

Title Predisposition of 'Braehurn' apples for developing flesh browning disorders in storage is related to the apoplast composition at harvest

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Abstract

The expression of flesh browning disorders during controlled atmosphere (CA) storage is problematic for many apple cultivars, including 'Braeburn'. Symptoms of Braeburn browning disorder (BBD) include brown water-soaked patches in the cortex, with cavities forming in severe cases. Currently there is limited understanding of the mechanism by which 'Braeburn' apples become predisposed to develop browning disorders in storage, and why fruit from different orchard blocks have different incidence of BBD despite being stored under similar conditions. The harvest period for 'Braeburn' in New Zealand occurs in early autumn, when there can be a sudden onset of cold temperatures and/or differences in diurnal temperatures of up to 20°C. This study investigates the concept that these diurnal change may affect sugar metabolism and translocation into the apoplast, which may alter the predisposition to develop BBD. Results from studies conducted over a three-year period show a higher incidence of BBD for fruit harvest early in the morning (0600-0700 h, <10°C) than fruit harvested from the same location later in the day (1300-1400 h, >20°C), suggesting the predisposition for BBD can change within a short timeframe (5-6 hours). Analysis of the apoplasmic fluid indicated that fruit with a high predisposition for BBD had lower concentrations of sucrose and tended to have higher concentrations of potassium. These results suggest that carbohydrate metabolism at harvest and in particular, the apoplasmic sugar/mineral balance, may be critical for determining the storage responses of fruit. Opportunities for developing predictive technologies for flesh browning in apples will be discussed.