

Title Prevention of superficial scald symptoms during storage in apples
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Abstract

Superficial scald, is a physiological disorder that induced by ethylene, which develops during cold storage of apple fruits. In 'Granny Smith' apples, we compared two chemical prevention methods (0.2% diphenylamine (DPA) dip or 1.0 ml/l 1-methylcyclopropene (1-MCP) vapors for 24 hr at 20°C) with a physical method (10 days of low O₂ at 20°C prior to cold storage at 0°C). We also tested a molecular approach, transgenic 'Greensleeves' apple lines in which ACC oxidase or ACC synthase were suppressed, for efficacy in avoiding superficial scald. Low-O₂ pretreatment of 'Granny Smith' apples induced endogenous production of acetaldehyde and ethanol, reducing ethylene production during cold storage and thus scald and bitter pit development. DPA also reduced both scald and bitter pit, but 1-MCP was only effective against scald. Low-O₂-treated fruits remained firmer, with higher acidity and acceptable aroma and flavor for eight months in regular air at 0°C. GC-MS and SPME revealed differences in the volatiles profile among treatments. Control fruit with superficial scald symptoms showed degradation of a-farnesene and production of its oxidation product, 6-methyl 5-hepten-2-one (MHO). Concentrations of MHO were much lower in DPA, 1-MCP, and low O₂- treated fruits. Similarly, ACC synthase-suppressed transgenic 'Greensleeves' apples neither exhibited superficial scald nor produced MHO, while wild type 'Greensleeves' apples exhibited superficial scald after 4 month at 0°C. The advantages and disadvantages of each method will be discussed.