Title Study on non-destructive evaluation methods for defect pods for green soybean processing by near-infrared spectroscopy

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Abstract

Reflectance spectroscopy ranging from visible light to the near infrared region (600–1100 nm) was investigated for the detection of outer and inner defects of fresh green soybean pods. The outer defect parameters, defined by the processing factory which exports frozen green soybean, were hangnail, thinness, brown spot, insect-eaten, rotten, and worm-eaten, and the inner parameters were those caused by disease, i.e. downy mildew and anthracnose, or by worm inside the pod. Using 802 samples, classification models for each group were identified, based on principle component analysis (PCA). Models were developed using primary spectra and second derivative spectra. The PCA score plots could classify clearly the group affected by downy mildew, those with worm inside, and the worm-eaten, rotten, and thin groups from the good pod group. The primary spectra with or without some kind of pretreatment showed a higher classification performance than the second derivative spectra. The good pod model created by primary spectra correctly classified 77.2% of samples as good pods or defective pods. SIMCA showed obviously better performance than PLS-DA in classification of green soybean pods. The good pod model by SIMCA could 100% self-prediction, though it showed low performance in predicting the other groups. This study provided the information by using NIR spectroscopy in the green soybean grading process in order for the appropriate sorting instruments to be developed