ČESKÁ
SPOLEČNOST
EXPERIMENTÁLNÍ
BIOLOGIE ROSTLIN

bulletin 2025

Book of Abstracts

18th Student Days in Plant Biology CS 2025
Plant Biology CS 2025

PLANT BIOLOGY CS 2025 BRATISLAVA

www.csebr.cz

Bulletin České společnosti experimentální biologie rostlin a Fyziologické sekce Slovenské botanické společnosti
Bulletin je vydáván s finanční podporou Akademie věd ČR.
Registrační číslo MK ČR E 13255

2025
Číslo 1/2025, ročník 2025. Vychází jednou ročně.
Toto číslo bylo dáno do výroby v srpnu 2025.

Tisk Rain, s.r.o., Otín 251, 377 01
Jindřichův Hradec
Náklad 180 výtisků
Toto číslo neprošlo jazykovou ani redakční úpravou.

ISSN 1 2 1 3-6670

Key words: amaranth, heavy metal, histochemistry, morphology, stress

Amaranth (*Amaranthus* spp.) is considered an agronomically important representative of pseudocereals. Moreover, this plant possesses potential traits that make it an attractive model for studying plant responses to negative effects of environmental pollution caused by abiotic stressors including heavy metals, salinity and extreme temperatures, as it can thrive under various harsh conditions. Our research focuses on understanding and exploring the responses of grain amaranth (*Amaranthus cruentus* cv. Pribina) to heavy metal stress under hydroponic conditions[1]. We investigated how lead (Pb, non-essential metal) and two essential metals - zinc (Zn) and manganese (Mn) - affect plant performance, growth tolerance indices and root morphology of amaranth. In addition, the accumulation of the tested metals applied in different concentrations over 14 days, was analysed. The spatial localisation of Zn within the amaranth root tissues was demonstrated by histochemical staining at light and fluorescent levels. We found that all metal treatments led to a reduction in plant biomass and to alterations of several root morphological parameters. In particular, Pb and Zn treatments were associated with the most significant reductions in root and total plant biomass, along with a corresponding decrease in growth tolerance indices. The accumulation of the tested metals was higher in the amaranth roots than in the shoots, and the translocation factor values were below 0.5. Zinc accumulation was increased in root tips, developing lateral root primordia, and vascular root tissues compared to the control plants. Our results showed that cv. Pribina exhibits different responses to applied heavy metal stressors.
[1] Hunková et al. (2024) A comparative analysis of heavy metal stress responses in different grain amaranth cultivars. Plant Stress 14, 100619. ISSN 2667-064X.

Acknowledgement
The work was supported by the Operational program Integrated Infrastructure within the project: Demand-driven research for the sustainable and innovative food, Drive4SIFood 313011V336, cofinanced by the European Regional Development Fund; by Scientific Grant Agency VEGA – grant no. 2/0013/22 and by COST action CA22144.

CULTIVATION OF HYDROPONIC LETTUCE IN PLASMA-ACTIVATED WATER: EFFECTS ON GROWTH, PIGMENTATION, AND SENSORY QUALITY

Mišúthová Adriana[1], Lukačová Zuzana[2], Mehrabifard Ramin[1], Machala Zdenko[1]

[1]Division of Environmental Physics, Faculty of Mathematics, Physics and Informatics, Comenius University, Mlynská dolina F1, 842 48 Bratislava, Slovakia
[2]Department of Plant Physiology, Faculty of Natural Sciences, Comenius University, Mlynská dolina B2, 841 04, Bratislava, Slovakia
adriana.misuthova@fmph.uniba.sk

Key words: *Lactuca sativa*, phenols, pigments, plasma-activated water, RONS

Cold atmospheric plasma generates multiple reactive oxygen and nitrogen species (RONS), which dissolve in water to form plasma-activated water (PAW), resulting in its subsequent chemical modifications. Due to the presence of RONS, PAW shows considerable potential in agriculture, as these species act as signaling molecules in plant metabolic pathways and enhance nutrient availability. This study evaluates the effects of PAW produced via a transient spark (TS) discharge system on the growth and physiological responses of hydroponically cultivated lettuce (*Lactuca sativa*). Four experimental treatments were established: (1) a control group grown in ½ Hoagland's nutrient solution; (2) plants from seeds primed in PAW for 1.5 hours, then transferred to Hoagland's nutrient solution; (3) plants from seeds primed in PAW and subsequently cultivated in PAW supplemented with ½ Hoagland's nutrient solution; and (4) plants cultivated solely in PAW enriched with ½ Hoagland's nutrients. Plant development was monitored over a 10-week period. At harvest, central rosette leaves (3–4 per plant) were analyzed for pigment content (chlorophylls and carotenoids), as well as pheophytin and phenolic compound concentrations. A sensory evaluation involving 15 participants assessed visual appearance, aroma, flavor, and texture. The PAW treatment showed significantly higher levels of *chlorophyll a* and phenolic compounds, consistent with sensory data indicating this variant as the greenest. However, it exhibited the lowest fresh weight and smallest leaf head size. In contrast, PAW + priming significantly increased biomass and head size, yielding the largest plants among all treatments and was rated the

most palatable. Additionally, this treatment displayed the highest *chlorophyll a+b* activity, indicating enhanced photosynthetic performance.

Acknowledgement
Funded by the EU NextGenerationEU through the Recovery and Resilience Plan for Slovakia under the project No. 09I03-03-V03-00033 EnvAdwice and Slovak Research and Development Agency APVV-22-0247.

DECODING PHYTOHORMONES AT HIGH RESOLUTION: MAPPING METABOLITE DYNAMICS IN ROOT TIP

Hladík P., Lemberk J., Herichová L., Petřík I., **Novák O.**

Laboratory of Growth Regulators, Institute of Experimental Botany, The Czech Academy of Sciences & Faculty of Science, Palacký University, Olomouc, Czech Republic
ondrej.novak@upol.cz

Key words: auxin, cytokinin, FACS, LC-MS, metabolism

Phytohormones are key regulators of plant growth, development, and stress responses, yet their precise roles often remain elusive due to the challenges associated with their detection. These chemically diverse compounds are present in extremely low concentrations, often in the pmol to fmol range per gram of fresh weight, making their detection in plant extracts highly challenging. However, breakthroughs in analytical instrumentation, coupled with the development of micro-extraction and purification techniques, now enable phytohormone analysis at the milligram scale. This progress allows us to move beyond whole-organ studies and investigate hormone distribution at the cellular and even organellar levels.
In our research, we employ fluorescence-activated cell sorting (FACS) to isolate fluorescently labelled cell populations from the root tip of *Arabidopsis thaliana*. Phytohormones are subsequently extracted from these sorted populations, and their metabolic profiles are analysed using liquid chromatography coupled with tandem mass spectrometry (LC-MS/MS). Employing these techniques, we would like to generate a high-resolution map of phytohormones within different cell types in the root tip.
Although previous studies have explored this topic, they have either used a limited number of fluorescently labelled *A. thaliana* lines or focused on a single metabolite. Furthermore, these measurements were time and plant consuming, as each sample required hundreds of thousands of cells due to the LC-MS/MS limits of detection. Therefore, we are currently developing cutting-edge analytical strategies to dramatically reduce the number of cells required for analysis by optimizing purification and analytical methods. This will minimize plant material consumption and make phytohormone measurements at the single-cell type level more feasible for routine experiments and should lead to the development of a detailed phytohormonal map in the plant root tip.

Acknowledgement
This work was supported by the project TowArds Next GENeration Crops, of the ERDF Programme Johannes Amos Comenius [grant number CZ.02.01.01/00/22_008/0004581] and by the European Research Council (ERC) under the Horizon Europe research and innovation programme (Grant No. 101166880, STARMORPH – Unravelling Spatio-temporal Auxin Intracellular Redistribution for Morphogenesis).

METABOLIC PROFILING OF PHYTOSTEROID COMPOUNDS IN SELECTED *PTERIDOPHYTE* SPECIES

Jana Oklešťková, Eliška Oriešková, Petra Amakorová, Ondřej Novák

Laboratory of Growth Regulators, The Czech Academy of Sciences, Institute of Experimental Botany & Palacký University, Faculty of Science, Šlechtitelů 27, 78371 Olomouc, Czech Republic.

bulletin

České společnosti experimentální biologie rostlin
a Fyziologické sekce Slovenské botanické společnosti

of the Czech Society of Experimental Plant Biology
and the PhysiologicaL Section of the Slovak
Botanical Society

2025

ISSN 1213-6670