

Title Antioxidant metabolism of 1-methylcyclopropene (1-MCP) treated ‘Empire’ apples during controlled atmosphere storage

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Abstract

‘Empire’ apples [*Malus sylvestris* (L.) Mill var. *domestica* (Borkh.) Mansf.] are susceptible to development of firm flesh browning during controlled atmosphere storage. The browning is thought to be a chilling injury and therefore fruit are typically stored at 2–3 °C to avoid fruit damage. However, flesh browning can be enhanced by 1-methylcyclopropene (1-MCP) treatment at these warmer temperatures. The objective of this work was to investigate the effect of 1-MCP on the antioxidant systems of ‘Empire’ apple fruit stored at 2 kPa O₂/2 kPa CO₂ at either 0.5 °C or 3.3 °C for up to 40 weeks. Lightness (*L*^{*}) and hue angle (*h*[°]) changes of the flesh tissues were correlated with development of flesh browning. Nitroblue tetrazolium reducing activity was lower in 1-MCP treated fruit, but while changes in H₂O₂, MDA, ascorbic acid and dehydroascorbate, reduced and oxidized glutathione concentrations, and the activities of associated enzymes were affected by storage temperature and 1-MCP treatment, no consistent patterns of change were detected. Partial least squares regression analysis revealed that the activity of ascorbate peroxidase might be the candidate metabolite in flesh browning development at 3.3 °C, but overall, the results do not reveal a direct role of antioxidant metabolism during development of flesh browning in ‘Empire’ apples.