Department of
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WASHINGTON STATE UNIVERSITY

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HORT 509/510
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Presented at the following WSU campuses and Research and Extension Centers: Pullman, Tri-Cities, Mount. Vernon, Prosser, Puyallup, Wenatchee

"Utilizing Near-Infrared Spectroscopy for Non-Destructive Phenotyping in the WSU Apple Breeding Program"

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Abstract

Washington state is the number one domestic apple (*Malus* × *domestica* Borkh.) producer in the U.S. and grows at least 28 varieties commercially. Until recently, none of those varieties had been bred for the Washington state growing region. The Washington State University Apple Breeding Program (WABP) aims to develop new and improved varieties with higher eating qualities that are better suited for the WA apple growing region. WABP uses a variety of destructive analytical tests, such as firmness, soluble solids and titratable acidity (instrumental), as well as appearance and eating quality (sensory) traits, to evaluate selections throughout the season, both at harvest and after several months of refrigerated storage. Young seedling trees typically have low fruit numbers; incorporating non-destructive evaluations could increase the number of traits evaluated per selection, including dry matter content (DM). In 2015 and 2016, fruit from the WABP advanced selections were harvested and stored for two months at 4°C. Fruit was evaluated after storage using the above-mentioned analytical and sensory tests with the addition of destructive DM measurements. Data was compared to near-infrared (NIR) spectral outputs to determine non-destructive measurement models. Correlations between DM and sensory fruit quality traits were also calculated. A sufficiently predictive model was developed for DM (R^2=0.85, RMSE=0.60), confirming the previously published studies showing the potential of using the NIR spectroscopy region between 729-925nm to measure DM. Models for firmness, soluble solids content and titratable acidity were developed with varying degrees of predictive accuracy. While DM was significantly correlated to all instrumental traits, only soluble solids content (r=0.85, p<0.001) and sensory trait "Sweetness" (r_s=0.50, p<0.001) had high and moderate correlation coefficients, respectively.