Importance of sample preparation of food samples for near infrared spectroscopy

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Introduction

In the food processing and animal feed manufacturing industry, considerable resources are invested in analytical instrumentation (GC, HPLC, MS, IR, NIR...). In this field, users are willing to make considerable investments if they can reduce detection limits and increase repeatability. Even as today's analytical systems become increasingly sophisticated, they still require accurate and reproducible sample preparation. This is especially true in the field of production control where numerous conventional mixers have shown substantial shortcomings.

Conventional mixers require excessive mixing times, produce a non-homogeneous matrix and in some cases actually change the sample character during mixing. The aim of this study was to evaluate that raw meat samples being homogenised with the Büchi Mixer B-400 can be determine with excellent repeatability using using the FT-spectrometer NIRLab N-200 (Figure 1). The results where compared with three other mixers.

Figure 1. BUCHI NIRLab N-200

Results

Qualitative calibration models

The samples were analysed by means of the Büchi NIRLab Raw Meat Application package with the parameters of fat, protein and moisture. The calibration performance is shown in Table 1.

Table 1. Detailed calibration results.

Parameter	Samples in calibration	Calibration range	*SEP*	*R* coefficient
Fat	160	8.7–35.2%	0.38	0.999
Protein	192	10.1–19.6%	0.42	0.977
Moisture	80	51–79%	0.56	0.996

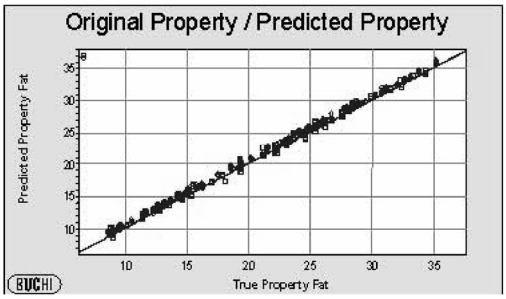

Figure 2. PLS calibration model for fat in raw meat.

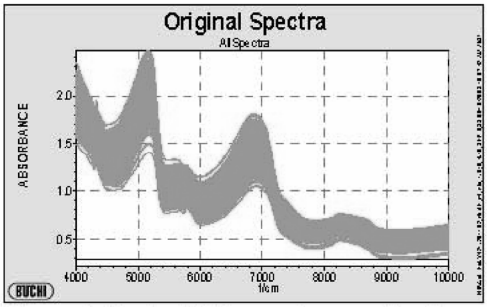

Figure 3. Typical NIR spectra used for the raw meat calibration.

Appearance of the samples after mixing

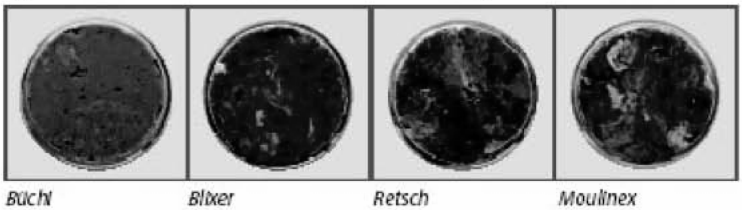

Figure 4. Appearance of raw meat samples after mixing.

Repeatability of measurements

Two different pork and beef samples were measured with NIRLab. Each of these samples was analysed on the basis of a triple determination.

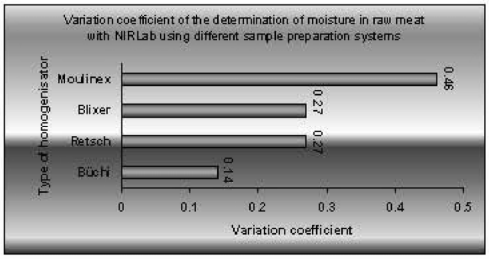

Figure 5. Variation coefficient of determination of moisture in raw meat with NIRLab using different sample preparation systems.

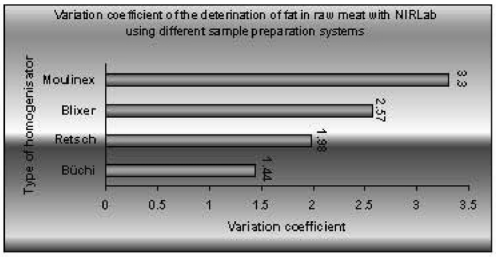

Figure 6. Variation coefficient of determination of fat in raw meat with NIRLab using different sample preparation systems.