *Qarri* (*Q. cerris*), *Bungëbuti* (*Q. pubescens*), etj., pastaj shkurret si *Boshtra* (*Forsythia europaea*), *Grathata* (*Erica carnea*) si dhe një numër i madh i bimëve barishtore, që kanë rëndësi shkencore, ekonomike, praktike, për njeriun dhe mjedisin. Ky thesar bimësh të gjelbra ka rëndësi për ne që jetojmë sot dhe gjeneratat e ardhshme. Roli i bimëve në natyrë është i shumëfishtë: pastrojnë ajrin, ujin, ruajnë natyrën nga erozioni, tokën, rregullojnë klimën e mjedisit në përgjithësi, formimin e humusit, rigjenerimin e tokës (Metaj, Zoto & Fierza 2012), etj.

Sikur edhe terrenet tjera serpentinore në Kosovë, edhe terreni i hulumtuar serpentin në Malësinë e Gjakovës nga aspekti gjeologjik përmban shkëmbinj bazikë dhe ultrabazikë me origjinë magmatike, me përmbajtje ultrabazike, ku mbizotërojnë perioditet e serpentinizuara (harzburgite të serpentinizuara), pastaj shkëmbinj bazikë (gabro e diabaze), ndërsa nga aspekti pedologjik përbëhet nga tokë rendëzinë dhe rendëzinë e hirtë kafe (Krasniqi 2021).

Nga aspekti klimatik, temperatura mesatare vjetore për Komunën e Gjakovës 9 - 14 ˚C (Avdullahi & al. 2007; ASK 2021; IHMK 2019; IHMK 2020), kurse sasia mesatare e reshjeve 917.6 mm (ASK 2021; IHMK 2019; IHMK 2020). Klima është kontinentale e butë me elemente kah ajo

mesdhetare dhe submesdhetare. Kjo për shkak të reshjeve më të mëdha gjatë dimrit dhe sasisë më të vogël të reshjeve gjatë verës. Nga aspekti hipsometrik zona e hulumtuar ka ndryshime të vogla dhe përfaqëson terren kodrinor-malor. Bimësia e zonës përgjithësisht ka karakter termofil.

Terrenet serpentine janë përgjithësishtë të varfëra me elemente biogjene, kanë përmbajtje të lartë të elementeve toksike (fitotoksike), radiacion të lartë, evaporim dhe degradim të lartë (Rexhepi 1979 b; Krasniqi & Millaku 2007).

Lloje bimore me rëndësi të veçantë në kuadër të zonës së hulumtuar kanë edhe rëndësi shkencore (llojet e kërcënuar, endemike, relikte, paleoendemike, neoendemike), pastaj ato me rëndësi praktike dhe ekonomike (bimët mjekësore, mjaltëse, helmuese, ngjyruese, aromatike). Bimët e grumbulluara dhe të thara janë determinuar me përdorimin e literaturës së florave dhe çelësave nga autorë të huaj dhe vendorë. Emërtimi shqip i bimëve është bërë me anë të literaturës nga autorë shqiptarë. (Sejdiu 1979, 1984; Krasniqi et al. 2003; Vangjeli et al. 2006).

Është konstatuar se zona e hulumtuar paraqet habitat natyror për rritje dhe zhvillim të llojit *Hemerocallis lilioasphodelus* në Kosovë.

Analiza e elementit floristik për llojet bimore tregoi prezencën e 12 elementeve korologjike në zonë: Evropian, Evroaziatik, Ballkanik, Mesdhetar, Submesdhetar, Pontik, Kozmopolit, Boreal, Ilirik, Cirkumpolar, Submezik dhe Alpik.

Të gjitha llojet bimore (371 lloje) të florës vaskulare në serpentine të Malësisë së Gjakovës (sektori Qafë e Morinës – Qafë e Prushit) u klasifikuan në 81 familje dhe 251 gjini. Familje që kanë numrin më të madh të llojeve janë: *Compozitae*, *Fabaceae*, *Rosaceae*, *Lamiaceae*, *Poaceae*, *Caryophyllaceae*, *Apiaceae*.

Gjinitë më reperezentative ishin: *Potentilla, Acer*, *Euphorbia*, *Linum*, *Trifolium*, *Centaurea, Asplenium, Genista, Lathyrus, Quercus, Silene, Stachys*.

Nga aspekti e formave jetësore bazuar nga principet e Raunkier (1934), në zonën e hulumtimit ishin prezent këto tipe bimësh: Hemikriptofite (H), Gjeofite (G), Hamefite (Ch), Fanerofite (P), Terofite (T), Hidrofite, Parazite (Par.) përfshirë edhe ato gjysëmparazite (Rexhepi 1994; Saric et al. 1992; Kojic, Popovic & Karadzic 1997; Vangjeli 2016, 2018).

Në zonën e hulumtuar ishin prezent rreth 30 lloje bimore që kanë mbrojtje ligjore në Kosovë.

Lloje bimore që i takojnë Listës së Kuqe të Florës Vaskulare të Kosovës janë 33 lloje bimore, në Listën e Kuqe të Botës janë të përfshira 7 lloje bimore (Millaku et al. 2013; AMMK 2016).

Prezenca e gjithë këtyre llojeve me kategori të ndryshme rreziku në zonën e hulumtimit si dhe prania e llojeve me rëndësi shkencore (endemike, relikte), praktike dhe ekonomike, tregon për nevojë e konservimit dhe hulumtimeve të mëtejshme.

Të gjitha bimët e grumbulluara, thara dhe të përcaktuara janë klasifikuar në disa grupe dhe nëngrupe bimore si: *Fierorë* (*Pteridophyta*) dhe *Farorë* (bimë me farë - *Spermatopyhta*) (Krasniqi 1985; Rexhepi 1986; Paparisto et al. 1988; Pajazitaj 2017; Krasniqi 2021).

Fierorët ishin të përfaqësuar me 9 lloje bimore ndërsa Farorët kishin diversitetin më të madh dhe ishin grupi më i zhvilluar i bimëve me 364 lloje, 245 gjini dhe 75 familje bimore. Në kuadër të këtij grupi dikotiledone ishin 294 lloje dhe monokotiledone 64 lloje. Nëngrupi i farëzhveshurave (*Gymnospermae*) ishte i përfaqësuar me 4 lloje.

Flora vaskulare serpentiniste e Malësisë së Gjakovës (sektori Qafë e Morinës - Qafë e Prushit) kishte prezent edhe 34 lloje bimore endemike të Ballkanit, endemikë të Kosovë dhe Shqipërisë 2 lloje, steno-endemike (6 lloje), relikte (43 lloje), paleoendemike (7 lloje), neoendemike (5 lloje).

Në zonën e hulumtuar është konstatuar edhe prezenca e një numri të madh llojesh bimore mjekësore (144 lloje), mjaltëse (90 lloje), helmuese (61 lloje), ngjyruese (41 lloje) dhe aromatike (13 lloje).

Duhet theksuar se gjendja e diversitetit të Florës vaskulare në Malësinë e Gjakovës (Sektori Qafë e Morinës – Qafë e Prushit) nuk është në gjendje natyrore të mirë, andaj zona duhet mbrojtur dhe faktori njeri duhet ndërgjegjësuar më shumë rreth mbrojtjes dhe shfrytëzimit të bimëve si dhe ruajtjes së mjedisit në përgjithësi. Në këtë hulumtim nuk është përfshirë flora ruderale (flora afër vendbanimeve).

Fjalët çelës: Diversiteti, Flora vaskulare, Serpentine, Endemike të Ballkanit, Relikte, Paleoendemike, Neoendemike, Steno-endemike, Mjekësore, Mjaltëse, Aromatike, Ngjyruese.

SUMMARY

Kosovo is situated in the central part of the Balkan Peninsula, respectively in the southeastern part of Europe (Cërabregu 1977). The research area is the Highland of Gjakova (area of Qafë Morinë - Qafë Prushë), which is located in the southwestern part of Kosovo. The nature of Kosovo is rich in plant species. Plants are important part of our national florist biodiversity. Serpentine lands represent terrain of particular interest study of floristics. These lands are fragmentary spread in Kosovo, in large or small areas. Highland of Gjakova (Qafë Morina - Qafë Prushë) was our research area for three years (2018-2021), which included an area of 92 square kilometers, ranging from the lowest sea level about 380 meters to the highest 1170 meters above sea level (http://geoportal.rks-gov.net/ search 2022).

From the aspect of flora in the researched area, there are high timber species such as: *Beech (Fagus Sylvatica), Sessile Oak (Quercus petraea), Turkey Oak (Q. cerris), Pubescent Oak (Q. pubescens)* etc., and also bushes such as *European Forsythia (Forsythia europaea), Winter Heath [Spring Heath] (Erica carnea)* as well as a large number of herbaceous plants that are of scientific, economic and practical importance to human and the environment. This green plant treasure is important to us who live today and for future generations. The role of plants in the nature is multiple: they clean the air, the water, protect the nature from erosion, the land, in general, they regulate the environmental climate in general, form humus, form regeneration (Metaj, Zoto & Fierza 2012) etc.

Like the other serpentine terrains in Kosovo, also the researched terrain the researched serpentine terrain in the Highland of Gjakova from the geological point of view contains basic and ultrabasic rocks of magmatic origin, with ultrabasic content, where serpentized periods (serpentized harzburgites) prevail, and basic rocks (Gabro and diabase), whereas from the pedology aspect consists of land rank and gray brownish land rank (Krasniqi 2021).

From the climate aspect, the average annual temperature was 9-14 Degrees Celsius in the Municipality of Gjakova for the years (Avdullahi & al. 2007; ASK 2021; IHMK 2019; IHMK 2020), while the average amount of rainfall was 917.6 millileters (ASK 2021; IHMK 2019; IHMK 2020). The climate is gentle continental with Mediterranean and Subsonic elements. This is due to more rainfall in the winter time and the smallest amount of rainfall during the summer. From the hypsometric point of view, the researched area has minor changes and represents the hilly-mountain ground. The vegetation of the area is generally thermofile.

Serpentine terrain are generally poor in biogenic elements, they have high content of toxic (phytotoxic) elements, high radiation, evaporation and high degradation (Rexhepi 1979 b; Krasniqi & Millaku 2007).

Plant species of special importance within the researched area and species of scientific importance are (threatened species, endemic, relic, paloendemic, neoendemic species), then those of practical and economic importance (medicinal plants, honey-bearing, poisonous, coloring, aromatic).

Collected and dried plants are determined using flora literature and keys from foreign and local authors. The Albanian plant denomination was done by using literature by Albanian authors. (Sejdiu 1979, 1984; Krasniqi et al. 2003; Vangjeli et al. 2006).

It is ascertained that the researched area presents natural habitats for growing and developing *Hemerocallis lilioasphedolus* in Kosovo. The analysis of the florist element for plant species reveals the presence of 12 corological elements in the area, where the European, Eurasian, Balkanian, Mediterranean, Submediterranean, Pontic, Cosmopolit, Boreal, Illyrian, Cirkumpolar, Submesic and Alpine florist element prevails. All vascular flora plants (371 species) in serpentine of Highland of Gjakova (area of Qafë Morinë - Qafë Prushë) were classified into 81 families and 251 genders. Families that have the largest number of species are *Compozitae, Fabaceae, Rosaceae, Lamiaceae, Poaceae, Cariophyllaceae, Apiaceae.*

The most representative genders are: *Potentilla Acer, Euphorbia, Linum, Trifolium,Centaurea, Asplenium, Genista, Lathyrus, Quercus, Silene, Stachys.*

From the point of view of life forms based on the principles of Raunkier (1934), in the researched area taking into account the vital forms aspect: Hemicriptophytes (H), Geophytes (G), Chamaephyte (Ch), Phanerophyte (P), Therophyte (T), Hydrophyte, Parasitic (Par.) including

semiparasitic plants (Rexhepi 1994; Saric et al. 1992; Kojic, Popovic & Karadzic 1997; Vangjeli 2016, 2018).

About 30 plant species that have legal protection in Kosovo were present in the researched area. The plant species belonging to the Red List of the Vascular Flora of Kosovo are 33 plant species, the World Red List includes 7 plant species (Millaku et al. 2013;AMMK 2016).

The presence of a large number of species with varying degrees of threats in the researched area, and the presence of species of scientific (endemic, relics), practical and economic importance shows the need for preservation and further research.

All accumulated, dried and defined plants are included in several plant groups, such as *Ferns (Pteridophyta)* and *Seed plants* (*Spermatophyta*) (Krasniqi 1985; Rexhepi 1986; Paparisto et al. 1988; Pajazitaj 2017; Krasniqi 2021).

Fern areas are represented with 9 plant species, while Spermatophyta is the flora group with the largest and most developed diversity of plants with 362 species, 245 genders and 75 plant families. Within this group we have dicotyledons with 294 species and monocotilidones with 64 species. The least represented flora group with species is seedless one (Gymnospermae) with only 4 species.

Serpentine Vascular Flora of the Highland of Gjakova (area of Qafë Morinë - Qafë Prushë) has also 34 endemic species of Balkans, 2 endemic species of Albania and of Kosovo, 6 steno-endemic species, 61 poisonous species, 41 coloring species and 13 aromatic species.

It must be emphasized that the state of diversity of the vascular plant is not in good natural state, thus the area must be protected and the human being must be more aware of the protection of vegetation and of the environment in general. In this research ruderal flora was not included (Flora near the dwelling places).

Key words: Diversity, Vascular Flora, Serpentine, Relic, Endemic, Paleendemic, Neoendemic, Steno-endemic, Medicinal, Honey-bearing, Aromatic, Coloring.