Comparison of colorimeter and different portable food-scanners for non-destructive prediction of lycopene content in tomato fruit

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Abstract

Lycopene, the red colored carotenoid in tomatoes, has various health benefits for humans due to its capability of scavenging free radicals. Traditionally, the quantification of lycopene requires an elaborate extraction process combined with HPLC analysis within the laboratory. Recent studies focused simpler methods for determining lycopene and utilized spectroscopic measurement methods. The aim of this study was to compare non-destructive methods for the prediction of lycopene by using color values from colorimeter measurements and Vis/NIR spectra recorded with three commercially available and portable Vis/NIR spectrometers, so called food-scanners. Tomatoes of five different ripening stages (green to red) as well as tomatoes stored up to 22 days after harvest were used for modeling. After measurement of color values and collection of Vis/NIR spectra the corresponding lycopene content was analyzed spectrophotometrically. Applying exponential regression models yielded very good prediction of lycopene for color values L*, a*, a*/b* and the tomato color index of 0.94, 0.90, 0.90 and 0.91, respectively. Color value b* was not a suitable predictor for lycopene content, whereas the $(a^*/b^*)^2$ value had the best linear fit of 0.87. In comparison to color measurements, the cross-validated prediction models developed for all three food-scanners had coefficients of determination (r^2_{CV}) ranging from 0.92 to 0.96. Food-scanners also can be used for additional measurements of internal fruit quality, and therefore have great potential for fruit quality assessment by measuring a multitude of important fruit traits in one single scan.