Darkness Affects Differentially the Expression of Plastid-Encoded Genes and Delays the Senescence-Induced Down-Regulation of Chloroplast Transcription in Cotyledons of *Cucurbita pepo* L. (Zucchini)

Kiril Mishev[a], Anna Dimitrova[b], and Evguéni D. Ananiev[c,*]

[a] Acad. M. Popov Institute of Plant Physiology, Bulgarian Academy of Sciences, Acad. G. Bonchev Str., Bl. 21, 1113 Sofia, Bulgaria
[b] Acad. D. Kostoff Institute of Genetics, Bulgarian Academy of Sciences, 1113 Sofia, Bulgaria
[c] Department of Plant Physiology, Faculty of Biology, St. Kl. Ohridski University of Sofia, 8 Dragan Tsankov Blvd., 1164 Sofia, Bulgaria. Fax: +359-2-856-56-41. E-mail: ananiev@biofac.uni-sofia.bg

* Author for correspondence and reprint requests

Z. Naturforsch. **66 c**, 159–166 (2011); received June 21/October 22, 2010

In contrast to differentiated leaves, the regulatory mechanisms of chloroplast gene expression in darkened cotyledons have not been elucidated. Although some results have been reported indicating accelerated senescence in *Arabidopsis* upon reillumination, the capacity of cotyledons to recover after dark stress remains unclear. We analysed the effect of two-days dark stress, applied locally or at the whole-plant level, on plastid gene expression in zucchini cotyledons. Our results showed that in the dark the overall chloroplast transcription rate was much more inhibited than the nuclear run-on transcription. While the activities of the plastid-encoded RNA polymerase (PEP) and nuclear RNA polymerase II were strongly reduced, the activities of the nuclear-encoded plastid RNA polymerase (NEP) and nuclear RNA polymerase I were less affected. During recovery upon reillumination, chloroplast transcription in the cotyledons was strongly stimulated (3-fold) compared with the naturally senescing controls, suggesting delayed senescence. Northern blot and dot blot analyses of the expression of key chloroplast-encoded photosynthetic genes showed that in contrast to *psbA*, which remained almost unaffected, both the transcription rate and mRNA content of *psaB* and *rbcL* were substantially decreased.

Key words: Cotyledon Senescence, Dark Stress, NEP, PEP