

Abstract

Firmness and soluble solids content (SSC) are important quality attributes for apples and many other fresh fruits. This research investigated the feasibility of using multispectral imaging to quantify light backscattering profiles from apple fruit for predicting firmness and SSC. Spectral images of the backscattering of light at the fruit surface, which were generated from a focused broadband beam, were obtained from Red Delicious apples for five selected spectral bands (10 nm bandpass) between 680 and 1060 nm. Ratios of scattering profiles for different spectral bands were used as inputs to a backpropagation neural network with one hidden layer to predict fruit firmness and SSC. The three ratio combinations with four wavelengths (680, 880, 905, and 940 nm) gave the best predictions of fruit firmness, with $r=0.87$ and the standard error of prediction (SEP)=5.8 N. Only two ratios with three wavelengths of 880, 905 and 940 nm were needed for predicting the SSC of apples with $r=0.77$ and SEP=0.78%. The multispectral imaging technique is promising for predicting firmness and sweetness of apples.