

Title Effect of high-pressure hot-water washing treatment on fruit quality, insects, and disease in apples and pears
Part I. System description and the effect on fruit quality of 'd'Anjou' pears

Author Jinhe Bai, Eugene A. Mielke, Paul M. Chen, Robert A. Spotts, Maryna Serdani, James D. Hansen and Lisa G. Neven

Citation Postharvest Biology and Technology Volume 40, Issue 3, June 2006, Pages 207-215

Keyword *Pyrus Communis*; Pear; Packingline; Hot-water; High-pressure; Heat scald; Friction discoloration; Ripening

Abstract

A manually operated high-pressure hot-water washing system consisting of a boiler, hot-water mixing tank, contact loop, heat exchanger, spray mixing tank, high-pressure hot-water washing manifold, low-pressure fresh water rinse manifold, and pressure pump was constructed and installed in a packingline. The system developed 20–50 °C washing water at pressures up to 980 kPa. 'd'Anjou' pears (*Pyrus communis* L.), shortly after harvest, and after storage for 3 and 4 months in regular air (RA) or for 4, 7 and 8 months in controlled atmosphere (CA) at –1 °C were washed through the packingline with different wetting agents (0.1% Silwet, 0.01 and 0.1% Defoamer, and water), water pressures (regular and high-pressure (210–980 kPa)), water temperatures (control (tap water, 4–22 °C), 40 °C, and 50 °C), and brushes (soft and firm), respectively. The effect of the washing conditions on fruit quality was investigated after 1 month of storage at –1 °C to simulate shipping condition, and then again after 1 week at 20 °C to simulate marketing condition. Hot-water caused severe heat scald. When nozzle temperature was 50 °C, the incidence of heat scald increased to over 50% for the fruit stored in RA for 3 months. Combined with hot-water, 540 kPa high-pressure washing increased the incidence of friction discoloration. There were lower incidences of friction discoloration and heat scald for fruit stored in CA for 7 months, in comparison to that in RA for 3 months. However, those fruit did not ripen properly as indicated by a high extractable juice content. Fruit washed at harvest had minor incidences of friction discoloration regardless of different brushes, water pressures, and wetting agents. Fruit washed after storages in either 4 months RA or 4 or 8 months CA suffered a high incidence of friction discoloration including scuffing symptoms and pressure marking. The firm brushes caused a higher incidence of friction discoloration mainly because of scuffing symptoms. However, no differences were found between different water pressures and wetting agents with respect to friction discoloration. Fruit stored for 4 months RA suffered 26–28% friction discoloration in comparison to 16–18% in CA stored fruit with firm brush washing. Extended CA storage increased friction discoloration even with soft brush washing. The results suggest that a washing system with high-pressure spray, <30 °C warm water, wetting agent Defoamer and rotating soft brushes were significantly effective in removing surface pests and decay control without causing internal or external damage of fruit.