

Title Comparing density and VNIR methods for predicting quality parameters of yellow-fleshed kiwifruit (*Actinidia chinensis*)

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Abstract

Non-destructive density and visible-near infrared (VNIR) measurements have been made on yellow-fleshed kiwifruit (*Actinidia chinensis* Planch. var. *chinensis* 'Hort16A') harvested on four occasions across a commercial harvest period. The fruit were examined both at harvest and/or after 12 weeks' cold storage to predict the internal quality parameters of dry matter (DM), soluble-solids content (SSC) and flesh colour using hue angle (Hue). Density measurements were made by flotation and the VNIR measurements using a polychromatic spectrometer system operating over the range 300–1140 nm, although much smaller spectral regions were better for predicting DM and SSC (both 800–1000 nm), or Hue (500–750 nm). Harvest-time and post-storage data sets were formed and used to develop models for predicting harvest-time and/or post-storage quality parameters. The VNIR method proved superior to the density method in every case, especially for DM and SSC predictions where the VNIR method was close to twice as accurate. The VNIR method yielded accuracies (standard errors in prediction) of $\pm 0.40\%$, $\pm 0.71\%$ and $\pm 1.05^\circ$ for predictions of harvest DM, SSC and Hue, respectively. Predictions of post-storage DM, SSC and Hue, from post-storage spectra, had improved accuracies of $\pm 0.24\%$, $\pm 0.31\%$ and $\pm 0.98^\circ$, respectively. The increased accuracy for SSC prediction, from ± 0.71 to $\pm 0.31\%$, is theorised to be a consequence of the VNIR method being better at predicting the total carbohydrate concentration, which comprises starch and soluble sugars in about equal amounts at harvest but is mainly soluble sugar after the fruit ripens during cold storage. That theory was supported by the observation that post-storage SSC predictions based on harvest-time VNIR spectral models were also more accurate ($\pm 0.38\%$) than the equivalent harvest-time SSC predictions. In addition, harvest-time DM predictions were shown to be capable of at least rank ordering ($R^2 = 0.87$) kiwifruit in terms of post-storage SSC.