

Accepted Manuscript

Differential impact of heat stress on the expression of chloroplast-encoded genes

Maria N. Danilova, Natalia V. Kudryakova, Alexandra A. Andreeva, Anastasia S. Doroshenko, Elena S. Pojidaeva, Victor V. Kusnetsov



PII: S0981-9428(18)30240-7

DOI: [10.1016/j.plaphy.2018.05.023](https://doi.org/10.1016/j.plaphy.2018.05.023)

Reference: PLAPHY 5270

To appear in: *Plant Physiology and Biochemistry*

Received Date: 22 February 2018

Revised Date: 17 May 2018

Accepted Date: 22 May 2018

Please cite this article as: M.N. Danilova, N.V. Kudryakova, A.A. Andreeva, A.S. Doroshenko, E.S. Pojidaeva, V.V. Kusnetsov, Differential impact of heat stress on the expression of chloroplast-encoded genes, *Plant Physiology et Biochemistry* (2018), doi: 10.1016/j.plaphy.2018.05.023.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Differential impact of heat stress on the expression of chloroplast-encoded genes

Maria N. Danilova^a, Natalia V. Kudryakova^{a,*}, Alexandra A. Andreeva^b, Anastasia S. Doroshenko^a, Elena S. Pojidaeva^a, Victor V. Kusnetsov^a

^a*Timiryazev Institute of Plant Physiology, Russian Academy of Sciences, Moscow 127276, Botanicheskaya st. 35, Russia*

^b*Lomonosov Moscow State University, Leninskie Gory, Moscow, 119991, Russia*

Abstract

Heat shock is one of the major abiotic factors that causes severe retardation in plant growth and development. To dissect the principal effects of hyperthermia on chloroplast gene expression, we studied the temporal dynamics of transcript accumulation for chloroplast-encoded genes in *Arabidopsis thaliana* and genes for the chloroplast transcription machinery against a background of changes in physiological parameters. A marked reduction in the transcript amounts of the majority of the genes at the early phases of heat shock (HS) was followed by a return to the baseline levels of *rbcL* and the housekeeping genes *clpP1*, *accD*, *rps14* and *rrn16*. The decline in the mRNA levels of *trnE* (for tRNA^{glu}) and the PSI genes *psaA* and *psaB* was opposed by the transient increase in the transcript accumulation of *ndhF* and the PSII genes *psbA*, *psbD*, and *psbN* and their subsequent reduction with the development of stress. However, the up-regulation of PSII genes in response to elevated temperature was absent in the heat stress-sensitive mutants *abi1* and *abi2* with the impaired degradation of D2 protein. The expression of *rpoA* and *rpoB*, which encode subunits of PEP, was strongly down-regulated throughout the duration of the heat treatment. In addition, heat stress-induced PEP deficiency caused the compensatory up-regulation of the genes for the nuclear-encoded RNA polymerases RPOTp and RPOTmp, the PEP-associated proteins PAP6 and PAP8, the Ser/Thr protein kinase cPCK2, and the stress-inducible sigma factor gene *SIG5*. Thus, heat stress differentially modulates the transcript accumulation of plastid-encoded genes in *A. thaliana* at least in part via the expression of HS-responsive nuclear genes for the plastid transcription machinery.

Keywords

Arabidopsis; Chloroplast gene expression; Heat stress; Abscisic acid; Chloroplast transcription apparatus

Abbreviations BCA, bicinchoninic acid; HS, heat stress; NEP, nuclear-encoded plastid RNA polymerase; PEP, plastid-encoded chloroplast RNA polymerase; PSII, photosystem II; TBARS; thiobarbituric acid reactive substances; Fv/Fm, the maximal photochemical efficiency of PSII; qRT-PCR, quantitative real-time polymerase chain reaction; MS, Murashige and Skoog nutrient medium; ROS, reactive oxygen species; YII, effective quantum yield of photosystem II; NPQ, Non-Photochemical Quenching

Download English Version:

<https://daneshyari.com/en/article/8352750>

Download Persian Version:

<https://daneshyari.com/article/8352750>

[Daneshyari.com](https://daneshyari.com)