

Detection of internal mold infection in tomato by transmittance near infrared spectroscopy

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Abstract

Alternaria alternate is the black mold occurring inside tomato. This defect can be normally found by destructive method but it cannot be detected by visible inspection from outside appearance of intact tomato. Therefore, a non-destructive technique for prediction of internal mold infection in tomato is required. Near infrared (NIR) spectroscopy technique was considered in this research. Transmittance NIR spectra in the range of 665-955 nm of tomato were acquired. Partial least squares-discriminant analysis (PLS-DA) was performed to establish the calibration model. Results indicated that combination of the standard normal variate transformation (SNV) and smoothing (Savitzky-Golay) pretreatment appeared the best method to develop the model. The calibration model was cross-validated by a training set (N=140) and used for prediction by a test set (N=60). It obtained 85.0% (corrected 88.7% in normal samples and corrected 81.2% in defected samples) and 91.7% (corrected 100% in normal samples and corrected 83.9% in defected samples) of the total accuracy for calibration and prediction, respectively. Moreover, defected samples were classified in 3 levels of infection severity. The accuracies of cross validation for groups of low, medium and high infection severity were investigated and obtained 82.2, 82.4 and 90.0%, respectively. In conclusion, the calibration model from transmittance NIRS technique can be applied for rapid and non-destructive sorting of internal mold infection in intact tomato.