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Article

Feasibility of Nondestructive Sugar Content Analysis of Korean Pears by Using NearÃƒÂ¢Ã‚Â€Ã‚Â•infrared DiffuseÃƒÂ¢Ã‚Â€Ã‚Â•reflectance Spectroscopy

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Abstract

Nondestructive sugar content analysis of fruits is important for effective quality monitoring during growing stages, postharvest storage, and distribution in markets. The requirement of nondestructive analysis can be satisfied by an optical spectroscopic technique with an appropriate data analysis approach. We applied nearÃƒÂ¢Ã‚Â€Ã‚Â•infrared (NIR) diffuseÃƒÂ¢Ã‚Â€Ã‚Â•reflectance spectroscopy in combination with multivariate calibration as the nondestructive method of sugar content analysis for Korean pears. The diffuseÃƒÂ¢Ã‚Â€Ã‚Â•reflectance spectra for 21 Korean pears with the sugar contents of 10.3ÃƒÂ¢Ã‚ÂˆÃ‚Â’12.9 ÃƒÂ‚Ã‚Â°Bx were obtained in the wavelength region between 900 and 1500ÃƒÂ¢Ã‚Â€Ã‚Â‰nm. The differential spectrum of the pear samples with the maximum and minimum sugar contents was found to show structures similar to those of the transmittance spectrum of an aqueous solution of glucose. This confirms that the NIR spectra of pears convey the quantitative chemical information of sugar molecules. A simple, effective spectral intensity normalization method was applied to improve the analysis precision. Based on the normalized NIR spectra, a multivariate calibration model was developed using partial least squares regression for predicting the sugar content of the Korean pear samples. The prediction accuracy was evaluated to be ~0.24 ÃƒÂ‚Ã‚Â°Bx by the test set switch method.

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