# Laser-light backscattering imaging approach in monitoring and classifying the quality changes of sweet potatoes under different storage conditions

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## Abstract

Optical imaging techniques have gained wide attention for quality detection of agricultural and food products. In this work, the non-destructive ability of the laser-light backscattering imaging technique (LLBI) for monitoring and classifying the quality changes of sweet potatoes under different storage conditions was investigated. Freshly-harvested sweet potato root samples were stored at 5 °C, 15 °C and 30 °C for a period of 21 d with 120 samples in each storage group. Laser diode emitting light at 658 nm wavelength along with the camera system was employed to capture the backscattered light from the subjected samples. The acquired backscattering images were then pre-processed and segmented, and the intended backscattering parameters (BP) were extracted. Quality parameters (QP) such as moisture content (MC), soluble solids content (SSC), texture and color properties (*L*, a*, b**) were measured using the conventional methods as standard reference data. Multivariate analysis in terms of partial least squares regression (PLSR), principal component analysis (PCA) and linear discriminant analysis (LDA) was carried out to correlate and classify the sweet potatoes based on the BP. Results showed that storage had a significant effect both in the BP and QP of sweet potatoes as well as in the interaction between the BP and the treatments (day and temperature) applied. Among all the QP, SSC gave the most promising results (R = 0.56-0.66; RMSE = 0.76–1.10) across all the storage conditions. The analysis also revealed that 15 °C was the most suitable storage condition with the favourable PLSR results (R > 0.50) in all the examined parameters. Moreover, variations on the BP of the samples with respect to the different storage conditions were correctly classified with over 90 % and 80 % accuracies using the PCA and LDA, respectively. Thus, the study indicates that the LLBI technique is feasible and can be a useful tool for a non-destructive quality measurement and classification of sweet potatoes under different storage conditions.