

CEIPEX MU TOPIC 6B

Položka / Field	Obsah / Content
NAME	prof. Mgr. Martin Lysák, Ph.D., DSc.
CEIPEX RESEARCH TOPIC LEVEL2	Genomics & Proteomics of Plant Systems: stress in plant system
NAME OF THE RESEARCH GROUP	Plant Cytogenomics / Advanced Instrumentation and Methods for Materials Characterization
TOPIC	How Whole-Genome Triplication Shaped Desert Adaptation in Brassiceae
ABSTRACT	Brassiceae, the most economically important lineage of the mustard family, includes major crops and desert-adapted species. These species exhibit contrasting life-history strategies: ephemeral annuals escape drought through rapid growth and reproduction after seasonal rains, whereas woody perennials tolerate prolonged water limitation. Vascular development is central to both strategies, yet its evolutionary and genomic determinants remain poorly understood. Modern Brassiceae genomes originated through an ancestral whole-genome triplication (WGT), followed by extensive diploidization. Asymmetric gene loss, sequence divergence, and regulatory remodeling differentially reshaped the three ancestral subgenomes, LF, MF1, and MF2. These divergent evolutionary trajectories provide a framework for investigating how post-WGT genome evolution shaped vascular development and drought adaptation. WGT2DESERT will determine how diploidization reshaped gene networks controlling vascular development in desert-adapted Brassiceae. Across species representing contrasting diploidization trajectories and life histories, we will reconstruct the retention, sequence divergence, and subgenome-specific expression of WGT-derived genes in regulatory pathways, including ARF5–TMO5/LHW, HD-ZIP III–miR165/166, VND, PXY–WOX4, and NST/MYB. We will integrate comparative genomics, transcriptomics, DNA methylation profiling, and chromatin-state analyses with high-resolution micro-computed tomography (microCT) to quantify vascular architecture in three dimensions. We will test whether differential gene loss and regulatory divergence altered xylem and phloem development, producing vascular architectures associated with rapid drought escape or sustained survival under extreme aridity.
WEBPAGE OF THE RESEARCH GROUP	https://www.plantcytogenomics.org/