

Title γ -Aminobutyric acid (GABA) concentrations in tomatoes in response to cold storage and elevated carbon dioxide

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Abstract

GABA is a four carbon amino acid that has been shown to accumulate rapidly in plant systems that are exposed to stresses such as cold, heat, anoxia and salt, but little is known about changes in GABA concentrations in harvested product. In this study, tomato fruit were untreated, or exposed to low temperature storage at 3 °C for 4 weeks, or to 10% carbon dioxide (in air) for 12 days. The GABA concentrations and glutamate decarboxylase (GAD), GABA transaminase (GABA-T) and succinate dehydrogenase (SSADH) gene expression and enzyme activities were assayed. Two chilling sensitive and two insensitive *L. esculentum* introgression lines were compared. Higher chilling sensitivity of the introgression lines was related to higher amounts of GABA in cold stored fruit, but concentrations in either chilling sensitive or tolerant lines declined after removal of the fruit to 20 °C. GAD activity decreased after removal of fruit to 20 °C, while GABA-T activity decreased during fruit ripening in all selections. Chilling treatment caused an increase in GABA-T activity in tolerant lines, but a decline in sensitive lines during cold storage. No distinct pattern in gene expression of GAD and GABA-T genes between tolerant and sensitive lines were found but mRNA levels of SSADH and GHBDH genes were much higher in tolerant lines. Carbon dioxide exposure did not affect GABA accumulation in breaker stage tomatoes but greater levels in GABA were found in carbon dioxide-treated fruit of red stage tomatoes, and GABA declined only during air storage. Overall, these results indicate that while accumulation of GABA may be involved in stress-responses of harvested tomatoes, rapid accumulation of GABA is not a general feature of either cold or carbon dioxide treated fruit.