

Title External carbon dioxide injury and 1-methylcyclopropene (1-MCP) in the 'Empire' apple
Author Fanjaniaina Fawbush, Jacqueline F. Nock and Christopher B. Watkins
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Abstract

The effects of several factors on the susceptibility of untreated and 1-MCP-treated 'Empire' apple (*Malus sylvestris* (L.) Mill var. *domestica* (Borkh.) Mansf.) fruit to external CO₂ injury have been investigated. These factors include CO₂ partial pressure, the timing of elevated CO₂ exposure, delays between harvest and exposure to elevated CO₂, DPA concentration, and the timing of DPA treatment after exposure of fruit to 1-MCP. 1-MCP-treated fruit were more susceptible to external CO₂ injury than untreated fruit when stored in 5 kPa, but not 1 kPa, CO₂ (in 2 kPa O₂). 1-MCP did not increase the period of highest susceptibility to injury during controlled atmosphere storage. The greatest sensitivity to injury occurred 0–3 weeks after harvest. Sensitivity to injury decreased when untreated fruit were kept in air for up to 14 days before exposure to 5 kPa CO₂, but not for 1-MCP-treated fruit. DPA treatment prevented development of CO₂ injury even at a level as low as 250 µL L⁻¹. DPA treatment could be delayed for 4 days after 1-MCP treatment while fruit were exposed to 5 kPa CO₂ in air without injury development. Overall the data indicate that 1-MCP enhances the risk of external CO₂ injury, but this injury can be prevented by treatment of fruit with DPA at harvest. In the absence of DPA treatment, handling procedures such as maintaining low CO₂ partial pressures in the storage atmosphere must be used.