

# Relationships between optical properties of peach flesh with firmness and tissue structure during storage

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## Abstract

The relationship between optical properties and tissue structure of firmness has been investigated. The light absorption (absorption coefficient,  $\mu_a$ ) and scattering properties (reduced scattering coefficient,  $\mu'_s$ ) of 'Baifeng' and 'Xiahui 8' peaches were acquired using a single integrating sphere (SIS) system combined with an inversion algorithm over a 6 d period at 20 °C. The relationship of  $\mu_a$  and  $\mu'_s$  with the firmness, equivalent diameter ( $dF$ ), roundness ( $e$ ), cell wall thickness (CWT) and intercellular space rate ( $R_{is}$ ) were quantitatively analyzed at different wavelengths, and prediction models were established by partial least squares regression (PLSR). The results showed that firmness was correlated with structural parameters (except  $e$ ), especially with  $R_{is}$  and CWT ( $r \geq 0.750$ ). In addition, firmness,  $R_{is}$  and CWT had good correlations with optical scattering in melting 'Baifeng' peaches ( $r \geq 0.919$ ). Similar results were also found for prediction models of firmness, CWT and  $R_{is}$  based on  $\mu'_s$  ( $R_p^2 \geq 0.799$ ). Moreover, in nonmelting 'Xiahui 8' peaches, both firmness and CWT had good correlations with optical scattering ( $r \geq 0.976$ ), which is consistent with the correlation analysis results of firmness and structural parameters. In addition, in the models based on  $\mu'_s$  for predicting firmness and CWT,  $R_p^2 \geq 0.823$ . These results further verified that the prediction of firmness based on optics may be related to the high correlation between tissue structural parameters and scattering properties.