DOCTORAL THESIS

Redox control of the transcriptional response to oxidative stress by Arabidopsis redox-sensitive basic leucine zipper protein 68

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Abstract

Cellular redox states mediate various physiological and developmental processes. Mechanisms involved in sensing cellular redox state and linking it to an appropriate physiological response remains poorly understood in plants. Arabidopsis bZIP68 was previously found to undergo reversible oxidation in its Cys320 in cells under oxidative stress. In this study, it was found that bZIP68 was localized in the nucleus in Arabidopsis seedlings under normal conditions. Upon treatment of oxidative stress, bZIP68 underwent nucleocytoplasmic shuttling and accumulated in the cytoplasm. This stress-dependent nucleocytoplasmic shuttling depends on the redox-sensitive Cys320 and its nuclear export signal. bZIP68 suppresses expression of stress response genes under normal conditions and its loss-of-function mutation of *bZIP68* leads to elevated expression of genes involved in oxidative stress defense including genes encoding for antioxidant proteins and for enzymes involved in biosynthesis of small molecule antioxidants. The *bzip68* mutant also showed enhanced responses to stress treatment such as the oxidative stress and cold stress. Our study suggests that bZIP68 directly or indirectly senses perturbation of cellular redox states and links the redox change to activation of oxidative stress defense genes through redox regulation of transcription.

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