Application Note 106: Calibration of Moisture in Whole Macadamia Nuts using an NIT-38 Analyser.

Introduction:

The requirement for determining the moisture content of Macadamia nuts is important for the ongoing processing of the nuts for their end market needs. At present, the primary means of determining the moisture within the whole nut is time consuming and requires destruction of the sample. A quick, reliable and non-destructive means of testing the moisture content of the nuts would be advantageous.

This study was undertaken to demonstrate the feasibility of measuring moisture in whole nuts and nutmeat. The NIT-38 Analyser was used for the purpose of this study.

Procedure:

Twelve sample sets of nuts were acquired, six sets of whole nuts and six lots of nutmeat. A special sample cell was prepared to hold the whole nuts and nutmeat in the instrument for analysis. Due to space constraints within the sample cell not all whole nuts could be tested, however, a sufficient number of the available sample set were tested. The modified cell consisted of a standardised holder and a rubber insert that held the samples in place whilst blocking any light from passing around the individual nut samples.

The samples were then scanned over the wavelength range of 720nm to 1100nm collecting scans from 10 nuts per sample set. The spectra were uploaded into NTAS (NIR Technology Australia Software) and Partial Least Squares Regression (PLS) was used to develop a trial calibration for Moisture. This process was repeated for the shelled nuts or nutmeat.

Results:

Figure 1, below, shows the NIT spectra, over the wavelength range of 720nm to 1100nm, for the 12 samples of nuts.

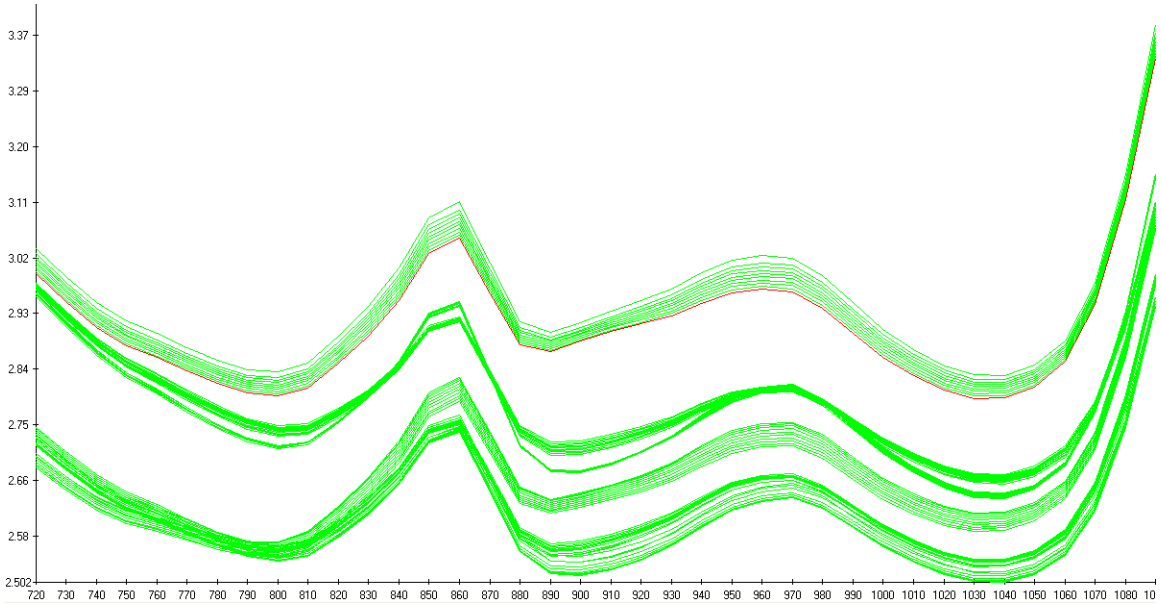

Figure 1: Plot of NIR Spectra for Whole Nuts.

Figure 2 shows the calibration statistics for the NIR Moisture values versus the reference Moisture value for whole nuts. The Standard Error of Calibration is 0.45% with a correlation (R^2) of 0.97.

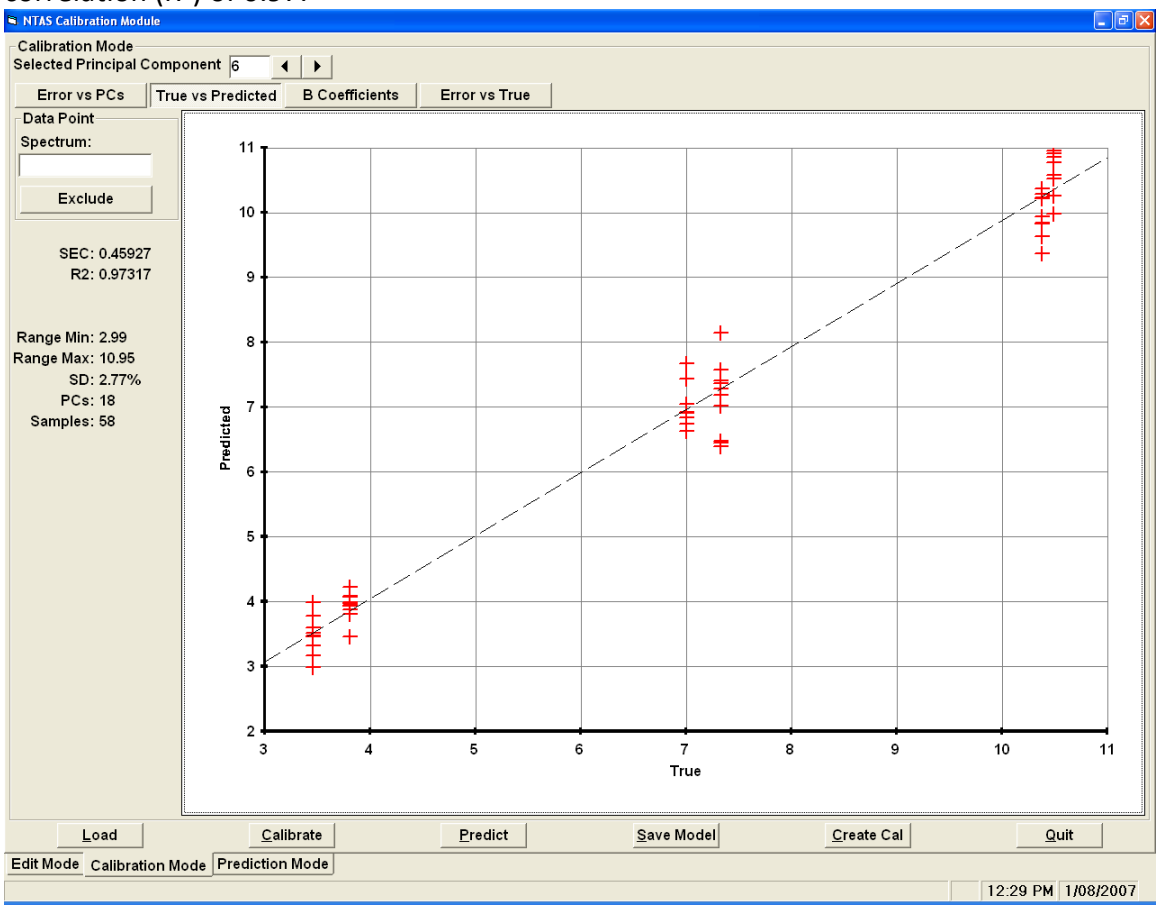

Figure 2: Plot NIR Predicted Moisture value vs. Reference Moisture value in whole nuts.

Figure 3, below, shows the calibration statistics for the NIR Moisture values versus the reference Moisture value for nutmeat. The Standard Error of Calibration is 0.12% with a correlation (R^2) of 0.99.

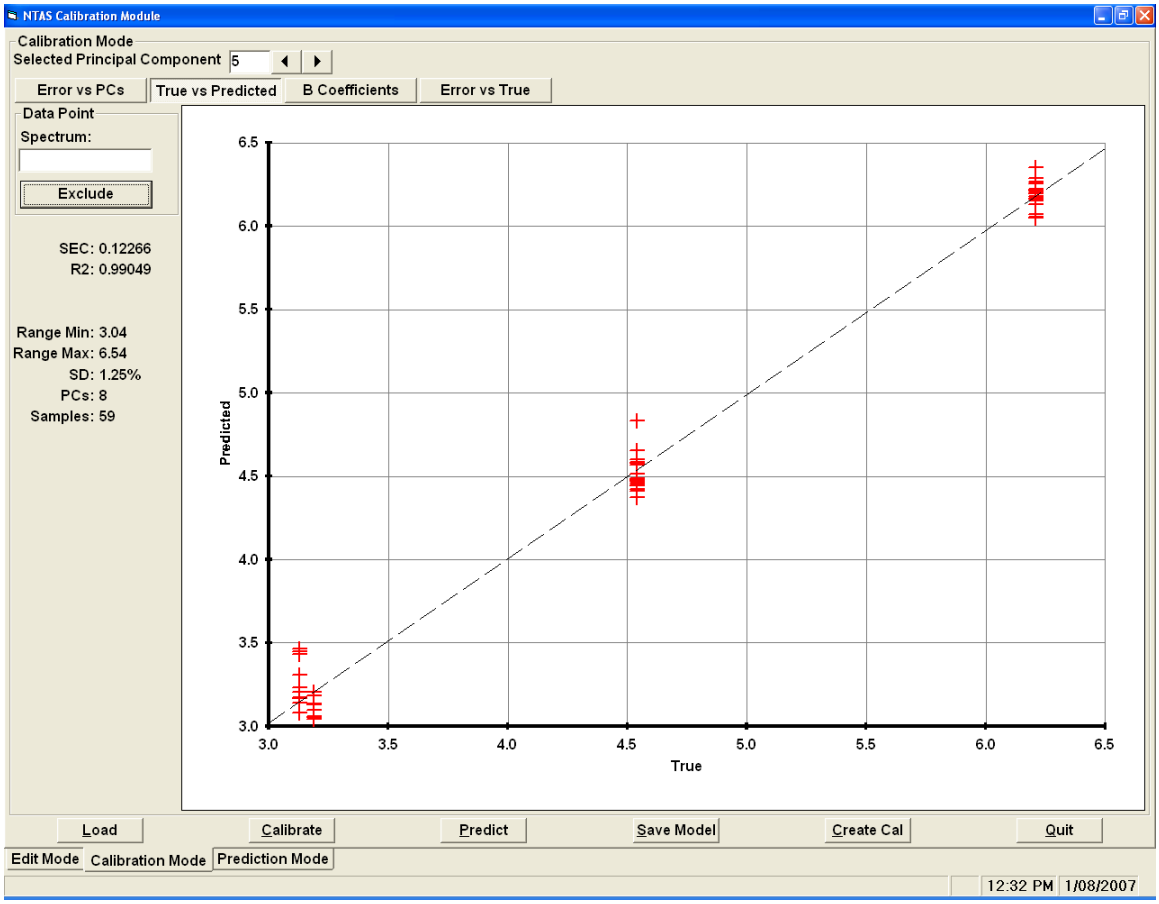

Figure 3: Plot NIR Predicted Moisture value vs. Reference Moisture value for nutmeat.

Conclusion:

It can be seen from figures 2 and 3 that the NIT-38 Analyser can be calibrated to measure the moisture values of both whole nuts and nutmeat. Whilst the sample set is insufficient to develop a calibration, it is still sufficient to demonstrate its ability.

As can be seen from the above plots, the nutmeat analysis shows significant improvement over that of the whole nut. Therefore, whilst there is a correlation for moisture in whole nuts, it is preferred to use the nutmeat as this presents a greater level of accuracy and correlation.

NIR Technology Systems
366 Edgar Street, Condell Park, NSW, 2200, Australia
Tel: 612 9771 5444, Fax: 612 9771 5255
Email: nirtech@nirtech.net, Web: www.nirtech.net