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Identification of proline content alternative 13 (pca13) as the Arabidopsis thaliana RING zinc finger 1 suppressor in plant environmental stress response

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Proline (Pro) metabolism is important for environmental responses, plant development and growth. However, the mechanism of Pro in abiotic and biotic stress processes is unclear. Using the atrzf1 (Arabidopsis thaliana RING zinc finger 1) mutant as a parental line for T-DNA tagging mutagenesis, we identified a suppressor mutant, designated proline content alterative 13 (pca13) that suppressed the insensitivity of atrzf1 to abiotic stresses during early seedling growth. Pro content of pca13 was lower than in atrzf1, while the complementary lines were less sensitive to Abscisic Acid (ABA) and abiotic stresses compared to WT. Through the TAIL-PCR of pca13, it was shown that T-DNA inserted at site chromosome 2 which encodes cell wall enzyme. Under condition of biotic stress, pathogen resistance was significantly higher in pca13 compared to WT and atrzf1. Moreover, pca13 mutant was significantly higher in several important drought parameters including malondialdehyde level, ion leakage and water loss. The fluorescence signal of the green fluorescent protein (GFP)-tagged PCA13 was quite strong in the cell wall of the root cells of the transgenic seedlings. Additionally, the PCA13 promoter-?-glucuronidase (GUS) construct revealed substantial gene expression in the root tissues and apical meristem. Collectively, these findings prove that pca13 acts as a suppressor mutant of atrzf1 in the abiotic and biotic stress responses through the Pro metabolism.

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