

Analysis of Oleic, Linoleic, Linolenic, Oil, and Moisture in Safflower Seeds using the Diode Array 7200

Introduction

Compositional analysis of oilseeds is vital to running an oilseed crushing plant and its overall profitability. For safflower seeds, knowledge of free fatty acid, protein, and oil content can help buyers to purchase the best seed, receiving areas to segregate, and production to monitor and ensure quality.

The Near Infrared Reflectance (NIR) technique is particularly suited for measurement of seeds, but in the past instrument limitations have not permitted users to reap the full benefits of NIR. Sample preparation requirements such as grinding or special cups made analyses laborious, time consuming and error-prone.

Diode Array 7200

The DA 7200 is a new full-spectrum NIR instrument designed for use in the grain and oilseed industries. Using novel diode array technology it performs a multi-component analysis in only 6 seconds with no sample grinding or sample preparation required. During this time approximately 300 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

Spectral data was collected on forty whole safflower seed samples by an oilseed processor in Mexico. Data was collected on a DA 7200. Each sample was analyzed with 2 repeats and 2 repacks in a 5” diameter open faced sample dish. Reference analyses were supplied by the customer. Calibrations were developed by Perten Instruments using Partial Least Squares (PLS) regression. Multiplicative Scattering Correction (MSC) was used as a data pre-treatment to improve the calibration models.

Results and discussion

The DA 7200 results are very accurate when compared to the results from the reference methods. Statistics for the respective parameters are presented in the table below and graphs are displayed on page 2. The individual fatty acids are indicated as percent of the total fatty acid content.

Parameter	Range	Samples	R ²	SEC ^v
Moisture	4.6–7.8	20	0.983	0.11
Oil	28.8–42.8	40	0.947	0.90
Oleic Acid	12.6–81.2	40	0.987	3.26
Linoleic Acid	10.5–78.3	40	0.987	3.23
Linolenic Acid	0.033–0.15	40	0.902	0.012

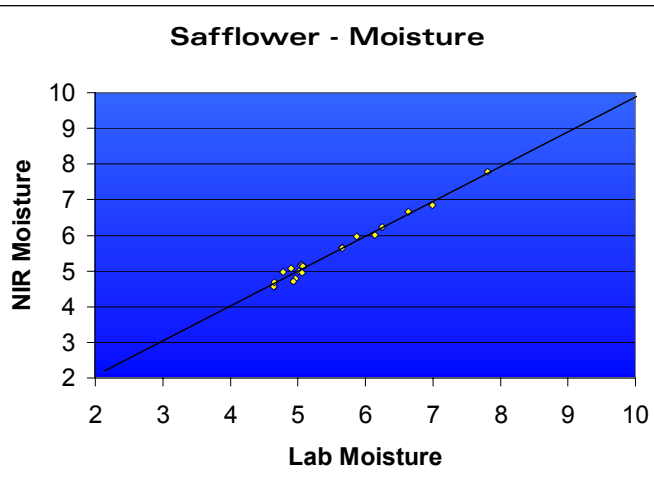
The differences between the DA 7200 and the reference method are of the same magnitude as typical differences between two different reference labs. The DA 7200 is more precise than the reference methods meaning that replicate analyses are much more repeatable and representative.

In summary it is concluded that the Diode Array 7200 can analyze safflower seeds for the aforementioned constituents. It should be noted again that these results are for whole safflower seeds. These seeds did not see any sample preparation – i.e. no grinding.

Perten Instruments Application Note DA – Safflower Seeds

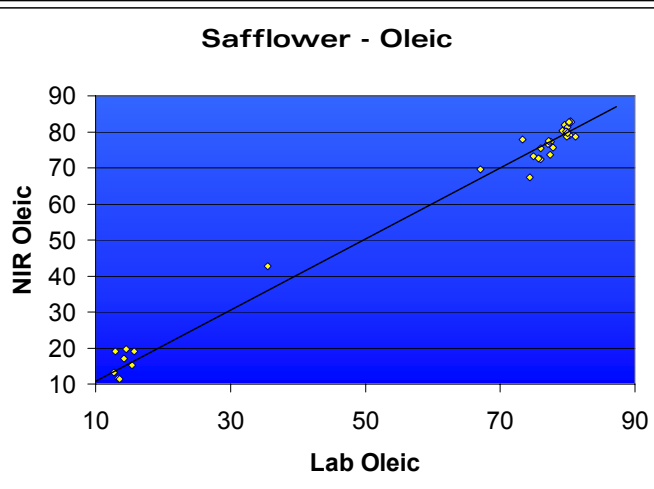
Moisture

Only 20 of the samples in the study had reference moisture values hence the reason for the fewer data points. The results are very good despite the small number of samples.



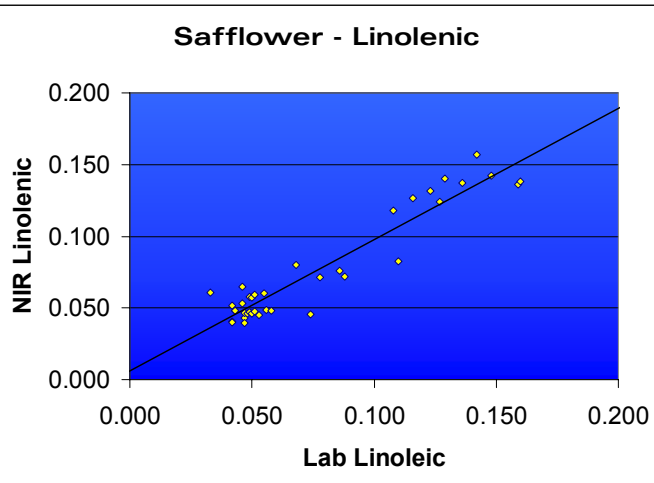
Oleic

This graph of the oleic content indicates that the oleic acid in these samples were of two populations.



Linolenic

The calibration for linolenic acid has a very small error on a good range of samples.



* SECV is the standard deviation between NIR and Lab data calculated in a way that describes the future performance of the calibration.