Title Inhibition of ethylene-induced α-farnesene synthase gene Pc*AFS1* expression in 'd'Anjou' pears with 1-MCP reduces synthesis and oxidation of α-farnesene and delays development of superficial scald

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Abstract

Pre-storage treatment of superficial scald-susceptible apple and pear fruits with the blocker of ethylene action 1-methylcyclopropene (1-MCP) inhibits the synthesis of α-farnesene. Consequently, accumulation of α-farnesene and its conjugated trienol (CTol) oxidation products in the fruit skin is diminished, and scald is largely prevented. In cold-stored apple fruit, a marked increase in expression of *AFS1*, the gene encoding α-farnesene synthase (AFS), precedes the rapid accumulation of α-farnesene. A *Pyrus communis* L. gene encoding AFS (Pc*AFS1*) was cloned using RT-PCR with primers based on apple *AFS1* and RNA from peel tissue of 'd'Anjou' pears cold-stored for 33–94 days. Non-treated control and 1-MCP-treated (300 nL L^{-1} for 6 h at 1 °C) pears were stored at −1 °C in air for up to 216 days. Pc*AFS1* expression in control fruit increased sharply over the first 63 days, remained high through 123 days, fell to much lower levels from 157 to 183 days, then increased again to maximum levels at 216 days. In comparison, expression of Pc*AFS1* was attenuated in 1-MCP-treated fruit. Pc*AFS1* transcript was almost nil through 94 days, rose sharply at 123 days and reached a maximum at 183 days that was two-fold lower than the highest level in controls. Maximum concentrations of α-farnesene and CTols in control fruit occurred at 94 and 123 days, respectively, and scald incidence was 100% after 94 days. α-Farnesene and CTol levels at these time points were, respectively, 9- and 19-fold lower in 1-MCP-treated fruit, which had no scald at 157 days, 13% at 183 days and 40% at 216 days. Post-storage ripening, with the associated increases in softening, respiration and ethylene production, was fully enabled in control fruit after 63 days at −1 °C, whereas 1-MCP-treated pears failed to ripen properly even after 216 days.