Detection of poultry breast freezing method by NIR spectroscopy

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The development of low-cost and quick methods for the inspection of deceptive practice in chilling *vs* freezing is an appealing goal for poultry meat supply chain. The study evaluated the capability of NIR spectroscopy to discriminate among chilling refrigerated and frozen/thawed poultry breasts. After 4 days *post mortem*, a total of 48 poultry breasts were longitudinally split and frozen by a controlled experimental freezer without (slowly frozen, SF) or with (rapidly frozen, RF) an air blast forcing a flow of air (at – 40 °C) at the velocity of 3 m/s by. Spectral data were acquired by a portable NIR instrument (ITPhotonics, Fara Vicentino, Italy) on the surface of fresh (4 days *post mortem*) and thawed (40 days at -30 °C) breasts; spectra were acquired on reflectance mode (900-1600 nm at 2 nm intervals) and submitted to a PLS-DA with no pre-treatments. The reliability of the PLS-DA model was assessed by a confusion matrix obtained by a venetian blind cross-validation criterion. The reliability of the discriminative model was assessed by a set of predictive statistics including the Matthews correlation coefficient (MCC) as reported in Bisutti et al. (2019). Based on the outcomes of the confusion matrix, the discriminant capacity of NIR spectral data was highly accurate (MCC = 0.94) for the refrigerated storage method (fresh samples). With regard to the frozen/thawed samples, there was a noticeable level of misclassification between SF (MCC = 0.50) and RF (MCC = 0.49), highlighting a moderate capacity of the portable NIR to correctly recognize between the two freezing methods. Despite the reduction of the freezing time (8.75 *vs* 5.8 hours to reach -18 °C for SF and RF, respectively) could have influenced the water crystal timing and size process inside the muscle tissues, there was no difference in physicochemical traits (*i.e.*, water holding capacity, chemical bonds) due to the freezing method that can be significantly detected by the tested portable NIR apparatus.

**Keywords:** fresh meat, freezing method, thawed meat, portable NIR, poultry

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