Investigation of proline in superficial scald development during low temperature storage of ‘Dangshansuli’ pear fruit

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Abstract

The role of proline in superficial scald development in pear fruit was investigated in this study. During low temperature storage of ‘Dangshansuli’ pear fruit, superficial scald incidence and index accumulated in association with the alternation of α-farnesene and conjugated trienols (CTols). 14 out of 17 free amino acids were identified; proline content gradually decreased, which was consistent with the up-regulation of PbrP5CS activity and down-regulation of PbrProDH activity in its metabolic pathway. A total of 14 genes involved in proline metabolism were identified based on transcriptome annotation with diverse expression profiles. Results from correlation analysis among proline content further indicate that enzyme activity and gene expression profile, *PbrProDH2*, *PbrProDH4*, *PbrProDH5* & *PbrP5CS5* might play a critical role in proline metabolism during low temperature storage of ‘Dangshansuli’ fruit; thus, influencing superficial scald development which was then functionally validated using the transgenic pear fruit. Postharvest 1-MCP and diphenylamine (DPA) treatment inhibited the accumulation of CTols, and thus, mitigated superficial scald development and maintained higher proline content, in association with the up-regulated PbrP5CS activity, *PbrP5CS4* & *PbrP5CS5* mRNAs as well as the down-regulated PbrProDH activity & *PbrProDH4* transcripts. In a further study, we found that exogenous application of proline alleviated superficial scald incidence and index. To that end, the results of our study confirmed that proline was involved in superficial scald development during pear storage.