

Yield, labor, and fruit and juice quality characteristics of machine and hand harvested 'Brown Snout' specialty cider apple

Miles, Carol A. and Jaqueline King. 2014. Yield, labor, and fruit and juice quality characteristics of machine and hand-harvested 'Brown Snout' specialty cider apple. *HortTechnology* 24(5):519-526.

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Summary

In this 2-year study of 'Brown Snout' specialty cider apple (*Malus domestica*) grafted onto Malling 27 (M.27) and East Malling/Long Ashton 9 (EMLA9), we compared weight of total harvested fruit, labor hours for harvest, tree and fruit damage, and fruit and juice quality characteristics for machine and hand harvest. Machine harvest was with an over-the-row small fruit harvester. There were no significant differences due to rootstock however there were differences between years for most measurements. Weight of harvested fruit did not differ due to harvest method, however harvest efficiency was 68% to 72% for machine pick and 85% to 89% for machine pick + clean-up weight (fruit left on trees and fruit knocked to the ground during harvest) as compared to hand harvest. On average for the 2 years, hand harvest required 23 labor-hours per acre at a total cost of \$417, while machine harvest required 5 labor-hours per acre at a cost of \$93. There were no differences due to harvest method on damage to spurs (four to eight damaged per tree) or limbs (0.5 -0.8 damaged per tree). While there were also no differences due to harvest method on fruit bruising (100% for both harvest methods in this study), 10% of fruit were sliced and 4% of fruit were cut in half inadvertently with machine harvest, and none were sliced or cut with hand harvest. Harvest method had no effect on fruit quality characteristics, specifically, soluble solids concentration (SSC), pH, specific gravity, titratable acidity (malic acid equivalents), or percent total tannin, when fruit was pressed immediately after harvest or stored for 2, 3 or 4 weeks before pressing. Juice quality characteristics were affected by storage, and SSC increased 11% in 2011 (3 weeks storage), and 12% and 18% in 2012 (2 and 4 weeks storage, respectively). Similarly, specific gravity increased both years after storage, 1% in 2011, and 1% and 2% in 2012 (a 1% increase in juice specific gravity corresponds to a potential 1.3% increase in alcohol by volume after fermentation for cider). Both years, juice pH tended to decline when fruit was stored (0.01 pH units in 2011, 0.06-0.12 pH units in 2012). Overall, cider apple harvest with an over-the-row small fruit machine harvester used four times less labor than hand harvest, yield reached 87% that of hand harvest (when clean-up yield was included), and juice quality characteristics were not negatively affected. These results suggest that machine harvest may be suitable for cider apples if equipment is available and affordable.