

Title Changes in anaerobic metabolism in 'Braeburn' apples during the stand-down period in air before CA storage

Author Nagin Lallu, Doug Burmeister, Chris Yearsley, David Billing, Paul Pidakala, Matthew Punter and Jeremy Burdon

Citation Abstracts, 10th International Controlled & Modified Atmosphere Research Conference, 4-7 April 2009, Antalya, Turkey. 80 pages.

Keyword Controlled atmosphere; apple; acetaldehyde

Abstract

The development of 'BBD' ('Braeburn' browning disorder) during cool storage of 'Braeburn' apples is exacerbated when fruit are placed directly into CA (controlled atmosphere) storage after harvest. To minimise the occurrence of 'BBD', it is common to hold fruit in air for 7 to 28 days before establishing an atmosphere of 2% O₂ with <2% CO₂. The firmness at the end of CA storage is related to the duration of the stand-down period, but there are no predictive methods available to determine how long the stand-down period should be. Since the disorder is increased by exposure to low O₂ and/or high CO₂, and stand-down in air prior to CA decreases the incidence of 'BBD', it is possible that fruit are becoming acclimated or more tolerant to low O₂ and/or high CO₂ during the stand-down period.

In this study, it was hypothesised the acclimation in 'Braeburn' apples during the stand-down period involves changes in the anaerobic response, and in particular, changes in the acetaldehyde (AA) and/or ethanol (EtOH) metabolism. The experimental approach taken was to determine the relationship between rates of AA and EtOH accumulation, including PDC (pyruvate decarboxylase) and ADH (alcohol dehydrogenase activity), and the development of 'BBD'. Fruit from 8 orchards were obtained during commercial harvest and held for 1, 4, 8 or 16 days in air at 0.5°C before transfer to CA storage using a 2% O₂/2% CO₂ atmosphere. At the end of each stand-down, subsamples of fruit from each orchard were placed in 0.1% O₂ and the EtOH levels measured after 0, 1, 2 and 4 days, and the PDC and ADH activity determined after four days.

The rates of AA and EtOH accumulation and PDC and ADH activity differed significantly between fruit from different orchards. However, whilst the accumulation of AA and EtOH was different in acclimated and non acclimated fruit, PDC and ADH activity did not to be increased greatly by the anaerobic induction. After 16 days of acclimation, there was a decrease in the production of anaerobically-induced AA and EtOH. In general, there was a negative relationship between incidence of 'BBD' and the production of EtOH, and a weaker positive relationship between AA and incidence of 'BBD'. The potential to use anaerobically-induced AA and EtOH production as an indicator of the efficacy or degree of acclimation of 'Braeburn' apples prior to CA storage will be discussed.