

Title Shortwave infrared hyperspectral imaging for detecting sour skin (*Burkholderiacepacia*)-infected onions

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Abstract

Sour skin (*Burkholderiacepacia*) is a major postharvest disease for onions and causes substantial production and economic losses in onion postharvest. In this study, a shortwave infrared hyperspectral imaging system was explored to detect sour skin. The hyperspectral reflectance images (950–1650 nm) of onions were obtained for the healthy and sour skin-infected onions. Principal component analysis conducted on the spectra of the healthy and sour skin-infected onions suggested that the neck area of the onion at two wavelengths (1070 and 1400 nm) was most indicative of the sour skin. Log-ratio images utilizing the two optimal wavelengths were used for two different image analysis approaches. The first method applied a global threshold (0.45) to segregate the sour skin-infected areas from log-ratio images. Using the pixel number of the segregated areas, Fisher's discriminant analysis recognized 80% healthy and sour skin-infected onions. The second classification approach used three parameters (max, contrast, and homogeneity) of the log-ratio images as the input features of support vector machine (Gaussian kernel, $\gamma = 1.5$), which discriminated 87.14% healthy and sour skin-infected onions. The result of this study can be used to further develop a multispectral imaging system to detect sour skin-infected onions on packing lines.