Analysis of Moisture, Protein, Starch and more in Wheat and Durum using the DA 7250

Introduction

Whenever wheat is used as a raw material it is important to have full knowledge of its composition and properties. In feed milling, starch production, flour milling 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) technique is highly suitable for this purpose, but in the past instrument limitations have not permitted users to reap the full benefits of NIR. Sample preparation requirements like grinding or special cups made analyses laborious and time consuming.

DA 7250 NIR Analyzer

The DA 7250 is a proven, full-spectrum NIR instrument designed for use in the grain and feed industry. Using novel diode array technology it performs a multi-component analysis in only 6 seconds. Thanks to excellent signal-to-noise ratio and solid state optics no grinding is required.

During this time a large number of 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

More than 4000 wheat samples from Europe, North and South America, and Australia, were analyzed on multiple instrument. The samples represent several crop years and thus include considerable variation.

Using Multivariate calibration tools, the collected data was pretreated to reduce scatter and calibrations were developed using the regression method Partial Least Squares (PLS).

Reference analyses were performed for moisture (130°C, 1.5h), protein (Dumas, N X 5.7) and starch (Polarimetric method).

Results and discussion

The DA 7250 proved to predict results very close to the results from the reference methods. Range and correlation (R) for the calibrations samples are seen in the table below.

| Parameter	Range (%)	Samples	R
Moisture	7.3 – 22.1	4000+	0.97
Protein	8.2 – 22.8	4200+	0.98
Starch	61.5 – 83.0	1200+	0.97
NDF	7.2 - 17.4	<100	0.77
Hardness (SKCS) (HI)	12.9 - 87.2	100+	0.81
Wet Gluten	16.7 – 39.6	200+	0.97
Dry Gluten	4.9 - 13.1	200+	0.97
W (Alveograph)	43 - 397	200+	0.95
Zeleny (ml)	16 – 54	200+	0.95

As can be seen in the table, there is a good correlation (R) between the reference method and the NIR results.

In summary, it can be concluded that the DA 7250 can determine moisture, protein, starch, NDF, Hardness, Wet and dry gluten, W and Zeleny in whole grain wheat and durum samples.

The graphs below show over 600 new validation samples predicted with the wheat moisture and protein calibration.

Moisture

The moisture validation samples show that the calibration predicts the new samples extremely well. The correlation between reference analysis and NIR is 0.98 for this samples.
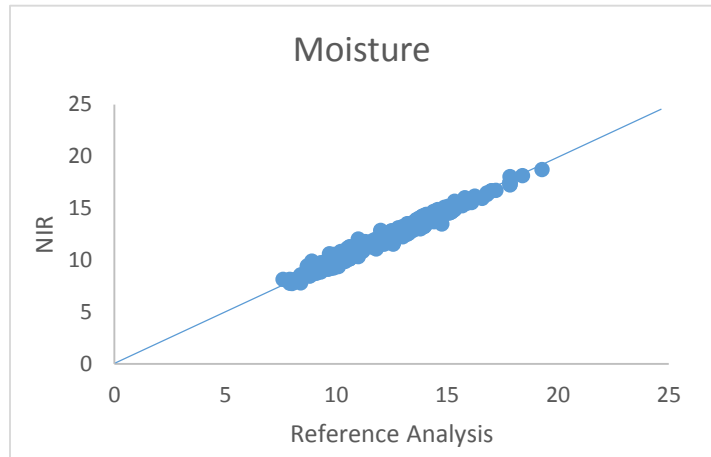
Protein

Also the protein calibration is based on samples with a great variety in content. This is seen in the validation of over 600 new samples that are predicted very well and show a correlation of 0.98.