

Title Quantifying flesh browning, polyphenoloxidase, total phenolic content and vitamin C in select apple varieties and progeny

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Abstract

Apple (*Malus domestica* Borkh.) enzymatic browning is a significant problem in the fresh cut and processing industries. Quantifying flesh browning among a variety of cultivars can assist apple breeders in selecting low-browning parents to use in crosses. Polyphenoloxidase (PPO) is the catalyst of the browning reaction; phenolic compounds present in apples are the substrates. Rates of browning, PPO activity and total phenolic content were measured in 12 commercial cultivars and 5 advanced breeding selections. Vitamin C, an important antioxidant and metabolite in plants and for humans, was also quantified in these cultivars.

'Liberty', 'McIntosh', and selection #2 (a 'McIntosh' x 'Fuji' hybrid) were consistently the highest browning apples. 'AutumnCrisp' (previously 'NY674') and selection #5 ('AutumnCrisp' x 'Braeburn') were the lowest browning apples. For most cultivars, flesh browning decreased over time in cold storage and was higher in the core than near the peel. Selection #2, #3 ('Braeburn' x 'AutumnCrisp') and 'Braeburn' had the highest measured PPO activity; 'AutumnCrisp', 'Cortland', 'Zestar' and 'McIntosh' had the lowest. 'McIntosh', #4 ('AutumnCrisp' x 'Fuji'), #5 and #2 had the highest phenolic content; 'Braeburn' and #3 had the lowest. PPO activity and total phenolic content were correlated ($p < 0.05$) to total color change only in some cultivars.

'Braeburn' had the highest mean vitamin C content, 21.7 mg/100g fresh weight. The five advanced breeding selections averaged higher than most of the commercial cultivars, with between 11.9 and 14.5 mg/100 g fresh weight. Harvest year and time in storage both affected vitamin C levels to varying degrees for different cultivars. There was a low but significant correlation between harvest date and vitamin C content.