Determination of fatty acid profile in butterfat and vegetable oils by fluorescence spectroscopy

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Fatty acid composition of bovine milk and vegetable oils influences the technological application of fats and oils and generates various effects on human health. A number of methods have been developed to quantify fatty acid composition, and among these methods spectroscopic techniques have the advantages of yielding information on all the components of a mixture in one spectrum. In this study potential of fluorescence spectroscopy to determine fatty acid composition of butterfat and vegetable oils (sunflower, maize, rice-bran, peanut, soybean, olive, tea/camellia, sesame and blended oil) was assessed. Multivariate partial least squares regression analysis was applied to the vitamin A excitation spectra of the samples, and the fatty acid profile was determined by gas chromatography. The samples were discriminated according to three principal components which accounted for 99% of total data variability. According to the matrix loadings plot, PC1, PC2 & PC3 correlated well to oleic and linoleic acids, linolenic acid and palmitic acid contents of the samples, respectively. The samples with high amounts of oleic acid (olive & camellia) and linoleic acid (sunflower & maize) displayed negative and positive PC1 scores, respectively. A good prediction model for the fatty acid profile of butterfat and vegetable oils was established with high coefficients of determination within acceptable error limits, and R² and RMSEP ranged from 0.946 – 0.996 and 0.309 – 1.990 respectively for various fatty acids. The present study demonstrated the great potential of fluorescence spectroscopy to rapidly predict fatty acid composition of fats and oils.