

# Perten Instruments Application Note

## DA 7250 Analysis of Soybeans

### Analysis of Moisture, Protein, Fiber, Oil and Free Fatty Acids in Soybeans Using the Diode Array 7250 Analyzer

#### Introduction

For soybean processors it is important to have full knowledge of the quality of the soybean they purchase, as its value to a high degree depends on the composition of for example oil and protein. For seed breeders, the fatty acid profile is also critical as there are increasing demand for varieties with specific characteristics.



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 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

Many thousands of samples of whole soybeans were analyzed in multiple instruments. Reference analyses were performed for moisture, protein, fiber oil and individual free fatty acids. The free fatty acid contents were expressed as % of total oil (dry basis). The samples were analyzed, without grinding or other sample preparation.



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 Partial Least Squares PLS regression.

#### Results and Discussion

The DA 7250 proved to predict results very close to the results from the reference methods. Statistics are presented in the table 1 and graphs are displayed in page 2

Parameter	Range	Samples	R
Moisture	4.0-15.7	3100+	0.94
Oil	13.6-	3300+	0.90
Protein	33.4-	3500+	0.94
Ash	4.6-6.2	800	0.59
Fiber	4.0-8.6	800	0.68
*Oleic acid	13.8-	3400+	0.94
*Linoleic acid	0.4-66.7	4000+	0.96
*Linolenic acid	0.8-14.2	4000+	0.82
*Palmitic acid	4.4-18.9	3400+	0.82
*Stearic acid	2.5-6.8	3500+	0.77

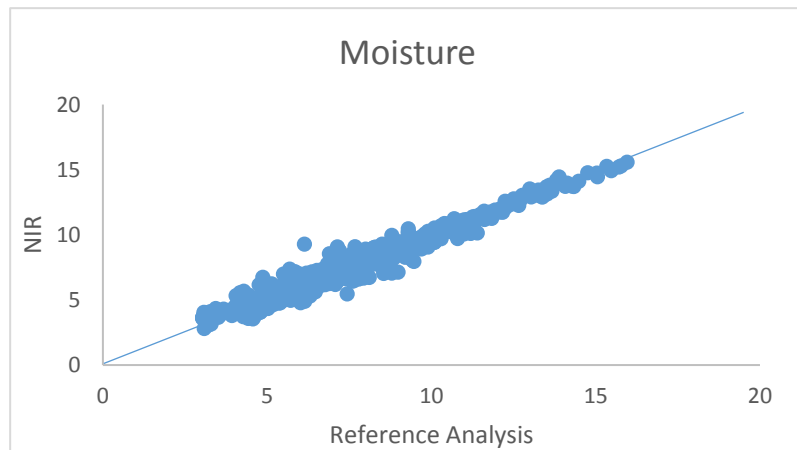
\*% of oil

**Table 1**

In summary, it can be concluded that the DA 7250 can determine moisture, protein, fiber, oil and individual free fatty acids in soybeans, with similar accuracy as the respective reference method.

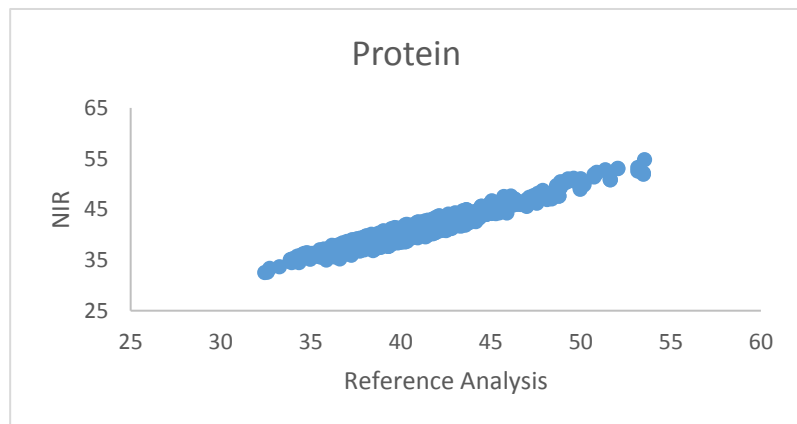
### Moisture

As the moisture content directly affects the price of soybeans it is important to be able to determine it accurately. This calibration has a very good performance and will predict moisture contents very close to the reference method.



### Protein

This calibration covers a very wide range of protein contents, and provides very accurate results.



### Linoleic acid

Linoleic content expressed as percentage of total oil (dry basis) can be predicted accurately with the DA 7250.

