

Title Harvest maturity, storage temperature, and 1-MCP application frequency alter firmness retention and chlorophyll fluorescence of 'Redchief Delicious' apples.

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Citation Journal of the American Society for Horticultural Science Vol: 126 (2001); 618-624

### Abstract

Fruit of 'Redchief Delicious' apple were harvested one week before the climacteric (harvest 1), at the onset of the climacteric (harvest 2), and one week after the onset of the climacteric (harvest 3). Fruit were stored at 0, 5, 10, 15, or 20 deg C and were treated with 0.7 micro l l-1 1-MCP on a once-per-week, once-per-2-week, once-per-month, and once-per-year basis or were left nontreated. The initial 1-MCP treatment was at 20 deg C and subsequent applications were at storage temperatures. The compound slowed softening at all temperatures relative to nontreated fruit, however as temperature decreased, the benefits of 1-MCP application became less pronounced. Effectiveness of 1-MCP declined slightly as harvest maturity increased. Efficacy of 1-MCP treatment increased with greater frequency of application at 5, 10, 15, and 20 deg C, but not at 0 deg C. Fruit stored without refrigeration (20 deg C) for more than 100 days did not soften significantly when treated once per week with 1-MCP. However, decay was a significant problem for treated and nontreated fruit stored at temperatures >5 deg C; 1-MCP application reduced, but did not prevent decay. Rate of decline in titratable acidity increased with storage temperature and 1-MCP had no significant effect on retarding the decline in acid content. Minimum ( $F_o$ ) and maximum ( $F_m$ ) chlorophyll fluorescence was altered markedly by 1-MCP application, but the ratio of  $(F_m - F_o)/F_m$  was only slightly affected. The most effective 1-MCP treatment frequency was once per week and, at all elevated temperatures (5, 10, 15, and 20 deg C), slowed loss of firmness to a greater extent than refrigeration (0 deg C) alone. Application of 1-MCP resulted in greater retention of firmness than controlled atmosphere (CA) with O<sub>2</sub> and CO<sub>2</sub> at 1.5 kPa and 3 kPa, respectively. Data suggest that 1-MCP application, has the potential to reduce reliance on refrigeration and CA storage for maintaining firmness of 'Redchief Delicious' apple, especially for relatively short storage durations (<50 days) when fruit are harvested within a week of the ethylene climacteric.