

Analysis of Moisture, Protein, Starch, Ash, NDF and Fiber in Rye using the Diode Array 7250 Analyzer

Introduction

For rye processors, moisture, protein starch, ash, NDF and fiber are important quality parameters that define the properties of the end product. Rapid and accurate determination of these parameters is of great benefit both in controlling the rye processing and the end product.



The Near Infrared Reflectance (NIR) technology is highly suitable for these purposes. NIR is an indirect analytical method, where the relationship 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, 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

About 300 rye and triticale samples from Sweden, Norway, Austria and Latvia were measured on multiple DA 7250 instruments. The samples were analyzed as they were, without grinding or any other sample preparation. Each sample was repacked once.

The samples compositions of moisture, protein, starch, ash, NDF and fiber were determined using wet chemistry reference methods. Using the moisture values results were displayed on dry basis. Calibration algorithms 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 were 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.

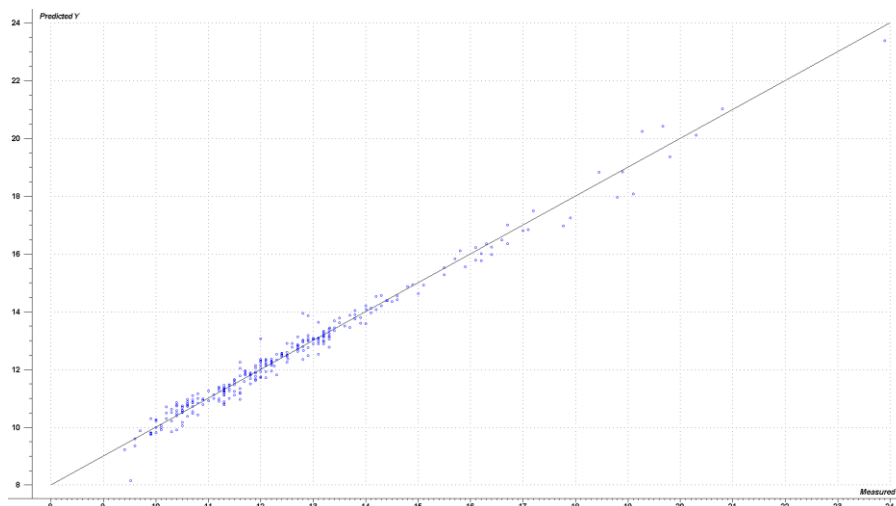
In summary, it is concluded that the DA 7250 accurately can analyze rye in a few seconds using large open rotating sample dishes

Parameter	Range %	Samples	R
Moisture	9.4-23.9	300+	0.98
Protein, db	6.8-14.7	270+	0.95
Starch, db	51.5-73.5	190+	0.95
Ash, db	1.4 – 2.6	140+	0.85
NDF, db	10.9 – 15.1	140+	0.6
Fiber, db	2.2 – 3.7	<60	0.85

Table 1

Moisture

The calibration covers a wide range, and generally shows a very good accuracy. As more samples are added, the calibration will be even more robust on the most wet samples.



Protein

The DA 7250 is highly accurate on protein in rye.

