Exogenous ethylene alleviates chilling injury of ‘Huangguan’ pear by enhancing the proline content and antioxidant activity

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Abstract

Peel browning spots (PBS) is a chilling injury (CI) symptom in cold-stored ‘Huangguan’ pear. In the present study, the effect of exogenous ethylene on CI and its correlation to proline and reactive oxygen species (ROS) metabolism was investigated. The results showed that ethylene treatment (100 μL L^{-1} for 24 h) could completely inhibit PBS appearance without significantly affecting fruit firmness, soluble solids content (SSC) and titratable acidity (TA), enhance ethylene production rate at the initiate stage of storage, and promote proline accumulation by increasing activities of pyrroline-5-carboxylate synthetase (P5CS), ornithine-delta-aminotransferase (OAT) and up-regulating expression of *P5CS1* and *OAT1* genes, decreasing proline dehydrogenase (PDH) activity and the expression of *PDH1* gene in peel. Moreover, the ethylene treatment suppressed the accumulation of H_2O_2, O_2- and malondialdehyde (MDA), maintained higher levels of ascorbic acid (AsA) and glutathione (GSH), and meanwhile enhanced activities of superoxide dismutase (SOD), catalase (CAT) and ascorbate peroxidase (APX), as well as expression of the genes such as *SOD1*, *CAT1*, and *APX1* which could encode these enzymes in peel. These results suggested that ethylene alleviated the CI of ‘Huangguan’ pear by promoting the proline accumulation and antioxidant activity of peel.