



Aalborg Universitet

AALBORG UNIVERSITY
DENMARK

Transcript, lipid and metabolite changes contribute to low temperature memory in *Arabidopsis*

Zuther, Ellen; Schaarschmidt, Stephanie; Fischer, Axel; Erban, Alexander; Pagter, Majken; Mubeen, Umarah ; Walther, Dirk ; Giavalisco, Patrick ; Kopka, Joachim ; Sprenger, Heike; K Hinch, Dirk

Publication date:
2018

[Link to publication from Aalborg University](#)

Citation for published version (APA):

Zuther, E., Schaarschmidt, S., Fischer, A., Erban, A., Pagter, M., Mubeen, U., Walther, D., Giavalisco, P., Kopka, J., Sprenger, H., & K Hinch, D. (2018). *Transcript, lipid and metabolite changes contribute to low temperature memory in Arabidopsis*. Abstract from Plant Biology Europe 2018 , København, Denmark.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- ? Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- ? You may not further distribute the material or use it for any profit-making activity or commercial gain
- ? You may freely distribute the URL identifying the publication in the public portal ?

Take down policy

If you believe that this document breaches copyright please contact us at vbn@aub.aau.dk providing details, and we will remove access to the work immediately and investigate your claim.

Transcript, lipid and metabolite changes contribute to low temperature memory in Arabidopsis

Ellen Zuther¹, Stephanie Schaarschmidt¹, Axel Fischer¹, Alexander Erban¹, Majken Pagter², Umarah Mubeen¹, Dirk Walther¹, Patrick Giavalisco^{1,3}, Joachim Kopka¹, Heike Sprenger^{1,4}, Dirk K. Hincha¹

¹Max-Planck-Institute of Molecular Plant Physiology, Am Mühlenberg 1, 14476 Potsdam, Germany

²Department of Chemistry and Bioscience, Aalborg University, Fredrik Bajers Vej 7H, 9220 Aalborg East, Denmark

³Max-Planck-Institut für Biologie des Alterns, Joseph-Stelzmann-Str. 9b, 50931 Köln, Germany

⁴present address: VIB-UGent Center for Plant Systems Biology, Ghent University, Technologiepark 927, 9052 Ghent, Belgium

Cold priming, also called cold acclimation, the adaptation of plants to low, non-freezing temperatures, is an important aspect of winter survival of plants. In addition, a tightly regulated deacclimation process, i.e. the subsequent loss of freezing tolerance in spring, is necessary to combine the transition to reproductive growth with the need for maintained freezing tolerance to be prepared for recurring cold periods. The molecular and metabolic basis of cold priming has been investigated in detail, but hardly anything is known about memory of a cold event during a subsequent warm spell. We show that cold priming at 4°C followed by an intervening lag phase at 20°C improves the freezing tolerance of the Arabidopsis accessions Col-0 and N14 after the occurrence of a second cold trigger compared to the primed plants. For the identification of possible molecular determinants of this improved freezing tolerance transcripts, metabolites and lipids were investigated after priming, memory phase and triggering by Illumina-based RNA-Seq, GC-MS metabolite profiling and UPLC FT-MS-based lipidomics. Both accessions showed differences in transcript, lipid and metabolite content when comparing triggered with primed plants. Unique changes after triggering included 93 and 128 differentially expressed genes in Col-0 and N14, respectively, with an overrepresentation in functional categories such as lipid and secondary metabolism, stress, redox and cell wall related reactions in Col-0. Furthermore, in Col-0 and N14 three and six lipids showed significant differences in content. They included three arabinosides as unique triggering responses in N14. In addition, one metabolite in N14 was identified as a unique triggering response. Possible functions of these candidates will be discussed. This is to our knowledge the first report on molecular and metabolic changes accompanying cold stress memory and triggering by a second cold stress.