Maturity determination at harvest and spatial assessment of moisture content in okra using Vis-NIR hyperspectral imaging

Guantao Xuan, Chong Gao, Yuanyuan Shao, Xiaoyun Wang, Yongxian Wang and Kaili Wang

Abstract

Maturity determination of fresh okra fruit is a crucial issue for farmers to optimize harvest date for good taste and economic return. In this study, visible and near infrared (Vis-NIR) hyperspectral imaging was employed to evaluate the maturity stage and moisture content of fresh okra fruit precisely. Immature, mature and post-mature okra samples were identified by measuring the shear force, and physicochemical analysis indicated the negative correlation between maturity and moisture content. A library for support vector machines (LIBSVM) model was developed using effective wavelengths, texture features and their fusion, respectively. The LIBSVM model using the fused dataset obtained the highest total maturity classification accuracy reaching 91.7 % for cross-validation. Further investigation was conducted to predict moisture content in okra with different maturity by multiple linear regression (MLR) model, and the determination coefficient, the root mean square error and residual predictive deviation of cross-validation was R^2_{cv} = 0.816, RMSECV = 1.348 %, RPD_{cv} = 2.333, respectively. After that spatial distribution map was generated to visualize the moisture content in okra fruit. These results demonstrated the potential of hyperspectral imaging for maturity determination and moisture content changes during growth, providing the support for the development of field monitoring sensor to determine the optimum harvest date of okra fruit.