Estimation of Fatty Acid Profile in Cow Milk by Mid-Infrared Spectrometry

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INTRODUCTION

Currently interest in fatty acids in dairy products is increasing. However determination of the fatty acid contents requires gas liquid chromatography. Even if this method is efficient, it involves a time consuming procedure, expensive reagents and qualified staff. Consequently a method like Mid-Infrared Spectrometry begins to be considered as a good alternative to assess profiles of fatty acids in milk. In particular, the speed of this analysis allows new perspectives in milk quality control and by extension of its current use by milk recording it has the potential to help improve the quality of milk produced on farms.

EXPERIMENTAL

600 milk samples were taken on 275 cows in 7 reference herds chosen from different criteria (e.g. the percentage of milk fat, the type and number of breeds,…). Then milk was analyzed by Mid-Infrared Spectrometry (FOSS MilkoScan^{TM} FT6000). Generated spectra files were recorded in a database. The scale of variation of the milk fat ranged between 2.97 and 7.73 g/dl milk. By principal component analysis based on the spectral variability, 49 samples were chosen. The milk fat was extracted and analyzed by gas chromatography. From chromatographic and spectral data, a specific program for multivariate calibration (WINISI III) computed the calibration equations by using the Partial Least Squares regression.

RESULTS AND DISCUSSION

The estimated concentrations of fatty acids in milk fat were less reliable than the estimated concentrations in the same fatty acids in milk. Ratio of standard error of cross-validation to the standard deviation (RPD) was influenced by a polynomial relationship with the concentrations of fatty acid in milk ($r^2 = 0.78$). Prediction equations to be useful should have a high cross validation coefficient of determination, a high RPD of cross validation and a good repeatability of chromatographic data. Our results showed that at least the calibration equations which predict C12:0, C14:0, C16:0, C16:1 *9-cis*, C18:1, saturated and monounsaturated fatty acids in milk could be used. These components represent the majority of fatty acids present in milk.

Acknowledgement
Hélène Soyeurt acknowledges the support of the FRIA through a grant scholarschip, Danny Trisman for his laboratory work, the Walloon Breeding Association (AWE), the Walloon Milk Committee, Walloon Agricultural Research Centre and the Walloon Regional Ministry of Agriculture for his partial financial support.