

Title Quantification and histochemical localization of ascorbic acid in ‘Delicious,’ ‘Golden Delicious,’ and ‘Fuji’ apple fruit during on-tree development and cold storage

Author Erin Felicetti and James P. Mattheis

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Abstract

Apple fruit are subject to multiple stressors during pre- and post-harvest development. Stress-induced reactive oxygen species (ROS) can be detrimental to the fruit, and ascorbic acid (AsA) is involved in many of the antioxidant pathways that detoxify ROS. An inclusive study to characterize AsA dynamics in ‘Delicious,’ ‘Golden Delicious,’ and ‘Fuji’ apples during pre- and post-harvest development was performed. AsA was quantified in fruit harvested prior to, at, and following attainment of physiological maturity. Fruit harvested at physiological maturity was stored in air at 0.5 °C and AsA was monitored at monthly intervals. AsA content in peel exceeded that in cortex for all cultivars at all sampling points. AsA in cortex declined early in fruit development and remained low relative to peel throughout development and storage. During development there was a slight increase in the quantity of AsA at physiological maturity, which correlates with an increase in internal ethylene. ‘Delicious’ apples harvested at 161 d after full bloom (DAFB) had the highest quantity of AsA, followed by ‘Golden Delicious’ at 149 DAFB and ‘Fuji’ at 178 DAFB. AsA localization in fruit sections stained with silver nitrate supported the analytical data obtained via HPLC and revealed AsA localizes to the core line and vascular bundles later in fruit development, and this pattern continues during cold storage.