

## Abstract

The present study evaluated how post-harvest treatment with 1-methylcyclopropene (1-MCP) and methyl jasmonate (MJ) affect responses of 'Fuji' apple fruit to CA storage conditions. 'Fuji' apples were harvested one week after optimum maturity for long-term storage from commercial orchard in north central Washington (seasons one and two) and from 4 commercial orchards in Santa Catarina, Brazil (season three). Fruit were cooled to 0.5°C within 24 h of harvest and then stored in air or controlled atmosphere (CA). Fruit from season one were stored in CA with 2 kPa O<sub>2</sub> + 0.05 kPa CO<sub>2</sub>; 0.25 kPa O<sub>2</sub> + 0.05 kPa CO<sub>2</sub> or 2 kPa O<sub>2</sub> + 3 kPa CO<sub>2</sub> for 6 months. Fruit from seasons two and three were stored in CA with 1.5 kPa O<sub>2</sub> + 0.05 kPa CO<sub>2</sub> or 1.5 kPa O<sub>2</sub> + 3 kPa CO<sub>2</sub> for 8 months as a rapid CA (established within 72 h of harvest) or a delayed CA (established after 2, 3, 4 or 6 weeks of harvest). In addition, CO<sub>2</sub> levels in low CO<sub>2</sub>-CA (1.5 kPa O<sub>2</sub>-0.05 kPa CO<sub>2</sub>) were increased to 3 kPa after 1, 2 or 3 months of harvest. Fruit were treated with 1 mM MJ or 1 µL L<sup>-1</sup> 1-MCP at harvest. Both CA conditions and 1-MCP treatment reduced ethylene production, improved maintenance of firmness and titratable acidity and reduced incidence of scald and core flush during long-term storage compared with untreated fruit stored in air. 1-MCP treatment was as or more effective as low CO<sub>2</sub>-CA storage for reducing ethylene production and preservation of firmness and acidity in 'Fuji' apples depending on season and/or storage period. 'Fuji' apples stored in 3 kPa CO<sub>2</sub> developed internal browning (CO<sub>2</sub>-injury) while fruit stored in 0.25 kPa O<sub>2</sub>, 0.05 kPa CO<sub>2</sub> or air did not, regardless of 1-MCP treatment. There were no significant impacts of 1-MCP treatment on development of CO<sub>2</sub>-injury in air or rapid CA-stored fruit from Washington, while 1-MCP treatment enhanced incidence and severity of CO<sub>2</sub> injury in rapid CA-stored fruit from Brazil. MJ treatment reduced severity of CO<sub>2</sub>-injury. Delaying CA (1.5 kPa O<sub>2</sub> + 3 kPa CO<sub>2</sub>) or CO<sub>2</sub> (3 kPa) accumulation during CA reduced the incidence of CO<sub>2</sub>-injury. However, CA and CO<sub>2</sub>delay procedures were less effective on prevention of CO<sub>2</sub>-injury for fruit treated with 1-MCP compared with untreated fruit regardless of orchard and region. Results indicate that 1-MCP treatment increased CO<sub>2</sub> injury sensitivity in the earlier period of storage when 'Fuji' apples are more susceptible to CO<sub>2</sub>-injury.