Title Measurement of soluble solids content in watermelon by Vis/NIR diffuse transmittance technique

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Abstract

Watermelon is a popular fruit in the world with soluble solids content (SSC) being one of the major characteristics used for assessing its quality. This study was aimed at obtaining a method for nondestructive SSC detection of watermelons by means of visible/near infrared (Vis/NIR) diffuse transmittance technique. Vis/NIR transmittance spectra of intact watermelons were acquired using a low-cost commercially available spectrometer operating over the range 350–1000 nm. Spectra data were analyzed by two multivariate calibration techniques: partial least squares (PLS) and principal component regression (PCR) methods. Two experiments were designed for two varieties of watermelons [Qilin (QL), Zaochunhongyu (ZC)], which have different skin thickness range and shape dimensions. The influences of different data preprocessing and spectra treatments were also investigated. Performance of different models was assessed in terms of root mean square errors of calibration (RMSEC), root mean square errors of prediction (RMSEP) and correlation coefficient (r) between the predicted and measured parameter values. Results showed that spectra data preprocessing influenced the performance of the calibration models. The first derivative spectra showed the best results with high correlation coefficient of determination [r=0.918 (QL); r=0.954 (ZC)], low RMSEP [0.65 °Brix (QL); 0.58 °Brix (ZC)], low RMSEC [0.48 °Brix (QL); 0.34 °Brix (ZC)] and small difference between the RMSEP and the RMSEC by PLS method. The nondestructive Vis/NIR measurements provided good estimates of SSC index of watermelon, and the predicted values were highly correlated with destructively measured values for SSC. The models based on smoothing spectra (Savitzky-Golay filter smoothing method) did not enhance the performance of calibration models obviously. The results indicated the feasibility of Vis/NIR diffuse transmittance spectral analysis for predicting watermelon SSC in a nondestructive way.

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