Pavol Jozef Šafárik University in Košice, Slovakia
Botanical Garden

Conference

BIODIVERSITY OF THE PLANT KINGDOM IN THE COURSE OF CLIMATE CHANGE

Košice 9th – 11th September 2025

BOOK OF ABSTRACTS

Conference 75 years since the founding
of the Botanical Garden in Košice

Košice 2025

Conference „Biodiversity of the plant kingdom in the course of climate change". Košice 9th – 11th September 2025. Book of Abstracts.

Editors:
Pavol Mártonfi
Lenka Mártonfiová
Botanical Garden of Pavol Jozef Šafárik University, Košice, Slovakia

Reviewers:
Iva Hodálová
Plant Science and Biodiversity Centre, Slovak Academy of Science, Bratislava, Slovakia
Michal Goga
Department of Plant Biology, Faculty of Science, Pavol Jozef Šafárik University, Košice, Slovakia

Available at: www.unibook.upjs.sk
Publication date: 03.09.2025

DOI: https://doi.org/10.33542/BPK-0429-3-0

ISBN 978-80-574-0428-6 (print)
ISBN 978-80-574-0429-3 (e-publication)

https://doi.org/10.33542/BPK-0429-3-1

Lichen Biodiversity in Slovakia: Molecular Identification of Species Based on ITS Sequences and Assessment of Antioxidant Potential of Lichen Secondary Metabolites

Miriam Bačkorová[1], Andrea Schreiberová[2], Lesia Schreiberová[1]

[1]Department of Pharmaceutical Technology, Pharmacognosy and Botany, University of Veterinary Medicine and Pharmacy in Košice, Komenského 73, 041 81 Košice, Slovakia
[2]Department of Epizootiology, Parasitology and Protection of One Health, University of Veterinary Medicine and Pharmacy in Košice, Komenského 73, 041 81 Košice, Slovakia

Lichens are symbiotic organisms formed by a fungal partner (mycobiont) and a photoautotrophic partner, such as green algae or cyanobacteria. Due to their ability to survive in extreme conditions and the production of specific secondary metabolites, they play an important role in ecosystems. This study contributes to the understanding of lichen biodiversity in Slovakia through molecular identification and phylogenetic analysis using PCR amplification and sequencing of the 18S rRNA gene and ITS1 (Internal Transcribed Spacer) region of ribosomal DNA. Six lichen species were identified from 17 locations, highlighting species distribution and diversity across different habitats. The most frequent species was *Pseudevernia furfuracea*, followed by *Hypogymnia physodes*, *Xanthoria parietina*, *Physcia adscendens*, *Physcia stellaris*, and *Bryoria fuscescens*/*implexa*. *Pseudevernia furfuracea* from Liptovský Hrádok had the highest flavonoid content 1.73 ± 0.14mg/100g dw, while *Hypogymnia physodes* from Regetovka showed the highest polyphenol content 8.85 ± 0.31 mg/100g dw. All species exhibited antioxidant activity proportional to their phenolic compounds. These results show that the variety of lichens is important because they produce useful natural compounds that can help protect health and the environment.

Acknowledgment
This research was funded by Slovak Grant Agency KEGA 003UVLF-4/2024.

https://doi.org/10.33542/BPK-0429-3-2

Research on Botany and the Cultivation of Medicinal Plants at the Educational Garden of the University of Nyíregyháza

Judit Csabai

University of Nyíregyháza, 4400 Nyíregyháza, Sóstói str. 32/b, Hungary

At the Educational Garden of the University of Nyíregyháza, ongoing research emphasizes the preservation of native plant diversity and the enhancement of eco-friendly cultivation methods. A key part of this work is the genetic conservation of rare and protected species such as *Dianthus plumarius* subsp. *praecox*, *Dianthus giganteiformis* Borbás subsp. *pontederae*, and *Dianthus superbus* L. Alongside this, we grow and study medicinal and aromatic plants, including *Calendula officinalis*, *Capsicum annuum*, *Agastache foeniculum,* and *Acmella oleracea*, paying close attention to how their chemical profiles change during cultivation. There's also ongoing research with exotic crops like *Eragrostis tef* and *Vigna unguiculata* subsp. *unguiculata*, examining how they adapt to local conditions. In plant protection, we monitor insect species, like *Cydalima perspectalis* and *Cydia interscindana*, that attack ornamental plant species, to support forecasting efforts. Students actively participate in these initiatives, gaining hands-on experience through activities like planting, herb collection, and on-site training.

https://doi.org/10.33542/BPK-0429-3-3

In vitro susceptibility testing of *Malassezia pachydermatis* clinical isolates against plant essential oils

Eva Čonková, Peter Váczi, Zuzana Malinovská

University of Veterinary Medicine and Pharmacy in Košice, Department of Pharmacology and Toxicology, Komenského 73, 041 81 Košice, Slovensko

The aim of the present study was to determine the susceptibility of *M. pachydermatis* strains, an important opportunistic secondary pathogen associated with dermatitis or otitis in dogs, to ten plant essential oils – EO: bergamot – *Citrus aurantium* subsp. *bergamia*, grapefruit – *Citrus paradisi*, coriander – *Coriandrum sativum*, hyssop – *Hyssopus officinalis*, lavender – *Lavandula angustifolia*, tea tree – *Melaleuca alternifolia*, nutmeg – *Myristica fragrans*, oregano – *Origanum vulgare*, rosemary – *Rosmarinus officinalis*, and Spanish sage – *Salvia lavandulifolia*. The lowest MIC was found in coriander, with average MIC of 400 µg/mL, followed by lavender (MIC 571.43 µg/mL), hyssop (MIC 5685.71 µg/mL), rosemary (MIC 737.50 µg/mL), bergamot (MIC 823.21 µg/mL), sage (MIC 846.43 µg/mL), tea tree (MIC 2360 µg/mL) and oregano (MIC 2430 µg/mL). Higher MIC values were noticed for EOs from nutmeg (MIC 5808.93 µg/mL) and grapefruit (MIC 15864.29 µg/mL). All 15 clinical strains tested were susceptible to coriander (100 %). Nutmeg EO showed activity against 14 isolates (93.33 %). Susceptibility to sage and hyssop EOs was found in 11 strains (73.33 %). Rosemary EO showed activity against 10 strains (66.67 %). EOs from lavender, tea tree and oregano were effective against 8 strains (53.33 %) and EOs from bergamot and grapefruit against 7 isolates (46.67 %). The obtained results indicate promising prospects for the clinical use of essential oils in the treatment of *M. pachydermatis* infections.

Acknowledgements
Authors thank to Ministry of Education KEGA, Grant No. 003UVLF-4/2024, Medicinal mushrooms in pharmacy and building 3D collections of medicinal mushrooms.

https://doi.org/10.33542/BPK-0429-3-4

Eastern Slovakian herbarium collections - their recent status and perspective

Matej Dudáš

Department of Plant Biology, Institute of Biology & Ecology, Faculty of Science, Pavol Jozef Šafárik University, Mánesova 23, SK-040 01 Košice, Slovakia

Herbarium specimens are an important part of the work of botanists. Herbarium specimens provide original evidence of the occurrence of a given plant species in a specific area at a specific time and provide irreplaceable material that, when properly stored and treated, can last for centuries. In Slovakia, over 30 public herbarium collections were established. In eastern Slovakia, 10 herbaria exist in total, most are museal collections with regional importance and documents the flora of the catchment area within its jurisdiction and one supraregional collection in University of Pavol Jozef Šafárik University in Košice. From these 10 collections, only six are mentioned in Index herbariorum and 7 are active, but not all have its own curator or botanist. The museal collections include Vlastivedné múzeum v Hanušovciach nad Topľou (acronym HNTS) with 5358 herbarium specimens; Krajské múzeum (acronym MPS) in Prešov with 23811 herbarium specimens, these two institutions were merged and today form Krajské múzeum Tripolitana; Šarišské múzeum (acronym SMB) in Bardejov with 6711 herbarium specimens; Vihorlatské múzeum (acronym HUM) in Humenné with 11973 herbarium specimens; Podtatranské múzeum (acronym POP) in Poprad with 6679 herbarium specimens; Banícke múzeum (acronym ROM) in Rožňava with 5320 herbarium specimens; Výskumná stanica, Štátne lesy TANAP (acronym TNP) in Tatranská Lomnica with 34893 herbarium specimens; Múzeum Spiša (acronym SNV) in Spišská Nová Ves with 20597 herbarium specimens and Východoslovenské múzeum (acronym VSM) in Košice with 5300 herbarium specimens. The last and the biggest is Herbarium of Botanical Garden of Pavol Jozef Šafárik University (acronym KO) in Košice which stores over 50.000 herbarium specimens. These collections contain together over 170.000 herbarium specimens including vascular plants, mosses, lichens, fungi and seeds collected mainly in eastern Slovakia and thus represent an important source of data for botanists, ecologists and nature conservation scientists.

https://doi.org/10.33542/BPK-0429-3-5

Panicum dichotomiflorum in Slovakia: casual migrant or future invasive species?

Pavol Eliáš Jr., Ľuba Ďurišová, Samuel Kšiňan

Institute of Plant and Environmental Sciences, Slovak University of Agriculture, A. Hlinku 2, 949 76 Nitra, Slovakia

Panicum dichotomiflorum is a North American synanthropic taxon with an original distribution range in northern Mexico, the eastern part of the USA and the Antilles. It has been introduced to almost all of Europe, except for the northernmost regions (Scandinavia, the Baltics, northern Russia). The species was found only rarely in Slovakia since the late 1970s in the Podunajská nížina lowland and the Východoslovenská nížina lowland. A total of 8 localities are known, however, it was recently found on only two sites (Zlaté Moravce, Humenné). It is most often found around railway corridors but is also starting to appear in ruderal habitats in cities. Its occurrence is mostly casual; it has been recorded repeatedly only rarely (Čierna nad Tisou). The occurrence outside the most typical habitat could indicate the beginning of a more intensive spread of this species in Slovakia.

Acknowledgement
The contribution was funded by VEGA grant no. 1/0359/22.

https://doi.org/10.33542/BPK-0429-3-6

Making the collection available to disabled visitors of the Botanical Garden - Herb Library for the Blind

Andrea Fridmanová, Martin Pizňak

Botanical Garden, Pavol Jozef Šafárik University in Košice, Mánesova 23, 04352 Košice, Slovakia

The new herb garden in the Botanical Garden of the UPJŠ in Košice was created in 2022 as part of a project with the subtitle Herb Library for the Blind. It has 170 m^2, is divided into 14 rectangular beds and is organized according to the use of medicinal plants. In each bed, herbs are grown according to their purpose and use. The planting is not invariable, the range of plants planted varies slightly from year to year. The characteristics of the plants grown, such as their distinctive scent and their use as medicinal or spice plants, make the herb garden suitable for exploration by visitors with visual impairments. By placing information boards at the beds and large information boards in Slovak, English and Braille, reliefs of the surrounding area, the herb garden itself and selected plants, individual tours for blind visitors are also possible. At the same time, the layout of the herb garden also covers the requirements for the transfer of immobile visitors. In addition, due to the usefulness of the plants, we also use the herb garden to organise experiential guided tours for group excursions, especially for primary school pupils.

https://doi.org/10.33542/BPK-0429-3-7

Cytogenetic insights into endemic Balkan *Onosma* species and their relatives

Andrea Galicová, Marianna Janová, Vladislav Kolarčik

[1]Department of Plant Biology, Institute of Biology and Ecology, Faculty of Science, Pavol Jozef Šafárik University in Košice, Mánesova 23, SK-041 54 Košice, Slovak Republic

Onosma is a species-rich genus characterized by complex morphological and karyological variation, as well as taxonomic complexity resulting from evolutionary processes such as polyploidization, hybridization, and general species similarity. In this study, we examined karyological variation and genome size in two endemic species of the genus *Onosma* from the south Balkan Peninsula—*O. frutescens* and *O. graeca*—along with their relatives, *O. rutila* from Asia Minor and *O. visianii* from Central Europe. Metaphase chromosome observations were conducted using microscopic squash slides, and genome size was measured via flow cytometry technique. We found that *O. frutescens* and *O. rutila* share the same chromosome number 2n = 14, while *O. graeca* and *O. visianii* typically have 2n = 18 chromosomes. Genome sizes across these species ranged from 2.833 to 3.878 pg. We outline species relationships and highlight common misidentifications between *O. graeca* and *O. frutescens*, despite their clear morphological differences. We briefly discuss the implications of climate change for species distribution limits.

https://doi.org/10.33542/BPK-0429-3-8

Experience of the Pavol Jozef Šafárik University Botanical Garden in designing new concepts of climatically and ecologically functional greenery in non-traditional environments (greenery on roof structures, roof wetland concept, park design with a water element in an industrial area and developing the concept of landscape design in the ECM)

Robert Gregorek

Botanical Garden, Pavol Jozef Šafárik University in Košice, Mánesova 23, 04352 Košice, Slovakia

In recent years, we have capitalized on practical experience in establishing and maintaining greenery outside the Botanical Garden's area. Among the most valuable results of cooperation with the business sector is the conceptual design of intensive roof plantings in the Villa Sandy area. In cooperation with IZOLA s.r.o. in Košice and the TUKE Faculty of Civil Engineering, we participated in the design and implementation of roof plantings, including the successful testing of the so-called "roof wetland". A close cooperation with the US Steel Košice culminated in an adaptation of the former fire-fighting water tank into a romantic pond with park landscaping. We support modern trends in a changed approach to maintaining the protective zones of power lines. In cooperation with VSD, a.s., we are also attempting to keep vegetation under MV lines in our area through grazing and verifying natural methods of landscape design in these areas. In close cooperation with the City of Košice, several business entities, and local activists, we have been contributing to the revitalisation and renaturalisation of the Mill Race in Košice for a long time.

https://doi.org/10.33542/BPK-0429-3-9

Curriculum vitae of the compendium Květena České republiky (1975-2025)♣

Lubomír Hrouda

Department of Botany, Charles University, Benátská 2, CZ-128 01 Praha 2, Czech Republic

In 2024, the last, 9th volume of the compendium of the Czech flora was published, this year the general index is being published. This marks the end of the 50-year history of the project, which was created in 1975 at the Institute of Botany of the Czechoslovak Academy of Sciences. The 9 volumes themselves were published in the years 1988-2024. The compendium has 5810 pages and 1062 full-page illustrations; it contains detailed treatment of 3349 species of vascular plants and another 400 species in notes. 80 authors contributed to the Flora. The contribution aims to capture how the work was created in the context of time and fundamental social changes, to highlight the main actors, starting with the first guarant of the project S. Hejný, through all the editors, and ending with the last editor-in-chief J. Štěpánková, who played a major role in the work being completed. Special thanks go to both illustrators, Mrs. A. Skoumalová and E. Smrčinová. In the end, it attempts to look behind the scenes of this extraordinary work, recall the fundamental projects that would not have been created without Květena, and compare Květena with similar compendia in Europe, including a comparison of Květena ČR and Flora Slovenska. The importance of the completed series is also highlighted by the fact that it is probably the last printed work on this topic.

♣ invited lecture

https://doi.org/10.33542/BPK-0429-3-10

Activities of the Union of Botanical Gardens of the Czech Republic

Magdaléna Chytrá

The Botanical Garden of the Faculty of Science, Masaryk University, Kotlářská 2, 611 37 Brno, Czech Republic

The Union of Botanical Gardens of the Czech Republic was founded on February 16, 2005, in Průhonice. Initially, it had 26 members, and now it has grown to include 36 full members and 4 associate members. Since 2016, the Union has also begun accepting honorary members.

The mission of the Union is to coordinate the activities of botanical gardens and to collectively protect both general and specific interests. This includes preparing documents and positions regarding legislative and other measures from government authorities that impact the work of botanical gardens. The Union serves as a representative for botanical gardens at international forums where a unified stance is necessary. It also shares information gathered from international collaborations with other botanical gardens and nature conservation organizations with all Czech botanical gardens. Additionally, it partners with educational institutions on professional and scientific projects.

To engage the public, the Union coordinates and methodically prepares events, with a recent emphasis on professional traveling exhibitions. It also supports the professional development of botanical garden staff and fosters mutual awareness and information exchange among gardens.

Within the Union, specialized working groups operate, including an Editorial Board that produces press releases, particularly the Newsletter of Botanical Gardens of the Czech Republic. Since 2016, there has been a group focused on gene pool protection, leading to several collaborative projects aimed at rescue programs for endangered species. In 2022, the Union started developing a system for National Collections.

https://doi.org/10.33542/BPK-0429-3-11

Ecological measures in the Botanical Garden of the Faculty of Science of Masaryk University in Brno reflect climate change

Magdaléna Chytrá

The Botanical Garden of the Faculty of Science, Masaryk University, Kotlářská 2, 611 37 Brno, Czech Republic

The Botanical Garden of the Faculty of Science at Masaryk University in Brno is situated in the heart of an arid city, within a very warm region at the northern edge of Pannonia. Year by year, the average annual temperatures are on the rise, while precipitation remains stagnant and often falls as torrential rains. Over the past two decades, various economical ecological measures have been implemented to conserve nature and water in the landscape, promote biodiversity, reduce costs, and educate both staff and visitors. These measures need to be sustainable and gradually become not only acceptable to users but fully integrated into their practices. Water conservation strategies encompass numerous small and large initiatives, with the most significant being the collection of rainwater for use in greenhouse irrigation. Biodiversity support extends beyond the plant life within the garden; by seeding native herb species and semi-parasitic plants into the lawns, the coverage is enriched with flowering types. Furthermore, mosaic mowing fosters a variety of insect species and, subsequently, birds. The construction of shelters and nesting boxes in the urban area also contributes to an increase in local wildlife. Utilizing natural materials and technologies minimizes the reliance on plastics, peat, and chemicals in plant cultivation. A vital aspect of the ecological programs includes raising awareness and educating both employees and the public through exhibitions, workshops, excursions, and similar activities.

https://doi.org/10.33542/BPK-0429-3-12

Exhibiting and Creating Art in Botanical Gardens, Parks, and Greenhouses♣

Zuzana Janečková

East Slovak Gallery, Hlavná 27, 04001 Košice, Slovakia

The intrinsic connection between nature, art, and humanity represents one of the most compelling developments in contemporary art. Artists engaging with these themes strive to cease their separation from nature, reevaluating anthropocentric theories. They recognize themselves as integral components of nature, exploring it from diverse perspectives. This awakening results in greater respect for environmental protection.

Many international art exhibitions, such as biennials or MANIFESTA, incorporate botanical gardens and parks into their exhibition spaces to educate audiences about interdisciplinary connections. These typically involve artistic interventions in permanent exhibitions or immersive installations in spaces with compelling residua of former environments.

This paper presents results of ongoing collaboration between the East Slovak Gallery and the Botanical Garden of UPJŠ in Košice. Both institutions, established around 1950-1951, focus on preserving cultural and natural heritage while providing aesthetic experiences. The collaboration involves exchanging collection objects: artworks are presented in the botanical garden, while plants are displayed in the gallery.

This experiment stems from similarities between institutions as collection-building entities that attract attention through beauty and aesthetics. Many contemporary artists collaborate with biologists and botanists, creating works based on joint research.

The primary objective is to present theoretical and practical research into new exhibition principles, aiming for long-term collaboration, audience expansion, and fostering biodiversity between art and nature.

♣ invited lecture

https://doi.org/10.33542/BPK-0429-3-13

Phytohormones: Always up to any challenge

Michal Karady, Kateřina Cermanová, Petra Bublavá, Ondřej Novák

Laboratory of Growth Regulators, Palacký University, Institute of Experimental Botany, The Czech Academy of Sciences & Faculty of Science, Olomouc, Czech Republic

Phytohormones function as essential small signaling molecules that orchestrate all developmental processes throughout a plant's life cycle. Their control mechanisms prove itself vital as mounting environmental pressures modify or threaten global plant biodiversity.

Our research focuses on developing state-of-art validated liquid chromatography-mass spectrometry techniques for precise quantification of key phytohormones and related compounds. These analytical approaches then serve critical roles in fundamental plant discoveries. Ethylene and its precursor ACC (1-aminocyclopropane-1-carboxylic acid) measurements reveal their pivotal involvement in soil compaction stress responses and root architecture modifications. Auxin represents one of the most extensively studied plant-specific molecules, with diverse functions spanning throughout the entire plant kingdom. Its profiling and cell-specific application, by novel technique, continuously demonstrates its fundamental growth coordination involvement. Polyamines, including putrescine, spermidine, and spermine, emerge as crucial stress protectants during salt and drought conditions, with our quantitative approaches revealing their specific mechanisms across diverse plant species. Understanding these hormone networks provides essential insights for addressing many current challenges and principles.

https://doi.org/10.33542/BPK-0429-3-14

Forest park of Botanical Garden of Pavol Jozef Šafárik University in the conditions of climate change

Peter Kelbel

Botanical Garden, Pavol Jozef Šafárik University in Košice, Mánesova 23, 04352 Košice, Slovakia

The paper deals with a complex of problems that affect changes in the woody composition of the forest park of the Botanical Garden of the Pavol Jozef Šafárik University in Košice. A special problem of greenery in the residential-industrial environment is the significant impact of various multispectral undesirable influences. Woody species are physiologically weakened by abiotic environmental factors, as a result of which suitable conditions are created for the activation of insect pests and the development of pathogens. In addition, unlike forest ecosystems, there is a very diverse dendrological structure, presented by a richly represented assortment of tree and shrub species. In recent years, non-native species of insects and diseases have often been introduced together with planting material. What were originally rare and isolated findings in parks, urban or other specialized plantings, have become a global problem in the course of a few years, not only aesthetic but also physiological with often fatal consequences even for old stands of introduced woody plants. Moreover, several species of introduced trees are changing their behavior and becoming invasive species with a potential threat to the species composition of original or artificially established plantings. In this paper, we map several negative tendencies in the development of species composition of woody plants over time.

https://doi.org/10.33542/BPK-0429-3-15

Principles of the *Taraxacum* study in global perspective♣

Jan Kirschner

Institute of Botany of the Czech Academy of Sciences, 25243 Průhonice, Czech Republic

Phenomena determining the taxonomic complexity of the genus *Taraxacum* include diplosporous agamospermy and its coexistence with sexuality at various scales, a complex hybridity with a partially known or unknown parentage, a widespread polyploidy from triploidy to dodecaploidy, a low level of structural morphological differentiation, and a large number of entities (taxa) to be studied. The study of *Taraxacum* is not facilitated by a very uneven level of exploration in different regions and among groups of taxa. Various combinations of the above phenomena result in contrasting evolutionary patterns. The concept of the accumulation of deleterious mutations on an agamospermous line is briefly discussed. Principles of *Taraxacum* taxonomy are outlined; they include incommensurable kinds of species, mapping of sexuality, a study of variation among siblings, recognition of entities at the lowermost level with possible *a posteriori* lumping, and a utilization of two-rank taxonomy. Nevertheless, there are problematic aspects that remain to be elucidated.

♣ invited lecture

https://doi.org/10.33542/BPK-0429-3-16

CITES plants in the greenhouses of the Botanical Garden of Pavol Jozef Šafárik University in Košice

Valéria Kocová

Botanical Garden, Pavol Jozef Šafárik University, Mánesova 23, 043 52 Košice, Slovakia

Many plants in the world of tropical and subtropical biomes are exposed to extinction. Many plants are endemic and live only in a small area. The extinction is caused especially by a human impact on environment. Natural biotopes are being destroyed by the intense deforestation for the purpose of agriculture, urbanization, road building or by the introduction of invasive plants. Some plants became extinct in nature and exist only in ex-situ collections, especially in the collections of botanical gardens throughout the world. They play very important role in the maintenance of threatened plant species. In the collections of the Botanical Garden of Pavol Jozef Šafárik University there are 786 taxa of tropical and subtropical plants protected by international convention CITES. The biggest collection of cacti in Slovakia is found there. It consists of 102 genera, 552 species, 613 taxa. In our collection the biggest genus is *Mammillaria* with 65 species (74 taxa). Another numerous genera are *Echinocereus* with 30 species a *Gymnocalycium* with 34 species. The whole family Cactaceae are listed under Appendix II with some exemptions. Another succulent plants in our collection with high number of CITES species are the genera *Aloe* and *Euphorbia*. In our collection there are also some species of orchids, cycads, carnivorous plants and one fern *Sphaeropteris cooperi* that are protected by CITES. The most valuable cycad species is *Cycas thouarsii* - we have only 1 plant with the age approximately 150 years.

https://doi.org/10.33542/BPK-0429-3-17

The importance of regional research for the knowledge of the diversity of vascular plants of Slovakia

Judita Kochjarová

Faculty of Forestry, Technical University at Zvolen, Slovakia

Regional botanical research, yielding basic field data, is a prerequisite for any larger national scientific study dealing with flora or vegetation. This was especially true in the early days of scientific research in the distant past. But even today, when botanical science can rely on large datasets and advanced capabilities for fast and easy searching of electronic databases, regional research has not lost its importance. New regional studies are continually being added, focusing in particular on botanically important regions such as preserved small-scale nature reserves, larger protected landscape areas or national parks. In areas where detailed data are available, from different time periods, they can also be used to compare the status of species diversity and to assess changes over space and time. The contribution deals with the detailed review of the most important regional botanical studies from the territory of Slovakia, focusing mainly on vascular plants and the period of the last 75 years.

Acknowledgment
I am grateful to the Agency of the Ministry of Education of the Slovak Republic (VEGA) for financial support (VEGA project code 1/0245/25).

https://doi.org/10.33542/BPK-0429-3-18

Vegetation on vertical vegetation structures and their benefits for the urbanized urban environment

Miroslav Kunt, Kateřina Sedláčková, Oldřich Vacek

Department of Landscape Architecture, Czech University of Life Sciences Prague, 165 00 Praha – Suchdol, Czech Republic

Vertical gardens are becoming increasingly popular around the world, but their significant expansion in Central Europe is limited by the climate. For growing plants, the biggest obstacle is the freezing winter. Due to the risk of damage to the irrigation system, it is necessary to turn it off in the winter and the plants must be able to survive this period without watering. This is a significant limiting factor, especially for the assortment of evergreen plants, although they are very popular for their aesthetic effect when grown in green walls.

Primarily, mainly drought-loving plants were tested for planting in vertical gardens, but due to the system used by the company Němec s.r.o., which operates on a system of self-watering flower pots, the growing environment was not suitable for a large part of the plants used. In the second phase of the research, plants of a mesophytic to hygrophilous nature were used, which, based on previous experience, showed a higher potential for use in the above-mentioned system. Observations in the first phase of the research took place on the ČZU campus in Prague from November 2017 to May 2020. Testing of another assortment is currently underway at the same location with promising results from July 2024. The result of the testing is an assortment of plants that can be recommended for use in vertical gardens with a substrate system in the climatic conditions of the Czech Republic.

https://doi.org/10.33542/BPK-0429-3-19

Restoration of the Hrádocké Arboretum based on archival research and inventory of woody plants

Monika Lachmannová

Secondary Vocational Forestry and Wood Technology School of J. D. Matejovie in Liptovský Hrádok, Slovakia

Hrádocké arboretum was established in the late 19th century as a botanical park affiliated with the School of Forestry in Liptovský Hrádok. Within its current area of 7.24 hectares, it gathers collections of woody plants, including approximately 800 taxa from Asia, North America, and Europe. Between 2017 and 2020, a comprehensive dendrological survey was conducted (Lachmannová-Salašová 2020), resulting in an extensive database on woody plant species. This database serves as a vital resource for the arboretum's maintenance and constitutes the basic material for research and study. During archival research, the earliest plan of the forestry school complex was discovered, including the arboretum, which originally covered an area of 27 hectares. Outputs of archival research and dendrological survey formed the foundation upon which the arboretum restoration was designed, initially in the architectural study of the restoration (Lachmannová-Salašová-Klaučová 2020), and later in the subsequent project documentation (Klaučová-Lachmannová-Macharová 2022; Klaučová et al. 2023; Reháčková-Heinrichová 2024). Project documentation includes restoration design solution of vegetation, technical elements, and water features.

Since its inception, the arboretum has served educational purposes, and it continues to serve as an 'outdoor living classroom', accessible not only to students of the School of Forestry, but also the general public and learners from other schools in town and the wider region.

https://doi.org/10.33542/BPK-0429-3-20

Enhancing Students' Awareness of Plants at the Botanical Garden of Pavol Jozef Šafárik University in Košice

Andrea Lešková[1], Andrea Fridmanová[2]

[1]Pavol Jozef Šafárik University, Faculty of Science, Institute of Biology and Ecology, Mánesova 23, 040 01 Košice, Slovakia; [2]Pavol Jozef Šafárik University, Botanical Garden, Mánesova 23, 040 01 Košice, Slovakia

Since 2010, the Botanical Garden of Pavol Jozef Šafárik University in Košice has been organizing the annual Botanikiáda competition for 5th-grade pupils and their teachers from schools in the Košice and Prešov self-governing regions. The event aims to stimulate interest in botany, broaden knowledge about plant biodiversity, and strengthen environmental awareness through direct contact with nature. The program connects biology with practical experience while fostering critical thinking, teamwork, and a positive attitude towards nature conservation. Students become familiar with trees, native meadow, aquatic and wetland plants, as well as lesser-known tropical and subtropical species. This year's theme focused on useful plants under the title "Green Helpers". After the activities, students completed an "Exit Ticket" where they wrote down three new things they learned, two interesting facts and one question they still have. The evaluation confirmed the benefits of experiential learning, revealed certain risks, and led to recommendations for future editions. A parallel program for biology teachers included scientific updates, methodological innovations, and insights into the botanical garden's current work. Since its beginning, Botanikiáda has involved 1,513 teachers and 2,914 pupils, significantly contributing to environmental education and children's relationship with the plant world.

Acknowledgment (if any)
This research was supported by the KEGA No. 001UPJŠ-4/2023 "Implementation of formative assessment in primary school teaching with the focus on the digital form" and KEGA No. 008TTU4/2023 "Modernization and attractiveness of teaching evolution in secondary education".

https://doi.org/10.33542/BPK-0429-3-21

Species protection in the face of climate change - when is it worth it? A case study of *Dracocephalum austriacum*

Luboš Majeský, Lucie Vaculná, Lucie Kobrlová, Miloslav Kitner

[1]Department of Botany, Faculty of Sciences, Palacký University Olomouc, Olomouc, Czech Republic

In recent decades, amid global social, trade, and environmental challenges, biodiversity protection has become more urgent than ever. A rapid decline in biodiversity is evident across nearly all taxa. While human influence is undeniable, we must also recognise that nature is inherently dynamic—e.g. vegetation cover is not stable, and its current state is only transient. Abrupt climatic oscillations over the past two million years have repeatedly reshaped global biota. This contribution focuses on *Dracocephalum austriacum*, a species of European conservation interest, legally protected across most of its range. Whole-genome genotyping revealed five genetic lineages largely corresponding to geographic regions. Surprisingly, despite the presumed western Asian origin of the species, the oldest lineage is found in the Spanish Pyrenees, suggesting long-term isolation since the Last Interglacial. The remaining four lineages display a clear phylogeographic pattern of westward recolonisation from the Caucasus during the last glacial period. In the Holocene, warmer and wetter conditions with forest expansion fragmented the species' range, confining it to current interglacial refugia. Climate models predict further niche contraction, leading to regional extinction in central Europe by the end of the century, mirroring the Last Interglacial. History may repeat, with future recolonisation potentially forming a new lineage—if not disrupted by human impact.

https://doi.org/10.33542/BPK-0429-3-22

Cardamine occulta – forgotten invasive species described already in 1819♣

Karol Marhold[1,2], Hiroshi Kudoh[3], Judita Zozomová[1], Yunpeng Zhao[4], Terezie Mandáková[5]

[1]Plant Science and Biodiversity Centre, Slovak Academy of Sciences, Bratislava, Slovak Republic; [2]Department of Botany, Faculty of Science, Charles University, Prague, Czech Republic; [3]Center for Ecological Research, Kyoto University, Otsu, Japan; [4]Zhejiang University, Hangzhou, China; [5]Central European Institute of Technology, and Faculty of Science, Masaryk University, Brno, Czech Republic

The genus *Cardamine* (Brassicaceae), encompassing almost 300 species, exhibits a global distribution except of Antarctica. *C. occulta*, an octoploid (2n=64) weed indigenous to Eastern Asia, has become invasive after introductions to various continents, including Europe. In Europe this species first appeared in the Mediterranean region, particularly in Spain and in Italy (here due to rice cultivation near Torino). *C. occulta* shares its Eastern Asian distribution area with related species such as the tetraploid (2n=32) *C. kokaiensis* and *C. scutata*, as well as the octoploid (2n=64) *C. dentipetala*. Genomic in situ hybridization and large-scale comparative chromosome painting were employed to elucidate the parental genomes and chromosome composition of these *Cardamine* species. All species trace their lineage to a common ancestral *Cardamine* genome (n=8), structurally resembling the Ancestral Crucifer Karyotype (n = 8) but differentiated by a translocation between chromosomes AK6 and AK8. The allotetraploid *C. scutata* resulted from hybridization between the diploids *C. parviflora* and *C. amara*. Conversely, *C. kokaiensis* has an autotetraploid origin related to *C. parviflora*. Notably, the octoploid *C. occulta* likely originated through hybridization between the tetraploids *C. scutata* and *C. kokaiensis*. The combination of diverse parental (sub)genomes adapted to distinct habitats conferred an evolutionary advantage to newly formed polyploids, allowing them to occupy new ecological niches.

Acknowledgment
This contribution was partly supported by the Slovak Research and Development Agency (grant no. APVV-21- 0044).

♣ invited lecture

https://doi.org/10.33542/BPK-0429-3-23

Three-quarters of a century of the Botanical Garden of the Pavol Jozef Šafárik University in Košice – traces of the past and challenges of the future♣

Pavol Mártonfi

Botanical Garden, Pavol Jozef Šafárik University in Košice, Mánesova 23, 04352 Košice, Slovakia

The Botanical Garden of Pavol Jozef Šafárik University in Košice (UPJŠ) celebrates its 75th anniversary as the largest botanical garden in Slovakia, covering 30 hectares and hosting over 4,000 plant taxa. Established in 1950, it has evolved into a significant scientific, educational, and cultural institution with national and international relevance. The garden plays a vital role in biodiversity conservation, particularly focusing on endangered species of the Carpathian-Pannonian region. It supports academic education, public outreach, and environmental awareness through exhibitions, educational programs, and collaborations. Notable achievements include the development of extensive plant collections, including the largest cactus and cycad collections in Slovakia, and the implementation of biological pest control. The garden has undergone substantial modernization and infrastructure improvements, including new greenhouses, water management systems, and visitor facilities. Scientific research at the garden spans plant systematics, reproductive biology, and conservation, with active participation in national and international projects. The garden also engages the public through exhibitions, cultural events, and educational initiatives such as the popular “Botanikiáda” for schoolchildren. With over 85,000 visitors in 2024, the Botanical Garden remains a cornerstone of botanical science and environmental education in Eastern Slovakia.

♣ main lecture

https://doi.org/10.33542/BPK-0429-3-24

Living plant collections of the Botanical Garden of Pavol Jozef Šafárik University and remarkable facts about them.

Lenka Mártonfiová

Botanical Garden, Pavol Jozef Šafárik University in Košice, Mánesova 23, 04352 Košice, Slovakia

In botanical gardens a lot of plant taxa are usually cultivated in a limited area. All these taxa form the living plant collection of the botanical garden. Some botanical gardens grow large spectrum of taxa from different areas and with different properties, the other ones are specialized. They cultivate either the taxa from certain geographical area or the taxa with some properties (arboreta, gardens of medicinal herbs, etc.).

The Botanical Garden of P. J. Šafárik University is not a specialized one. It grows: 1. both autochtonous and introduced plants, botanical taxa and ornamental flora, herbs and trees and shrubs, medicinal herbs, utility plants, aquatic plants, rock plants, etc., 2. plants from different parts of the world, event tropical and subtropical taxa.

The living plant collection nowadays comprises 4439 taxa. Out of them, 2322 are cultivated in the greenhouses, the rest are the plants that tolerate temperate climate. These taxa are listed in the Catalogue of Plant Collections. This type of catalogue is issued by the Botanical Garden since 1982, when the first catalogue – Enumeratio plantarum appeared with the list of 3086 taxa. Further lists were issued under the title Catalogue of Plant Collections in the years 1989, 2000, 2006, 2010, 2015, 2020 and 2025. This catalogue always represents a major revision of our living plant collections also from the scientific point of view (it solves also the taxonomy and nomenclature of the cultivated taxa) and is planned each 5 years.

https://doi.org/10.33542/BPK-0429-3-25

The Ecological Importance of Algae in a Changing World: Connecting Science and Education

Anna Mišianiková, Andrea Lešková, Zuzana Boberová, Viktória Augustiňáková

Pavol Jozef Šafárik University, Institute of Biology and Ecology, Mánesova 23, 043 52 Košice, Slovakia

Climate change is a major driver of biodiversity loss and ecosystem degradation. Green algae (*Chlorophyta*) play a significant role in the global ecosystem, as well as in solving environmental problems. These organisms produce oxygen through photosynthesis and sequester large amounts of atmospheric carbon dioxide, thereby mitigating the concentration of greenhouse gases in the atmosphere and regulating the climate. Despite the key role of green algae, this topic is not given sufficient attention in education at elementary and secondary schools in Slovakia. For this reason, based on the analysis of the current state of environmental education, educational methodological materials for teachers were designed and practically verified with the aim of improving the teaching of algae-related topics, developing students' environmental awareness and interdisciplinary education. Teaching methods included microscopy, project-based learning and field exercises. The paper analyzes the level of knowledge of secondary school students about algae and summarizes experiences and recommendations for teaching the topics. The findings support the importance of integrating the algae-realted topics into educational programs at elementary and secondary schools as a tool to enhance environmental literacy, address global environmental challenges and promote informed decision-making.

https://doi.org/10.33542/BPK-0429-3-26

Public Relations and Activities of the Botanical Garden of the Faculty of Science, Masaryk University in Brno, Czech Republic

Hana Ondrušková

The Botanical Garden of the Faculty of Science, Masaryk University, Kotlářská 2, 611 37 Brno, Czech Republic

The Botanical Garden of the Faculty of Science at Masaryk University in Brno develops a long-term public engagement strategy aimed at building trust, mutual understanding, and a positive public image.

Public relations encompasses all forms of communication that support an open dialogue between the botanical garden and society. This includes direct interaction with visitors, online communication, collaboration with the media, and partnerships with community organizations. As part of its information services, the garden offers a multi-level system of signage and educational elements, including an audio guide and advisory services. A year-round programme of expert and cultural events – such as exhibitions, lectures, and smaller community gatherings – plays an important role. The communication strategy includes active management of social media, regular press releases, and visual promotion within the garden grounds. The garden collaborates with television, radio, and regional press, maintains contact with local organizations, and supports the activities of the Friends of the Garden Association. It also involves the public through volunteering and provides a space for education and research.

Long-term quality public engagement is not merely a tool for promotion – it is an integral part of the garden's operation. Public relations help build understanding and support that can determine whether the garden is perceived as a vibrant, necessary space or an expendable institution. In a time of increasing competition for public attention and limited funding, these activities are not just a matter of prestige, but of the garden's survival.

https://doi.org/10.33542/BPK-0429-3-27

Flavonoids as phytochemical characters of plant species

Veronika Petruľová[1], Vladislav Kolarčik[2], Petra Regulý[1]

[1]Department of Pharmaceutical Technology, Pharmacognosy and Botany, University of Veterinary Medicine and Pharmacy, Komenského 73, SK-041 81 Košice, Slovak Republic; [2]Department of Plant Biology, Institute of Biology and Ecology, Faculty of Science, Pavol Jozef Šafárik University in Košice, Mánesova 23, SK-041 54 Košice, Slovak Republic

Flavonoids are structurally variable, chemically stable plant metabolites forming the largest group of plant phenolics. Phytochemical studies show that the qualitative or quantitative composition of flavonoids of the plant species is unique. Nevertheless, it is rarely studied in plant hybrids, in which it may even reflect their evolutionary formation. In this study, two examples variation in flavonoid composition in genera with frequent hybrids are presented. The genus *Onosma*, the most species-rich genus of the *Boraginaceae* family, includes hybrid species whose identification by morphological characters is rather difficult and often inaccurate. The genus *Crataegus* is highly morphologically and karyologically variable, characterised by the formation of interspecific difficult identified hybrids. In this work, HPLC-DAD analyses of leafy-methanol extracts of three *Onosma* species (*O. pseudoarenaria, O. echioides, O. fastigiata*) and three *Crataegus* species (*C. macrocarpa, C. subsphaerica, C. roubali*) showed different intraspecific phytochemical compositions. The *Onosma* species differed significantly in the presence of apigenin and luteolin glycosides. The assumed parental species were characterized by a much simpler phytochemical composition than their hybrid. Hybrid *Crataegus* species with assumed the same parent were qualitatively phytochemically similar. The observed differential abundance of luteolin-7-*O*-glycoside and isoquercetin appears to be specific marker of these hybrids.

Acknowledgment
We are thankful to Grant Agency for Science, Bratislava (VEGA, No. 1/0741/19 and partly also No. 1/0708/23) and to The Slovak Grant Agency KEGA (contract No. 003UVLF- 4/2024) for providing of this research and conference paper.

https://doi.org/10.33542/BPK-0429-3-28

Distribution and habitat conditions of the European bladdernut *Staphylea pinnata* L. in Slovakia

Łukasz Piechnik[1], Tomasz Wójcik [2], Matej Dudáš[3]

[1]Władysław Szafer Institute of Botany, Polish Academy of Sciences, ul. Lubicz 46, Kraków, Poland; [2]Department of Nature Conservation and Landscape Ecology, University of Rzeszów, Zelwerowicza 4, 35-601 Rzeszów, Poland; [3]Department of Botany, Institute of Biology and Ecology, Faculty of Science, Pavol Jozef Šafárik University, Mánesova Str. 23, Košice, Slovakia

European bladdernut *Staphylea pinnata* is the only native representative of the Staphyleaceae family in Central Europe. It is a deciduous, medium-sized shrub that occurs mainly in *Fagion sylvaticae*, *Carpinion betuli* and *Tilio-Acerion* communities in Central Europe. Based on a literature review, multidisciplinary search methods, field study and the revision of herbarium specimens in central European herbaria, we prepared an updated distribution map of *Staphylea pinnata* in Slovakia. The species was recorded in Slovakia in 8 geoecological regions situated in the area of the Pannonian and 17 in the area of the West Carpathian, respectively. Currently, 120 localities of the species have been confirmed. The main centers of occurrence of the species in Slovakia are the Malé Karpaty, Považský Inovec, Slovenský kras and Vihorlatské vrchy. Despite the large number of localities of the species in the Polish part of the Carpathians (Beskid Niski), the complete absence of *S. pinnata* on the Slovak side in the regions of Busow and the northern part of Ondavská vrchovina is surprising. Based on unpublished data, we present the occurrence of *S. pinnata* in two geoecological regions previously unknown in the literature: Oravská vrchovina and Ľubovnianska vrchovina. The authors suggest a high probability of anthropogenic origin for both.

https://doi.org/10.33542/BPK-0429-3-29

Design and Methodological Framework for the Evaluation of Herbaceous Plantings and Meadow Communities in Urban Environments

Alica Saková[1], Marek Hus[2], Pavol Eliáš Jr.[3], Michaela Hrúzová[1]

[1]Botanical Garden, Slovak University of Agriculture in Nitra, T. A. Hlinku 2, SK-949 76 Nitra, Slovakia; [2]Institute of Landscape Architecture, Slovak University of Agriculture in Nitra, T. A. Hlinku 2, SK-949 76 Nitra, Slovakia; [3]Institute of Plant and Environmental Sciences, Slovak University of Agriculture in Nitra, T. A. Hlinku 2, SK-949 76 Nitra, Slovakia

Changes in climatic conditions and the requirements for sustainable urban green space management are increasing the demand for ecologically stable, low-maintenance, and biodiversity-rich vegetation elements.

The aim of the presented research is to develop and test planting models of herbaceous plantings and meadow communities in urbanized environments, with a focus on self-regulatory processes and responses to various management interventions. The research has been underway since 2024 on the campus of the Slovak University of Agriculture in Nitra, covering an area of more than 15,000 m², where 18 types of meadow mixtures have been established across 25 spatial units. In the first phase of the research, detailed mapping of site conditions was carried out, followed by the design of planting methodologies and the setup of monitoring protocols. Data are being collected on plant parameters such as longevity, vitality, ground cover, stress resistance, and regeneration capacity. The influence of different mowing intensities, sowing densities, and the application of soil additives is also being monitored.

This paper presents the methodological framework of the research, the infrastructure used, and the experimental setup as a basis for future result-oriented publications and applied research in the fields of landscape architecture and urban green space design

https://doi.org/10.33542/BPK-0429-3-30

The adaptability and sensitivity of autochthonous oak species (*Quercus* sp.) of Slovakia to the climate change

Ivana Sarvašová, Ivan Lukáčik

Arboretum Borová hora, Technical University in Zvolen, Borovianska 66, 960 01 Zvolen

Nine native oak species grow in Slovakia. Their representation is approximately 14% and are included in sections: *Roburoides* 10%, *Robur* 1%, *Dascia* <0.5%, *Cerris* 2.5%.

The sensitivity of oaks to warm and dry weather is reported in many European countries. The temperature increase during the growing season may contribute to their increased mortality. They are less resistant to frost, sensitive to fungal pathogens attached to water-conducting tissues (*Ophiostoma* sp., acute oak decline) and other animal pathogens. Oaks from sections *Roburoides* and *Robur* react more sensitively to moisture deficiency and increased temperature during the growing season than *Dascia* and *Cerris* oaks, which can withstand more extreme conditions. The influence of relief prevails over the zonal differences between the vegetation stages in oak grow response.

Oaks can respond favourably to the previous season, in which moisture conditions may have been suitable. They begin their cambial activity and growth early in the spring, so they can use soil moisture reserved from the previous period. *Quercus pubescens* demonstrates specific drought tolerance while maintaining a functional photosynthetic apparatus and rapid recovery of photosynthetic activity after sufficient moisture, which is able to withstand and survive extreme droughts. The species natural distribution could be an indicator of climate change in our conditions.

Growth, fructification and survival of seedlings of Downy oak (QP) and Turkey oak (QC) were studied in detail at three locations on the Krupinská planina (Drienovo, Medovarce, Plášťovce). The representation of both oak species and their natural regeneration were monitored (0.62 – 2.1% for QP and 16.2 – 66.24% for QC). The collected acorns of both species were sorted, stratified and sowed in the Arboretum Borová hora conditions. The ratio of damaged seeds ranged from 0 - 67.1% (QP), 14.3 - 32.1 (QC), field germination 0 - 61.8% (QP) and 3.1 - 26.3% (QC). The 3rd year old seedlings viability was in controlled arboretum conditions in the range of 4.4 - 100% for QP and 82.4 - 100% for QC. The results of the study showed that the spread and survival of xerothermic oaks, despite their resistance, will be more complicated in Slovakia conditions and significantly influenced by endogenous and exogenous factors.

Acknowledgment
The Ministry of Education, Science, Research and Sport of the Slovak Republic under the agreement VEGA 1/515/23 supported this study.

https://doi.org/10.33542/BPK-0429-3-31

The importance of long-term monitoring of animals in the Botanical Garden of the Pavol Jozef Šafárik University in Košice

Martin Suvák

Botanical Garden, Pavol Jozef Šafárik University in Košice, Mánesova 23, 043 52 Košice, Slovakia

Botanical gardens, with their wide range of plant species, are an ideal place to study the diversity of animals and their relationship to plant life. This work summarizes the significance of information on animal species from the Botanical Garden of P.J. Šafárik University in Košice over the past 20 years. The data were obtained mainly through direct observation, photography and occasional or systematic sampling in context of localities, meteorological data and relevant plant species. Of the special devices, phototraps were used specifically for vertebrate monitoring, while pitfall traps, sticky cards, Lindgren traps, night traps with UV light and Malaise traps were used for monitoring invertebrates. Rearing parasitoids from collected plant parts infested by pests is another important source of information. Knowledge of potential pests and their natural enemies, both outtdoor and in greenhouses, are especially important for effective management and decision-making in biological control regime preferred here. Among the registered species, there are several first records for Slovakia, including invasive pests, beneficials or species interesting from a faunal point of view. Rare and protected species of mammals, birds, reptiles, amphibians and insects were found here too. Such monitoring provides also opportunities to educate staff, partners and visitors about the importance of animals in the environment and the wider role of botanical gardens in biodiversity conservation.

https://doi.org/10.33542/BPK-0429-3-32

Changes of forest communities in Slovakia over the last 60 years♣

Karol Ujházy[1], Mariana Ujházyová[2], Marek Kotrík[1], František Máliš[1], Juraj Cipa[1], Marek Čiliak[2], Tomáš Koutecký[3], Vlastimil Knopp[1], Jaroslav Gizela[4], Dávid Kupček[4], Ľudovít Vaško[4]

[1]Department of Phytology, Faculty of Forestry, Technical University in Zvolen, Slovakia; [2]Department of Applied Ecology, Faculty of Ecology and Environmental Sciences, Technical University in Zvolen, Slovakia; [3]Department of Forest Botany, Dendrology and Geobiocoenology, Mendel University in Brno, Czech Republic; [4]National Forest Centre, Zvolen, Slovakia

Similarly to a major part of temperate Europe, forest communities of Slovakia were affected by multiple anthropogenic drivers, and their significant changes were expected. Unlike large-scale tree diebacks, changes in forests understorey are less apparent, and were not sufficiently studied. To reveal its dynamics in the last six decades, we analysed 163 twice resampled permanent plots in oak, beech and spruce dominated forests. NMDS ordination was used to reveal trends in species composition changes, species turnover was tested by paired tests, mean annual rates of vascular-plant understorey properties were compared to demonstrate an acceleration of vegetation change.

Species richness and species pool decreased in the oak forests, species homogenization was found in the understorey of the beech dominated stands. Rapid decrease in a herbaceous cover was observed in all broadleaved forests. Species turnover even accelerated when annual rates of Bray-Curtis dissimilarity were significantly higher in the latest period of resampling. Magnitude of changes decreased with the altitude, and the most changed understories of vascular plants were found in the oak forests. In the montane mixed forests, a shift towards the submontane beech forest understoreys was observed. Species composition and plant diversity in natural supramontane spruce forests remained relatively stable in spite of a gradual disintegration of their canopies.

Acknowledgment
The research was supported by the Slovak Grant Agency VEGA (1/0624/21 and 1/0245/25).

♣ invited lecture

https://doi.org/10.33542/BPK-0429-3-33

The influence of habitat conditions on abundance and selected individual traits of *Lunaria rediviva* L. (Western Carpathians)

Tomasz Wójcik[1], Kinga Kostrakiewicz-Gierałt[2], Iwona Makuch-Pietraś[1]

[1]Department of Nature Protection and Landscape Ecology, Institute of Agricultural Sciences, Environment Management and Protection, University of Rzeszów, Zelwerowicza 4, 35-601 Rzeszów, Poland; [2]Department of Tourism Geography and Ecology, Institute of Tourism, Faculty of Tourism and Recreation, University of Physical Culture in Krakow, Jana Pawła II 78, 31-571 Kraków, Poland

Lunaria rediviva L. is a montane species found in the lower montane zone and foothills of the Western Carpathians. It prefers moist and fertile habitats in shady forests. It develops best on steep, north- and west-facing slopes, as well as in sloping valleys and at the foot of cliffs. It grows in neutral and alkaline soils. It is most commonly found in mountain linden-sycamore forests (*Tilio platyphyllis-Acerion pseudoplatani*), but also in mountain beech forests (*Fagion sylvaticae*).

The investigations were conducted at four study sites located in the foothils zone of Karpaty Zachodnie. In the year 2020 the area and abundance of populations were assessed, the soil moisture was measured and the physicochemical analyses of soil samples were carried out. In the period 2020-2024, in each population the measurements of selected traits of 30 generative individuals occurred in one permanent study plot were conducted. The following traits were investigated: shoot height, number of leaves, leaf blade length and width, number of siliques, as well as their length and width.

The tallest shoots and the highest number of siliques were found at the Wydrze site, located in a submontane riparian forest. This was due to the higher humidity and richness of the habitat. At the other three sites, located within the Carpathian beech forest, generative individuals reached lower heights and produced lower amount of siliques. This could be due to their location at the top of the slopes (shallow soils) and the lower richness and humidity of the soil.

Index of authors

NOTES:

Conference „**Biodiversity of the plant kingdom in the course of climate change**“. Košice 9th – 11th September 2025. **Book of Abstracts.**

Conference 75 years since the founding of the Botanical Garden in Košice

Publisher: Pavol Jozef Šafárik University in Košice
Publishing ŠafárikPress
Year: 2025
Print run: 100 copies
Pages: 38
Authors' sheets: 1.67 AH
Edition: first
Print: EQUILIBRIA, s. r. o.

DOI: https://doi.org/10.33542/BPK-0429-3-0

ISBN 978-80-574-0428-6 (print)
ISBN 978-80-574-0429-3 (e-publication)