Analysis of Canola/ Rapeseed Meal, Cake and Expeller using the DA 7250 NIR Analyzer

Introduction

For rapeseed processors, feed and pet food manufacturers alike, rapid and accurate quality control of the rapeseed meals, expeller or other intermediates is important. For the rapeseed processor it means an opportunity to optimize the oil extraction process, and for the feed and pet food manufacturers the chance to improve least-cost formulations.

The Near Infrared Reflectance (NIR) technology is highly suitable for these purposes. Instead of the time consuming and labor intensive traditional wet chemistry methods, with NIR the multi component analysis is done in seconds. The latest Diode Array Technology combined with advanced algorithm types allows the benefits to be even further exploited, not requiring sample grinding and possibility to make very robust yet accurate calibration models.
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. The DA 7250 is dust and waterproof and can be used in the lab as well as in the production area. Based on the same diode array platform the PerkinElmer on-line versions DA 7350 and DA 7440 can use same calibrations as the DA 7250.

Results and Discussion
Using HR calibration type it was possible to combine all the various canola process products into same models, while maintaining high accuracy. Table below summarizes statistics of developed calibrations. Reference vs NIR calibration graphs of the moisture, protein and fat models are displayed in the figures below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>N</th>
<th>Range</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture %</td>
<td>3000+</td>
<td>1.2 - 15.3</td>
<td>0.99</td>
</tr>
<tr>
<td>Protein % asi</td>
<td>1600+</td>
<td>25.0 - 44.0</td>
<td>0.98</td>
</tr>
<tr>
<td>Fat % asi</td>
<td>2600+</td>
<td>0.5 – 34.6</td>
<td>0.99</td>
</tr>
<tr>
<td>Fiber % asi</td>
<td>1000+</td>
<td>5.1 – 15.8</td>
<td>0.89</td>
</tr>
<tr>
<td>Ash % asi</td>
<td>300+</td>
<td>4.4 - 7.2</td>
<td>0.93</td>
</tr>
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Calibrations are very robust and flexible for analyzing a vast variety of canola meals and process intermediates. The differences between the DA 7250 and the reference methods are of the same magnitude as typical differences between two different reference labs.

In summary, it is concluded that the DA 7250 accurately can analyze canola/rapeseed meal, expeller and other related process intermediates using combined models.

Method
Several sets of samples from North America as well as Europe were measured on multiple DA 7250 instruments. Sample sets contained large variability in products and intermediate types including both meals, expeller, cake and expelled meals. Large cake samples were slightly crushed to fit into sample cup, but no grinding or other sample preparation were done on collected samples. To even further increase variability, a set of samples collected on DA 7350 were also included.

Calibrations were developed to model the relationships between the collected NIR spectra and reference chemistry results using PerkinElmer Hongis Regression™, HR. HR is an algorithm designed for handling large calibration ranges and complex samples matrixes.

Figure 1: Moisture. The DA 7250 is very accurate for moisture. The calibration covers a wide range which makes it suitable both for optimizing the drying process as well as for verifying final product moisture.
Figure 2: Protein. The DA 7250 is an excellent tool verifying conformance to protein specifications.

Figure 3: Fat. The DA 7250 is accurate from the low oil contents found in the commercial product up to the higher oil contents found in process intermediates.