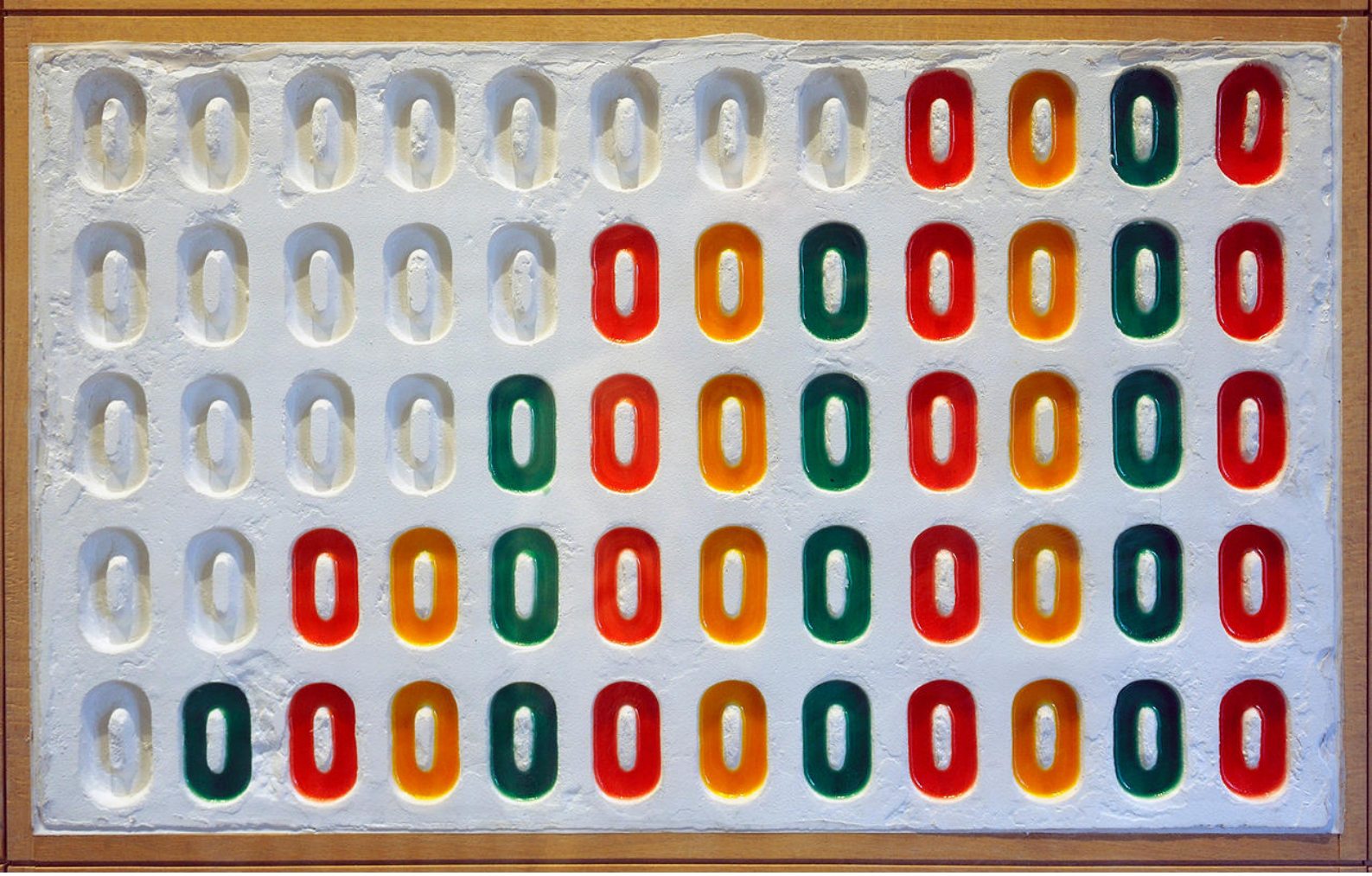

Application Note AN-NIR-151

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).

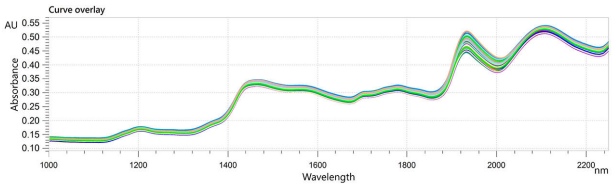

Figure 2. Selection of NIR spectra from starch samples measured in this study. Data was obtained with an OMNIS NIR Analyzer Solid.

RESULT MOISTURE CONTENT IN CORN STARCH

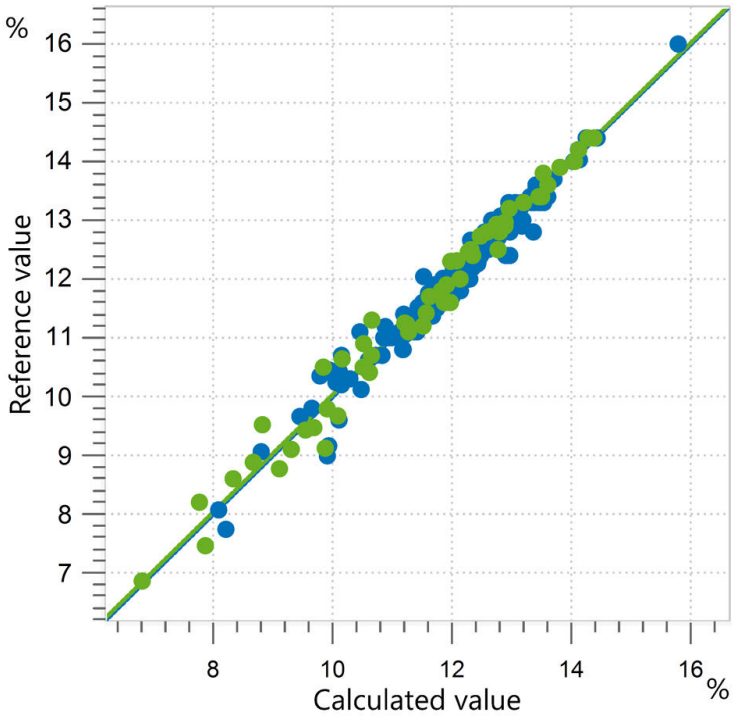

Figure 3. Correlation diagram and the respective figures of merit for the prediction of moisture content in corn starch using an OMNIS NIR Analyzer Solid. Reference values were obtained with Karl Fischer titration.

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

RESULT PROTEIN CONTENT IN CORN STARCH

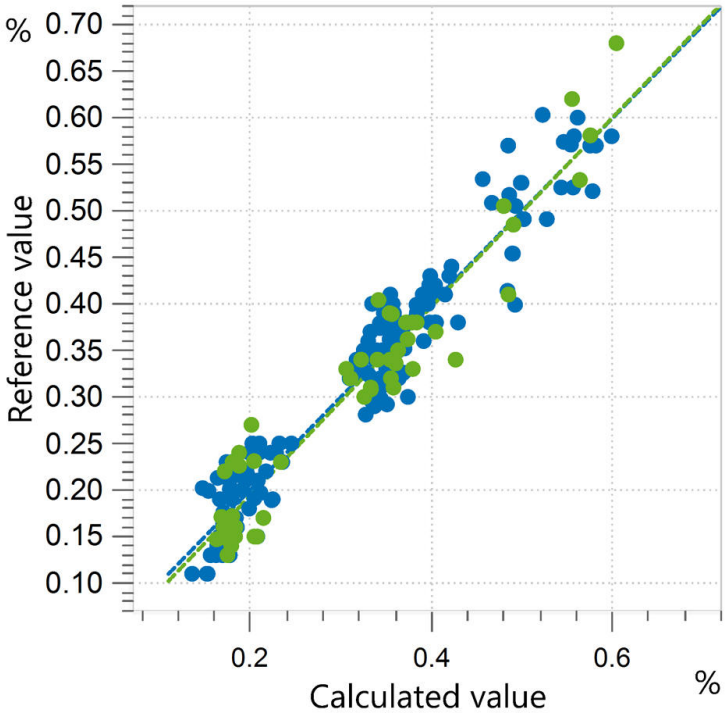

Figure 4. Correlation diagram and the respective figures of merit for the prediction of protein content in corn starch using an OMNIS NIR Analyzer Solid. Reference values were obtained with the Kjeldahl method.

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.

CONTACT

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CONFIGURATION

OMNIS NIR Analyzer Solid

Nahinfrarotspektrometer für feste und viskose Proben.

Der OMNIS NIR Analyzer ist die nach Schweizer Qualitätsstandards entwickelte und produzierte Nahinfrarotspektroskopie(NIRS)-Lösung für die Routineanalyse entlang der gesamten Produktionskette. Die Anwendung neuester Technologien und die Integration in die moderne OMNIS Software spiegeln sich in der Geschwindigkeit, der Bedienbarkeit und dem flexiblen Einsatz dieser NIR-Spektrometer wider.

Die Vorteile des OMNIS NIR Analyzer Solid im Überblick:

- Messungen von Feststoffen und viskosen Proben in weniger als 10 Sekunden
- Automatisierte Mehrpositionenmessungen für reproduzierbare Resultate auch bei inhomogenen Proben
- Einfache Integration in ein Automationssystem oder Verknüpfung mit weiteren Analysentechniken (Titration)
- Unterstützung zahlreicher Probengefässe

Grosser Halter OMNIS NIR, 100 mm

Grosser Halter für Grosses Probengefäss OMNIS NIR, 100 mm (6.07402.110).

Erlaubt eindeutige Positionierung des Probengefässes und die Rotation des Probengefässes.

Grosse Schale OMNIS NIR, 100 mm

Grosses Probengefäss für die Spektrenaufnahme von Pulvern und Granulaten in Reflexion an unterschiedlichen Probenstellen.

Der Glasboden besteht aus widerstandsfähigem Gorilla® Glass.

Kompatibel mit:

- Grossen Halter OMNIS NIR, 100 mm (6.07402.100)

OMNIS
A WHOLE NEW LEVEL OF PERFORMANCE

OMNIS Stand-Alone Lizenz

Ermöglicht den Stand-Alone Betrieb der OMNIS Software auf einem WindowsTM Computer.

Merkmale:

- Die Lizenz enthält bereits eine OMNIS Geräte Lizenz.
- Muss über das Metrohm Lizenzierungsportal aktiviert werden.

OMNIS
A WHOLE NEW LEVEL OF PERFORMANCE

Softwarelizenz Quant Development

Softwarelizenz für die Erstellung und Bearbeitung von Quantifizierungsmodellen in einer Stand-Alone OMNIS Software Installation.