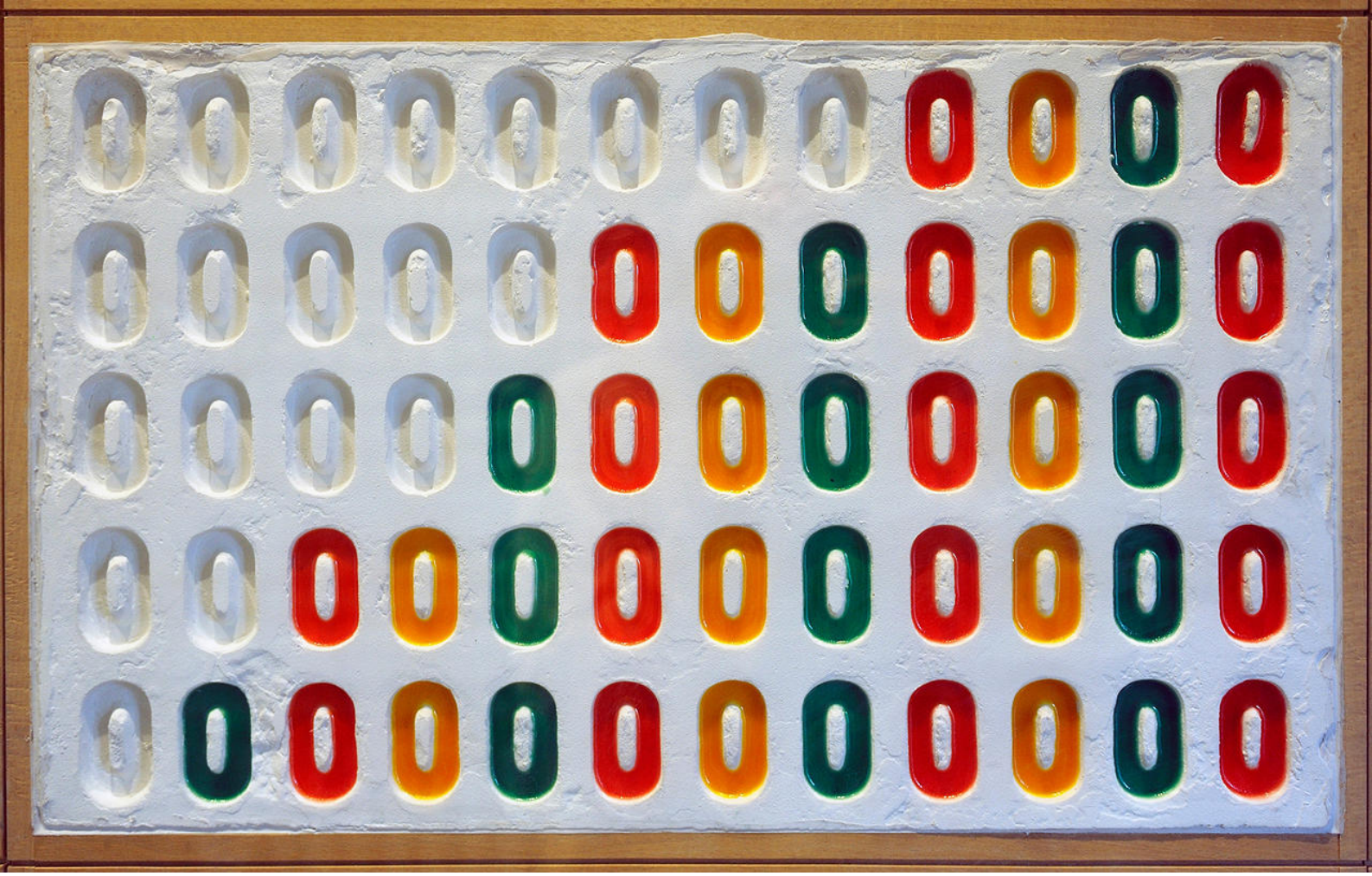


Application Note AN-NIR-151

# 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).

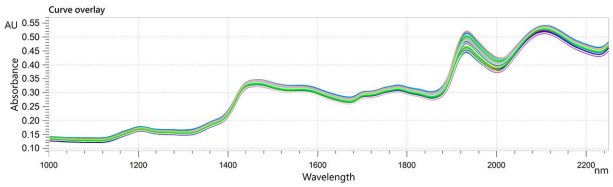



**Figure 2.** Selection of NIR spectra from starch samples measured in this study. Data was obtained with an OMNIS NIR Analyzer Solid.

## RESULT MOISTURE CONTENT IN CORN STARCH

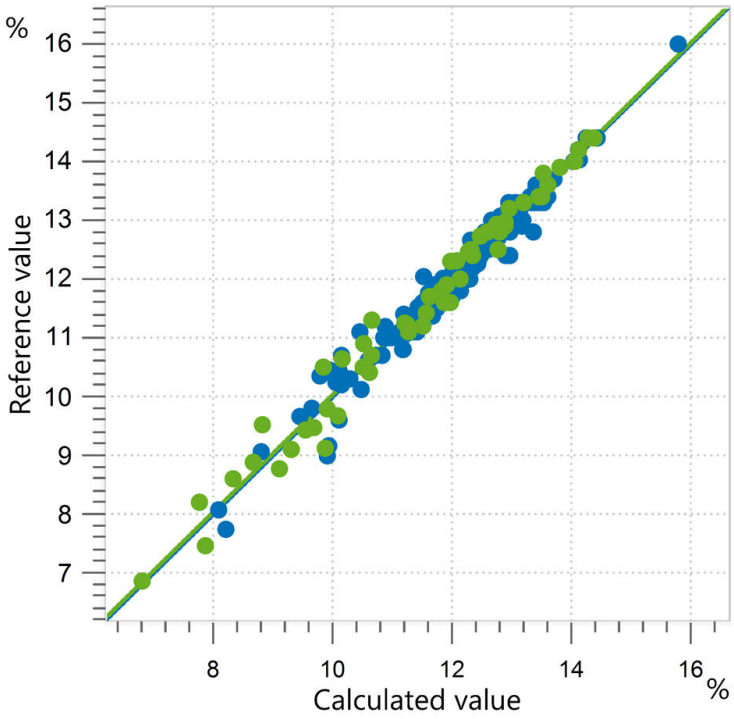



**Figure 3.** Correlation diagram and the respective figures of merit for the prediction of moisture content in corn starch using an OMNIS NIR Analyzer Solid. Reference values were obtained with Karl Fischer titration.

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

## RESULT PROTEIN CONTENT IN CORN STARCH

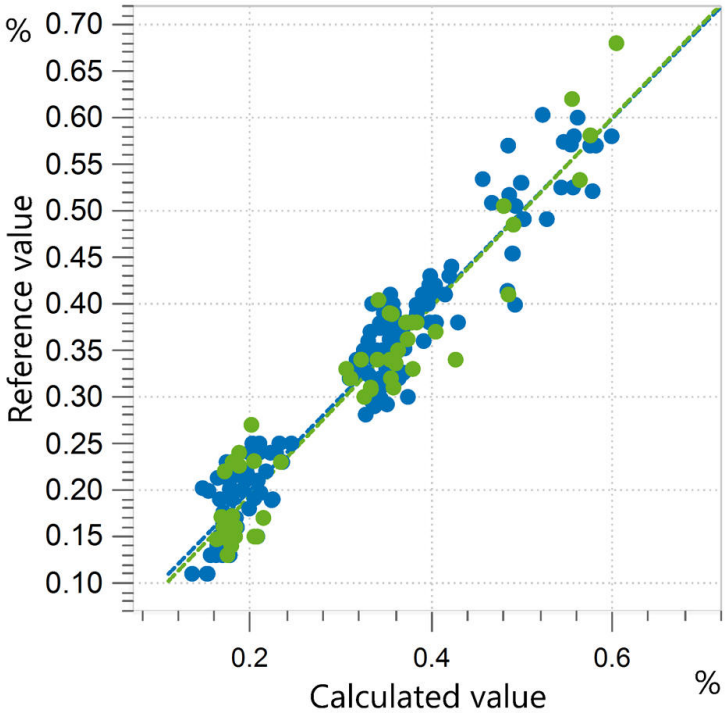



**Figure 4.** Correlation diagram and the respective figures of merit for the prediction of protein content in corn starch using an OMNIS NIR Analyzer Solid. Reference values were obtained with the Kjeldahl method.

| $R^2$ | 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

Spectromètre proche infrarouge pour échantillons solides et visqueux.

L'OMNIS NIR Analyzer est la solution de spectroscopie proche infrarouge (NIRS) développée et produite selon les normes de qualité suisses pour les analyses de routine tout au long de la chaine de fabrication. L'application des technologies les plus récentes et l'intégration dans le logiciel OMNIS moderne se reflètent dans la vitesse, la facilité du maniement et la flexibilité d'utilisation de ce spectromètre NIR.

Apercu des avantages de l'OMNIS NIR Analyzer Solid :

- Mesures d'échantillons solides et visqueux en moins de 10 secondes
- Mesures multi-positions automatisées pour des résultats reproductibles, même avec des échantillons non homogènes
- Intégration simple dans un système d'automatisation ou liaison avec d'autres technologies d'analyse (titrage)
- Prise en charge de nombreux récipients d'échantillon



Grand support OMNIS NIR, 100 mm

Grand support pour grand récipient d'échantillon OMNIS NIR, 100 mm (6.07402.110).

Permet un positionnement univoque du récipient d'échantillon et sa rotation.



Grande coupelle OMNIS NIR, 100 mm

Grand récipient d'échantillon pour l'enregistrement de spectres par réflexion de poudres et de granulés en différents points de l'échantillon.

Le fond en verre est en Gorilla® Glass résistant.

Compatible avec:

- Grand support OMNIS NIR, 100 mm (6.07402.100)

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### Licence OMNIS autonome

Elle permet l'exploitation autonome du logiciel OMNIS sur un ordinateur WindowsTM.

Caractéristiques :

- La licence comprend déjà une licence pour appareils OMNIS.
- Elle doit être activée via le portail d'octroi de licences Metrohm.

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### Licence logicielle Quant Development

Licence logicielle pour la création et l'édition de modèles de quantification dans une installation du logiciel OMNIS Stand-Alone.