

Perten Instruments Application Note

DA 7250 Analysis of Vegetable Oils

Analysis of Free Fatty Acids and Phosphorus in Vegetable oils using the Diode Array 7250 Analyzer

Introduction

For oilseed processors it is critical to monitor and control free fatty acid content and phosphorus levels in the oil. High levels of free fatty acids promote oxidation of oils leading to rancidity.

The Near Infrared (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, samples handling and cloud based instrument networking.

DA 7250 NIR Analyzer

The DA 7250 is a Near Infrared Reflectance (NIR) instrument designed for optimal use on food products. Using novel Diode Array technology, the DA 7250 is unique in its measurement speed, versatility and accuracy.

In only 6 seconds' samples are measured in flexible open dishes and the instrument is handled by an intuitive touch screen interface.

A dedicated gold coated transfectance sample cup allows for easy handling of oil samples, as compared to use of cuvettes which could be tricky to clean and fill properly.

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 the production environment.



Method

More than 400 samples of crude as well as degummed rapeseed and soybean oil from various oilseed processing companies were analyzed on multiple DA 7250 instruments.

Samples were measured in transfectance cup, for each measurement filling the sample cup with 3 ml oil. The Transfectance cup was put in measurement position using the DA 7250 Accessory tray. Once placed in measurement position the samples were analyzed immediately to avoid excessive heating. The oil samples compositions of Free Fatty Acids, FFA and phosphorus were determined using wet chemistry reference methods.



Calibration algorithms were developed to model the relationships between the instruments optical NIR spectra and reference results. Model development were done including pathlength and scatter normalizing spectra pre-treatments and with use of PLS multivariate regression.

Results and Discussion

Table 1 summarizes statistics or developed calibrations. Correlation strength is denoted R, range denotes the chemical variability of each parameter in calibration.

| Parameter | Range | Samples | R |
|------------------|------------|---------|------|
| Free Fatty Acids | 0.05-4.05% | 400 | 0.94 |
| Phosphorus | 1-320 ppm | 300 | 0.94 |

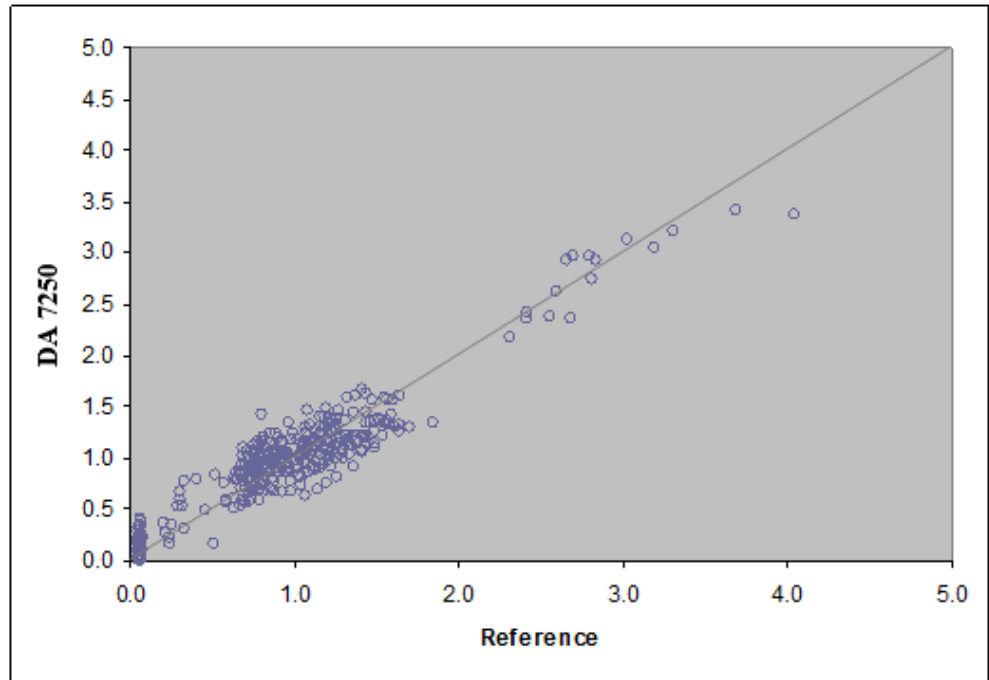
Table 1

The accuracy of measurements using the DA 7250 was similar to the reproducibility of the reference methods.

In summary, it is concluded that the DA 7250 accurately can analyze vegetable oils in a few seconds using the transfectance sample cup.

Free Fatty Acids

The FFA content in the samples spanned from about 0.1% to 4%. The samples at both the low and high ends are predicted very well and prove the performance of the calibration.



Phosphorus

The levels of phosphorus range from 0-320 ppm, which are very low concentrations from an NIR perspective. The DA 7250 achieves an excellent correlation and all samples are predicted accurately.

