

Ph.D. projects in progress

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Title of the research topic: Engineering of rapeseed redox pathways to improve environmental stress tolerance

Description of the research topic: Crops yields are influenced considerably by annual precipitation, temperature and soil conditions. In Hungary temporal drought and extreme temperatures represent climatic constraints, while soil salinity may reduce yield in some areas. We have designed a translational research project, trying to address such problems with biotechnological tools which are either available or can be developed during the Ph.D. project. Our group has identified several genes from Arabidopsis model and from its halophytic relative, with the capacity to influence redox balance and signaling with reactive oxygen species (ROS). Preliminary results indicate that these genes can modulate tolerance to salt, drought or heat. To verify the capacity of these genes in rapeseed, we will generate transgenic or genome-edited lines to provoke enhanced expression or reproduce the type of mutations, studied in model plants. CRISPR/Cas9 genome editing will be adapted to rapeseed to generate targeted mutations. Arabidopsis and Lepidium genes will be overexpressed under the control of a stress-inducible promoter. Stress tolerance of transgenic or mutant lines will be evaluated either by established in-vitro protocols, or with a complex plant phenotyping system. We expect, that our project will help to develop biotechnological (even non-GMO) tools for rapeseed (and other crops) to increase tolerance extreme environmental conditions.