

Flesh browning development of 'Empire' apple during a shelf life period after 1-methylcyclopropene (1-MCP) treatment and controlled atmosphere storage

Mahmoud Koushesh Saba and Christopher B. Watkins

Scientia Horticulturae 261: 108938. (2020)

Abstract

Little information is known about metabolism of flesh browning disorders in apples after removal of fruit from cold storage. 'Empire' apples develop a firm flesh browning, a physiological disorder that is assumed to be a chilling injury because it occurs usually at 0.5 °C; however, incidence is increased in fruit at warmer storage temperatures (2–3 °C) if fruit have been treated with 1-methylcyclopropene (1-MCP). In this study, fruit were untreated or treated with 1-MCP and stored in controlled atmospheres at 0.5 or 3 °C for 40 weeks, followed by a 10 d shelf life period at 20 °C. The greatest increase of internal ethylene concentration (IEC) and softening occurred in the fruit that had been stored at 3 °C without 1-MCP, and the lowest in fruit from 0.5 °C plus 1-MCP. Flesh browning was present in 1-MCP treated fruit and in fruit stored at 0.5 °C at the time of removal, and low in fruit stored at 3 °C. Incidence and severity of the disorder in 1-MCP treated fruit stored at 3 °C increased greatly during the shelf life period. Electrolyte leakage was higher in 1-MCP treated fruit stored at 0.5 °C than in the other treatments. Polyphenol oxidase (PPO) activity was higher in 1-MCP treated fruit regardless of storage temperature but peroxidase (POX) activity was higher in fruit that had been stored at 0.5 °C regardless of 1-MCP treatment. The highest POX activity was measured in the fruit that had been stored at 0.5 °C without 1-MCP treatment. Overall, browning development during the shelf life is associated with higher PPO activity in 1-MCP treated fruit and higher POX activity at the lower storage temperature.