Title Sensory characteristics, quality and optical properties measured by time-resolved reflectance spectroscopy in stored apples

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Abstract

Time-resolved reflectance spectroscopy (TRS) studies have shown that in apples the absorption coefficient (μ_a) at 630 nm is linked to fruit maturity, whereas the scattering coefficient (μ'_s) is related to fruit texture not only at a macroscopic level but also to cell wall and middle lamella pectic composition. This work aimed at studying the classification models based on the optical properties of absorption and scattering measured by TRS in order to select apples with distinctive quality and sensory characteristics at consumption. After 6 months' storage in normal and controlled atmosphere plus 7 d of post-storage shelf life at 20 °C, 'Jonagored' apples were measured for TRS optical properties (μ_a and μ'_s) at 630, 670, 750 and 780 nm, and for quality characteristics (firmness, stiffness, percent juice, soluble solids content, titratable acidity, background and red side colour parameters) and assessed by a sensory panel for seven attributes (firm, crispy, mealy, juicy, sour, sweet, aromatic). Data of quality and sensory characteristics and of optical properties were processed together by Principal Component Analysis. According to sensory intensity scores, apples were either divided into three classes (low, medium, high intensity) separately for every attribute, or clustered into five groups, each one representing a specific sensory profile. The optical coefficients were used as variables to classify fruit according to either the class of intensity for every attribute, or according to the sensory profile. All the models showed better classification performances when also including selected absorption coefficients, as well as scattering coefficients. The performance of the classification models ranged from 57.3% for the juicy model to 71.9% for the mealy one. The model sorting apples into five different sensory profiles showed a lower percentage of well-classified fruit if compared to the classification models developed for each sensory descriptor, even if it was able to correctly classify almost 70% of fruit having either a mealy-dry texture without flavour or a not-mealy-juicy texture with a moderate flavour.