

Analysis of Fat, Sucrose, Glucose, and Maltose in Flour Based Bakery Mixes

Introduction

Bakery mixes are a convenient, portable and shelf stable material. Proper shelf stability and subsequent bake performance are dependent upon proper manufacturing - making certain the correct ingredients are present in the right proportion. Bakery mixes are used in both food service and home uses. Since these are produced in bulk, small improvements in consistency lead to large savings. Measurements of quality attributes such as fat and sugar content are therefore important in the profitability, proper manufacture and quality control of the mixes. Both fat and sugar content play important roles in the development, taste, and shelf life of bakery mixes.

The Near Infrared Reflectance (NIR) technique is particularly suited for measurement of these types of powdered mixes, but past instrument limitations have not permitted users to reap the full benefits of NIR. Sample preparation requirements such as packing 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 food processing facilities. 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 6 seconds, a baseline is collected, noise monitored, wavelength accuracy is standardized, and a large number of full spectra are collected and averaged. As the sample is analyzed in an open dish, the problems associated with sample cups such as cleaning and cross contamination are avoided and operator influence on results is minimal.

Experimental

Spectral data was collected on several DA 7200 instruments over the course of 3 years. The samples were poured into a large sampling dish and struck

smooth with a straight edge. Each sample was analyzed in duplicate to examine sample homogeneity and reproducibility. The resulting spectra were



combined to create one database. The samples came from a mix manufacturer in the US. Reference analyses were conducted at a commercial lab for the customer who supplied the samples. Calibrations were developed by a Perten Application Specialist using Partial Least Squares (PLS) regression. Multiplicative Scattering Correction (MSC) and Savitsky-Golay 1st derivatives were used as a data pre-treatment to enhance some of 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.

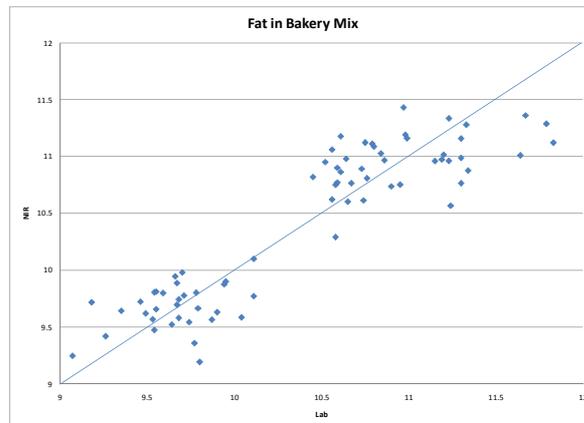
Parameter	Range	Samples	R
Fat	9.1 – 11.8%	73	0.91
Sucrose	4.0-14.7%	80	0.94
Glucose	2.1 – 5.8%	78	0.99
Maltose	1.6 – 6.7%	76	0.96

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 readily measure fat and sugar profiles in bakery mixes in as little as 6 seconds. The same instrument can also measure other mixes and Oils for Free Fatty Acids and Moisture content.

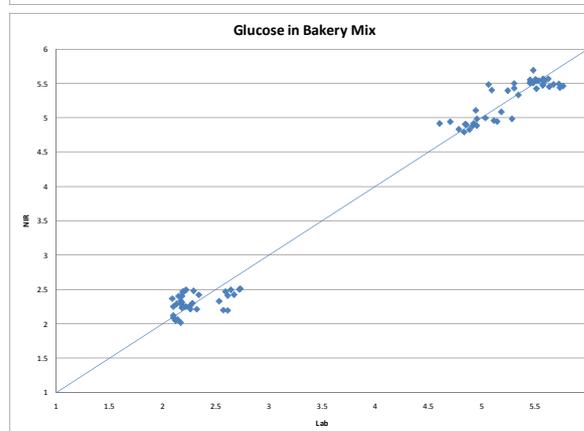
Fat

These results are very demonstrable of NIR's fat measurement capability. The results are well within 1.5x the S.D. of the reference method. Fat is often a primary carrier of flavor.



Glucose

While there is an obvious gap in the range of the data, the upper range is particularly well correlated.



Maltose

This calibration covers a wide range of maltose values.

