

Application Note AN-NIR-155

近红外光谱法(NIRS)测定酱腌菜中的盐分含量

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.

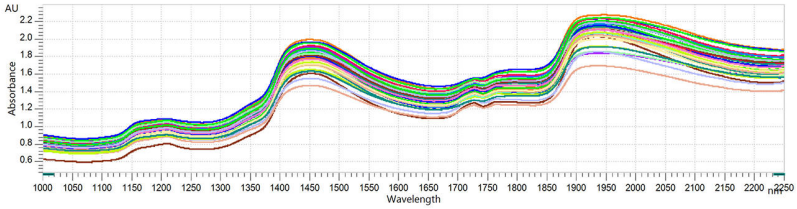


Figure 2. NIR spectra of different pickled olives measured on an OMNIS NIR Analyzer Solid.

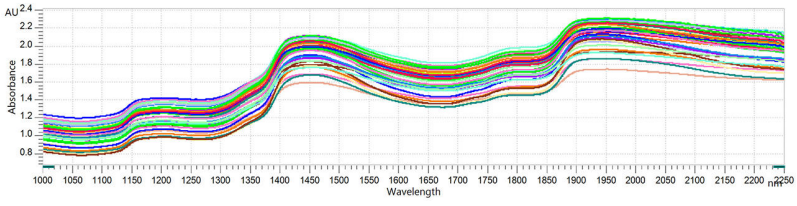
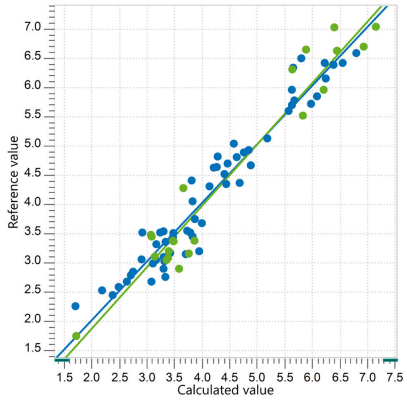


Figure 3. NIR spectra of different pickled peppers measured on an OMNIS NIR Analyzer Solid.

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.

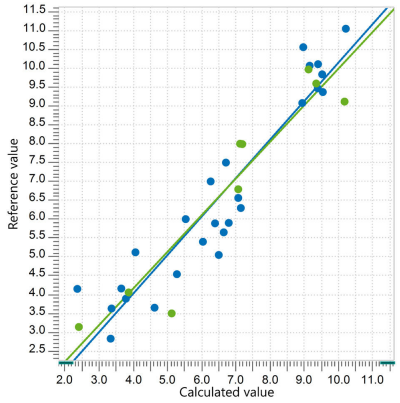


R^2P	SEC (%)	SECV (%)	SEP (%)
0.940	0.26	0.32	0.42

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

Metrohm Taiwan Ltd.
開封街二段 46 號 5 樓
108 台北市
info@metrohm.com.tw

CONFIGURATION



OMNIS NIR Analyzer Solid

用于固体物质和粘稠样品的近红外光谱仪。

OMNIS NIR Analyzer 按照瑞士质量标准开发和制造,是用于整个生产链中常规分析的近红外光谱 (NIRS) 解决方案。最新技术的应用以及与现代 OMNIS Software 的集成,体现在这款 NIR 光谱仪的速度、操作性和灵活应用上。

OMNIS NIR Analyzer Solid 的优势概览:

- 固体物质和粘稠样品测量时间小于 10 秒
- 自动多位置测量,确保即使在非均质样品中也能获得可重现的结果
- 可轻松集成至自动系统,或与其它分析技术(滴定)联用
- 支持多种样品容器



OMNIS NIR60 mm

适合小样品容器的小支架 OMNIS NIR,60 mm (6.07402.210)。

允许明确地定位样品容器和旋转样品容器。



OMNIS NIR60 mm

用于在不同样品位置处通过反射进行粉末和颗粒光谱记录的小样品容器。

玻璃底板由坚固耐用的 Gorilla® 玻璃制成。

兼容:

- 小支架 OMNIS NIR,60 mm (6.07402.200)

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