# Assessment of avocado fruit dry matter content using portable near infrared spectroscopy: Method and instrumentation optimisation

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## Abstract

Avocado flesh dry matter content (DMC) is an index of eating quality of ripened fruit, and DMC is also related to fruit maturity, with a (cultivar dependant) minimum DMC recommended for harvest. Based on DMC variation within the fruit, the outer equatorial region of the fruit was chosen for optical and physical sampling. Three handheld near infrared spectrophotometers were compared for in-field non-invasive assessment of DMC, with the best results for prediction of independent sample sets obtained using an instrument employing an interactance optical geometry and the wavelength range 720–975 nm, with mean centred second derivative of absorbance spectra (e.g., correlation coefficient of determination, $R^2$, for partial least squares regression model (PLSR) prediction of an independent test set of 0.71, compared to 0.37 and 0.31 for two reflectance geometry instruments). This performance difference to the reflectance geometry units was less marked for fruit with skin removed (e.g., prediction set $R^2$ 0.88 for the interactance geometry unit and 0.74 and 0.71 for the reflectance geometry units). PLSR model performance was examined for models based on cumulative combination of fruit populations across three growing seasons and four growing locations for a single cultivar model and a combined two cultivar model. Bias corrected root mean square of error of predictions stabilized in the third season at approximately 1.5 % dw/fw, with bias varying by approximately 1 %. The coefficients of the PLSR model stabilised as population size increased, making these values a useful guide to model stability. In-field use was demonstrated, tracking DMC of fruit on tree from between 14 and 27 % over several months to inform a harvest timing decision. Use on ripening fruit was also demonstrated. Tracking of known (tagged) fruit was recommended over assessment of randomly chosen fruit to reduce bias error in estimation of population DMC change.