# Application Note 52: Evaluation of Protein and Moisture Analysis in Central European Wheat.

## Introduction:

Calibration of NIR instruments to measure Protein and Moisture in Wheat has been done for some time. It is, however, important to determine the differences in wheat types as this can significantly alter the calibration requirements.

This study was conducted to illustrate the importance of separating wheat types when calibrating near infrared spectrometers. The NIR Technology Australia Series 3000 Food Analyser was used to conduct this study on Central European soft and hard wheat types.

## Procedure:

Ninety wheat samples of hard and soft wheats were scanned on the Series 3000 Food Analyser using a 15mm deep Petri dish, collecting 16 scans per sample over the wavelength range of 720nm to 1100nm in duplicate. The spectra were uploaded into NTAS (NIR Technology Australia Software) and Partial Least Squares Regression (PLS) was used to develop calibrations for Protein and Moisture.

The samples were separated in to soft and hard wheat files. Separate calibrations for Protein and Moisture were developed for each wheat type.

## Results:

Figure 1 shows the NIT spectra of the 90 samples of wheat.

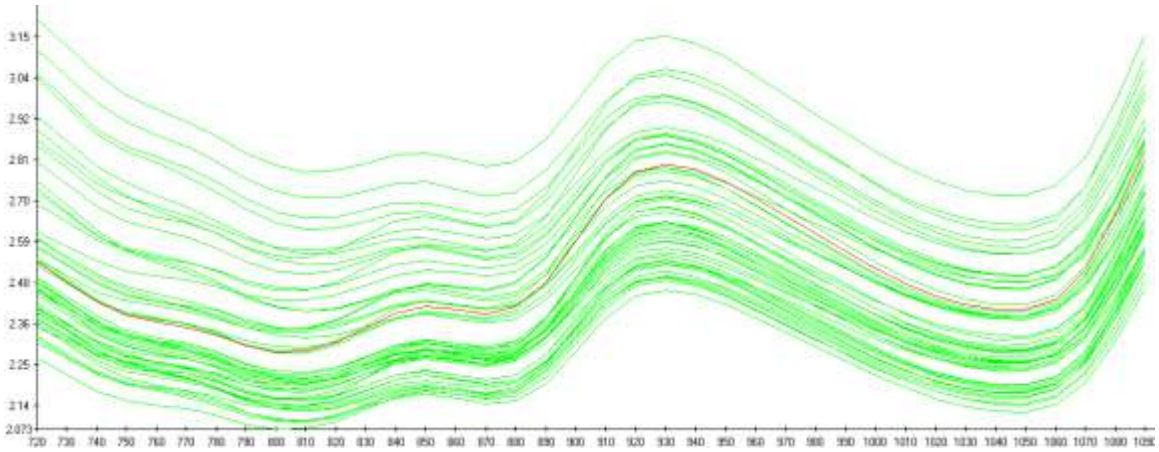

**Figure 1:** Plot NIT Spectra for scanned wheat samples.

Figures 4 and 5 show the calibration statistics for protein and moisture in the combined soft and hard wheat spectral file.

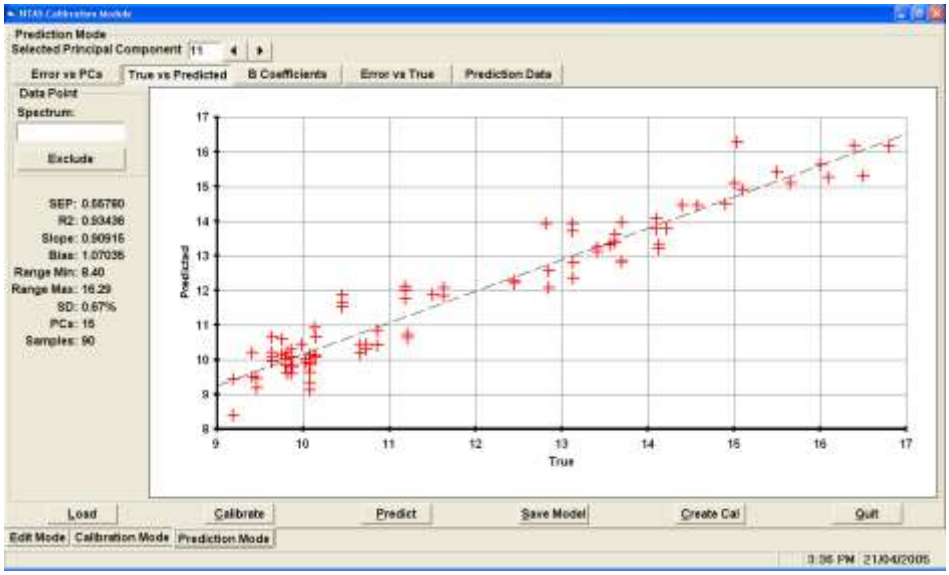


**Figure 4:** Plot NIR Predicted Protein vs. Reference Protein for combined Wheats.

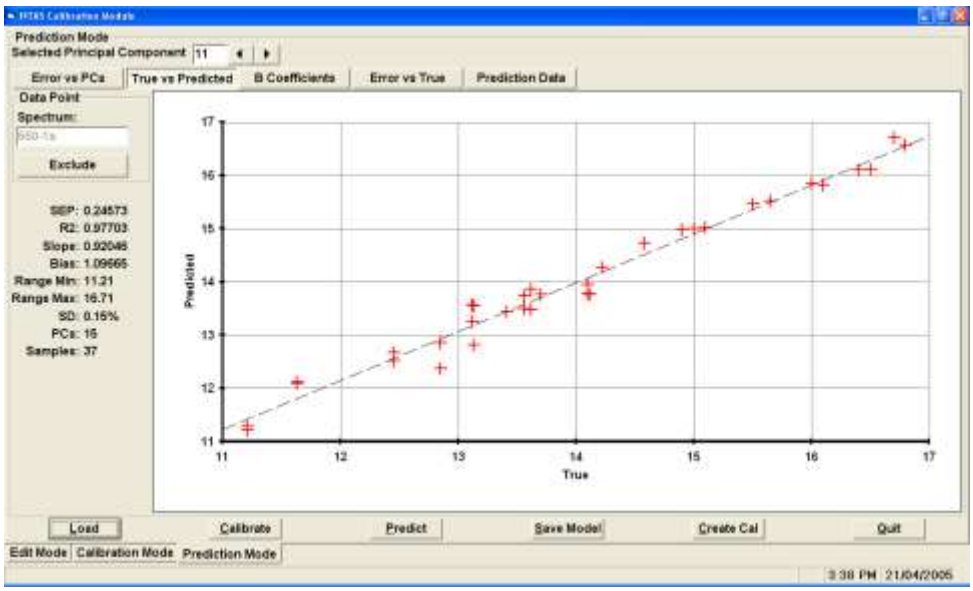


**Figure 3:** Plot NIT Protein vs. Reference Protein for Hard Wheat.

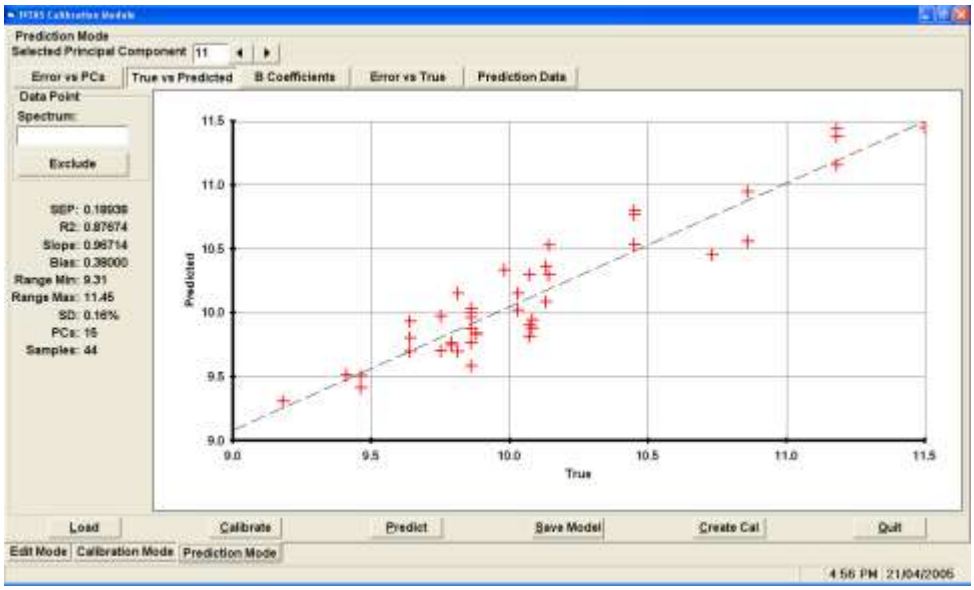


**Figure 4:** Plot NIT Protein vs. Reference Protein for Soft Wheat.

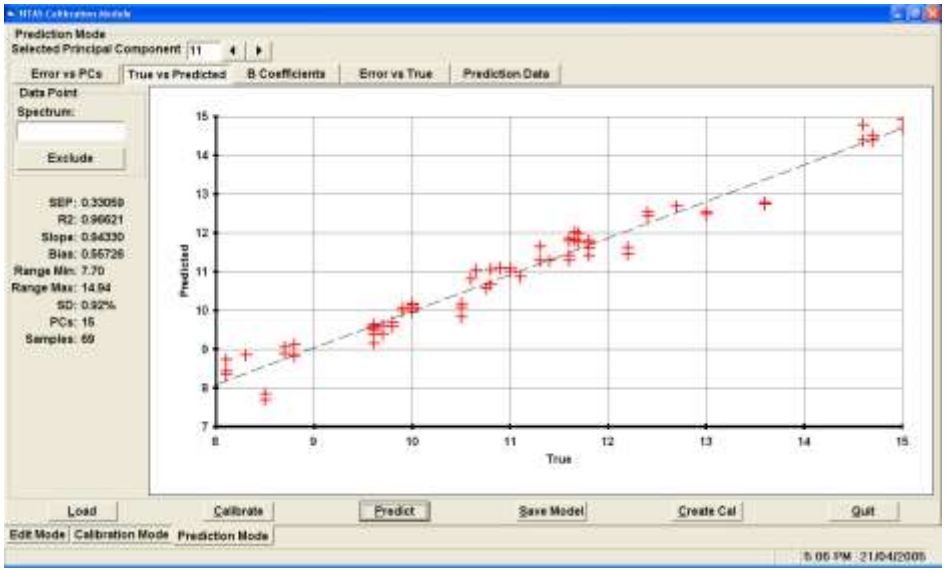


**Figure 5:** Plot NIT Moisture vs. Reference Moisture for Combined hard and soft wheats.

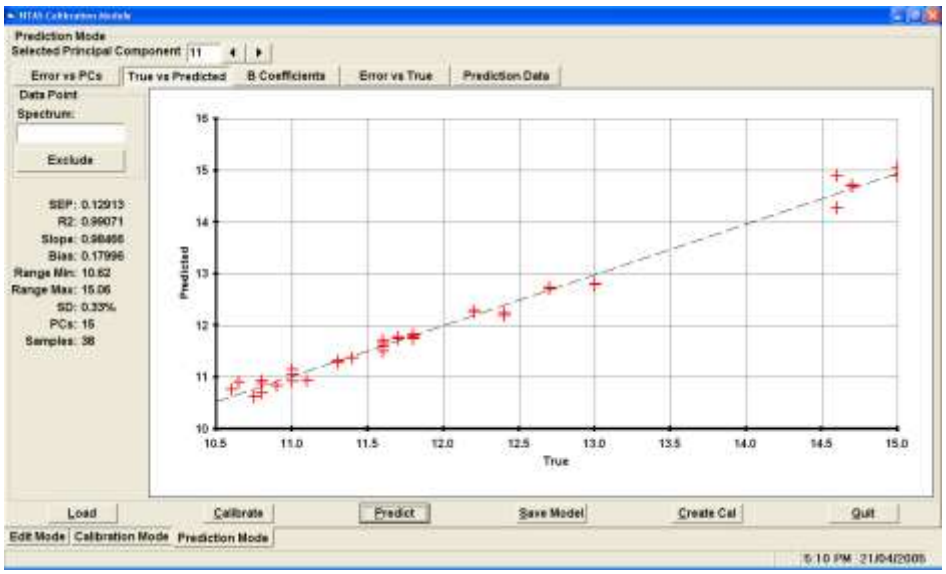


**Figure 6:** Plot NIT Moisture vs. Reference Moisture for hard wheats.

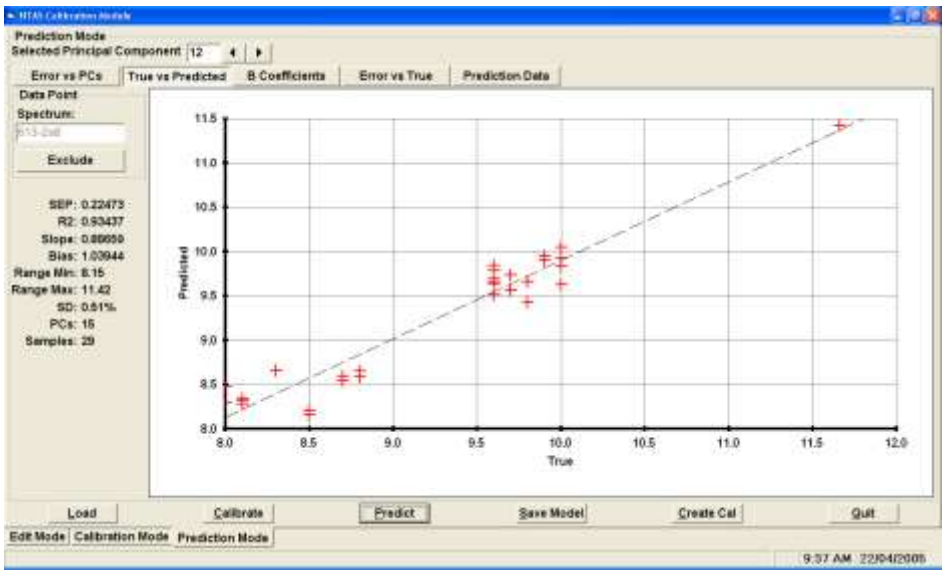


**Figure 7:** Plot NIT Moisture vs. Reference Moisture for soft wheats.

Table 1 shows the summary of the calibration statistics for protein and moisture in the combined wheats, hard wheat and soft wheat.

| Wheat Type | Protein | | Moisture | |
|---|---|---|---|---|
| | SEC | $R^2$ | SEC | $R^2$ |
| Combined | 0.55 | 0.93 | 0.33 | 0.97 |
| Hard | 0.25 | 0.98 | 0.13 | 0.99 |
| Soft | 0.19 | 0.98 | 0.22 | 0.93 |

**Table 1:** Table of results for Combined, Hard and Soft wheats.

## Conclusion:

The separation of the samples into hard and soft wheats shows significant improvements in both correlation ($R^2$) and SEC (Standard Error of Calibration). This is consistent with NIR calibrations developed in Australia.

The SEC's and $R^2$ for protein and moisture in the hard and soft wheat samples show a clear improvement over the combined set.

It is therefore recommended that separate calibrations for hard and soft wheat types be used where a distinct difference in the size, colour and shape of the seed is evident.

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