

Assessment of the Discrimination of Animal Fat by FT-Raman Spectroscopy

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Animal fats are important animal by-products and are currently used as ingredient in feeding formulations. However, in the aftermath of the BSE crisis all animal by-products utilised in animal nutrition have been subjected to close scrutiny [1]. Therefore, the majority of European Union Member States have regulated the use of the animal by-products in the animal feeds. Criteria for the safe use of ruminant fat in animal nutrition in Europe are defined by the Regulation 1774/2002 [1] which requires that the material belongs to category of the animal by-products fit for human consumption and the maximum concentration of residual insoluble impurities after purification does not exceed 0.15%.

In the same time, scientists are already working on methods in order to determine and differentiate the fats used in feedstuff formulations in terms of their sources [1], the production technology and from composition data [2]. The objective of our work is to evaluate the suitability of Fourier Transform – Raman spectroscopy for the differentiation of various animal fat origins. This technique is one of the new generation of analytical techniques, fast and non-destructive. Raman spectroscopy is based on the scattering of the light by the molecule.

For this study, we have worked on samples from previous studies [3, 4] which have permitted us to constitute a sample set of 80 fats representative of the major sources of animal fats (fish, poultry, chicken, beef, pig, lamb). Samples were measured by FT-Raman and then treated by chemometric methods to examine the ability of Raman spectroscopy to differentiate the studied animal fats.

Spectra were first treated by Multiplicative Scatter Correction (MSC), followed by a base line correction. We applied a Principle Component Analysis (PCA) on samples corresponding to individual species (in exception of fish oils) to visualize differences between fats and then we have projected samples and mixtures of different fats on the obtained PCA space. Examination of the loadings associated to the principal components informs on the discriminant Raman shift and shows clearly the potential of the methodology proposed.

- [1] EC (1998) Bovine spongiform encephalopathy (BSE), 3rd edn. Vademecum, 16 October 1998. European Community, Brussels.
- [2] EC (2002) Regulation (EC) No 1774/2002 of the European Parliament and of the Council laying down health rules concerning animal by-products not intended for human consumption. Off. J. Europ. Commun., L273:1-95.
- [3] S. Bellorini, S. Strathmann, V. Baeten, O. Fumière, G. Berben, S. Tirendi, C. von Holst *Anal. Bioanal. Chem.* 382 (2005) 1073-1083.
- [4] G. Gasperini, E. Fusari, D.B. Bella, P. Bondioli, *Eur. J. Lipid Sci. Technol.* 109 (2007) 673-681.