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6TH EDITION OF GLOBAL CONFERENCE ON

PLANT SCIENCE AND MOLECULAR BIOLOGY

Sept 30-OCT 01, 2021

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GPMB 2021

BOOK OF ABSTRACTS

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Theme:

Accentuate Innovations and Emerging Novel Research in Plant Sciences

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atpI expression in different developmental stages of maize during chilling

Improving yield potential, crop quality and abiotic stress tolerance have always been some of the most important requirements for successful crop production. Poor environmental conditions arising as repercussions of climate change, like the drastically higher temperatures and drought during the summer, have become a significant cause of productivity and yield loss. Therefore, many strategies are focused on minimizing their negative effects, like changing the cropping patterns, including earlier sowing (early spring). Maize is especially sensitive to extreme heat occurring during the flowering and grain filling stages in summer, and earlier sowing enables avoiding this. However, it also means exposure to suboptimal temperatures and chilling stress during earlier developmental stages, leading to a demand for the development of maize lines tolerant to low temperatures during those stages.

In this study, 46 maize lines used in breeding programmes were grouped as Lancaster and group consisting of different heterotic groups like BSSS, Iowa dent, etc. and further studied by whole transcriptome sequencing (maize leaves, V4 stage, optimal temperature conditions). Gene expression analyses revealed a set of 77 differentially expressed genes (DEGs) between the two groups, out of which 20 were annotated as related to abiotic stress response. ATP synthase CF0 A subunit gene (atpI) was chosen for further characterization under low temperature conditions in two inbred lines (L1, L2) with most contrasting FPKM values, one belonging to each group. The experiment was performed with 5-day old and V4 maize seedlings, under optimal (25°/20°C) and low (8°/10°C) temperature conditions, with a 12h photoperiod. Samples for RNA extraction, cDNA synthesis and qPCR expression analysis were taken after 6h and 24h exposure to experimental temperatures.

The results showed different expression regulation of atpI dependent on cold exposure duration, developmental stage and genetic background. atpI expression was up-regulated in both genotypes in V4 stage, with the expression peak after 6h of treatment. In the 5-day old seedling stage, atpI expression depended on the genotype – it was down-regulated in L1, and up-regulated in L2. The expression in both genotypes in this developmental stage was at its highest after 24h of treatment. This suggests that mechanisms involved in ATP synthesis and photosynthetic phosphorylation are differentially regulated based on low temperature exposure duration, developmental stage and genetic background.

What will audience learn from your presentation?

- Bringing light to mechanisms involved in the chilling response in the early developmental stages of maize is crucial for finding and creating molecular tools that can be used further to assist in maize breeding and selection. Additionally, using atpI expression for this purpose can also be applied in the same way in other plant species.
- Since, maize is the one of the most important crops worldwide, lessening the negative effects of climate change on its production is of global importance. Finding ways of quickly and accurately predicting the maize inbreds tolerant to these changing conditions and the introgression of these traits into more susceptible genotypes is crucial. Confirming the role of atpI in the abiotic stress response could mean its inclusion in maize breeding programs, through marker assisted or possibly genomic selection, and creation of maize hybrids with superior traits.

Biography:

Manja Božić studied Biology at the University of Belgrade and graduated as MS of Plant Physiology and Molecular Biology in 2018. She started working on her PhD research shortly after joining the Laboratory for Molecular Genetics and Physiology, Maize Research Institute „Zemun Polje". She is currently working there as a research trainee and focussing on abiotic stress factors affecting maize gene expression, and how it further affects their growth and production.