Information, program and abstracts

2nd Young Lichenologists' Workshop in Hungary

12–15 November 2015, Budapest, Hungary

Institute of Ecology and Botany
MTA Centre for Ecological Research
Hungarian Academy of Sciences

Vácrátót
2015

Edited by

Edit Farkas and Nóra Varga

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Contents

2nd Young Lichenologists' Workshop in Hungary

12–15 November 2015, Budapest, Hungary

Organisers:
Edit Farkas and Nóra Varga

General information:

Aim of the workshop: The future of lichenology mostly depends on the younger generations. However especially the young scientists are those who have more difficulties in establishing contacts, they are mostly unable to attend large scientific meetings, often their knowledge on foreign languages needs some training, as well as their oral abilities in discussions are insufficient for speaking in front of a larger public. Therefore we decided to organise a small, rather local meeting for young scientists with deep interest for lichenology. Students and colleagues who completed their PhD recently (*i.e.* some years ago) are invited to present on their current research topic. All topics within lichenology are welcome. You may also bring new ideas what might be in focus of our discussions as well as in the future lichenological research.

Registration: 12 November, 2015, 15.15-16.15 in Danube Research Institute, MTA Centre for Ecological Research, Hungarian Academy of Sciences (H-1113 Budapest, Karolina út 29.

Venue: Danube Research Institute, MTA Centre for Ecological Research, Hungarian Academy of Sciences (H-1113 Budapest, Karolina út 29.
N 47.478962°, E 19.031062°

Language: The official language of the workshop is English.

Scientific programme: Oral presentations and poster section on 13 Nov, 2015.

Excursion:

- 14 November, 2015, in Buda Mountains.
- 15 November, 2015, in National Botanical Garden and Institute of Ecology of Botany, MTA Centre for Ecological Research, Hungarian Academy of Sciences, 2136 Vácrátót, Alkotmány u. 2-4.

Travel: using public transportation operated by BKV. For more information and time-tables, visit the official website of the company http://www.bkk.hu/en/timetables/

Program:

Thursday, 12 November 2015

14.30–15.15 Arrival to Danube Research Institute, MTA Centre for Ecological Research, H-1113 Budapest, Karolina út 29.

15.15–16.15 Registration and technical information.

16.15–16.45 Workshop Opening by Péter Ódor, director of Institute of Ecology and Botany, MTA Centre for Ecological Research, Vácrátót.

Ódor, P., Király, I., Tinya, F., Nascimbene, J.: Environmental drivers of epiphytic bryophyte and lichen assemblages in Hungarian mixed forests.

16.45–19.00 Welcome reception and projecting lichen photographs (bring your best ones!).

Friday, 13 November 2015

9.00–9.15 Welcome

9.15–10.45 Oral presentations, invited speakers, *convener*: Varga, N.

- 9.15–9.55 Kondratyuk, S.: Lichenicolous fungi: taxonomic and 'floristic' approaches.
- 9.55–10.25 Farkas, E.: An account on the investigations of secondary lichen chemistry.
- 10.25–10.45 Engel, R., Szabó, K., Abrankó, L., Füzy, A., Takács, T., Farkas, E.: Active substances: from lichens to herbs.

10.45–11.15 Coffee break

11.15–12.10 Oral presentations, *convener*: Csintalan, Zs.

- 11.15–11.35 Varga, N., Lőkös, L., Farkas, E.: Studies on *Xanthoriicola physciae* and allied species in various habitats.
- 11.35–11.55 Laufer, Zs.: Adaptation of lichens to the extreme environment, effect of high light intensity and heat stress.
- 11.55–12.15 Veres, K., Csintalan, Zs.: The role of seasonality and microhabitat conditions on the photosynthetic activity of some terricolous lichen species.

12.15–14.00 Lunch break

14.00–15.00 Oral presentations, *convener*: Kondratyuk, S.

- 14.00–14.20 Matus, G., Szepesi, J., Rózsa, P., Lőkös, L.: *Xanthoparmelia mougeotii* newly discovered member of the Hungarian lichen flora.
- 14.20–14.40 Sinigla, M.: Some rare, dangerous and protected lichen species in Balaton Uplands, Hungary.
- 14.40–15.00 Hämäläinen, A.: Epiphytic lichens in boreal clear-cut stands: significance of retained trees and stumps as lichen habitat.

15.00–15.30 Coffe break

15.30–16.30 Oral presentations, *convener*: Farkas, E.

15.30–15.50 Matura, N.: Freshwater lichens in the Polish Western Carpathians.

15.50–16.10 Frolov, I.: Distinction of three seemingly cryptic lichen species (*Pyrenodesmia*, Teloschistaceae) with two-tier method.

16.10–16.30 Fačkovcová, Z., Zozomová-Lihová, J., Guttová, A.: What can genetic diversity of lichenized fungus *Solenopsora candicans* tell us about its origin in Pannonia?

16.30–16.45 Coffe break

16.45–17.40 Poster presentations, *convener*: Varga, N.

16.45–17.00 Balogh, R., Béregi, B., Martins, L. S., Novák, T., Lőkös, L., Varga, N., Papp, B., Matus, G.: Composition and biomass of a cryptogamic community in grazed and fenced dry acidic grassland.

17.00–17.15 Maslać, M.: Using lichens as bioindicators of air quality: from physiological to the community change.

17.15–17.30 Biró, B., Lőkös, L., Farkas, E.: HPTLC chromatographic analysis of *Cetrelia* species.

17.30–18.00 Dicussion on selected topics.

18.30– Dinner in Mechwart Pince, H-1024 Budapest, Keleti K. u. 4. (close to the tram nr 4-6 stop „Mechwart tér”).

Saturday, 14 November 2015

9.00–15.30 Workshop excursion in Buda Mountains.

15.30–19.00 „Labwork” and discussions on different topics in the Danube Research Institute, MTA Centre for Ecological Research, H-1113 Budapest, Karolina út 29.

Sunday, 15 November 2015

9.30–15.30 Visit in the National Botanical Garden and Institute of Ecology of Botany, MTA Centre for Ecological Research, Hungarian Academy of Sciences in Vácrátót.

15.30– Travel home.

Abstracts

Composition and biomass of a cryptogamic community in grazed and fenced dry acidic grassland

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Effect of grazing exclosure on cryptogams in an open acidic sandy grassland at Nyírség region (NE Hungary) has been studied. Composition and biomass in nearby grazed and fenced parts of a *Corynephorus* stand have been compared. The fence constructed in 2008 excluded grazing mammals (hare, sheep) and resulted in a shifting dominance of vascular plants and of cryptogams as detected in permanent plots. Both grazed and excluded parts have been sampled in 40 replicates of 10 x 10 cm quadrates in spring 2013. Over seven times more lichen biomass (>40 g/m^2) and 1.3 times more of mosses (>45 g/m^2) have been recorded in the exclosure. Cryptogams altogether weighted 2.2 times (>90 g/m^2) more in the exclosure. Significantly higher biomass of the dominant lichen, *Cladonia rangiformis* and of *Brachytecium albicans* has been detected in exclosure. Contrary, biomass of the legally protected *C. magyarica* proved significantly higher under grazed conditions. Cryptogams altogether weighted 2.2 times (>90 g/m^2) more in fenced part. In this community *Phoma*-like lichenicolous species were detected as new records for the area.

HPTLC chromatographic analysis of *Cetrelia* species

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A taxonomic revision on Hungarian *Cetrelia cetrarioides* and *C. olivetorum* specimens of BP, EGR, VBI, SZE, JPU and SZO herbaria was carried out by HPTLC and microcrystal tests. The distribution of species was mapped and the habitats of the species were compared, aspects of nature conservancy were discussed.

Specimens of the same species were analysed in foreign lichen herbarium of BP. Also new collections from Asia were identified by the help of secondary chemistry analysed by HPTLC.

Our work was supported by the Hungarian Scientific Research Fund (OTKA K81232).

Active substances: from lichens to herbs

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Wide scale of active substances produced by herbs and lichens can provide health-promoting properties. Therefore the examination and accurate determination of these compounds based on up-to-date analytical methods are hot topics in the research field of medicinal plants and lichenology as well.
The present report can be divided into two main parts. On one hand we focused on the development and optimization of analytical methods for the measurement of certain group of chemical compounds derived from herbs (*Lamiaceae* species) and lichens (*Cladonia*, *Hypogymnia* species). On the other hand we were wondering how the biotical ecological factors such as the presence of arbuscular mycorrhizal fungi (AMF) in the root systems of herbs can affect their chemical composition.

As results of this study two HPLC (High Performance Liquid Chromatography) methods were optimized. One of the methods allows the determination of the major polyphenols (e.g. rosmarinic acid, lithospermic acid isomers) of marjoram and lemon balm, while the other can be applied for the measurement of usnic acid, atranorin and chloroatranorin from lichens. In terms of the root colonization of AMF we found that the mycorrhization should be considered as a significant environmental factor that can influence the synthesis of polyphenols in herbs.

As our further aim we are planning to examine the effect of environmental factors on the production of the active substances in lichens.

Authors thank OTKA (PD105750) for the financial support.

What can genetic diversity of lichenized fungus *Solenopsora candicans* tell us about its origin in Pannonia?

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The species *Solenopsora candicans* (Leprocaulaceae) is a saxicolous lichen occurring mainly in Mediterranean basin and along Atlantic coast up to British Isles. In Central Europe, it represents remarkable element with only a few recently known populations, e.g. in Pannonian basin in four orographic units – Bakony, Balaton-felvidék, Budai-hegység, Keszthelyi-hegység. Position of Pannonia may represent important connection between centre of species distribution in the Mediterranean and northern periphery in the Western Carpathians. Based on samples across distributional range we work on its phylogeography with focus on northern peripheral populations. Using molecular DNA markers (nrITS, β tubulin) we study genetic diversity in order to reveal their origin and diversification in this area. According to preliminary analyses of ITS dataset, the samples from Pannonia are genetically unexpectedly heterogeneous. They include two groups – ubiquistic and younger, derived ribotypes. This points at the fact that Pannonia, namely the area of Lake Balaton is an evolutionary hotspot. Geological bedrock (basalts) in combination with humid climate of the lake resembles Mediterranean conditions. Pannonia is a crossroads between the Mediterranean and lower altitudes in the European continent supporting biological diversification.

An account on the investigations of secondary lichen chemistry

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Lichens produce a great variety of secondary metabolites, and most of them are unique to lichen-forming fungi. Approximately 1000 secondary compounds have been identified so far.

These chemically diverse (aliphatic and aromatic) lichen substances have relatively low molecular weight. They are produced by the mycobiont, and accumulated in the cortex (such as atranorin, parietin, usnic acid, fungal melanins) or in the medullary layer (such as norstictic acid, physodic acid, physodalic acid, protocetraric acid) as extracellular tiny crystals on the outer surfaces of the hyphae. The photobiont might also have an influence on the secondary metabolism of the mycobiont.

The distribution patterns of secondary metabolites within lichen thalli are usually taxon specific, and therefore have been widely used in lichen taxonomy and systematics since they represent cryptic chemical diversity additional to morphological-anatomical biodiversity.

The production of secondary chemistry is genetically controlled, and in some instances is correlated with morphology and geography in individuals at the species and genus levels. In addition to their role in lichen chemotaxonomy and systematics, lichen secondary compounds have several possible biological roles, including photoprotection against intense radiation, as well as allelochemical, antiviral, antitumor, antibacterial, antiherbivore, and antioxidant action. These compounds are also important factors in metal homeostasis and pollution tolerance of lichen thalli.

We realized that the study of secondary lichen substances is a real challenge in Hungary.

Secondary lichen chemistry in Hungary was studied exclusively by the usual spot reactions until 1998 when HPTLC studies were introduced. The history, methods, roles concerning to lichen substances and some examples from our investigations are presented.

Our work was supported by the Hungarian Scientific Research Fund (OTKA K81232).

Distinction of three seemingly cryptic lichen species (*Pyrenodesmia,* Teloschistaceae) with two-tier method

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Two-tier phenotype evaluation, consisting of a pilot study and a subsequent detailed study, is used here to recognize three morphologically very similar taxa of *Pyrenodesmia* (Teloschistaceae) with black apothecia, which were first recognized by phylogenies of ITS and β-tubulin. We have found sixteen characters that are at least partly diagnostic, but using the two best characters in combination we may correctly identify close to 100 % of samples of all three taxa. We have thus shown that these taxa are not cryptic phylogenetic species, but phenotypically separable taxa.

Epiphytic lichens in boreal clear-cut stands: significance of retained trees and stumps as lichen habitat

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The European boreal forests are to large extent managed by clear-cutting, which has drastic impacts on the forest-dwelling lichen species. I studied the epiphytic lichen communities on stumps and retained trees in clear-cut sites 12 years after harvest, with the aim to assess whether these substrates could support lichen assemblages in the cut sites. Both retained trees and stumps hosted high species richness, including also red-listed species and dead wood specialists. All lichen species were, however, not able to persist in the cut sites; particularly microlichens were vulnerable to the impact of clear-cutting. Still, retained trees and stumps provided suitable substrates for a majority of the species. Thus tree retention could help to maintain lichen diversity in the managed forests, whereas the rapidly increasing practice of harvesting stumps for energy production may be harmful for lichens, especially dead wood specialists.

Lichenicolous fungi: taxonomic and 'floristic' approaches

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Comparison of results of special study of lichenicolous fungi during taxonomic revision of some genera of lichen-forming fungi of the families Stictaceae, Parmeliaceae, Teloschistaceae and many years 'floristic' (species inventory) studies of lichen-forming and lichenicolous fungi of Ukraine, Israel, South Korea and some central Asian countries is provided.

Key characters, ecology and distribution of some representatives of the following genera of lichenicolous fungi are illustrated and discussed: *Adelococcus*, *Arthoria*, *Byssoloma*, *Capronia*, *Dactylospora*, *Lichenochora*, *Lichenoconium*, *Lichenodiplis*, *Lichenodiplisiella*, *Lichenostigma*, *Llimoniella*, *Melaspilea*, *Norrlinia*, *Opegrapha*, *Pezizella*, *Phoma*, *Plectocarpon*, *Polycarpon*, *Pronectria*, *Pseudonitschkia*, *Roselliniopsis*, *Sclerococcus*, *Stygiomyces*, *Unguiculariopsis*, *Vouauxiomyces*, *Wentiomyces* and *Zwackhiomyces*.

Adaptation of lichens to the extreme environment, effect of high light intensity and heat stress

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In this study, I would present two types of adaptation of lichens to environmental stresses. Firstly, the presence of the enzyme tyrosinases, those are essential in the formation of pigments such as melanin. Melanin protects the lichens from potentially harmful high light intensity, UV radiation and heat. We tested for the presence of tyrosinases and characterised the enzyme in a range of 50 species of lichens. Possible roles of tyrosinases in lichens are discussed. Secondly, desiccation and light stress often accompany high temperature. In our recent work we investigated the seasonal variation of the thermal stability of PSII in connection with the amount and ratio of chlorophylls and xanthophyll cycle pigments (VAZ) in lichen species collected from different habitat in Bugacpuszta.

Using lichens as bioindicators of air quality: from physiological to the community change

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Since lichens receive all necessary water and nutrients from the air, they are among the most commonly used biological indicators for the assessment of air quality in the world, significant for showing the multi-pollutant/multi-effect state of the environment. With analysing either the physiological changes on individuals and/or specifying the range of lichen species (since there are sensitive and resistant species) one can fairly quickly assess and map the long-term (cumulative) effects of air pollution over large areas, something that is technically not possible when using the standard approach with measuring stations. My PhD thesis will focus on changes due to air pollution, both on changes in lichen metabolism (e.g. secondary metabolites, photosynthesis, etc.) and on comparing this approach to changes in the lichen communities. I plan to research lichens around the area of Slavonski Brod (Croatia), where there is a recognized problem of industry induced air pollution.

Freshwater lichens in the Polish Western Carpathians

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Lichens (lichenized fungi) occurring in aquatic ecosystems or permanently humid habitats comprise a small and poorly known group of organisms, compared to the terrestrial lichens and reports about their occurrence in Poland are only fragmentary. Due to the low state of knowledge of these organisms the studies about occurrence of freshwater lichens in the Polish Western Carpathians were undertaken. The main object of the study is to estimate freshwater lichen diversity in streams of the Polish Western Carpathians and to study their distribution and ecological preferences. The project is based on field works and laboratory analysis. Many interesting freshwater lichens were found in the course of the study. They represent both frequent and rare species in the Polish Western Carpathians.

Xanthoparmelia mougeotii newly discovered member of the Hungarian lichen flora

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X. mougeotii, an Atlantic species has been recorded as new for the lichen flora of Hungary (Telkibánya, Tokaj Mts.). Presence of soralia as well as of usnic acid, norstictic acid and stictic acid validated the identification. Atlantic species ($K_{Ellenberg}$=2) of a Western European distribution – weight/emphasis – and only with isolated to scattered occurrences in Central Europe are scarce in Hungary. The so far detected 16 species are mostly confined to higher elevations and tend to count from single to a limited number of records. *X. mougeotii* – Mougeout's shield lichen – is the second saxicolous Atlantic lichen to Hungary. The substrate at the new locality is grey-veined fluidal rhyolite, a highly acidic rock (>77% SiO_2) which originated from a Sarmatian (Middle Miocene, 12.7–11.6 Myrs) lava dome. The species, considered as endangered in Central Europe and the Baltic states (EE, LV, LT, DE, CZ, PL and SK), numbers several thalli at the new locality. Voucher specimens have been deposited at BP, DE and EGR.

Some rare, dangerous and protected lichen species in Balaton Uplands, Hungary

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I analyzed the legally protected and red-listed species from April to September, 2015 supported by the Balaton-felvidék National Park. The examined area included 36 plots, approximately 6000 hectares in Balaton Uplands wich belong to the Natura 2000 Network Habitats Directive, each plot was a 100-meter in diameter during the survey and I visited each plot more times in order to better results of data collection. Altogether 223 lichen species were recorded. The number of red-listed and protected lichen species is 49, these are critically endangered, endangered, vulnerable, rare and protected by national law categories. From these 49 species the most frequent ones can be listed in rare category. The critically endangered category contains only three lichen species.

Environmental drivers of epiphytic bryophyte and lichen assemblages in Hungarian mixed forests

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The effect of management related factors on species richness and species composition of epiphytic bryophytes and lichens was studied in managed deciduous-coniferous mixed forests in Western-Hungary. At the stand level, the potential explanatory variables were tree species composition, stand structure, microclimate and light conditions, landscape and historical variables; while at tree level host tree species, tree size and light were studied.

Species richness of the two epiphyte groups was positively correlated. Both for lichen and bryophyte plot level richness, the composition and diversity of tree species and the abundance of shrub layer were the most influential positive factors. Besides, for bryophytes the presence of large trees, while for lichens amount and heterogeneity of light were important. Tree level richness was mainly determined by host tree species for both groups. For bryophytes oaks, while for lichens oaks and hornbeam turned out to be the most favourable hosts. Tree size generally increased tree level species richness, except on pine for bryophytes and on hornbeam for lichens. Tree species was among the most important driver of species composition in both organism groups. For bryophytes, the continuity of forest microclimate and the presence of shrub layer are also important, while lichen assemblages are influenced by light availability.

The key variables for epiphytic diversity and composition of the region were directly influenced by recent forest management; historical and landscape variables were not influential. Forest management oriented to the conservation of epiphytes should focus on: (i) the maintenance of tree species diversity in mixed stands; (ii) increment the proportion of deciduous trees (mainly oaks); (iii) conserving large trees within the stands; (iv) providing the presence of shrub and regeneration layer; (v) creating heterogeneous light conditions. For these purposes tree selection and selective cutting management seem more appropriate than shelterwood system.

Studies on *Xanthoriicola physciae* and allied species in various habitats

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Lichenicolous fungi in Hungary were neglected and undercollected in the middle of the last century. One of the oldest data of lichenicolous fungi in Hungary is *Xanthoriicola physciae*, which was discovered by the Hungarian mycologist, László Hollós in Kiskunság area in 1913. In the last decade we started to pay more attention to these fungi and collect samples intensely from the whole country. The common orange lichen, *Xanthoria parietina* as a host was in our focus, because of its wide ecological tolerance and easily recognizeable thallus. Our first preliminary results showed that its most common parasite, *X. physciae* distributed mainly in the low-lands, but soon more mountainous locations were found.

After 100 years of Hollós' finding, we recognized, that the area of Kiskunság is rich in lichenicolous species. Not only *X. physciae*, but many other xanthoriicolous species occur together.

Humid areas are generally considered to have higher diversity of lichenicolous species than that of dry ones. Our results refer to that the Kiskunság area in contrary to its extremely dry climate, represents a hotspot for lichenicolous species. Our records of lichenicolous fungi confirm the importance of protection of this special habitat of steppe with virgin forest of juniper, which is unique in European level.

Our work was supported by the Hungarian Scientific Research Fund (OTKA K81232).

The role of seasonality and microhabitat conditions on the photosynthetic activity of some terricolous lichen species

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Semiarid sandy grasslands with many endemic lichens are native vegetation types of Kiskunság Region, Hungary. On this area sand dunes ensure diverse microhabitats for terricolous lichen species having different environmental requirements. It is not exactly known how seasonal photosynthetic activity changes in different microhabitats. Therefore, we assessed the photosynthetic activity of terricolous lichens between two microclimatic conditions (North-East and South-West slope directions). Chlorophyll *a* fluorescence measurements were made on 7 species in all seasons for two years. For studying microhabitat differences, microclimatic parameters were also continuously monitored during two years. Our results indicate that because of the different amount of irradiation there are different microclimatic conditions on slopes with NE and SW directions. This caused different species composition and within species different photosynthetic activity between sun and shade populations during the year.

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