

Analysis of Moisture, Protein and Fat in Bakery Mixes using the DA 7200

Introduction

Analysis of flour and flour based products using near infrared (NIR) spectroscopy is widely accepted as an accurate analytical technique. Due to its speed, this non-destructive and inexpensive technology is used in many operations.

In this pre-study 27 different bakery mixes were measured and spectral information collected on a DA7200 NIR analyzer.

The purpose of this pre-study is to see if these different samples should be combined into one or several calibrations for the DA7200 to properly predict the proximate reference values.



The sample was simply poured into the open-face dish, and the excess struck off. Each sample was measured once.

Calibrations were developed by Perten Instruments using Partial Least Squares (PLS) regression. Multiplicative Scattering Correction (MSC) and Savitzky-Golay derivatives were used as data pre-treatment to improve the calibration models.

Results and Discussion

When developing a calibration for a certain product, it is customary to use several samples from each product with constituent levels covering the expected range. In this case, there was only one sample from each mix, so this was not possible. We therefore expect that the results can be improved significantly if more samples are added to the calibration.

Diode Array 7200

The DA 7200 is a new full-spectrum, NIR instrument designed for use in the grain, flour, food and feed industries. Using novel diode array technology it performs a multi-component analysis in only 6 seconds with no sample preparation required.

During this time about 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.



Parameter	Range	Samples	R ²	SECV*
Moisture	3,8-11,3	25	0,98	0,38
Protein	5,9-14,3	14	0,93	0,86
Fat	2,8-12,4	25	0,96	0,49

In summary it is concluded that the Diode Array 7200 can analyze quality parameters mentioned above in a wide variety of bake mixes using only one calibration. With one or two additional calibrations all products included in this study can be measured accurately.

Protein : Two samples had to be dropped to achieve a reasonable calibration line. One Multigrain bread mix protein content was very high at 28.6%. One possible explanation for this is the different protein source for Multigrain bread. To be improved the calibration at least needs to see more very high protein samples to accommodate the different protein source.

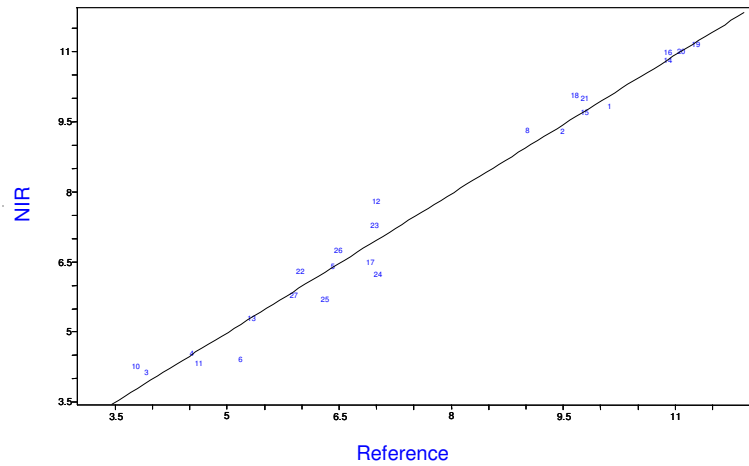
It was also found that a pie crust mix showed spectral differences compared to the other mixes and that these differences are too great to overcome in one calibration.

Experimental

27 samples representing a diverse collection of mixes (one sample per mix) were analyzed with the DA7200, and by reference methods. Not all samples had reference analysis values for fat.

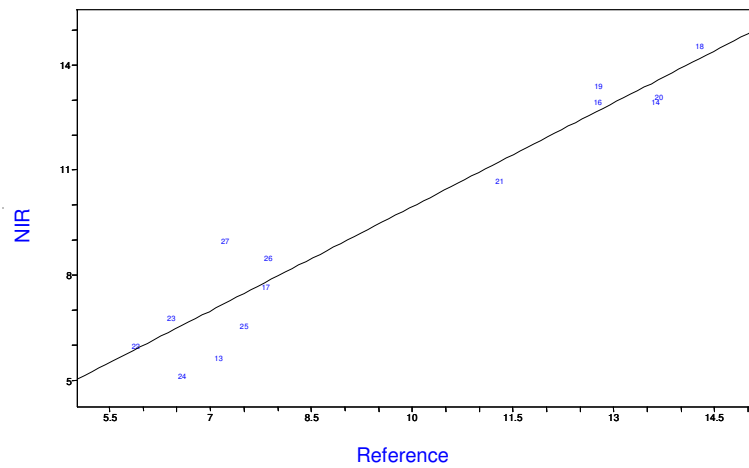
Moisture

With the exception of one chocolate cake mix, all of the samples appear to fit into one NIR calibration for moisture. It is expected that faulting mix can be measured using a dedicated calibration.



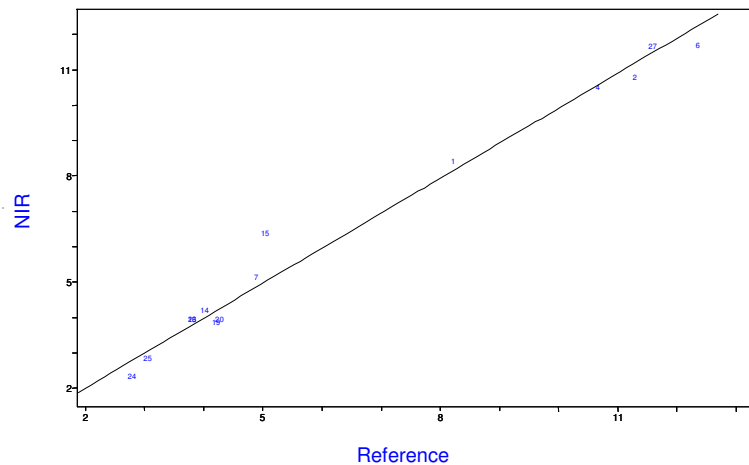
Protein

There are two groups of samples, those with lower proteins and those with higher proteins. These two groups are essentially the muffin mixes at the low end and the bread mix samples at the high end.



Fat

For fat analysis, with the exception of one chocolate cake mix and one brownie mix, it appears as if one calibration can be used for fat analysis on all of these mix products.



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