Investigation of the role of strigolactones in response to drought using a barley mutant collection
INSIGHT

The main scientific goal of presented project is the answer the question about role of strigolactones in plant response to drought. Strigolactones are group of carotenoid-derived phytohormones that play a multiple roles in plant growth and development. For the first time strigolactones were described in 1966 as a component of root exudate with a stimulatory effect on germination of parasitic seeds. 40 years later the role of strigolactones in promoting interactions between roots and arbuscular mycorrhizal fungi was discovered. Finally, in 2008 strigolactones were characterized as a phytohormones that inhibit shoot branching in rice and *Arabidopsis thaliana* L. Subsequent studies revealed additional roles of SLs in plant development, i.e. in regulation of root architecture, in promotion of nodulation in pea or regulation of senescence. Moreover it was proved that SLs are involved in plant response to nutrient stresses or pathogen attack and additional functions of SLs were proposed based on *in silico* analysis of genes encoding proteins involved in SL biosynthesis

Drought and water use efficiency are important factors that contribute to agricultural productivity worldwide. Most cropland is rain fed leaving overall productivity to less predictable weather patterns. Furthermore, increasing global temperatures introduce additional uncertainty. In addition, there is a push to maintain or increase productivity in an environmentally sustainable way. Finally, the rate of productivity improvement for many crops is also in decline. Taking all this into account the research focused on the increasing plant tolerance to drought are the main challenge for scientists.

Plants respond to drought on different ways, however the central part of this response is one of the phytohormones – abscisic acid (ABA). Under drought stress ABA elicits two distinct responses: rapid and gradual. The earliest and most rapid plant reaction, regulated mainly by ABA, is stomatal closure which minimizes the water loss through limited transpiration. Exposure to ABA triggers guard cells to decrease their volume and close across the airway pore. This is achieved via changes in ion fluxes within the guard cell. ABA gradually increases hydraulic conductivity and promotes cell elongation in the root, enabling the plant to recover after water-deficit stress. ABA induces accumulation of osmotically active compounds, which protects cells from damage. The last decade enabled a better understanding of the molecular basis of ABA metabolism and transport, and using the high-throughput technologies brought us closer to elucidation of ABA signaling in response to stress. However there are an additional components of plant response to drought, and our knowledge about that components is limited. To shed a new light for the mechanisms underlying plant adaptation to water limited conditions we are planning to develop collection of barley strigolactone mutants, and used that collection as a tool for investigation of role of that phytohormone in plant response to drought. Based on our *in silico* analysis, preliminary results and literature data, strigolactones might be an important component of plant response to drought.