Application Note 54: Analysis of Sobrasada Meat Samples.

Introduction:

Near Infrared transmission analysis is a proven technique for measuring fat, protein and moisture content of processed and raw meats.

This study was conducted to develop a preliminary calibration for Sobrasada Meat Paste using the NIT-38 Meat Analyser. As well as the standard Protein, Moisture and Fat measurements, the additional constituents of Hydroxyproline, Water Activity level and pH will also be examined.

Procedure:

Over 160 samples of Sobrasada Meat Paste with laboratory data for moisture, protein, fat, hydroxyproline, water activity and pH were scanned in the NIT-38 Meat Analyser. Approximately 100 grams of Sobrasada meat paste was placed into a Squeeze Cell with a 10mm pathlength. The sample was compressed between two glass windows to form a consistent 10mm thick layer. The cell was inspected for holes in the meat sample and for even spread across the cell. The cell was loaded into the NIT-38 Meat Analyser which moves the cell up and down in front of the light beam to collect five spectra for each sample across the wavelength range of 720nm to 1100nm. The spectra were averaged for each sample and the resultant spectra are displayed in Figure 1.

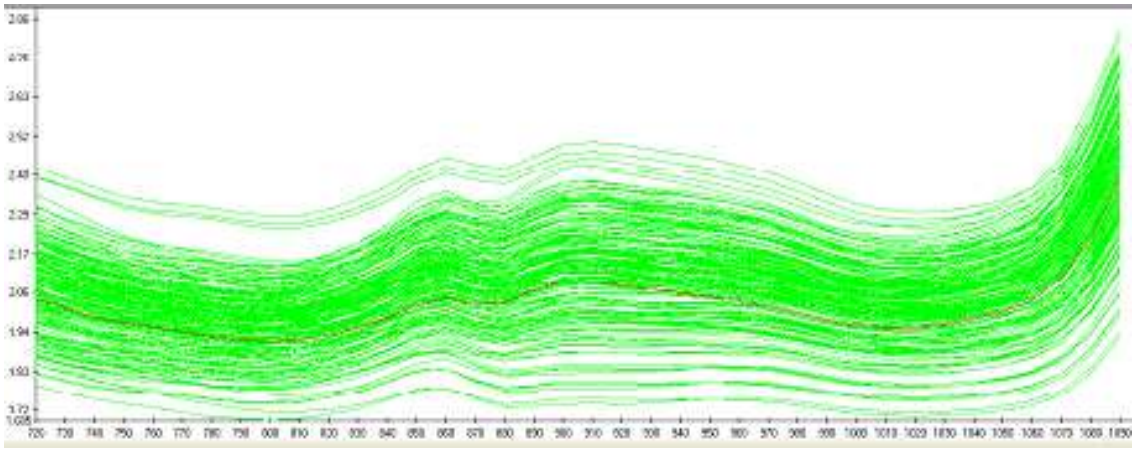

Figure 1: Absorbance spectra for samples of Sobrasada meat paste.

NIR Technology Australia Software (NTAS) was used to perform Partial Least Squares (PLS) Regression analysis on the samples.

Results:

Figures 2, 3 and 4 show the calibration plots of the NIT-38 Predicted vs Reference Values for protein, moisture and fat respectively. These calibrations were performed using absorbance spectra.

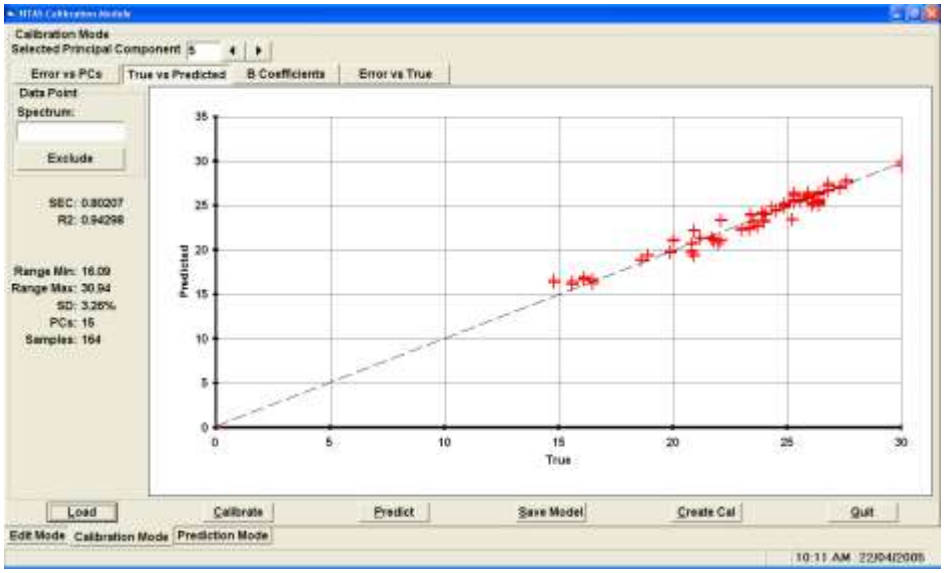

Figure 2: Plot of NIT Moisture vs. reference Moisture values.

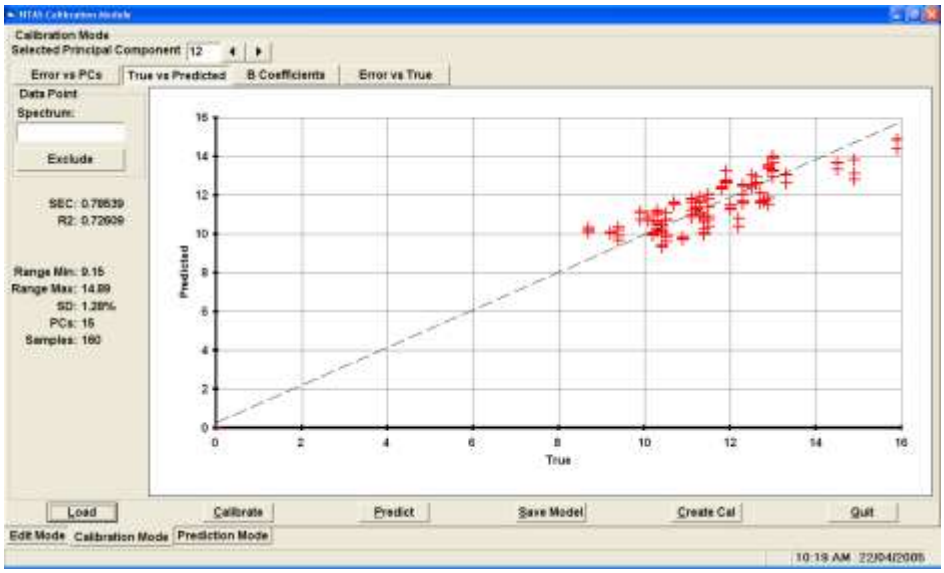

Figure 3: Plot of NIT Protein vs. reference Protein values.

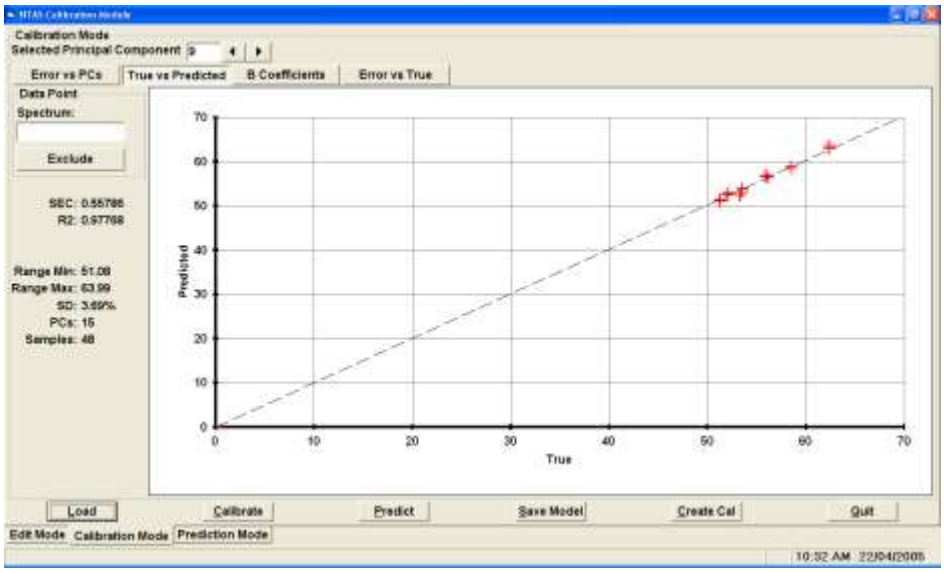

Figure 4: Plot of NIT Fat vs. reference Fat values.

Figures 5, 6 and 7 show the calibration plots of the NIT-38 values vs. the Reference values for hydroxyproline, water activity and pH respectively.

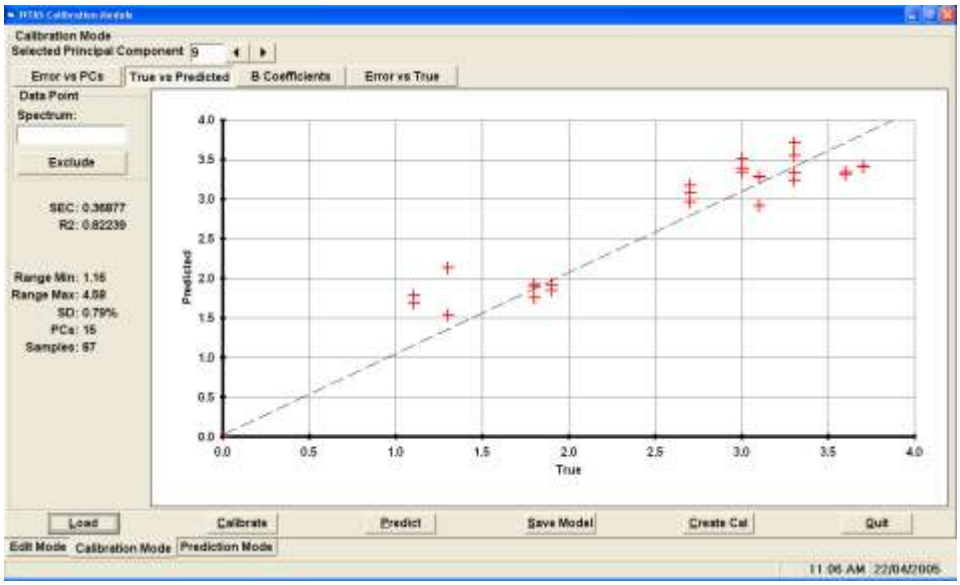

Figure 5: Plot of NIT Hydroxyproline vs. reference Hydroxyproline values.

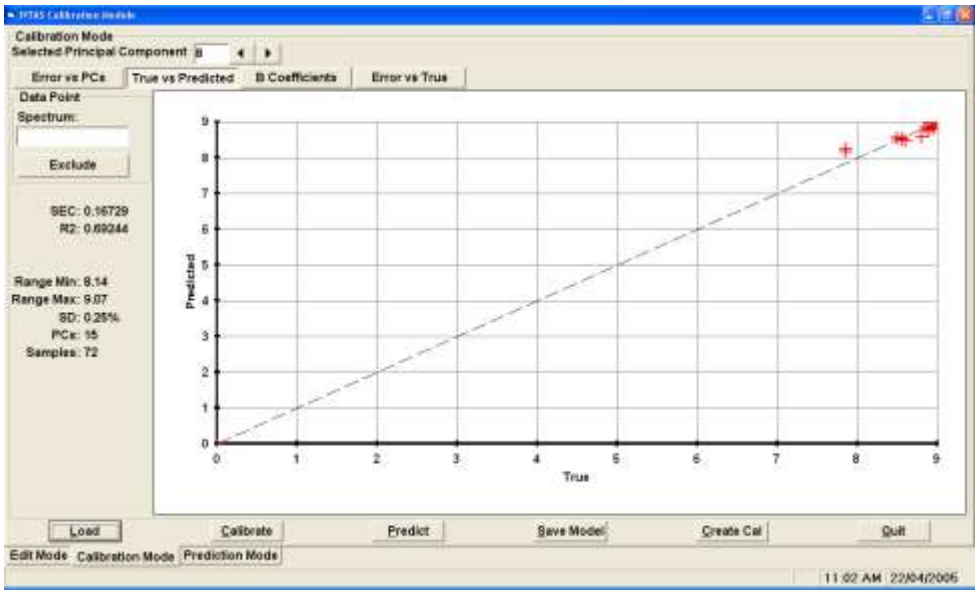

Figure 6: Plot of NIT Water Activity vs. reference Water Activity values.

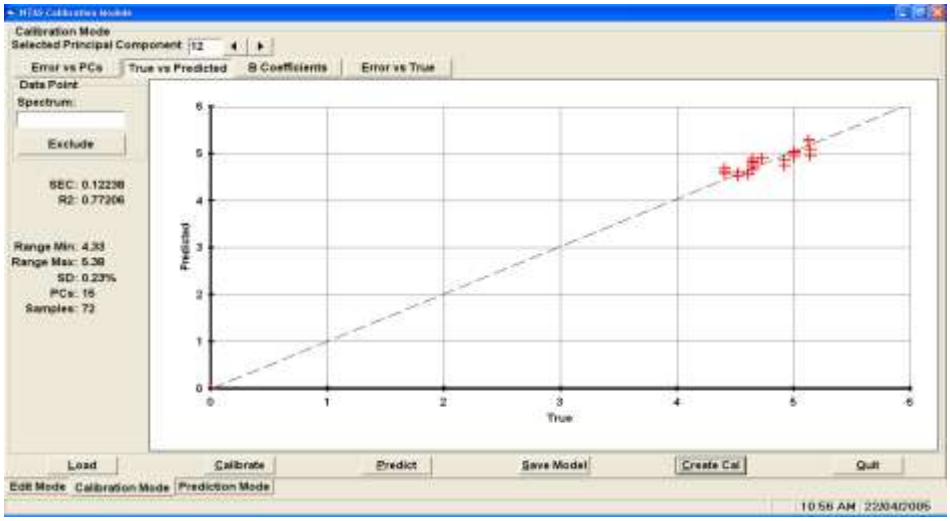

Figure 7: Plot of NIT pH vs. reference pH values.

Table 1 lists the Standard Error of Calibration (SEC) and the Correlation (R^2) for the six constituents in Sodrasada Meat Paste.

Constituent	SEC	R^2	Range
Moisture	0.80	0.94	15-30
Protein	0.78	0.72	8.5-16
Fat	0.56	0.98	51-65
Hydroxyproline	0.37	0.82	1-4
H_20 Activity	0.17	0.69	7.5 – 9.0
pH	0.12	0.77	4.5 – 5.5

Table 1: Standard Errors of Calibration (SEC) and Correlations (R^2) for each constituent.

Conclusion:

The results show good correlation between moisture and fat in Sobrasada, however protein, hydroxyproline, water activity and pH show moderate to poor correlation.

The Sobrasada Meat Paste can contain pieces of meat of differing sizes. As such the NIR spectra can be affected thus resulting in poor correlation between spectral data and the constituent levels. Whilst Moisture and Fat levels are more evenly distributed through out the samples, the Protein is more dependent on the amounts of solids within the given samples. It is considered that the use of a simple household blender to shred and mix the samples into a more inconsistent paste could improve the calibration for protein.

The difficulty with developing NIR calibrations for samples with very narrow constituent ranges is shown for hydroxyproline, pH and water activity. The SEC to range for these constituents is approximately 1 to 10. An analytical method should have a ratio of 1 to 20. As such sample with a broader range are required to develop more robust calibrations.

NIR Technology Systems
366 Edgar Street, Condell Park, NSW, 2200, Australia
Tel: 612 9708 5068, Fax: 612 9708 5537
Email: nirtech@nirtech.net, Web: www.nirtech.net