

Glycine betaine alleviated peel browning in cold-stored ‘Nanguo’ pears during shelf life by regulating phenylpropanoid and soluble sugar metabolisms

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Abstract

Long-term cold storage can postpone the senescence and preserve the quality of postharvest ‘Nanguo’ pear fruit. However, peel browning (PB), which is deemed to be a symptom of chilling injury (CI), usually develops after the fruit are transferred to shelf life at room temperature. In this study, the effect of glycine betaine (GB) treatment (10 mmol L⁻¹ for 10 min) on PB, as well as on phenylpropanoid and soluble sugar metabolisms of pear fruit was investigated. The results showed that GB treatment effectively delayed the occurrence of PB by 6 d after cold storage for 120 d, and significantly inhibited the browning index in fruit by more than 35% during the 15 d of shelf life. Enzymes activities and genes expression levels related to phenylpropanoid metabolism were increased after GB treatment, which resulted in the increase of total phenols and flavonoids content. Moreover, higher sucrose content, and lower fructose and glucose content were observed in GB-treated fruit, which was concomitant with increased activities and genes expression levels of sucrose synthase (SS) and sucrose phosphate synthase (SPS), as well as decreased activities and genes expression levels of invertase. The results showed that the development of PB in cold-stored ‘Nanguo’ pears was closely related to phenylpropanoid and soluble sugar metabolisms. GB treatment could alleviate PB by ways of regulating phenylpropanoid and soluble sugar metabolisms, as well as by sustaining higher levels of phenolic and sucrose content. Therefore, exogenous GB treatment could be an effective method to alleviate PB of ‘Nanguo’ pear fruit during cold storage.