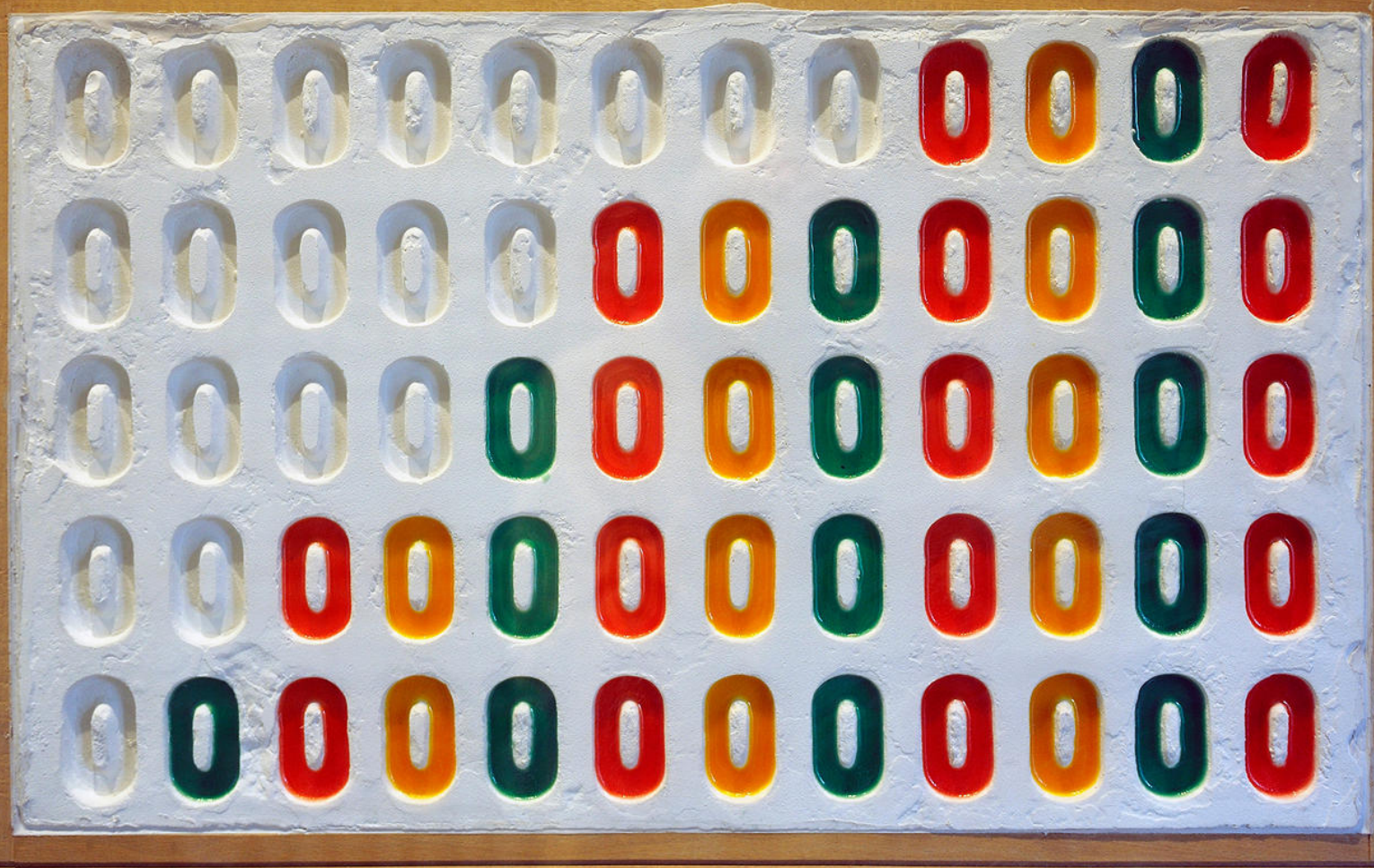




Application Note AN-NIR-151

Moisture and protein content in corn starch with NIR spectroscopy

Easily measure the quality of corn starch in seconds with NIR

Starch is a fundamental component in candy production where it is often used as a gelling agent and thickener. The confectionery industry uses it to create products with a certain consistency, like pie fillings. It is also used in a process known as starch molding where shapes are pressed into a corn starch bed for gummy candies and similar treats. Corn starch also acts as a desiccant during the candies' drying

process before reuse. Therefore, the corn starch moisture content is a very important factor to consider in this process.

Near-infrared spectroscopy (NIRS) is a fast, chemical-free analysis technique for the determination of moisture content and corn protein content in corn starch. The NIRS solution is easy to use and can be used either atline or in a quality control laboratory.

EXPERIMENTAL EQUIPMENT

210 samples of corn starch were measured with an OMNIS NIR Analyzer Solid (Figure 1). All measurements were performed in reflection mode (1000–2250 nm) using a large holder and large cup (Table 1). OMNIS Software was used for all data acquisition and prediction model development. Karl Fischer titration was used to determine the water content in corn starch, and the Kjeldahl method was used to determine its protein content.



Figure 1. OMNIS NIR Analyzer Solid.

Table 1. Hardware and software equipment overview.

Equipment	Article number
OMNIS NIR Analyzer Solid	2.1071.0010
Large holder OMNIS NIR, 100 mm	6.07402.100
Large cup OMNIS NIR, 100 mm	6.07402.110
OMNIS Stand-Alone license	6.06003.010
Software license Quant Development	6.06008.002

RESULT

The obtained NIR spectra (Figure 2) were used to create prediction models for both moisture and protein content in corn starch. An external validation procedure was used.

Correlation diagrams which display the relation between the NIR prediction and the reference values are shown in Figures 3 and 4 together with the respective figures of merit (FOM).

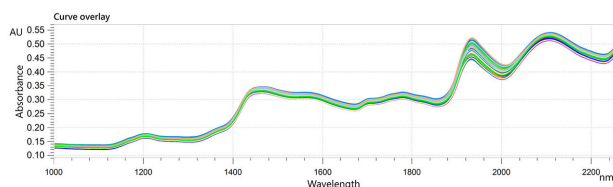


Figure 2. Selection of NIR spectra from starch samples measured in this study. Data was obtained with an OMNIS NIR Analyzer Solid.

RESULT MOISTURE CONTENT IN CORN STARCH

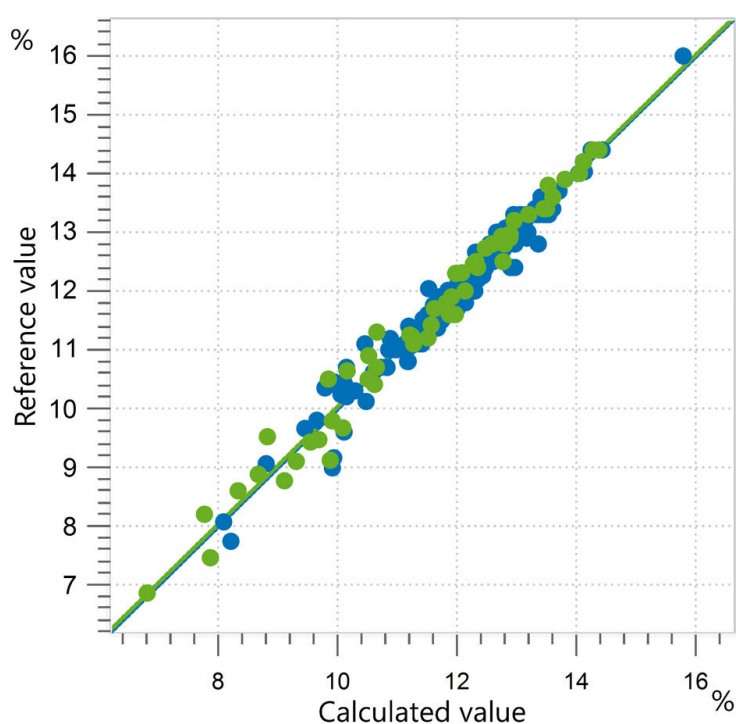


Figure 3. Correlation diagram and the respective figures of merit for the prediction of moisture content in corn starch using an OMNIS NIR Analyzer Solid. Reference values were obtained with Karl Fischer titration.

R^2	SEC (%)	SECV (%)	SEP (%)
0.977	0.21	0.23	0.28

RESULT PROTEIN CONTENT IN CORN STARCH

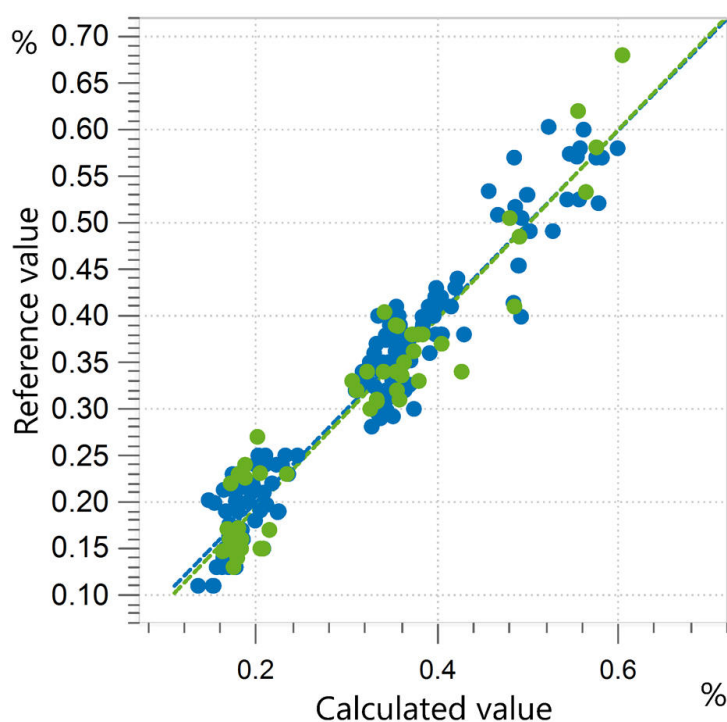


Figure 4. Correlation diagram and the respective figures of merit for the prediction of protein content in corn starch using an OMNIS NIR Analyzer Solid. Reference values were obtained with the Kjeldahl method.

R^2	SEC (%)	SECV (%)	SEP (%)
0.915	0.032	0.033	0.038

CONCLUSION

This Application Note shows the feasibility of using near-infrared spectroscopy for the determination of moisture and protein content in corn starch. Compared to the conventional analysis techniques used to determine these quality parameters, NIRS

saves a considerable amount of time and costs.

With NIR spectroscopy, analyses can be conducted without using any chemical reagents, giving users reliable results in seconds.

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CONFIGURATION



OMNIS NIR Analyzer Solid

Espectrómetro del infrarrojo cercano para muestras sólidas y viscosas.

El OMNIS NIR Analyzer es la solución de espectroscopía del infrarrojo cercano (NIRS) desarrollada y producida conforme a los estándares de calidad suizos para los análisis de rutina a lo largo de toda la cadena de producción. El empleo de las tecnologías más avanzadas y la integración en el moderno OMNIS Software se reflejan en la velocidad, la manejabilidad y el uso flexible de estos espectrómetros NIR.

Información general sobre las ventajas del OMNIS NIR Analyzer Solid:

- Medidas de materias sólidas y muestras viscosas en menos de 10 segundos
- Medidas automatizadas en múltiples posiciones para obtener resultados reproducibles, incluso en muestras poco homogéneas
- Fácil integración en un sistema de automatización o vinculación con otras tecnologías de análisis (titulación)
- Compatible con numerosos recipientes de muestras



Soporte grande OMNIS NIR, 100 mm

Soporte grande para recipiente de muestras grande OMNIS NIR de 100 mm (6.07402.110).

Permite el posicionamiento inequívoco del recipiente de muestras y la rotación del recipiente de muestras.



Placa grande OMNIS NIR, 100 mm

Recipiente de muestras grande para la adquisición de espectros de polvos y granulados en reflexión en diferentes puntos de muestra.

Compatibles con:

- Soporte grande OMNIS NIR, 100 mm (6.07402.100)

OMNIS
A WHOLE NEW LEVEL OF PERFORMANCE

Licencia "Stand-Alone" de OMNIS

Habilita el modo "Stand-Alone" del software OMNIS en un ordenador con WindowsTM.

Características:

- Se incluye una licencia de los aparatos OMNIS.
- Debe activarse en el portal de licencias de Metrohm.

OMNIS
A WHOLE NEW LEVEL OF PERFORMANCE

Licencia de software de Quant Development

Licencia de software para la creación y edición de modelos de cuantificación en una instalación de OMNIS Software "Stand-Alone".