Evaluation of fungal infection in peaches based on optical and microstructural properties

Ye Sun, Renfu Lu and Xiaochan Wang

Postharvest Biology and Technology, Volume 165, July 2020, 111181

Abstract

The objective of this research was to measure the changes of optical properties and quality or microstructural properties of peaches during fungal infection, and classify the fungal infected peaches based on the optical parameters. Spectra of the absorption (μ_a) and reduced scattering coefficients (μ_s') over 600-1000 nm for healthy and fungal infected peaches over a period of four days were measured by using a spatially-resolved spectroscopic technique. The color and microstructural features of fruit pulp and peel were measured and evaluated, using colorimetry and scanning electron microscopy (SEM), as indicators of the changes in tissue appearance and internal quality in infected peaches. The μ_a and μ_s' spectra exhibited a pattern of decrease during the fungal infection, and their values at wavelengths of 670 nm and 970 nm were correlated with the microstructural parameters of fruit peel and pulp (i.e., mycelial area, intrusion rate, and the energy, entropy and contrast extracted from the SEM images). Significant differences in the quality parameters between healthy and infected peaches were found after 3 d of inoculation for the peel tissues and after 2 d for pulp tissues. Significant differences between the healthy and infected peaches after 1 d of inoculation were also observed for both μ_a and μ_s'. The optical parameters were more sensitive to disease infection than some of the quality parameters. Partial least squares discriminant analysis (PLSDA) models were developed, based on the two optical parameters and their combinations, for classifying diseased and healthy peaches. The PLSDA model for the optical parameter of $\mu_a \times \mu_s'$ achieved better overall classification accuracies of 70–88 %, when the peaches were classified into four (based on infection days) and two (i.e., healthy and diseased) classes, respectively. This research demonstrated that optical properties can be used to assess quality or structural changes and detecting disease infection in peach fruit.