Non-destructive determination of fatty acid composition of in-shell and shelled almonds using handheld NIRS sensors

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Abstract

One of the major compounds in almond kernels, which determines their nutritional quality, are lipids. The aim of this research was to determine the fatty acid profile in intact in-shell and shelled almonds (145 samples) using two new generation handheld near infrared spectroscopy (NIRS) sensors, of different optical design and technical specifications, adapted for *in situ* analysis in different stages in the food supply chain: in the industry after harvest, at the reception points and during postharvest storage. For both instruments, two procedures for taking near infrared (NIR) spectra were tested: (1) static, where point spectral readings were taken of almonds placed on trays; (2) dynamic, where spectra were taken by scanning the entire trays. Modified partial least squares (MPLS) regression models were developed using NIR spectra with different combinations of signal pre-treatments — derivative and scatter correction methods. The residual predictive deviation for cross validation (RPD_{cv}) of the best models developed for the prediction of palmitic, stearic, oleic, and linoleic acids using shelled almonds were 2.40, 2.16, 3.98, and 3.77, respectively, and 1.73, 1.73, 2.02, and 2.11 for the in-shell almonds. These results confirm the feasibility of NIRS technology to measure the fatty acid profile in in-shell and shelled almonds. A comparison between the presentation mode (in-shell or shelled) and analysis mode (static or dynamic) showed that the best results were obtained for shelled almonds analysed in dynamic mode.