

Near Infrared Spectroscopy

Authors:

Per Liden

Nadja Eremina

PerkinElmer, Inc.
Stockholm, Sweden

Analysis of Cheese Using the DA 7250 NIR Analyzer

Introduction

Analysis of moisture, fat, protein, salt and pH is of great importance to cheese plants.

By accurately controlling these constituents, the producer can experience significant savings and ensure product quality. Availability of fast results allows for process optimizations and to avoid costly mistakes and potential penalties.

The Near Infrared Spectroscopy (NIR) technique is particularly suited for cheese analysis, but past instrument limitations have not allowed users to reap the full benefits of the technology. Sample presentation requirements such as glass samples that had to be filled properly and were difficult to clean made analyses laborious, time consuming and error-prone.



DA 7250 NIR Analyzer

The PerkinElmer DA 7250 is a proven NIR instrument designed for use in the food industry. Using novel diode array technology it performs a multi-component analysis in only 6 seconds.

Measurements are done in open cups or disposable petri dishes without risk of non clean cups interfering with results.

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 in the production environment.

Method

Around 10,000 different cheese samples from processing plants in North America and Europe were collected and combined to serve as NIR calibration set. The calibration set included various processed and finished cheese types. Spectral data for each sample was collected on the DA 7250 instruments using open faced sampling dishes and disposable petri dishes.

Calibration models were developed to model the relationships between the instruments NIR spectra and reference chemistry results using Perten Hongis Regression, HR, and Artificial Neural Network Regression, ANN.



Results and Discussion

Table below summarizes statistics of developed calibrations. N is number of calibration samples, correlation strength is denoted R and range the variability of each parameter. Reference vs NIR calibration graphs are displayed in Figures 1, 2, and 3.

Table 1. Summary of developed calibrations.

Parameter	N	Range	R
Moisture %	9500+	8.2 – 77.7	0.99
Fat % asis	5000+	10.0 – 41.0	0.98
Salt % asis	5500+	0.04 – 5.7	0.95
Protein % asis	800+	6.5 – 29.9	0.99
pH	900+	4.6 - 6.2	0.82

The differences between the DA 7250 and the reference method are of the same magnitude as typical differences between two different reference labs.

In summary it is concluded that the DA 7250 can analyze cheese for moisture, fat, salt, protein and pH with very high accuracy in only 6 seconds.

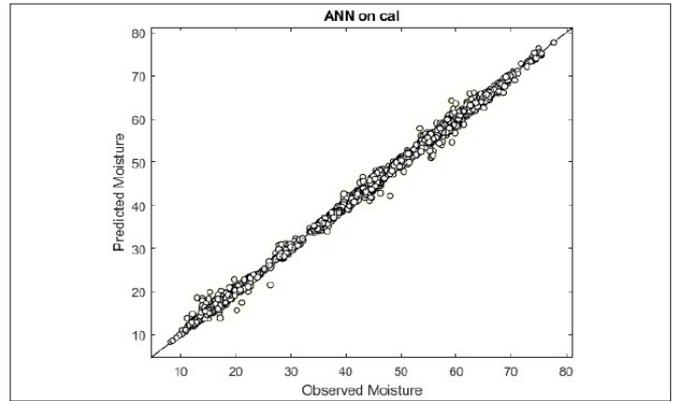


Figure 1. **Moisture:** Proper moisture levels affect the profitability of the plant as well as the quality of the product. The DA 7250 ANN calibration is robust and covering a large moisture range.

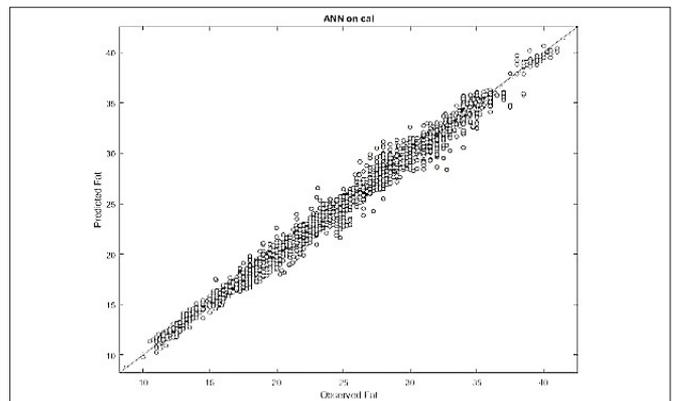


Figure 2. **Fat:** Fat is accurately and readily measured across a wide range of values. With the DA 7250 the fat content can be monitored in production and ensure produced cheese is within specification.

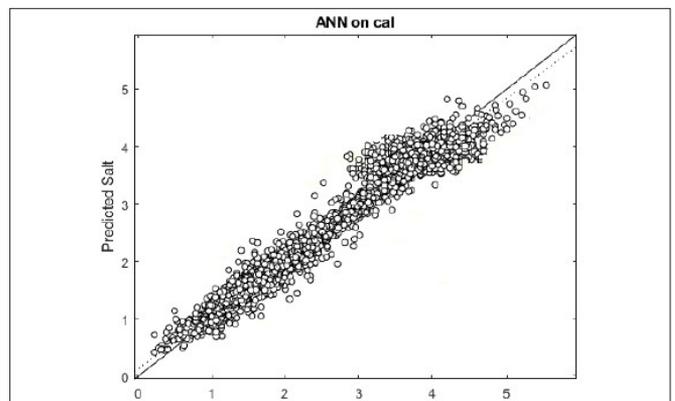


Figure 3. **Salt:** Salt effects taste and performance in different products. The DA 7250 ANN salt calibration is robust and cover large variability in range and included products.