Predicting pork belly firmness with a portable NIR device

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Pork belly firmness is an important quality trait because it determines the processing aptitude and consumer acceptability. Firmness is partially modified by the ratio of unsaturated to saturated fatty acids (FA), where a higher ratio produces softer bellies and is less favourable. A common method to assess this ratio is the iodine value (IV). The objectives of this study were to assess the feasibility of a NIR device to: (1) predict belly firmness based on the determination of IV and the subjective firmness of the subcutaneous fat and (2) classify bellies into firmness categories. A total of 182 bellies from pigs with different origin, diet, genotype, and sex were used. The subcutaneous fat from the central part of the belly was measured with a NIR SCIO 2.0 sensor (Consumer Physics, Israel). Five spectrums were obtained for each belly within the range 740-1070 nm. Two trained technicians scored firmness applying pressure with a finger in the same fat region using a 5-point scale (1: very firm; 5: very soft). Fatty acid composition of this fat region was determined by gas chromatography, and the IV was calculated using a stablished equation including all the unsaturated FA detected (Lo Fiego et al., 2016). Models were obtained with the Lab for SCIO software by pre-processing the spectra and applying PLS regression for the prediction models and RF algorithm for the classification one. Prediction equations for IV and subjective firmness had a RMSE of 2.03 and 0.57 and a R2 of 0.74 and 0.51, respectively. The classification model had an average sensitivity of 0.49 and discriminated 100% of bellies with extreme firmness categories. The obtained models can be useful for the meat industry for sorting bellies according to their firmness although further pre-treatments, spectral range and algorithms should be tested to improve their accuracy.

**Keywords:** belly, fatty acids, firmness, iodine value, pocket-sized NIR, pork

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