Title An assessment of the potential use of DCA (Dynamic controlled atmosphere) storage for export of 'Cox's orange Pippin' apples from New Zealand

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Abstract

Potentially DCA could be used during the shipping phase and/or during storage onshore in New Zealand prior to export. In this study, the response of 'Cox's Orange Pippin' apples to DCA conditions was assessed by undertaking a short-term (simulated shipping) trial, a long-term storage trial, and characterising the induction and recovery response 'Cox's Orange Pippin' to anaerobic atmospheres. In the shipping and long-term storage trials, a comparison was made between the responses of 'Cox's Orange Pippin' apples to air, SmartFresh™, CA and DCA storage.

For the simulated shipping trial, fruit from four orchards were held at 3°C in air with or without SmartFresh treatment, a CA of 2% O_2 plus 2% CO_2 or under DCA conditions where the O_2 varied between 0.8 and 1.2% and the CO_2 was maintained between 1 and 2%. Fruit were stored for four weeks to simulate the shipping period and then all fruit were transferred to air storage at 3°C for a further four weeks.

For the long-term storage trial, two additional treatments: CA storage with SmartFresh and DCA with SmartFresh were added and the fruit stored for 20 weeks before evaluation after 7 days of shelf life at 20°C. Flesh firmness, background colour and internal ethylene levels of acetaldehyde (AA) and ethanol (EtOH) were determined during exposure of fruit to 0.1 % or 0.5% O_2 and after transfer to air.

In the shipping trial, DCA fruit were as firm as SmartFresh-treated fruit or CA fruit at the end of shipping, but after four weeks in air, the SmartFresh-treated fruit were the firmest, although DCA-stored fruit had the best retention of background colour. In the long-term storage trial, the firmest fruit and fruit with the greenest background colour after storage and shelf life were the DCA-stored fruit irrespective of SmartFresh treatment. However, brown discolouration was present in the flesh of some of the DCA-stored fruit and this was related to AA and EtOH levels. Recovery from the induction of increased levels of AA and EtOH in atmospheres of 0.1 % O_2 or 0.5% O_2 was possible after several days in air, with no visible damage symptoms.

It is concluded that DCA is suitable for long-term storage of 'Cox's Orange Pippin' apples, especially to supply fruit late into the market window. The use of SmartFresh appears to be the best option for shipping and short-term storage. P