

NIR Diode Array

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Analysis of Meat and Bone Meal, and Poultry Meal using the DA 7250 NIR Analyzer

Introduction

Fast compositional analysis of Meat and Bone Meal (MBM) and Poultry Meal (PM) is very valuable when running a rendering plant producing the meal or formulating pet foods from it. Rendering plants can use results to monitor and control the process avoiding production of out-of-spec material. Feed and

pet food manufacturers can use the results to verify the purchased meal is correct in specification and to optimize formulation and cost control of ingredients.

The Near Infrared Reflectance (NIR) technology is highly suitable for these purposes. Instead of the time consuming and labor intensive traditional wet chemistry methods, with NIR the multi component analysis is done in seconds. The latest technology and software developments allows the benefits to be even further exploited with easy to use instruments and web based instrument networking.

DA 7250 NIR Analyzer

The DA 7250™ is a Near Infrared Reflectance (NIR) instrument designed for optimal use on agricultural products. Using novel Diode Array technology, the DA 7250 is unique in its measurement speed, versatility and accuracy.

The instrument is handled by an intuitive touch screen interface and analyze samples in flexible open dishes in less than ten seconds.

The DA 7250 instrument is IP 65 rated and also available in stainless steel sanitary design version, allowing it to be used in the lab as well as in the production environment.



Method

Spectral data were collected on more than 5000 samples of MBM and PM from several producers, using multiple DA 7250 instruments. Each sample was analyzed in a large 150 mm diameter open faced sample dish with no prior grinding. The large surface area helps to remove effects of heterogeneity associated with odd pieces of large bone.

Calibration models were developed to model the relationships between the instruments NIR spectra and related reference chemistry results of moisture, protein, fat and ash. Additionally, on a smaller set of 300 MBM samples, amino acid composition was also determined and calibrated against. Model development were done using scatter correcting spectra pre-treatments, temperature variation compensation and multivariate Partial Least Squares, PLS, regression and Hongis Regression™, HR. HR is a Perkin Elmer proprietary calibration methodology designed for handling large datasets with big product variability, while maintaining high accuracy.

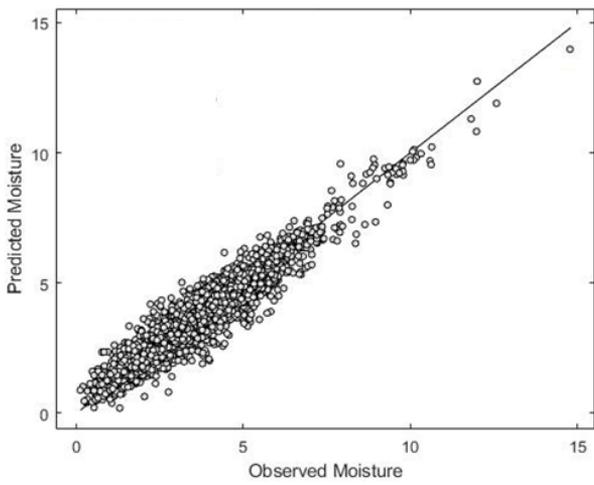
Results and Discussion

The developed calibrations for the DA 7250 showed high correlation and accuracy, similar to the reproducibility of the reference methods. Moisture, protein, fat and ash models include large product variability and using HR calibration technique they will provide high accuracy on a wide range of MBM and PM samples. Amino acids models are based on a smaller set but can be used as guideline calibrations for individual AA composition in MBM.

Table 1. Statistics of developed calibrations

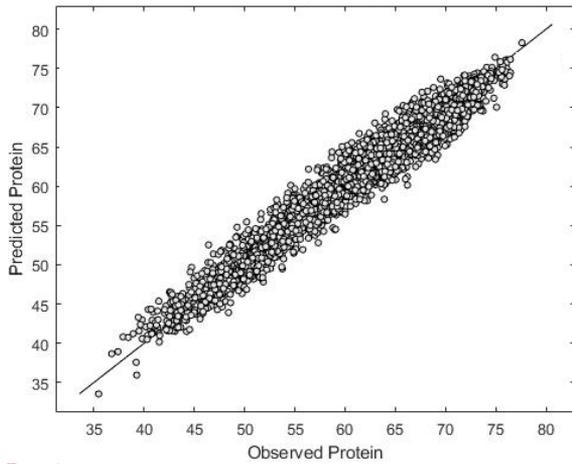
Parameter	N	Range % (%)	R
Moisture %	5200+	0.1 – 14.8	0.97
Protein % asis	5200+	35.5 – 80.6	0.98
Fat % asis	5100+	5.9 – 24.8	0.95
Ash % asis	5000+	4.4 – 45.4	0.99
Arginine % asis	300+	2.9 – 4.8	0.94
Cysteine % asis	300+	0.2 – 3.1	0.98
Isoleucine % asis	300+	0.8 – 3.2	0.98
Leucine % asis	300+	1.8 – 5.7	0.98
Lysine % asis	300+	1.7 – 4.4	0.96
Methionine % asis	300+	0.4 – 1.7	0.95
Threonine % asis	300+	1.0 – 3.1	0.98
Tryptophan % asis	300+	0.2 – 0.7	0.93
Valine % asis	300+	1.4 – 4.9	0.97

In summary it is concluded that the DA 7250 NIR Analyzer accurately can analyze meat and bone meal and poultry meal in a few seconds with very convenient samples handling using large open faced dishes.



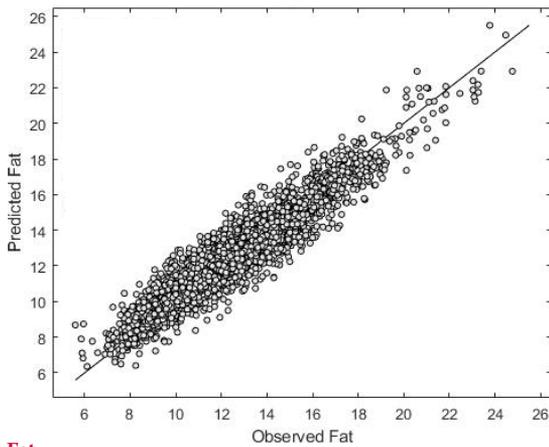
Moisture

The calibration covers a very wide range, enabling rendering plants to use moisture readings to optimize production process and get product closer to specification.



Protein

The protein calibrations covers a wide range and is very accurate. This makes it highly suitable for verification against product specifications.



Fat

The DA 7250 provides rapid and accurate results from low to high fat content samples.

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