Title Interpretation of temporal changes in color spectra from machine vision to judge antibrowning effectiveness of oxalic acid on cut surfaces of fruits

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Abstract

In traditional color analysis of food, the average surface color is used. For example, oxalic acid was shown to suppress browning discoloration at cut surfaces by analyzing the average CIE L*values, often used as a browning index. When the surface has a non-homogeneous color distribution, color spectra obtained from machine vision can present more information, especially if temporal changes are measured. Video images of apple and banana slices dipped in different concentrations of oxalic acid were obtained in a light box. Temporal changes in color spectra on water-dipped controls and oxalic-acid treatments were compared using color analysis software. The R, G, and B axes were divided into 8 regions, each. Any color that falls into one of the resulting 512 blocks was represented by the center color of the block. The average of the 4 replicates' color blocks at each treatment level, corrected by area, were calculated. Images and color spectrum profiles of the samples obtained during a 7 h storage period at room temperature were presented. A sharp decrease in the level of the lighter colors followed an increase in the level of darker colors for controls. There was no significant change in color spectra of apple and banana slices treated with 5 and 60 mM oxalic acid solutions, respectively, indicating preservation of the natural colors on the surfaces. This is consistent with visual observations and the results from the interpretation of color data in terms of average CIE L* values. Machine vision rapidly and non-destructively measures color spectra to quantify the disappearance of lighter colors and formation of darker colors in non-uniform color surfaces. Access to color spectra allows use of multivariate statistics and neural networks in the analysis of browning.