Application Note 30: FOP-38: Analysis of Blue Cheese Samples.

Introduction:

This study was designed to test the ability of the FOP-38 (Fibre Optic Probe) analyser to measure the fat, moisture and protein content of blue cheese samples, using a reflectance probe.

Procedure:

The study was performed on a limited number of blue cheese samples with various presentations. The samples were scanned in the wavelength region 720-1100nm with an interactance probe placed in direct contact with the sample. The data for the cheese samples is presented in table 1.

Sample ID	Fat (%)	Moisture (%)	Protein (%)
Sb1220802fr	33.3	47.4	13.9
Sb5150802fr	37.0	44.2	13.9
Bo4040902fr	25.5	46.8	19.7
Bo6040902fr	26.3	45.6	19.9
Gb2280802fr	28.4	48.2	19.0
Gb4280802fr	27.4	48.7	18.6

Table 1: Composition analysis of blue cheese samples.

Calibrations were developed using the PLS algorithm and the results are presented graphically in the results section.

Results: Figures 1 and 2 show the explained variation with Principal Components and the Predicted vs. Measured data for fat analysis.

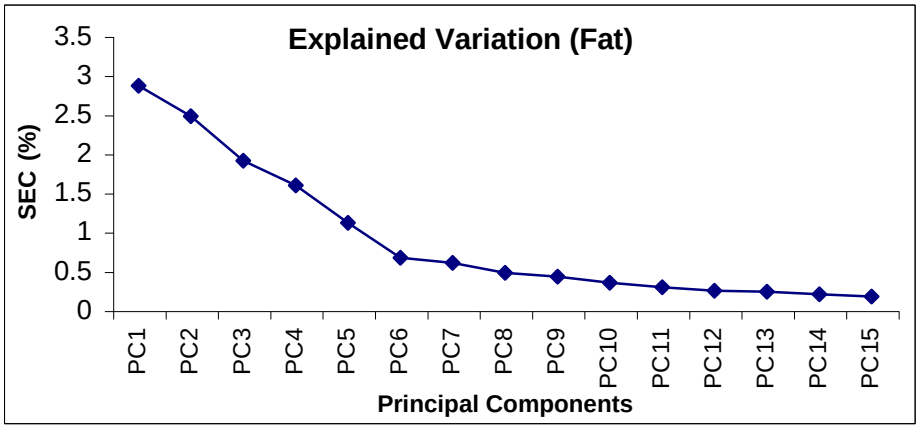

Figure 1: Standard Error of Calibration (SEC) vs. Principal Component for cheese fat content.

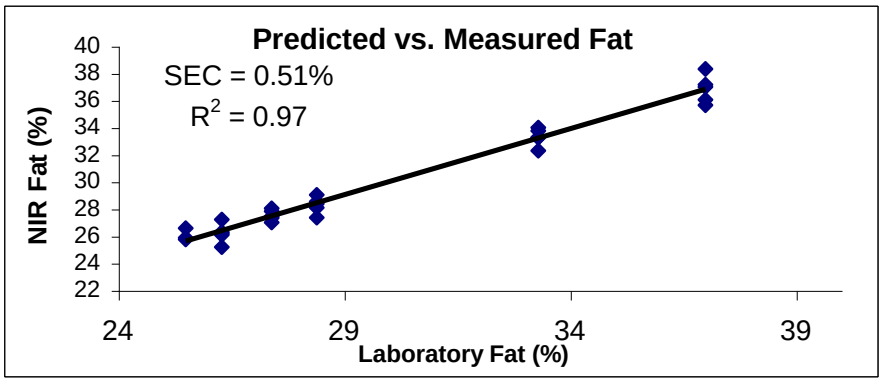

Figure 2: Predicted vs. Measured fat content in Blue Cheese.

The results of figure 1 show that the data converge to an error below 0.5% fat, but due to the small number of samples, the inclusion of too many Principal Components can only lead to unstable calibrations. The fact that convergence is noticed is a good indication that the FOP-38 NIR analyser can be calibrated for fat. Figure 2 presents the predicted vs. measured fat content calibration data. A standard error of 0.51%, and R^2 value of 0.97, using 5-6 Principal Components, is an indication that better results will be obtained with more samples.

Figures 3 and 4 show similar results for moisture analysis.

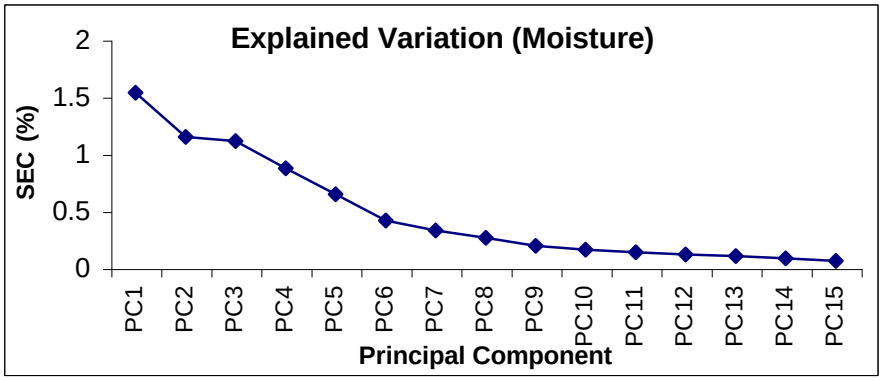

Figure 3: Standard Error of Calibration (SEC) vs. Principal Component, cheese moisture content.

Convergence is also noticed for moisture. A SEC of 0.33% was obtained for this data and the predicted vs. measured moisture data of figure 4 show that a R^2 of 0.96 gives a good indication that linear calibrations are possible. It was mentioned that the laboratory data for these samples was collected some time earlier before being scanned on the FOP-38 NIR analyser and that some moisture loss was possible. This would tend to indicate that better calibrations would be obtained with recent data.

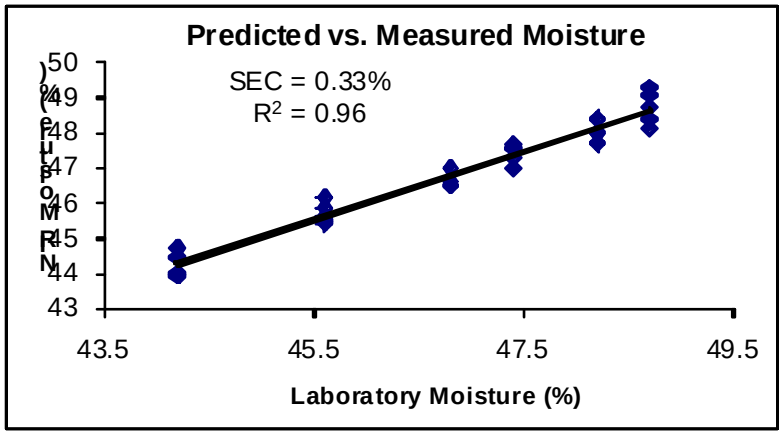

Figure 4: Predicted vs. Measured moisture content in Blue Cheese.

Figures 5 and 6 graphically represent the calibration data obtained for protein.

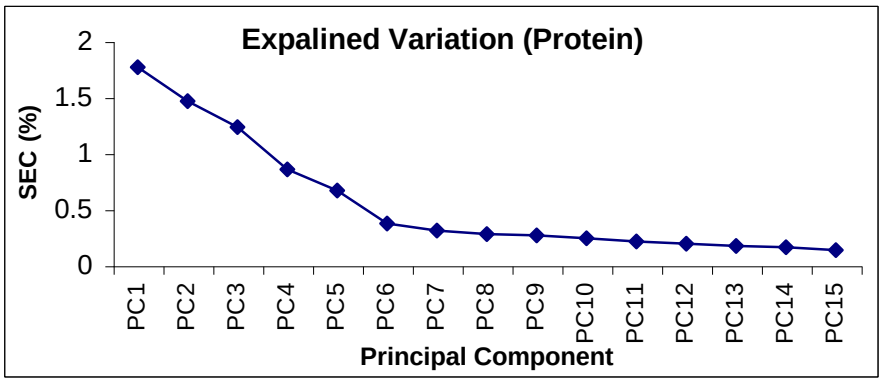

Figure 5: Standard Error of Calibration (SEC) vs. Principal Component, cheese protein content.

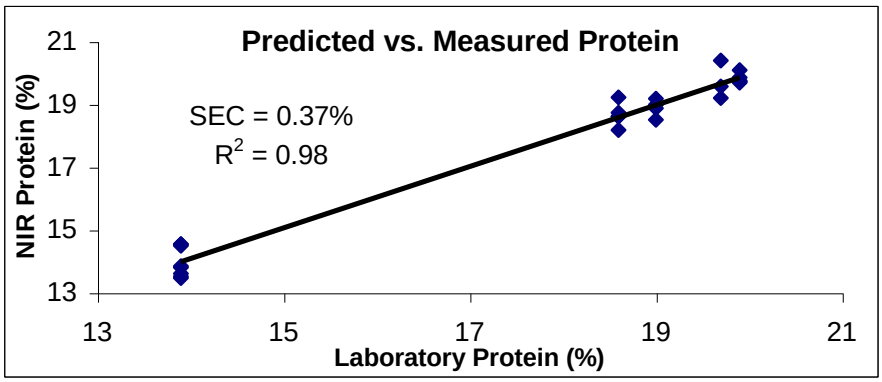

Figure 6: Predicted vs. Measured protein content in Blue Cheese.

The results of figure 5 and 6 look the most promising of the data analysed, although the protein range measured in not too broad. Convergence occurs at about 6 Principal components, but a SEC of 0.37% with $R^2 = 0.98$, indicate that calibration for this constituent is possible.

Conclusion:

The above graphical data are evidence that the FOP-38 NIR analyser is capable of being calibrated to measure fat, moisture and protein simultaneously for blue cheese samples. The results are indicative that the addition of further samples should result in a robust calibration. For the next set of samples, it is suggested that they be measured at a defined working temperature, and that a small set be measured at higher and lower temperatures in order to build temperature stability into the calibration.

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