

# Perten Instruments Application Note

## DA 7250 Analysis of Barley

### Analysis of moisture, protein, starch, fiber and ash in Barley using the Diode Array 7250 Analyzer

#### Introduction

Whenever barley is used as a raw material it is important to have full knowledge of its composition and properties. In malting, feed milling, ethanol production and other processing, the raw material will affect the process efficiency as well as the quality of the final product.



The Near Infrared Reflectance (NIR) technology is highly suitable for these purposes. NIR is an indirect analytical method, where the relationships between reference values and the spectra of the samples are related using multivariate calibrations. 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, simple operation handling 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 in only 6 seconds samples are measured in flexible open dishes. Most sample types can be measured as they are



without any preparation or as an alternative be grinded and measured as powder or coarse meal. Pre-installed NIR Calibration models are available for a wide range of products and parameters.

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

#### Method

More than 2000 barley samples from all major grain growing regions were analyzed on multiple DA 7250 units. The samples represent many crop years and thus include considerable variation.

The samples were analyzed, without grinding or other sample preparation.



The samples compositions of moisture, protein, starch, fiber and ash were determined using wet chemistry reference methods. Calibration models were developed to model the relationships between the instruments NIR spectra and the reference chemistry results. Model development were done using scatter correcting spectra pre-treatments and multivariate regression.

#### Results and Discussion

Table 1 summarizes statistics of developed calibrations. Calibrations were developed expressing results on dry basis. Correlation strength is denoted R and range the chemical variability of each parameter. Figure 1 and figure 2 displays the Reference vs NIR calibration graph for moisture and protein. The accuracy of measurements using the DA 7250 was similar to the reproducibility of the reference methods.

Repeatability of measurements using the DA 7250 instrument was generally lower than reference method

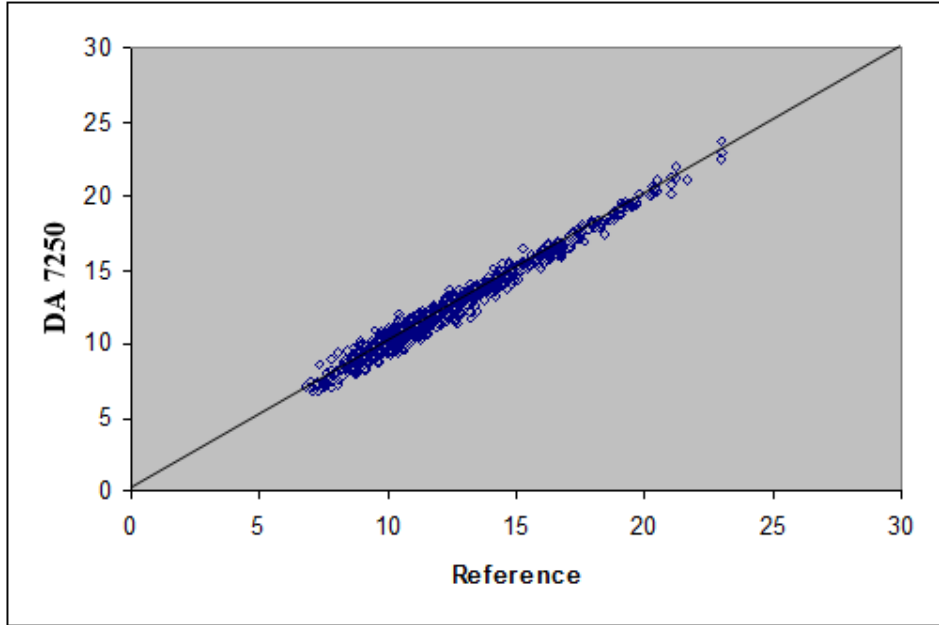
repeatability. Results can be displayed both as is and dry based on instrument based on automatic moisture correction calculation.

In summary, it is concluded that the DA 7250 accurately can analyze barley in a few seconds using large open rotating sample dishes

Parameter	Range %	Samples	R
Moisture	6.8-24.8	2400+	0.97
Protein, db	6.8-15.8	2200+	0.95
Starch, db	45.1-60.2	300+	0.95
Fiber, db	2.9-7.8	200+	0.95
Ash, db	1.6-2.2	100+	0.85

Table 1

**Moisture**  
 The moisture calibration covers a very wide range. It will be valid under all but the most extreme conditions, and performs very well even on samples with the highest moisture contents.



**Protein**  
 The performance of the protein calibration is excellent and will give accurate information for pricing, acceptance and feed formulation.

