Integrating Vis-SWNIR spectrometer in a conveyor system for in-line measurement of dry matter content and soluble solids content of durian pulp

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Abstract

The prediction of dry matter content (DMC) and soluble solids content (SSC) in durian pulp were performed using a small laboratory scale in-line visible and short wave near infrared (Vis-SWNIR) spectroscopic system. The fiber optic diode array spectrometer with a charged coupled device (CCD) detector in a wavelength range of 450–1000nm was used for spectral data acquisition. The spectra of the sample were acquired on the moving conveyor belt in two different orientations, including scanning in the upright position of pulps collected in 2018 and the stable position by scanning on the side of the pulps collected in 2019. Partial least squares regression (PLSR) was used to establish the relationship between the spectra and observed DMC and SSC values using the different wavelength ranges, including 450–1000, 700–1000, and 800–1000nm for the comparison. The results showed that the durian pulp should be scanned in the upright position at the center of the pulp. Moving average smoothing preprocessing combined with the standard normal variate (SNV) for DMC and multiple scatter correction (MSC) for SSC gave the best result. The suitable wavelength range for model development to predict the DMC and SSC was 700–1000nm and 800–1000nm, respectively. After comparing the results, the optimum model showed the coefficient of determination of calibration (R_C^2), and prediction (R_P^2), root mean square error of prediction (RMSEP), bias, and the ratio of performance to interquartile distance (RPIQ) of 0.88, 0.83, 4.32 %, 1.25 %, and 3.52 for DMC and 0.70, 0.70, 4.0 %, 0.4 %, and 2.2 for SSC prediction.