Assessment of frying oil quality by FT-NIR spectroscopy

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Deep frying is one of the most common processes used in food industry. Oils producers companies need to assess the maximum frying cycles to retain the quality of certain types of oils. Near Infrared Spectroscopy has demonstrated its ability to predict physico-chemical parameters in a broad range of raw and frying oils (Garrido et al., 2004). This work aims to study the degradation of different oil types through the optimisation of regression models based on FT-NIR spectroscopy. A total of 14 different oils were subjected to a discontinuous deep-frying process until reaching 50 frying events or 25% of total polar compounds. Both NIR spectral data and fatty acids content, determined by Gas Chromatography as reference method, were used to develop models to predict palmitic acid and total saturated fatty acid contents. For each parameter, several models were built using PLS regression and testing different spectral ranges and pre-processing math treatments. T-test and methods proposed by Roggo et al., (2003) and Fearn, (1996) were used to compare the models prediction ability. In general, the accuracy and precision obtained were excellent for almost all the models related to the parameters studied: the RMSEP was less than 1.5 times the RMSEL and the R2P was higher than 95%. Furthermore, the statistical tests evaluated suggested all the methods applied provided similar information. As an example, for palmitic acid, the tests agreed on not need to use any pre-processing indeed, since although the “hard pre-processing” provides lower RMSEP but not significantly different. This work demonstrates that, for the assessment of the frying oil quality, models developed using soft and hard pre-processing could achieve optimal and comparable prediction ability.

**Keywords:** frying oil, PLS regression, statistical tests, deep frying

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