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Aleš Eichmeier, Jana Čechová, Kristýna Kříčková

Trends in Horticulture and Landscape Architecture 2024

COLLECTION OF SCIENTIFIC CONFERENCE ABSTRACTS

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Mendel University in Brno

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Trends in Horticulture and Landscape Architecture 2024

Collection of scientific conference abstracts

November 19, 2024
Lednice

2024



Conference organizer:

Faculty of Horticulture, Mendel University in Brno

Place and date of the conference:

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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 2024" this year. The conference is scheduled for November 19, 2024, 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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THE IMPACT OF VINE PRUNING METHODS ON PHYSIOLOGICAL DEVELOPMENT AND HEALTH CONDITION OF *VITIS VINIFERA*

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Abstract

This project aims on monitoring the plant development and comparison of the effects of various training systems on vine fertility and physiological processes. It seeks new approaches to enable vines to adapt to the continuous evolution of climate conditions. Proper establishment and development of cordon training systems are key to ensuring the sustainability of vineyard conditions. Several options have been explored, including newly established cordon vineyards, converted old cane-trained vines, and original cane-trained vineyards. The study compares training systems based on bud fertility according to the position on the arm. Additionally, it examines parameters of berry development through analytical and uvological assessments, changes in yield characteristics, and evaluates the vineyards vigor and vitality using the Ravaz index of overall vine vitality, reflecting the plant's response to significant physiological and morphological changes. The outcomes indicate that newly established cordon vines achieve slightly better analytical results. However, older transformed cane-trained vines are physiologically weaker and more unstable, with high mortality rates due to pre-existing open wounds. The study also applies established viticultural principles by Simonit & Sirch, which are crucial for the modernisation and sustainability of vineyard management, especially with older vines. These principles provide a deeper understanding of the challenges in converting cane-trained vines and establishing young cordon vineyards.

Keywords: *Vitis vinifera*, training systems, cordon, vine pruning, Simonit & Sirch

COMPARISON OF A SELECTED ASSORTMENT OF ASIAN PEAR VARIETIES AND PEAR HYBRIDS

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Abstract

The dissertation deals with the evaluation of pear genotypes, including 22 Asian varieties, 10 European varieties, 4 interspecific hybrids and 24 new hybrids bred by the Department of Fruit Science. The evaluation includes an examination of key phenological phases, growing and pomological traits are measured using standard descriptors or in metric units. Laboratory analyses assess the quality parameters and the amount of various chemical compounds. As expected, several new hybrids and varieties show potential for cultivation under our conditions and for future breeding. In the last two years, other new hybrids from the breeding programme have started to produce steadily and have been evaluated. Measurements of genome size and ploidy levels of selected genotypes were made as part of the IGA project, which also extends and contributes to the complexity of the dissertation.

Keywords: *Pyrus*, pear, pomology, fruit quality, phenology

INCREASING THE EFFICIENCY OF GRAPEVINE BREEDING BY USING DNA MARKERS LINKED TO GENES FOR RESISTANCE TO FUNGAL DISEASES

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Abstract

The dissertation focused on interspecific grapevine genotypes harboring resistant loci (Rpv-loci) to the pathogen *Plasmopara viticola*. A group of three genotypes harboring Rpv12, Rpv12+1 and Rpv12+1+3 loci was selected, artificially inoculated with *P. viticola*. Genomic RNA was subsequently extracted for transcriptomic analysis. Simultaneously, an additional experiment was conducted to explore the possibility of long-term preservation of *P. viticola* spores in different media and temperature conditions. Based on the transcriptomic data, a group of candidate genes potentially playing a crucial role in the immune response of resistant grapevine cultivars was identified. Specific genes driving the individual loci of resistance and their immune response characteristics were also highlighted. Following this, the artificial inoculation experiment was repeated, and leaves were collected at several time points. After RNA isolation and reverse transcription of all samples, qPCR was performed to verify the importance and timing of expression of selected genes. The different roles and interactions of genes in the plant defence system are currently being evaluated.

Keywords: grapevine, *Plasmopara viticola*, transcriptomics, qPCR, gene expression

**STUDY OF THE RESISTANCE OF GRAPEVINE VARIETIES TO THE PATHOGEN
*CADOPHORA LUTEO-OLIVACEA***

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Abstract

Grapevine trunk diseases (GTD complex) cause extensive damage to grapevines. The causal agents of GTD are found in the *Basidiomycetes* division, as well as among species of the *Botryosphaericeae*, *Diatrypaceae* families of fungi and also among species of the *Cadophora*, *Campylocarpon*, *Cylindrocarpon*, *Cylindrocladiella*, *Dactylonectria*, *Ilyonectria*, *Phaeoacremonium* and *Phaemoniella* genera. *Cadophora luteo-olivacea* (CLO) is classified as a causal agent of Petri disease and chiefly affects young vine plantings. There is currently no direct effective protection against fungal pathogens of the GTD complex, so it is important to seek effective measures to increase the resistance of grapevines through breeding methods. There is a large number of CLO isolates which have different levels of pathogenicity. A suitable isolate for subsequent inoculation of grapevine plants was selected from three isolates named H8, H9 and I1, which Chardonnay and Cabernet Moravia varieties were inoculated with. An assessment was performed after three months by measuring the length of the lesions caused by each isolate. Isolate I1 was selected for further research and a total of 18 grapevine varieties were inoculated with this isolate under field conditions.

Keywords: *Cadophora luteo-olivacea*, inoculation, GTD complex

HORTICULTURAL CROPS AS A TOOL FOR SUSTAINABLE DEVELOPMENT IN DEVELOPING COUNTRIES

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Abstract

The economy of Guimaras Island in the Philippines is reliant mostly on the mango production, as it is incorporated in all sectors (agriculture, production, services). Farmers have faced several challenges throughout the last few years, from pandemic restrictions to climate change. Farmers are now forced to consider diversification of the crops planted on their farms, to lessen the impact of these difficulties. Data were collected in 2023 and 2024 through 25 semi-structured interviews with local farmers, authorities, and other stakeholders. Thematic analysis was used in the software Atlas.ti. Secondary data were obtained through the Provincial Office for Agricultural Services. Analysis suggests that farmers still consider mango as the main commodity but are sceptical about the future (increasing cost of cultivation). Pitahaya represents an opportunity with lower cultivation costs, longer bearing season, less prone to climate change, and the same price on the local market as mango.

Keywords: mango, pitahaya, Philippines, diversification, sustainable development

STUDY OF FERMENTATION GASES DURING THE FERMENTATION OF GRAPE MUST

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Abstract

During alcoholic fermentation, a significant amount of CO₂ is produced and the carbon dioxide stream can remove aromatics from the fermenting must. This project focuses on a new technology for the capture of fermentation gases. The concentration of individual volatile compounds in the fermentation gas was determined by gas chromatography and the highest values were obtained for isoamyl acetate, isoamyl alcohol and ethyl decanoate. Ethyldodecanoate had the lowest values among the volatiles investigated. For sensory evaluation, water carbonated with fermentation gas and water carbonated with commercial food carbon dioxide were compared by quantitative descriptive analysis (QDA). Quantification of fermentation gas capture was also performed. Finally, an experiment was conducted to capture the condensates that form during fermentation gas capture. These condensates contained large amounts of volatiles and alcohol.

Keywords: carbon dioxide, carbonation, volatile substances

INFLUENCE OF THE MODIFIED SOIL ENVIRONMENT ON ESTABLISHMENT AND VITALITY OF TREES AFTER PLANTING

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Abstract

The environment in the city is very stressful for trees, especially due to the high day and night temperatures in the summer months. These stressors affect not only current tree plantings, but also the development and viability of newly planted trees. The dissertation deals with improving soil conditions and increasing the tolerance of woody plants to stressors using soil amendments and aeration with soil injection. Experiments were established with model plants of *Prunus serrulata* Lindl. in the cities of Brno and Znojmo and container experiments at the Faculty of Horticulture in Lednice. Two amendments (Hydrogel[®] and Endomyk Prof + Tri) were selected for the experiment. During the vegetative period the reactions of the trees to the treatments are monitored. The reactions are recorded using physiological parameters (stomatal conductance, chlorophyll content and chlorophyll fluorescence). The temperature and moisture of the soil environment are also evaluated.

Keywords: soil amendments, young trees, urban environment, soil injection

IDENTIFICATION, INTERPRETATION AND POSSIBILITIES OF REGENERATION OF DESIGNED LANDSCAPE

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Abstract

The dissertation is focused on the identification and interpretation of the designed landscape on the example of a selected model area. The subject of the research is the territory of the existing Landscape Heritage Zone Vranovsko-Bítovsko. Despite its unquestionable quality, it is a relatively neglected area that has not been the subject of systematic research so far. There is a strong presumption that these are two separate compositions, the extent of which is much greater than has been previously reported. The intention is to identify and describe these two compositions and to create appropriate expert documents that can be implemented in the spatial analysis documents and further used for the needs of conservation. The contribution to the conference focuses on the identification and interpretation of the landscape composition of Vranov nad Dyjí.

Keywords: designed landscape, Vranovsko-Bítovsko, heritage conservation, interpretation

CHANGING IN WINE THE COMPOSITION DURING THE AGING ON YEAST LEES

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Abstract

The dissertation focuses on the influence of yeast autolysis and its effects on the composition of still wines. The experiment compared technologies that used fermentation lees in wooden barrels and those that did not use fermentation lees in inert containers. Total polyphenols, total amino acids, carbonyl compounds, individual higher fatty acids and higher alcohols, and the amount of dissolved oxygen in the wine were analysed over 300 days in each year (2021-2023). The results showed that the variant in wooden barrels with fermentation lees had many times higher levels of amino acids, higher alcohols and higher fatty acids and higher levels of dissolved oxygen. Sensory analysis confirmed that wines aged in inert containers without lees were lighter, fresher and fruity.

Keywords: yeast lees, aminoacids, higher alcohols

OPTIMIZATION OF LETTUCE NUTRITION IN A HYDROPONIC GROWING SYSTEM

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Abstract:

Optimizing plant nutrition in aquaponics involves challenges such as balancing fish and plant systems, selecting suitable feed, and enhancing plant growth with plant growth-promoting microorganisms (PGPMs). Our study focused on the effects of microbial inoculums on the growth and mineral composition of 'Hilbert' and 'Barlach' lettuce and basil in a vertical indoor farm. Four nutrient solutions were tested: hydroponic, standard aquaponic, aquaponic with *Trichoderma harzianum*, and aquaponic with *Bacillus mojavensis*. *T. harzianum* significantly boosted basil growth, leading to a 44.9 % increase in leaf number, 36.4 % higher nitrate content, and 126.0 % more vitamin C. *B. mojavensis* improved Na⁺ and Cl⁻ ion removal by 243.1 % and 254.4 %, respectively, and increased leaf numbers by 44.9–82.9 %, along with a 168.3 % rise in vitamin C in basil and 45.0 % in 'Hilbert' lettuce. Microbial inoculums showed potential for reducing the need for supplemental fertilizers. A subsequent study is now focused on analyzing macronutrient (N, P, K) dynamics across different aquaponic system configurations to further optimize nutrient cycling and improve system efficiency.

Keywords: aquaponics, plant growth promoting microorganisms, nutrient dynamics

EVALUATION OF TERROIR CONDITIONS AND VINEYARD MANAGEMENT DURING THE CULTIVATION OF WELSCHRIESLING

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Abstract

The dissertation examines the influence of natural conditions on the cultivation of Welschriesling in Pálava, specifically in the village of Perná. The experiment is carried out on six vineyards (one of the vineyards is divided into two parts, due to a large height difference), these vineyards have two different lines. The first is the classic high Rhenish-Hessian line and the second is the low line that is trimmed in a cordon style. The microclimate in the vineyards is investigated using data loggers that measure temperature and air humidity every 15 minutes. These stations are located directly in the leaf wall of the vine. In one vineyard there is also a weather station that provides regular measurements at a height of 30, 60, 90, 120, 150 and 200 cm above the ground. The experiment also includes the evaluation of phenophases. Every year, a sample of 15 vines is harvested, and then, is used a uniform technology, to produce wine from the grapes, in which aromatic and phenolic substances are determined.

Keywords: Welschriesling, microclimate, terroir, microbiome

A TECHNOLOGY OF VEGETABLE PRODUCTION WITH ZERO OR LOW PESTICIDE RESIDUES

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Abstract

With the growing need for sustainable and safe agricultural practices, innovative approaches to vegetable production have been developed, particularly with the aim of reducing pesticide residues in food. In this study, we investigated neem tree (*Azadirachta indica*)-derived Azadirachtin-based biopesticides as a way to produce crops with no pesticide residues. Azadirachtin is a naturally occurring insecticidal substance that is biodegradable and has minimal toxicity to people and non-target creatures, making it perfect for controlling pests in the environment. An experiment was carried out in an open field by planting tomato plants at the Faculty of Horticulture, Lednice, Mendel University, Brno. The experiment was comprised of two treatments and three replications. Furthermore, the experimental layout was set up in such a way that spraying was done on leaves, green fruits, green fruits covered with bags, ripen fruits and ripen fruits covered with bags. The leaf and fruit samples were collected for residue analysis prior to immediately following, and 1 day, 2nd, 4th, 6th, 8th, and 10th day respectively. To assess the degree of pesticide degradation, the results were subjected to gas chromatography analysis. The results show that after 10 days, the residue level was below the detection limit, so growers should wait at least ten days after spraying to ensure that no residue remains. In addition, the study indicates that the active ingredient (Azadirachtin) does not move from leaves to fruits, as no residue was detected on the covered fruits (green as well as ripened). These findings highlight the potential for Azadirachtin to be used effectively in reducing pesticide residues.

Keywords: sustainable, *Azadirachta indica*, azadirachtin, biopesticide, biodegradable, gas chromatography

MANAGEMENT OF NUTRITION DURING SECONDARY FERMENTATION

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Abstract

The dissertation thesis examines the influence of nutrition, to be more precise individual amino acid during the secondary alcohol fermentation (AF) of sparkling wine made using the traditional method. The literature search consists of a detailed review of the anorganic nutrition in the form of ammonia and organic nutrition, particularly amino acid and their impact on metabolism during fermentation and production of side products. In the experimental part was compared use of individual ten amino acids - phenylalanine, valine, alanine, serine, glutamic acid, arginine, aspartic acid, leucine, isoleucine, threonine and check in form ammonia and complex of all amino acids in commercial organic nutrition. Their influence was compared of production ethanol, higher alcohol, esters and kinetics of AF related to pressure in bottles. The result showed differences in kinetics of AF, speed of metabolism of sugar, and different total pressure in each variant.

Keywords: secondary fermentation, wine nutrition, amino acid, sparkling wine

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