

P.39.- IR camera and Chemometrics (SVM): the winner combination for the detection of MBM

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This study concerns the development of a new system to detect Meat and Bone Meal (MBM) in compound feed, which will be used to enforce legislation concerning feedstuffs enacted after the European mad cow crisis. Focal plane array near infrared imaging spectroscopy (NIR camera), which collects thousands of spatially-resolved spectra in a massively-parallel fashion, has been suggested as a more efficient alternative to the current methods, that are tedious and require significant expert human analysis. This camera allows to acquire in few minutes 76800 NIR spectra corresponding to the information of about 400-600 particles. The instrument includes a camera coupled to a wavelength selector (Liquid Crystal Filters) that allows the reflected energy for the wavelengths to be passed through. The activity range of the camera is 900-1700 nm. For each of these wavelengths one image of the analysed region is recorded. Then, the spectrum for each pixel can be reconstructed by joining together the absorbance at each wavelength. The spectra for all pixel constitutes the spectral volume.

In order to extract and to treat all the useful information from the spectra associated to each pixel, a methodology has been developed herein that combines image processing techniques and Chemometrics. SVM (Support Vector Machines) has been applied as new Chemometric method for classification. Several samples have been measured using the NIR camera in order to discriminate them according to the differences on particle origin. The procedure used in this work is as follows: 1) A large spectral data bank was firstly constructed using the NIR camera including spectra representative of the diversity of feed ingredients usually used for feedingstuffs. Spectra coming from the analysis of different terrestrial animal MBM and fish meals were added to the spectral data library. 2) This data bank was used in order to build the discrimination equations using SVM in order to classify the different ingredients. 3) These equations are applied in new data sets.

SVM as classification algorithm performed admirably in analysing the training data and when analysing the data of spectral types which were represented within the training data set (vegetal and MBM particles). Also SVM shows good results in generalisation ability when un-modelled data were encountered. With this study it was proved that the combination of NIR imaging spectroscopy and a non-linear chemometric classification technique (SVM) should allow a laboratory to detect and quantify the presence of meat and bone meal in processed animal feed.

Keywords

Meat and Bone Meal, NIR camera, Chemometrics, Support Vector Machines