Title Non-destructive determination of water-holding capacity in fresh beef by using NIR hyperspectral imaging

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Abstract

This study was carried out for post-mortem non-destructive prediction of water holding capacity (WHC) in fresh beef using near infrared (NIR) hyperspectral imaging. Hyperspectral images were acquired for different beef samples originated from different breeds and different muscles and their spectral signatures were extracted. Both principal component analysis (PCA) and partial least squares regression (PLSR) models were developed to obtain an overview of the systematic spectral variations and to correlate spectral data of beef samples to its real WHC estimated by drip loss method. Partial least squares modeling resulted in a coefficient of determination (R_{CV}^2) of 0.89 and standard error estimated by cross validation (SECV) of 0.26%. The PLSR loadings showed that there are some important absorption peaks throughout the whole spectral range that had the greatest influence on the predictive models. Six wavelengths (940, 997, 1144, 1214, 1342, and 1443 nm) were then chosen as important wavelengths to build a new PLS prediction model. The new model led to a coefficient of determination (R_{CV}^2) of 0.87 and standard error estimated by cross validation (SECV) of 0.28%. Image processing algorithm was then developed to transfer the predicting model to each pixel in the image for visualizing drip loss in all portions of the sample. The results showed that hyperspectral imaging has the potential to predict drip loss non-destructively in a reasonable accuracy and the results could be visualised for identification and classification of beef muscles in a simple way. In addition to realize the difference in WHC within one sample, it was possible to accentuate the difference in samples having different drip loss values.