2026



Aleš Eichmeier, Jana Čechová, Kristýna Kříčková (Eds.)

Trends in Horticulture and Landscape Architecture 2026

Collection of Scientific Conference Abstracts

MENDELU
Faculty
of Horticulture

Mendel University in Brno

Aleš Eichmeier, Jana Čechová,
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November 24, 2026
Lednice

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Editors
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Faculty of Horticulture, Mendel University in Brno

Place and Date of the Conference
Lednice, November 24, 2026

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FOREWORD

Dear Readers and Conference Participants,
Just like in previous years, the Faculty of Horticulture at Mendel University in Brno is hosting a doctoral scientific conference titled “Trends in Horticulture and Landscape Architecture 2026” this year. The conference is scheduled for November 24, 2026, under the patronage of the Dean, Prof. Ing. Patrik Burg, Ph.D., and it will be focus around the subject of Horticultural Engineering and Landscape Architecture.

We firmly believe that this scientific conference will provide doctoral students with the opportunity to showcase their research accomplishments, discover uncharted avenues for scientific and creative endeavours, and influence trends in their fields of interest in science, research, and creative activities. Simultaneously, the conference demonstrates the Faculty of Horticulture’s commitment to supporting student-driven scientific initiatives, serving as a solid foundation for the future scientific and research pursuits of each institute. Looking ahead, we would be delighted if the conference’s content also caters to master’s degree students as potential candidates for doctoral studies at our faculty.

The primary objective of the conference is to present the latest findings from doctoral program dissertations, which not only contribute new knowledge but also enhance the overall understanding of the research undertaken by the participating authors, who are students in doctoral programs. The conference also carries an educational dimension by fostering the presentation skills of individual speakers, strengthening their capacity to respond to questions, and engage in professional discussions effectively.

The conference benefits greatly from expert discussions and the exchange of opinions and valuable information, all of which are enriched by being hosted at the Faculty of Horticulture. These dialogues also play a pivotal role in shaping the development of doctoral students and emerging scientific and creative minds across various realms of horticultural research. We extend our heartfelt gratitude to all those who organize and support students’ research and creative work, as well as to those who serve as mentors, dedicating their time to the scholarly and artistic education of their students. Special thanks go to all those involved in the organization of this conference.

Conference Scientific Committee

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of Horticulture



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PHYSIOLOGICAL AND MOLECULAR ANALYSIS OF BASAL AND INDUCED HEAT TOLERANCE OF TOMATOES (*SOLANUM LYCOPERSICUM* L.)

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Abstract

Climate change is a serious threat for food security. Waves of high temperatures cause crucial physiological plant demage which result in decreased crop yield. This dissertation project aims to response to these current challenges that agriculture is facing. Tomatoes has been chosen as the model organism. The aim of the project is to analyze relations between the basal and the induced heat tolerance which is evoked by the process called thermopriming. Approximately 12 various genotypes of tomatoes will be exposed to heat shock according to the methodology and then their physiological answers will be measured. Based on different ability to cope with heat, 2–4 contrasted genotypes will be analyzed molecularly. Finally, the analysis of transcriptome including RNA sequencing, will be done in order to validate the presence of the candidate genes which had been activated after the priming. This procedure should lead to the effective selection of thermotolerant parental components for the development of climate-resilient hybrid varieties.

Keywords: heat stress, thermopriming, RNA seq, resilient crop

WILD EDIBLE SPECIES AS POTENTIAL NEW CROPS

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Abstract

This research evaluates wild and weed species of the Czech flora as novel crops for sustainable horticulture, particularly in controlled environments like hydroponics and indoor farming. Focusing on four selected model species, the research investigates their transition into cultivation by optimizing propagation and growing technologies, analyzing nutritional and bioactive profiles, and assessing preliminary economic viability. Ultimately, the work aims to promote crop diversification and sustainable production using previously neglected local plant species.

Keywords: wild edible species, novel crops, crop diversification, indoor farming, sustainability

YEASTS AS A BIOTECHNOLOGICAL TOOL FOR WINE ACIDITY MANAGEMENT

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Abstract

Rising temperatures due to climate change accelerate grape ripening, decrease malic acid content, and increase the pH of musts, threatening both the freshness and stability of wine. Yeast itself can serve as a gentle alternative to chemical acidification. In a synthetic must with an initial pH of 2.9–3.4, we compared *S. cerevisiae* strains ZYMAFLORE XORIGIN (neutral) and ZYMAFLORE KLIMA (acidity-increasing). While XORIGIN practically did not change the pH, KLIMA decreased it in all variants, most notably in musts with the highest pH (by up to 0.39), and increased the malic acid content at lower pH levels. However, unlike the XORIGIN strain, it frequently failed to complete fermentation, leaving residual sugar, predominantly fructose, in the wine. The choice of strain is thus a promising tool to restore the acidity that the climate takes away from the wine – provided that the fermentation is successfully managed.

Keywords: Biological acidification, malic acid, pH, *Saccharomyces cerevisiae*, climate change

EFFECT OF VINEYARD-WASTE BIOCHAR AND NATIVE ARBUSCULAR MYCORRHIZAL FUNGI ON GRAPEVINE MORPHOLOGY

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Abstract

Grapevine (*Vitis vinifera* L.) growth and vitality are closely linked to soil properties and interactions with soil microorganisms. Biochar produced from vineyard pruning residues represents a potential soil amendment, while native arbuscular mycorrhizal fungi (AMF) may contribute to plant nutrition and growth through symbiotic interactions with roots. This study aims to evaluate the effects of vineyard-waste biochar and native AMF on the morphological development of grapevine seedlings. Plant growth is assessed in two experimental settings: a pot experiment and a field trial, comparing treatments with and without biochar application. The assessment focuses on plant habitus and morphological growth parameters to identify differences between treatments and experimental conditions. This contribution presents the first results of morphological measurements, providing initial insights into the effects of vineyard-waste biochar and the potential contribution of native AMF to grapevine growth.

Keywords: biochar, grapevine, *Vitis vinifera*, native arbuscular mycorrhizal fungi, plant morphology, vineyard pruning

THE INFLUENCE OF TECHNOLOGICAL OPERATIONS ON SELECTED PARAMETERS OF FRUIT WINE QUALITY

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Abstract

This thesis focuses on aging of fruit wine on lees and its maturation in the presence of wood fragments. The aim of both these oenological steps is to enhance the quality and antioxidant capacity of the wine. The results obtained will help in recommending maturation techniques for various styles of fruit wine production. An improvement in wine quality is expected with both oenological procedures, as is an increase in antioxidant capacity in both cases.

Keywords: sour cherry wine, yeast lees, wooden fragments, fruit wine, wine aging

STUDY OF THE PROPERTIES AND UTILIZATION OF CONDENSATES FROM GRAPE MUST FERMENTATION GASES

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Abstract

Alcoholic fermentation of grape must is associated with the release of fermentation gases containing a wide range of volatile metabolites that can be recovered by condensation. This research focuses on the characterization of fermentation gas condensates and their temporal evolution. During Riesling fermentation, 1,439 mL of condensate was collected in 13 fractions. Ethanol content increased from 3.11 to 53.14% (v/v), while isoamyl alcohol and ethyl octanoate reached maximum concentrations of 1,871.15 and 1,191.56 $mg \cdot L^{-1}$, respectively, in the fraction collected on day 23. Ethyl acetate increased from 32.04 to 439.22 $mg \cdot L^{-1}$ by day 29. These findings demonstrate substantial temporal variability in condensate composition and highlight the importance of collection timing for the potential recovery and utilization of volatile compounds in winemaking technology and the broader food industry.

Key words: Alcoholic fermentation; Fermentation gases; Condensates; Volatile aromatic compounds

OPTIMISATION OF ORGANIC PRODUCTION OF FORCED WITLOOF CHICORY (*CICHORIUM INTYBUS* VAR. *FOLIOSUM*)

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Abstract

Organic witloof chicory production requires integrated phytosanitary management across field production, root storage and forcing. This doctoral research evaluates biological control agents (BCA), biopolymer-based carrier systems and water-hygiene measures against Sclerotinia sclerotiorum, Phytophthora spp. and Pseudomonas spp. In an initial forcing experiment, 3,655 chicons from four cultivars were evaluated following biological root treatments. Treatment, cultivar and their interaction significantly affected net chicon weight ($p < 0.001$). Descriptively, the proportion of chicons in commercial quality classes 1–2 ranged from 57.7–61.7 % in controls to 69.6–72.4 % with Coniothyrium minitans and 77.3–78.9 % with a Bacillus spp. + Trichoderma spp. consortium. These preliminary findings indicate genotype-dependent treatment responses but require confirmation in repeated forcing cycles and subsequent seasons before general agronomic conclusions can be drawn. Ongoing field experiments and pathogen-specific qPCR will extend the evaluation across the production chain.

Keywords: witloof chicory; biological control; phytosanitary management; forcing; marketable yield

OPTIMIZATION OF THE NUTRITIONAL AND PHYTOCHEMICAL COMPOSITION OF MICROGREENS THROUGH BIOFORTIFICATION

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Abstract

Microgreens are valued for their nutritional composition, while biofortification and alternative growing systems offer opportunities to improve their quality and production sustainability. Previous experiments demonstrated that magnesium enrichment increased mineral accumulation without reducing fresh biomass yield. A comparative assessment of eight microgreen species revealed exceptionally high total phenolic content (3,618 mg GAE·kg^{-1} FW) and DPPH antioxidant activity (10,402 mg TE·kg^{-1} FW) in evening primrose, although its sensory acceptability was low. Current research investigates how four commercial growing media and red, blue and white LED light affect magnesium biofortification. In parallel, the development of growing mats from secondary raw materials includes a purpose-built, heavy-duty metal mould for hydraulic pressing. These approaches aim to improve microgreen nutritional quality and resource efficiency.

Keywords: microgreens, magnesium biofortification, growing mats, sustainability, LED lighting

EFFECT OF MICROCLIMATIC CONDITIONS OF THE HABITAT ON *VITIS VINIFERA*

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Abstract

Vineyard microclimate may influence grapevine growth and ripening. Spatial variability was investigated in Riesling at Sonberk, Czech Republic (2025–2026), across three slope positions. Air temperature, humidity, shoot growth and grape composition were evaluated. In 2025, the middle slope showed the greatest mean shoot increments during the later monitoring intervals. Preliminary 2026 data indicated more shoots per vine on the upper slope but longer shoots on the lower slope. Mean afternoon temperature was 2.22 °C higher at a lower-slope station than at a middle-slope station. On 16 September 2026, lower-slope grapes had higher sugar content (22.44 vs 20.71 °NM) and lower titratable acidity (8.75 vs 10.33 g/L) than upper-slope grapes. These findings indicate within-vineyard differences in vegetative growth and grape ripening.

Keywords: vineyard microclimate, temperature, slope position, spatial variability

THE EFFECT OF TECHNOLOGICAL PARAMETERS ON BIOGENIC AMINE CONTENT IN RED WINES

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Abstract

Biogenic amines (BA) are biologically active nitrogen-containing compounds formed primarily through microbial amino acid decarboxylation. In wine, their content is mainly associated with procceses during and after malolactic fermentation. Their concentrations are influenced by pH, storage temperature, content wine lees, and malolactic fermentation method.

This doctoral thesis aims to assess the effects of selected technological parameters on BA formation in red wines. The first completed experiment examines wine lees content, malolactic fermentation method, and storage temperature. The second, currently ongoing, investigates wine lees content and malolactic fermentation method, with pH value as an additional parameter.
The findings are expected to clarify the relationships between winemaking conditions and BA formation and support the optimisation of red wine production practices.

Keywords: biogenic amines, malolactic fermentation, technological parameters

ANALYSIS OF CHANGES IN THE CONCENTRATION OF '*CANDIDATUS PHYTOPLASMA PRUNORUM*' IN THE TISSUE OF SELECTED PRUNUS SPECIES USING REAL-TIME PCR

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Abstract

The study investigates seasonal changes in the concentration and tissue distribution of *'Candidatus Phytoplasma prunorum'* in four *Prunus* host species (*P. armeniaca*, *P. domestica*, *P. persica* and *P. salicina*). During 2025, roots, one-year-old shoots and annual shoots were sampled monthly (january-december) from 21 infected trees. ‚Ca. P. prunorum' concentration was determined by absolute quantification using real-time PCR, and multilocus genotyping was performed to assess genetic diversity of Ca. P. prunorum'. Roots showed the most consistent year-round detection rates, whereas above-ground tissues exhibited greater seasonal variation. *P. domestica* displayed lower detection rates and phytoplasma concentrations in above-ground tissues, particularly annual shoots. Multilocus genotyping identified ten distinct profiles, however their distribution limited further evaluation of associations with phytoplasma concentration and symptom expression of European stone fruit yellows.

Keywords: *European stone fruit yellows*, apricot, rootstock, real-time PCR

BIOCOUPLER AS A NOVEL PLATFORM FOR OLIVE MICROPROPAGATION

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Abstract

Temporary immersion systems (TIS) offer a promising approach to olive (*Olea europaea* L.) *in vitro* micropropagation. This study evaluated the suitability of the BioCoupler® system (Plant Cell Technology, Washington, DC, USA) through pilot trials and investigated immersion duration in the cultivars Frantoio and Moraiolo. Pilot experiments identified key cultivation parameters requiring optimization, including immersion regime, vessel configuration and explant characteristics. Daily immersion for 1, 3 and 5 min was compared with semi-solid culture as a control. In Frantoio, 1-min immersion produced the highest total number of nodes (4.85 ± 0.30 per explant), significantly exceeding the semi-solid control (3.41 ± 0.65; $p = 0.046$) and 5-min treatment (2.98 ± 0.88; $p = 0.009$). In Moraiolo, differences among treatments were not significant. The results highlight cultivar-dependent responses and support further optimization of immersion frequency and the development of an automated system.

Keywords: olive; micropropagation; temporary immersion system; BioCoupler

THE STUDY OF POMOLOGICAL TRAITS AND GENETIC VARIABILITY OF THE SERVICE TREE (*SORBUS DOMESTICA*)

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Abstract

The service tree (*Sorbus domestica L.*) is a rare and underutilized fruit species valued for its high nutritional quality, ecological resilience, and better adaptability to dry, warm climates. This research evaluates the pomological and biochemical traits of various *S. domestica* genotypes. Pomological characterization focuses on the morphological traits of leaves, shoots, inflorescences, and fruits, while biochemical analyses assess the content of bioactive compounds, particularly total phenolics and flavonoids, as well as antioxidant activity. In parallel, genetic diversity is investigated using simple sequence repeat (SSR) markers to assess genetic variation among the studied genotypes. The transferability of SSR markers developed for related *Rosaceae* species, particularly apple (*Malus domestica*), is also explored.

Keywords: *Sorbus domestica*, service tree, pomological traits, SSR markers, genetic diversity

DEVELOPMENT AND TESTING OF SELECTIVE SORBENTS FOR SULFUR COMPOUNDS IN THE FLOW OF FERMENTATION GAS MIXTURE

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Abstract

Alcoholic fermentation produces ethanol and carbon dioxide, alongside volatile compounds that contribute to wine aroma. These are also present in the fermentation gas and include esters, higher alcohols and undesirable sulfur compounds, particularly hydrogen sulfide, which is responsible for the characteristic odor of rotten-egg. Selective removal of hydrogen sulfide could enable the safe reuse of fermentation gases while preserving desirable volatile aroma compounds. The experiment evaluates different sorbent variants to identify the most effective option for removing hydrogen sulfide. The selected variant is applied to fermentation gas capture technology under practical conditions, with sorbent efficiency assessed through the gas chromatography analysis of collected gas samples.

Key words: Fermentation gas, Carbon dioxide, Sorbents, Sulfur compounds

STUDY OF THE MICROBIOME AND POLYPHENOLIC PROFILE OF GRAPE MUST AND WINE

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Abstract

This study evaluated the wine microbiome and polyphenolic profile across seven vinification variants of Sauvignon blanc, combining spontaneous and inoculated fermentations with pomace contact. Microbial succession was tracked via high-throughput sequencing alongside LC-MS polyphenolic profiling. Alcoholic fermentation homogenized the microbiota through *Saccharomyces* dominance. In later stages, phenolic extraction intensity distinctly modulated bacterial succession; skin contact delayed *Leuconostoc* establishment and supported greater microbial heterogeneity, whereas lower phenolic extraction enabled stable *Leuconostoc* dominance post-MLF. Overall, extractive practices showed a stronger modulatory association with microbial succession than the fermentation regime itself.

Keywords: wine microbiome, polyphenols, fermentation strategy, microbial succession, high-throughput sequencing

SPECIFIC HEALING GARDENS

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Abstract

The dissertation focuses on healing gardens for older adults, particularly people with dementia and Alzheimer's disease. The aim is to examine the relationship between spatial design, vegetation, sensory elements and the actual use of gardens by their users. The research will include a literature review, inventory and assessment of selected gardens, field observations and data analysis. Particular attention will be paid to safety, orientation, accessibility, sensory stimulation and opportunities for outdoor activities. The expected outcome is an assessment methodology and design recommendations for creating and improving healing gardens that meet the needs of their users.

Keywords: healing gardens, garden assessment, landscape architecture

POSSIBILITIES OF DIGITAL TWIN CREATION FOR VAST LANDSCAPE UNITS

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Abstract

This paper aims to generate vegetation based on environmental conditions. Utilizing game engines for presentation and GIS data as input, the research seeks to communicate vegetation dynamics to both professional and lay audiences through 3D outputs. Game engines provide an alternative mode of data communication compared to conventional GIS formats. While traditional GIS tools face limitations regarding visual fidelity and human imagination, integration with gaming technologies facilitates the creation of visually accurate landscape representations. These systems are capable of procedurally generating vegetation and visualizing spatio-temporal changes within the territory. Ultimately, the outputs serve as a platform for transparent communication and the participatory evaluation of landscape interventions.

Keywords: Game Engines, Procedural Vegetation, Landscape Visualization, GIS Integration

PRINCIPLES OF DESIGNING URBAN PUBLIC SPACES FOR AGEING POPULATION

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Abstract

Population ageing is a global topic that also affects Czech Republic. The aim of the dissertation is to develop a methodology for assessing public spaces with focus on the needs of ageing population and to create a design manual of principles for designing inclusive and functional public spaces that encourage intergenerational coexistence. This dissertation thesis analyses current approaches to creating ageing-friendly public spaces in the Czech Republic and abroad. It also examines the specific needs of older people in the Czech Republic in comparison with those in other countries. Thesis identifies and compares the needs of people aged under and over 65. On the basis of these needs, it develops principles for designing public spaces for ageing population. The research identifies key factors such as accessibility, safety, spatial orientation, social inclusion, and opportunities for active leisure.

Keywords: the needs of the elderly**,** inclusive design, design manual

STRATEGY FOR A SUSTAINABLE PERI-URBAN LANDSCAPE

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Abstract

This paper presents a critical literature review on the sustainable development of peri-urban landscapes as part of the theoretical framework of doctoral research. It aims to define the concept of peri-urban landscape within ecological, spatial planning and social contexts. The review highlights terminological inconsistencies and identifies peri-urban areas as distinct, dynamically evolving spatial entities rather than transitional zones between urban and rural environments. A comparison of Czech and international approaches reveals differences in typologies, spatial scales and planning practices. Key challenges include landscape fragmentation, agricultural land take, transport dependency and conflicting land-use interests. An assessment of the Czech planning framework identifies insufficient inter-municipal coordination and limitations in addressing peri-urban dynamics. The findings emphasise the need for context-specific planning approaches and establish a theoretical foundation for subsequent empirical research.

Keywords: peri-urban landscape, sustainable development, landscape planning, urban–rural interface, spatial transformation

THE ROLE OF LANDSCAPE ARCHITECTURE IN PLANNING AND DESIGNING PEDESTRIAN CONNECTIONS IN CITIES – SAFETY AND PUBLIC HEALTH

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Abstract

This doctoral research examines urban pedestrian connections using the established Healthy Streets framework, a people-centered approach to assessing street environments in relation to walking and cycling, with particular attention to safety and comfort. To gain practical insight into the framework in its place of origin, field observations focus on London streets with contrasting Healthy Streets Index ratings and explore how published scores relate to on-site impressions. Building on this experience, the Healthy Streets Design Check is applied in Brno to examine its applicability in the Czech urban context. The research also examines how a landscape architecture perspective can complement existing assessments, particularly in relation to spatial organization and pedestrian continuity. The findings aim to inform recommendations for improving pedestrian connections in Brno.

Keywords: Walkability, Healthy Streets, Landscape Architecture, Pedestrian Routes, Urban Planning

ADAPTATION OF MONUMENT OF GARDEN ART FOR THEATRICAL PERFORMANCES

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Abstract

This doctoral thesis examines the impact of large-scale cultural events on the historical, compositional and natural values of heritage-protected gardens and parks. The main case study is the Český Krumlov castle garden, which hosts theatre performances at its revolving auditorium. Field surveys document the garden's condition before and after the theatre season to assess potential damage. Field surveys assess the garden's condition before and after the theatre season. The findings are compared with historic sites in Litomyšl, Bouzov, Sovinec and Náměšť na Hané. The research highlights different approaches to cultural events in historic settings and their impact on heritage and landscape values. It aims to propose measures to minimise damage, restore the garden's historic composition and establish priorities for long-term conservation and management.

Keywords: theatre productions, restoration and revitalisation of gardens, management

FUNCTIONAL APPROACHES TO HERBACEOUS PLANTING DESIGN IN URBAN PUBLIC SPACES

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Abstract

Herbaceous plantings are an important component of urban green infrastructure, providing aesthetic, ecological, and environmental benefits. This research evaluates existing herbaceous plantings in public green spaces in selected cities, based on the initial criteria of their design concepts. It focuses on assessing the functions of plantings rather than classifying them solely according to design style or the designer's approach. The research draws on contemporary planting design concepts and the Designed Plant Communities (DPC) framework, which combines aesthetic quality with biodiversity support, self-regulation, ecosystem services, and maintenance requirements. Functional assessment can complement traditional classifications based on design style by incorporating ecological benefits, self-regulation, and maintenance demands. The aim is to contribute to the development of a more comprehensive framework for assessing the functions of herbaceous plantings in urban public spaces.

Keywords: herbaceous plantings, urban green infrastructure, planting design, ecosystem services, Designed Plant Communities

STUDY AND CRITICAL EVALUATION OF ARCHIVAL SOURCES ON THE HISTORICAL DEVELOPMENT OF THE LEDNICE CHATEAU PARK - PROGRESS OF THE STUDY

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Abstract

This paper relates to a doctoral thesis whose subject is the evaluation of existing documentation on the historical development of the Lednice Castle Park and its possible supplementation with yet unexamined sources. The period under investigation spans the 17th to the 19th centuries. The paper describes the methodological approach to the systematic classification of the large number of maps and pictorial materials already collected, summarises the source materials and collections in the archives that have been examined to date, assesses the current state of the research, and sets out the next steps. The focus is on two significant phases in the development of the castle park. The earlier of these can be dated to the 17th century, when the garden layout at Lednice Castle was first recorded on a map. This is followed by the period from 1700 to 1850, during which two stylistically very different garden designs were gradually realised here: the older formal Classicist garden and the later Romantic landscape design, which, as a significant example of an English-style natural park in the Czech lands, has been preserved almost in its original form to this day. Based on preliminary findings, this paper assesses the current validity of the working hypothesis, which posits that, with the aid of previously unexamined sources, it is possible to supplement the missing information regarding the motivations and decisions of the ruling Princes of Liechtenstein concerning the landscaping around the castle.

Keywords: landscape architecture, historical object of landscape architecture, Lednice chateau park, development of Lednice chateau park

INDOOR PLANTS AND THEIR USE IN VERTICAL GARDENS

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Abstract

Vertical gardens represent a significant trend in contemporary interior design. These systems enable the sophisticated integration of vegetation onto vertical surfaces, thereby expanding the possibilities of plant utilization beyond traditional horizontal space. They serve as a vital ecological, climatic, aesthetic, and psychological enhancement of the indoor environment through a biophilic approach that supports human contact with nature and improves overall indoor quality. In the next phase of its research, the dissertation builds upon previously acquired theoretical knowledge and focuses on the investigation, evaluation, and practical application of indoor greenery, particularly in the form of vertical gardens. The aim is to bridge theoretical knowledge with real-world practice through field research, experimental implementation, and publication activities, thereby creating a comprehensive perspective on contemporary indoor floriculture and its sustainable development.

Keywords: interior design, indoor plants, vertical gardens

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