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“Bridging the gap between increasing knowledge and decreasing resources”

Image Fusion System for Non-Destructive Colour Evaluation of Papaya During Drying

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Abstract

Colour changes are common physical phenomenon observed during drying which need to be controlled, as it directly affects consumer acceptance of the dried products. This study aimed to investigate the effects of drying temperatures (50, 60, 70, 80 °C) on colour kinetics of papaya during drying. In addition, it monitored the feasibility of a computer vision system (CVS) combined with laser light backscattering analysis at 650 nm for predicting colour changes. The results showed that the lightness (L^*) and redness (a^*) values decreased, whereas yellowness (b^*), hue (h^*), chroma (C^*) and total colour difference (ΔE) values increased as drying proceeded. The zero-order kinetic model was found to generate the great fit for L^* , a^* and ΔE values, whereas b^* , h^* and C^* values were adequately explained by the fractional conversion model. The activation energy (E_a) was manifested that the h^* value was more sensitive to temperature than other parameters.

For non-invasive colour evaluation, the results also revealed that each image processing factor obtained can potentially be used to describe each colour attribute change, except for C^* value. The multivariate correlations of measured backscattering parameters and digital image properties were found to yield the best fit for colour validations. As a result of this study, it is possible to estimate the optimum process conditions for achieving desired dried papayas through the parameters of the derived models. Moreover, the use of CVS technique coupled with laser backscattering methods provides a useful tool for quality control based on a rapid, consistent, non-intrusive, and objective method for in-line measurement of product quality in fruit drying processes.

Keywords: Colour, drying, image analysis, laser backscattering, papaya