Application Note 156. Analysis of Yoghurt using the Series 2000 Near Infrared Transmission Analyser

Introduction:

Yoghurt is a popular dairy food that is used in cooking, as a snack food and as a dip for flat bread as well as many other uses. Yoghurt is produced by fermenting milk with Lactobacillus which causes the protein to clot and form a thick smooth consistency. The major components of yoghurt are proteins, fat, lactose and water. The range in concentrations varies depending on the use and the market. Low fat yoghurts are popular amongst young people and the diet conscious. Desert yoghurts tend to be flavoured and may have fruit or nuts added. Control of the protein, fat and water is important to make sure the yoghurt meets label claims but also for ensuring consistency, mouth feel shelf life and stability.

This study demonstrates the use of the Series 2000 NIT Analyser to measure yoghurt quickly and accurately.

Procedure:

Approximately 20 packs of yoghurt were purchased from a super market. The packs were chosen to provide a wide range of concentrations for protein, fat, carbohydrates and total solids. 60 grams of each sample was y up yoghurt was scanned in the Series 2000 using a 10 mm pathlength Squeeze Cell (figure 1). The cell folds to seal the yoghurt in between two glass windows. The cell is moved down and up in front of the light beam. Light passes through the sample and is collected into a diode array spectrometer that scans from 720-1100nm. Protein (N-H), Fat(C-H), Water (O-H) and Carbohydrates(C-O-H) absorb light at specific frequencies. The amount of light absorbed at each frequency is proportional to the concentration of each component. The NIT spectra were collected for each sample and stored in the Series 2000. The spectral files were imported into NTAS (NIR Technology Analysis Software) where the reference values for protein, fat and carbohydrate were appended and a Partial Least Squares Regression analysis was performed to develop calibrations for fat, protein, carbohydrates (lactose) and total solids.

These calibrations were downloaded into the Series 2000 and 12 samples of yoghurt were analysed to assess the accuracy of the NIT methods.

Results:

Figure 2. shows the NIT spectra of the yoghurt samples.

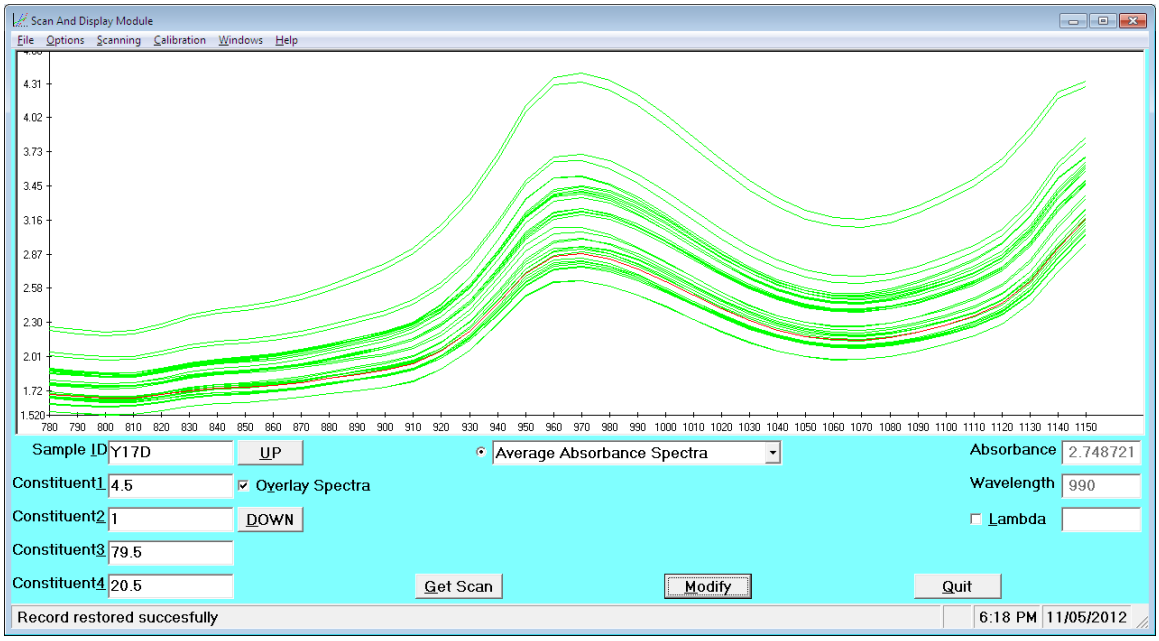

Figure 2.

Figures 3 through 5 show the calibration plots for protein, fat and total solids

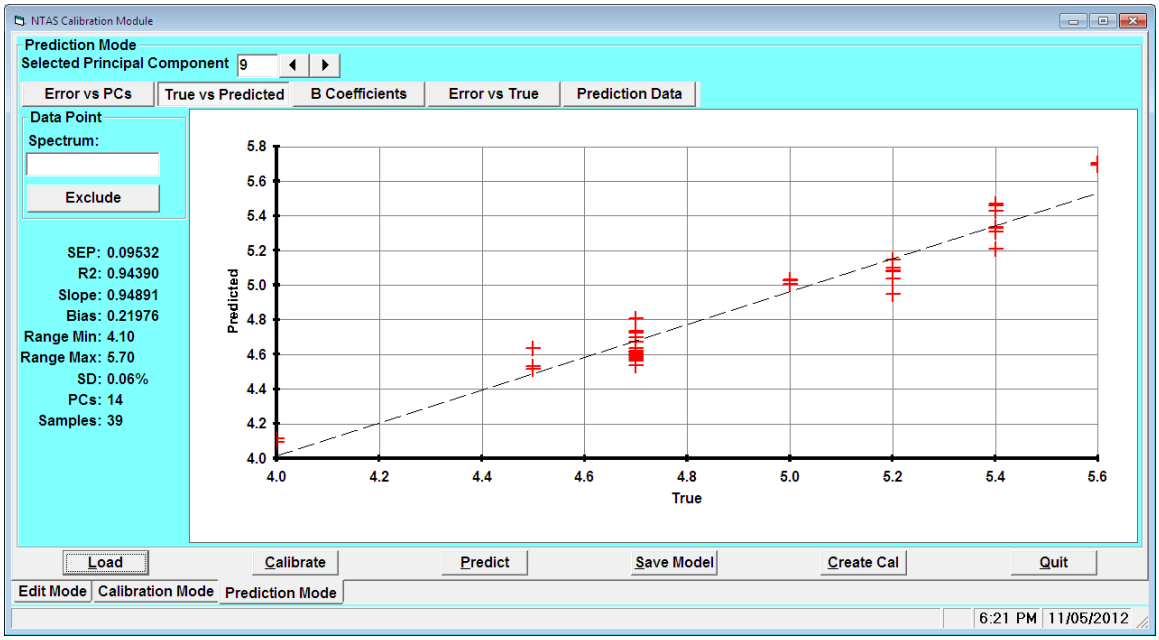

Figure 3. Protein Calibration Plot

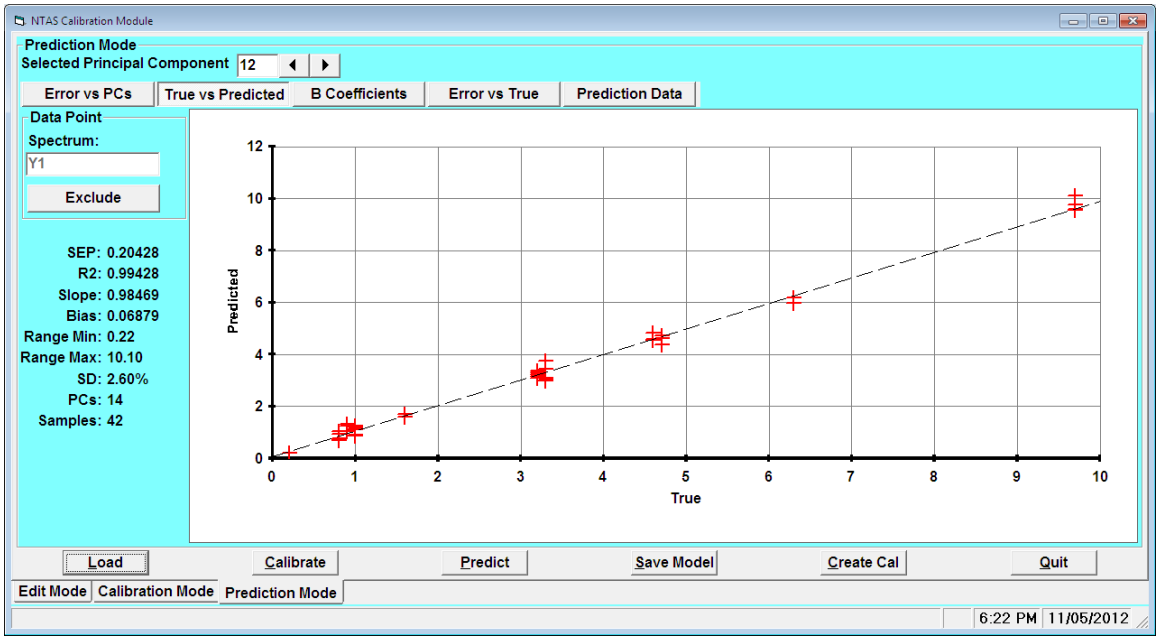

Figure 4. Fat Calibration Plot

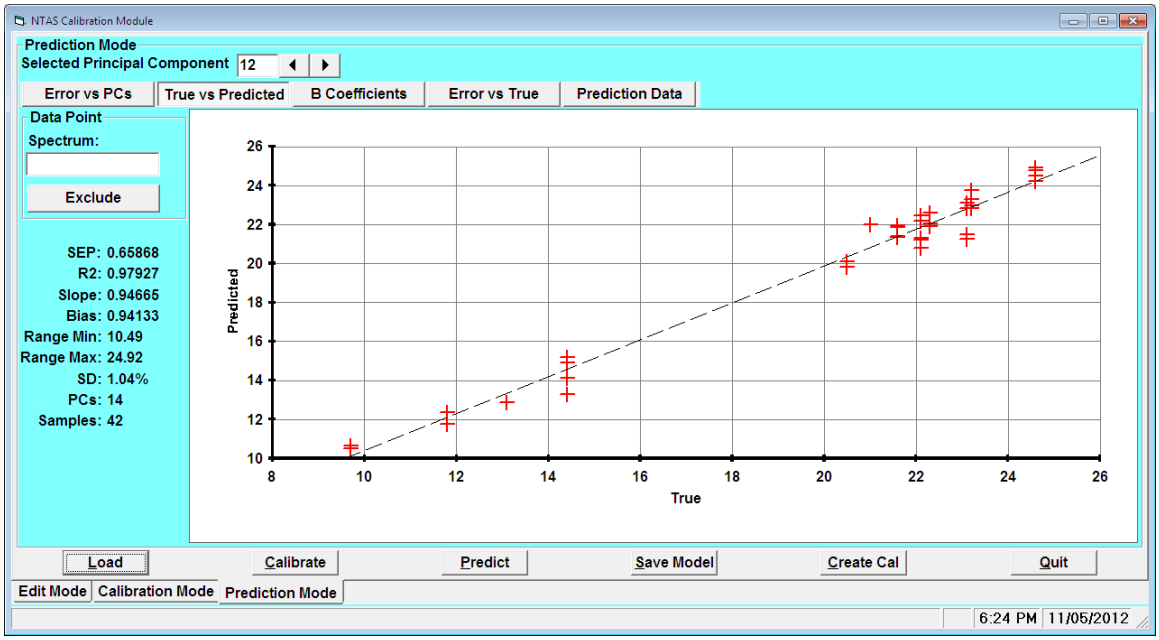

Figure 5. Total Solids Calibration

12 samples of natural and sweetened yoghurt were analysed using the above calibration models. Table 1 shows the predicted results vs the laboratory tested values for each sample.

Table 1. Prediction of Protein, Fat and Total Solids in Yoghurt.

Sample ID	Protein		Fat		TS	
	Lab	NIR	Lab	NIR	Lab	NIR
SY1	5.50	5.40	6.10	6.08	73.9	73.9
SY2	5.50	5.72	5.90	5.99	72.9	73.7
SY3	5.50	5.52	6.00	6.10	73.0	72.9
SY4	5.50	5.50	6.00	6.14	73.0	72.7
SY5	5.50	5.72	5.90	5.81	73.5	73.5
SY6	5.50	5.61	6.00	5.98	73.5	73.4

KV1	5.75	5.59	3.3	3.26	84.0	84.6
KV2	5.75	5.57	3.3	3.27	84.4	84.7
KV3	5.75	5.66	3.3	3.23	84.2	84.4
NY2	5.25	5.24	3.6	3.46	84.2	85.0
NY3	5.25	5.34	3.5	3.59	84.4	84.1
NY4	5.25	5.35	3.5	3.58	83.9	84.1

The Standard Error of Prediction (SEP) for these components in Yoghurt were calculated to be:

Protein	0.08%
Fat	0.10%
TS	0.47%

Conclusion:

The Series 2000 Near Infrared Transmission Analyser has been shown to provides very accurate and precise analyses of yoghurt.

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