GABA Accumulation Causes Cell Elongation Defects and a Decrease in Expression of Genes Encoding Secreted and Cell Wall-Related Proteins in Arabidopsis thaliana

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Résumé en anglais	GABA (γ-aminobutyric acid), a non-protein amino acid, is a signaling factor in many organisms. In plants, GABA is known to accumulate under a variety of stresses. However, the consequence of GABA accumulation, especially in vegetative tissues, remains poorly understood. Moreover, gene expression changes as a consequence of GABA accumulation in plants are largely unknown. The pop2 mutant, which is defective in GABA catabolism and accumulates GABA, is a good model to examine the effects of GABA accumulation on plant development. Here, we show that the pop2 mutants have pollen tube elongation defects in the transmitting tract of pistils. Additionally, we observed growth inhibition of primary root and dark-grown hypocotyl, at least in part due to cell elongation defects, upon exposure to exogenous GABA. Microarray analysis of pop2-1 seedlings grown in GABA-supplemented medium revealed that 60% of genes whose expression decreased encode secreted proteins. Besides, functional classification of genes with decreased expression in the pop2-1 mutant showed that cell wall-related genes were significantly enriched in the microarray data set, consistent with the cell elongation defects observed in pop2 mutants. Our study identifies cell elongation defects caused by GABA accumulation in both reproductive and vegetative tissues. Additionally, our results show that genes that encode secreted and cell wall-related proteins may mediate some of the effects of GABA accumulation. The potential function of GABA as a growth control factor under stressful conditions is discussed.

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