Analysis of Moisture, Protein, Fat, & Ash in Poultry Meal Using a Perten DA 7200 Diode Array Based High Speed Analysis System

Introduction

Compositional analysis of poultry meal is vital to running a rendering plant and to formulating pet foods and feeds. The composition affects processing of the materials and selling & buying of this important ingredient thereby impacting profitability. Rendering plants can use the essentially real time analysis to monitor and control the process avoiding production of out-of-spec material. Pet food and feed plants can use the system to optimize formulation and cost control of ingredients.

The Near Infrared Reflectance (NIR) technique is particularly suited for measurement of poultry meal, but in the past instrument limitations have not permitted users to reap the full benefits of NIR. Sample preparation requirements such as grinding or special cups, and a small analysis area made analyses laborious, time consuming and error-prone.

Diode Array 7200

The DA 7200 is a new full-spectrum, NIR instrument designed for use in the grain and oilseed industries. Using novel diode array technology it performs a multi-component analysis in only 6 seconds with no sample grinding or sample preparation required. During this time 180 full spectra are collected and averaged. As the sample is analyzed in an open dish, the problems associated with sample cups are avoided and operator influence on results is minimal.

Experimental

Spectral data was collected on 376 samples of poultry meal from 4 different companies encompassing 12 different processing facilities. The samples cover both Feed grade and Pet Food grade poultry meals. Each sample was analyzed with 2 repacks in a 3" or 5" diameter open faced sample dish. The large analysis surface area helps to remove effects of heterogeneity associated with the odd piece of large bone. Data was collected using 4 different DA 7200 instruments. The data was combined into one single dataset. Reference analyses were supplied by the sample suppliers. Perten Instruments developed calibrations using Partial Least Squares (PLS) regression. Multiplicative Scattering Correction (MSC) was used as a data pre-treatment to improve the calibration models.

Results and discussion

The DA 7200 results are very accurate when compared to the results from the reference methods. Statistics for the respective parameters are presented in the table below and graphs are displayed on page 2.

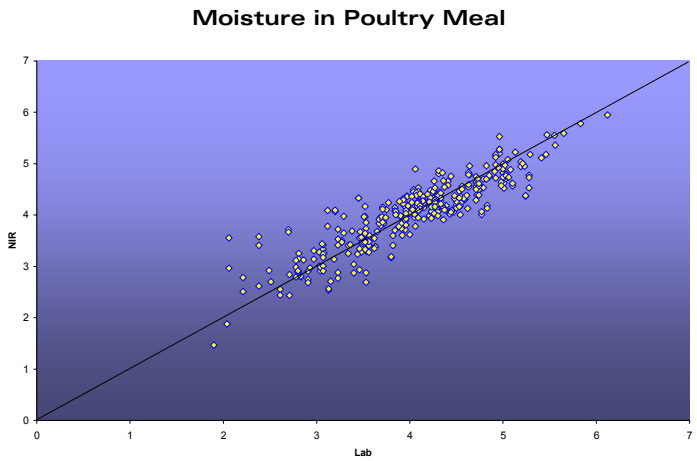
Parameter	Range	Samples	R^2	SECV*
Moisture	1.9 – 6.5	376	0.798	0.33
Protein	51.1 – 74.8	376	0.916	1.13
Fat	10.2 – 17.0	376	0.777	0.50
Ash	9.2 – 17.9	376	0.921	0.92

The differences between the DA 7200 and the reference method are of the same magnitude as typical differences between two different reference labs. The DA 7200 is more precise than the reference methods meaning that replicate analyses are much more repeatable and representative.

In summary it is concluded that the Diode Array 7200 can analyze meat & bone meal for the aforementioned constituents. The large spot size and analysis area remove the effects of sample heterogeneity thereby producing more reliable and representative results. The speed allows users to easily and accurately analyze many samples a day in nearly real time.

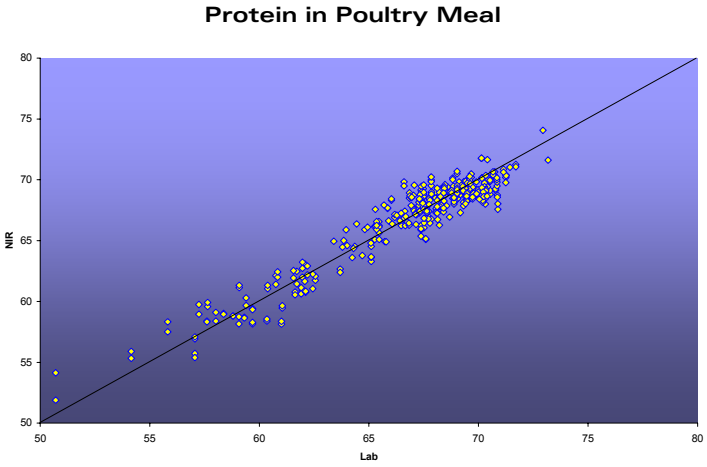
Moisture

Moisture is an important control parameter at rendering facilities.



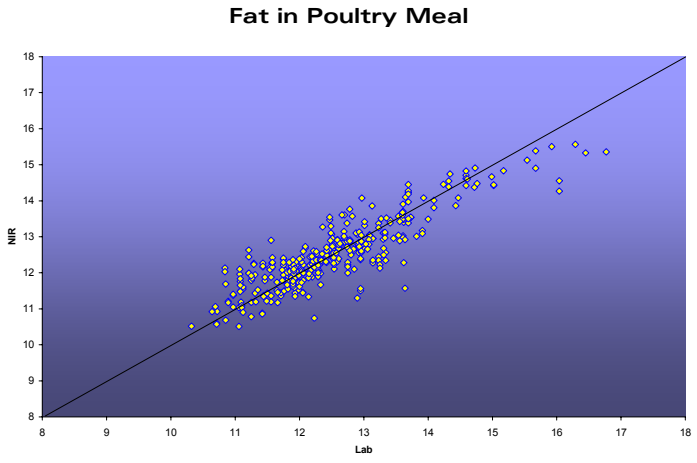
Protein

Poultry meal is a primary component of pet foods and protein content is a key factor in proper formulation. The speed of the DA 7200 allows users to analyze all materials as they are received.



Fat

Fat addition can be optimized by knowing the fat of the incoming ingredients. Optimization of sprayed on fat can result in significant savings.



* SECV is the standard deviation between NIR and Lab data calculated in a way that describes the future performance of the calibration.