

Title Chlorophyll fluorescence-based low-O₂ CA storage of organic 'Cortland' and 'Delicious' apples
Authors J.M. DeLong, R.K. Prange, P.A. Harrison
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Abstract

This study was conducted to determine if chlorophyll fluorescence-based low-O₂ controlled atmosphere (CA) storage maintained higher fruit quality compared with conventional CA storage of organically-grown 'Cortland' and 'Delicious' apples. Fruit from 25 year-old 'Cortland' and 'Delicious' trees on MM.111 and M.26 rootstocks, respectively, were harvested in 2003 and 2004 from the same transitional organic orchard in the Annapolis Valley of Nova Scotia. Half of the 'Cortland' fruit were stored in standard CA (SCA) conditions at 2 kPa O₂ + 3 kPa CO₂ and 3°C, while half of the 'Delicious' apples were held at 2.0-2.2 kPa O₂ + 2.5-3.0 kPa CO₂ at 0°C. The remainder of the fruit were monitored with the HarvestWatch™ chlorophyll fluorescence (CF) system which held 'Cortland' apples at 1.0-1.3 kPa O₂ (1.0-1.2 kPa CO₂) and 3°C, and 'Delicious' fruit at 0.9-1.1 kPa O₂ (1.2-1.3 kPa CO₂) and 0°C. Fruit were removed from all CA storage at 4 and 8 months and held in ambient air for 0, 7, 14 and 21 d at 0°C. Apple quality measurements were taken immediately following storage removal, and after 7 d at 20°C for the fruit held in refrigerated ambient air conditions. The CF system consistently maintained higher fruit firmness (2.4-11.6 N) in both cultivars compared with SCA storage at most evaluation periods. Superficial scald in 'Cortland' fruit under the CF system was markedly reduced, particularly after 7 d at 20°C for all removals. However, the CF system had less effect on superficial scald in 'Delicious' apples as the expression of this disorder was generally lower. The CF technology generally maintained higher levels of soluble solids and titratable acidity in 'Cortland' fruit after the 7-d shelf life following the 8-month removal in particular, and reduced rot incidence in 'Cortland' to some degree. The results of this work show that the CF system sustained fruit quality to a greater extent than SCA storage and is an option for organic apple producers as a non-chemical means for maintaining higher fruit quality during long-term storage.