

A method using near infrared hyperspectral imaging to highlight the internal quality of apple fruit slices

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Abstract

The heterogeneity of apple fruit was highlighted by near-infrared hyperspectral imaging (NIR-HSI) using a data analysis in two successive steps. First, NIR-HSI images were acquired on the cut surface of six transverse slices per apple, which were then systematically sampled with 5 or 6 cylinders per slice. PCA carried out on the NIR-HSI images allowed to select 141 representative cylinders from the total dataset (1056 samples), in which the contents of dry matter (DMC), total sugars (TSC), fructose, glucose, sucrose, malic acid and polyphenols were quantified by spectrophotometry and chromatography. In a second step, leave-one-out PLS models were developed and successfully used to describe the distribution of DMC ($R_{cv}^2 = 0.83$, RPD = 2.39) and TSC ($R_{cv}^2 = 0.81$, RPD = 2.20) in each apple slice. A strong heterogeneity of DMC and TSC was detected inside each fruit. Such a simple and rapid method reduced the needs of numerous chemical characterizations to demonstrate the distribution of quality traits within and between fruit and contributed to better manage the fruit quality measurements.