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## Analysis of Dry Peas for Moisture, Protein, Ash and Starch

### Introduction

Accurate monitoring of moisture, protein, ash and starch content of dry peas is important for quality control and cost monitoring. Since dry peas are a bulk commodity, there is a need to analyze many samples quickly. Reference methods of analysis – particularly the analysis of starch – are time consuming, error prone, and require trained lab technicians. In all instances, cost savings are dependent both upon the accuracy of the analyses and the availability of real-time results. Using the DA 7250 at-line NIR, operation staff can perform their own analysis 24/7 and have instant access to the results. The results can be used for binning, blending, process optimization, quality control and prevention of costly mistakes.

The Near Infrared Reflectance (NIR) technique is particularly suited for measurement of dry peas, but limitations of older technology instruments did not allow users to reap the full benefits of NIR. Older instruments often required samples to be ground prior to analysis risking moisture loss and required use of cells that require packing and clean-up. The DA 7250 requires little or no clean-up between samples as they are analyzed as-is in open faced dishes.

## Diode Array Instruments

The DA 7250 is Perten's 3rd generation diode array based, full-spectrum, NIR instrument designed for use in agricultural facilities. The innovative diode array technology performs each multi-component analysis in seconds. During this time, a large number of full spectra are collected and averaged. The instrument case is fully sealed (IP65 rated) and requires no external computer for operation. Full connectivity provides connections to LIMS and/or process software. Since the sample is analyzed in an open faced, non-contact dish in the DA 7250, the problems associated with glass cells are avoided and operator influence on results is minimized.



## Data Collection

Approximately 100 samples of dry peas served as the calibration set. Reference methods used: moisture – forced air oven (AOCS Ba 2a-38), protein – combustion (AOAC 990.03), fat – extraction (AOAC 920.39), ash – furnace, starch – enzymatic method (Enzymatic, Wenger method modified by Mary Beth Hall). Spectral data was on the collected on the whole peas using a DA 7200 (2nd generation instrument) using a 5" diameter dish. Calibrations were developed using Partial Least Squares (PLS) regression. A Perten proprietary harmonization method was applied as a pre-treatment to the spectra.

## Results and Discussion

The results are very accurate when compared to the reference methods. Statistics are presented in the table below and graphs are displayed on page 2.

Table 1: Calibration Statistics

Parameter	Range	Samples	R
Moisture	9.59-14.86%	100+	0.932
Protein	19.6-25.25%	100+	0.921
Ash	2.01-3.13%	100+	0.947
Starch (Dry-Basis)	44.38-58.00%	85+	0.896

The differences between the DA 7200 and the reference methods are of the same magnitude as typical differences between two different reference labs. The calibration for the DA 7200 is directly transferable to the DA 7250. The DA 7250 is more precise than the reference methods; replicate analyses are therefore generally more repeatable and representative.

In summary, the DA 7250 NIR from Perten can accurately analyze dry peas. The speed of analysis and rapid work flow allows users to easily and accurately analyze many samples a day in nearly real-time. With 2-button functionality, non-technical operators can confidently use the instrument. Its flexibility – it can analyze whole grains, pellets, liquids, slurries, powders – makes it ideal for use in agricultural processing facilities worldwide.

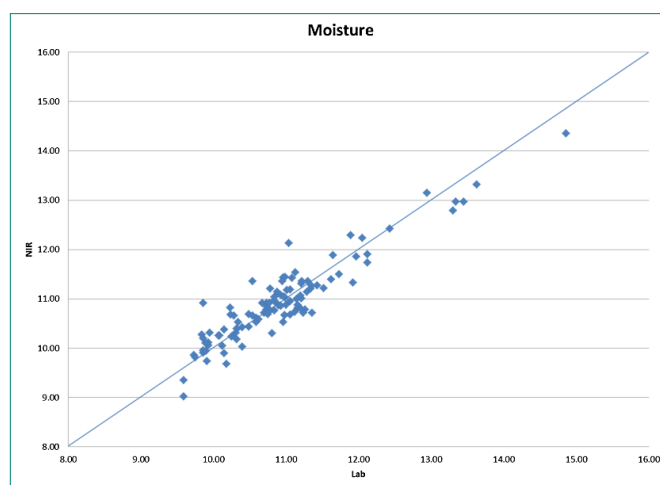


Figure 1: Moisture is an important and accurate measurement using NIR.

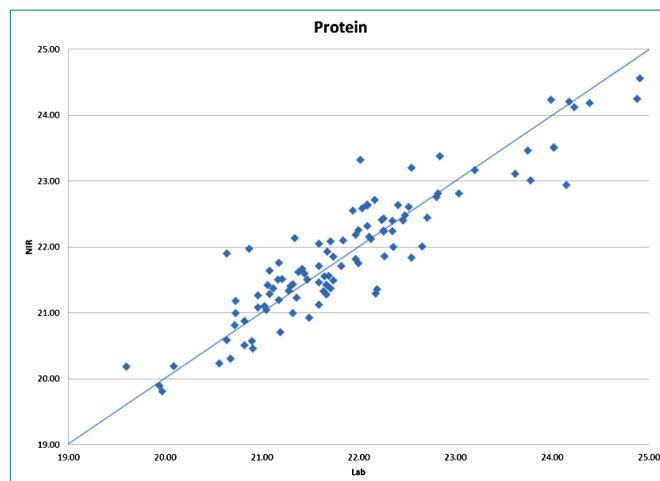


Figure 2: Protein is an important nutritional value and often a value upon which materials are traded.

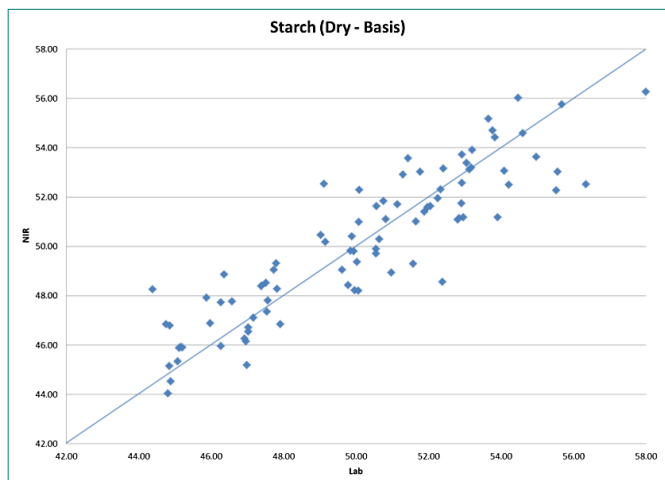


Figure 3: The reference method for starch is laborious and error prone. NIR performs this analysis in just seconds with little operator influence thereby providing more error free analysis.

This solution can be used with NetPlus software. NetPlus is a cloud solution that allows 24/7 access to results and instrument configuration. Analysis results are synchronized from the instruments to a server, providing access to registered users through a website. NetPlus allows an administrator to monitor performance and perform remote calibration updates and adjustments to all networked instruments. Using NetPlus reports, a registered user can view instrument results from one or multiple instruments and create reports for performance comparison and use in production monitoring.

