DISSERTATION ABSTRACT

Plants are daily exposed to challenges in the environmental conditions and must be able to alter their metabolism in order to sustain a large number of influences. Human impact on the earth has increased the anthropogenic part of the environmental changes in relation to the natural ones.

In order to study the molecular responses in plants after exposure to environmental stress, gene expression analysis was performed. Suppression subtractive hybridization was applied with pea plants for isolation and identification of genes regulated in leaf tissue by UV-B irradiation and ozone fumigation, and in roots by hydroponic exposure to mercury+EDTA. In total, 20 genes were identified that could be categorised into four different classes according to their predicted functions, photosynthesis-related genes, pathogen responsive genes, defense and signalling genes, and genes with unknown function in stress response. Interestingly, the genes isolated after UV-B irradiation could be found in all four categories compared with the ozone-isolated genes where all (except one novel gene) belonged to the class of pathogen responsive genes. The lack of stress-specificity in regulation of many of the genes was obvious and indicates cross talk between the pathways altering the gene expression during the different stresses.

The regulation pattern of the isolated genes during UV-B irradiation was to some extent different compared with the other stresses. These results indicate one more general stress-regulated pathway, most likely ROS dependent, and one UV-B-specific pathway. Similar results were obtained when studying the *pyroA* mutant defective in the *PYROA* gene, encoding an enzyme involved in the biosynthesis of pyridoxine. This gene had previously been shown to be important for resistance to ROS and singlet oxygen. However, no difference was seen between Arabidopsis *pyroA* mutant and wild-type plants during phenotype studies.

Keywords: UV-B radiation, environmental stress, suppression subtractive hybridization, pea, *Arabidopsis thaliana*

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