Application Note AN-NIR-155

Salt content in pickled vegetables by near-infrared spectroscopy (NIRS)

Determination of the salt content in food in a few seconds

The salt content is one of the most important quality and safety parameters to monitor during the manufacturing process of pickled vegetables. Salt content must be controlled during the production process as well as in the final product. Compared to conventional lengthy wet chemical methods, near-infrared (NIR) spectroscopy can be used for quickly analyzing the salt content in pickled foods.

While sodium chloride (NaCl) has no specific absorption band(s) in the NIR region, the presence of salt in a sample causes changes in the height, width, and position of the absorbance bands of water. For that reason, it is expected to find information about the changes in salt concentration in the NIR spectra. This Application Note demonstrates that NIRS is a good choice for the rapid quantification of salt content in ready-to-eat foods.

EXPERIMENTAL EQUIPMENT

This application studied 45 samples of pickled peppers and 107 samples of pickled olives. Samples with different concentrations of salt (sodium chloride) were ground and measured with an OMNIS NIR Analyzer Solid (Figure 1) in diffuse reflection mode (1000–2250 nm) using a small cup OMNIS NIR, 60 mm and small holder OMNIS NIR, 60 mm. To compensate for the inhomogeneity of the samples, rotating and multipoint measurement was used.

Figure 1. The OMNIS NIR Analyzer Solid.

RESULT

The NIR spectra (Figures 2–3), along with the corresponding reference values, were used to create prediction models for quantification of salt content.
The quality of the prediction models was evaluating using correlation diagrams (Figures 4–5) which display the relation between the NIR prediction and the reference values of salt content using a wet chemical method. Out of the total, 25% of the samples were selected as the validation set and the other 75% as a calibration set. The respective figures of merit (FOM) display the expected precision during routine analysis.

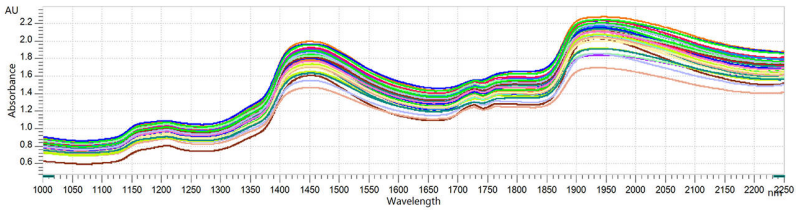


Figure 2. NIR spectra of different pickled olives measured on an OMNIS NIR Analyzer Solid.

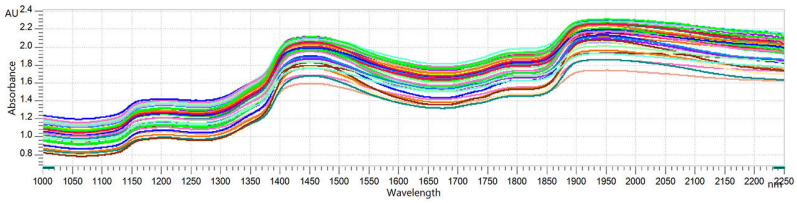
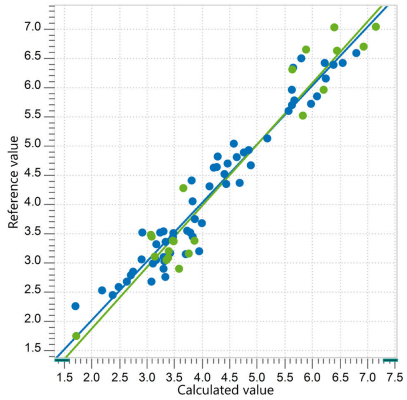


Figure 3. NIR spectra of different pickled peppers measured on an OMNIS NIR Analyzer Solid.

RESULT SALT CONTENT IN PICKLED OLIVES

Figure 4.

Correlation diagram and the respective FOMs for the prediction of salt in picked olives measured in an OMNIS NIR Analyzer Solid. Reference values were measured using potentiometric titration according to Metrohm Application Note AN-T-003.

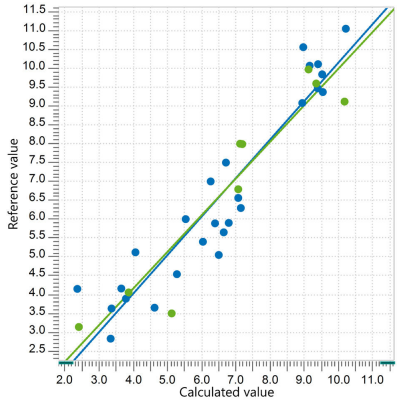


R^2P	SEC (%)	SECV (%)	SEP (%)
0.940	0.26	0.32	0.42

RESULT SALT CONTENT IN PICKLED PEPPERS

Figure 5.

Correlation diagram and the respective FOMs for the prediction of salt in picked peppers measured in an OMNIS NIR Analyzer Solid. Reference values were measured using potentiometric titration according to Metrohm Application Note AN-T-003.



R^2P	SEC (%)	SECV (%)	SEP (%)
0.885	0.59	0.83	0.86

CONCLUSION

This Application Note shows the feasibility of using NIR spectroscopy for the analysis of salt content in ready-to-eat food (i.e., pickled vegetables). By using NIRS, this measurement can be conducted in seconds without the use of chemicals.

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

Petit support OMNIS NIR, 60 mm

Petit support pour petit récipient d'échantillon OMNIS NIR, 60 mm (6.07402.210).

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

Petite coupelle OMNIS NIR, 60 mm

Petit 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:

- Petit support OMNIS NIR, 60 mm (6.07402.200)

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A WHOLE NEW LEVEL OF PERFORMANCE

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.

OMNIS
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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.