

Title Cold-induced changes in ACC metabolism determine softening recovery in 1-MCP treated ‘conference’ pears

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Abstract

To better understand physiological response to cold stress and physiological changes triggered by 1-MCP treatment in relation to softening recovery, ‘Conference’ pears were harvested in three orchards, at three maturities and treated with $0.3 \mu\text{L L}^{-1}$ 1-MCP for 24 h. Changes in 1-aminocyclopropane carboxylic acid (ACC) and malonyl-ACC (MACC) levels, ACC synthase (ACS) and ACC oxidase (ACO) activity were followed during cold storage and 2 weeks of further ripening at 20 °C. Cold storage induced significant changes in ACC metabolism which depended on the maturity of the fruit at harvest and to a lesser extent on the orchard location. In control fruit, ripening behaviour upon removal from cold storage directly relied on the amount of ACC accumulated during cold storage as well as on harvest maturity-dependent increases in ACO and the capacity to convert ACC to MACC. Similar to control fruit, the increase of ACC levels during cold storage determined the further softening behaviour of 1-MCP treated fruit. However, in 1-MCP treated fruit, malonylation had a more limited role and the capacity of the fruit to recover softening was directly related to the inhibition of ACO and mainly to the residual ACS activity which was maintained after 1-MCP treatment during cold storage.