



Application Note AN-NIR-129

近外光技(NIRS)在干性物食品分析中的用

Rapid determination of moisture, protein, fat, and ash

SUMMARY

Pet food testing involves accurate monitoring and control of moisture, protein, fat, and ash content. This allows pet food manufacturers to satisfy nutritional adequacy requirements, meet regulatory guidelines, and provide high-quality foods to pet owners.

Traditional analysis methods are often slow and

labor-intensive. Near-infrared (NIR) spectroscopy provides a fast, nondestructive alternative for analyzing these key quality control parameters with minimal sample preparation. This study evaluates the use of NIR spectroscopy in the pet food industry for efficient and reliable quality control during dried pet food production.

EXPERIMENTAL EQUIPMENT

199 dried pet food samples (mainly dog and cat food) from different suppliers were analyzed in whole and ground forms on an OMNIS NIR Analyzer Solid (Figure 1). The samples were added to an OMNIS sample cup and analyzed in diffuse reflection mode. To include sample variety, the sample rotated during measurement to collect spectra from different locations. The automatically averaged spectra values were used for model development. Reference values were obtained by official methods such as ISO 6496 (moisture), ISO 5983 (protein), ISO 5984 (ash), and ISO 6492 (fat).



Figure 1. OMNIS NIR Analyzer Solid

RESULT

The obtained NIR spectra (Figure 2) were used to create prediction models for the different reference parameters. An external validation set was used to verify the predictive performance of the calculated prediction models. Correlation

diagrams, which display the relation between the NIR prediction and the reference values, are shown in Figures 3–10 together with the respective figures of merit (FOM).

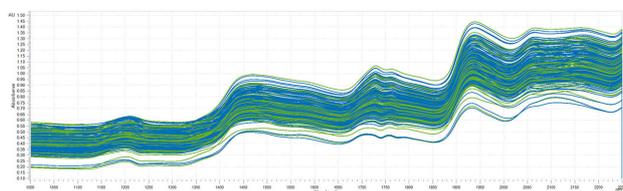


Figure 2. NIR spectra of pet food samples. Data was obtained with an OMNIS NIR Analyzer Solid. Spectra shown in blue have been used to calibrate the model, while green spectra have been used for validation.

Result moisture in dried pet food (whole)

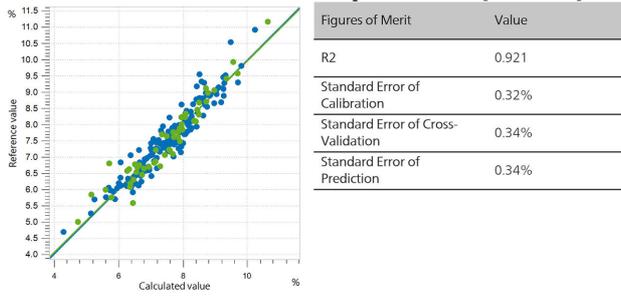


Figure 3. Correlation diagram and the respective FOMs for the prediction of moisture in dried pet food (whole) using an OMNIS NIR Analyzer Solid. Blue dots represent calibration samples, green dots represent samples used to validate the model.

Result moisture in dried pet food (ground)

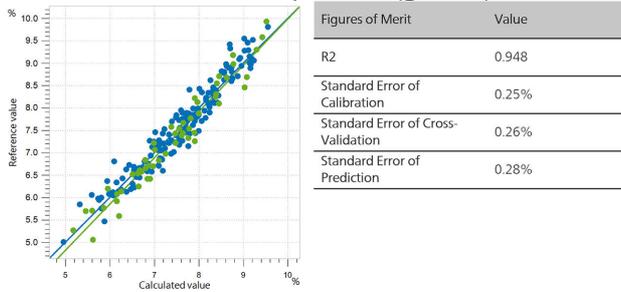


Figure 4. Correlation diagram and the respective FOMs for the prediction of moisture in dried pet food (ground) using an OMNIS NIR Analyzer Solid. Blue dots represent calibration samples, green dots represent samples used to validate the model.

Result protein in dried pet food (whole)

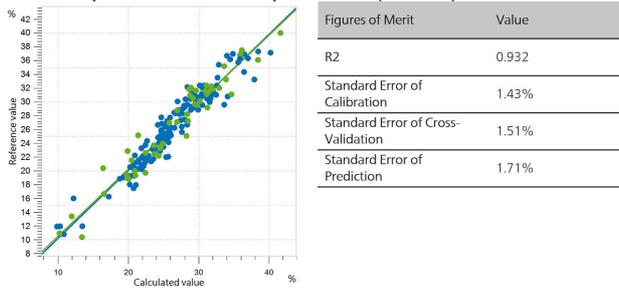


Figure 5. Correlation diagram and the respective FOMs for the prediction of protein in dried pet food (whole) using an OMNIS NIR Analyzer Solid. Blue dots represent calibration samples, green dots represent samples used to validate the model.

RESULT

Result protein in dried pet food (ground)

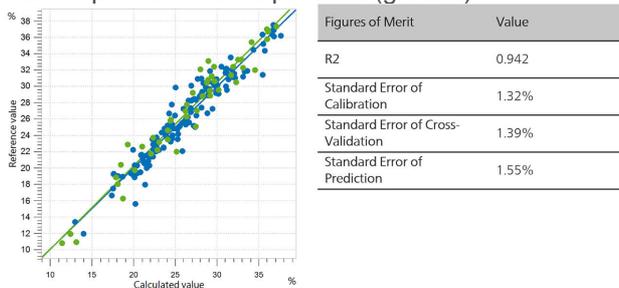


Figure 6. Correlation diagram and the respective FOMs for the prediction of protein in dried pet food (ground) using an OMNIS NIR Analyzer Solid. Blue dots represent calibration samples, green dots represent samples used to validate the model.

Result fat in dried pet food (whole)

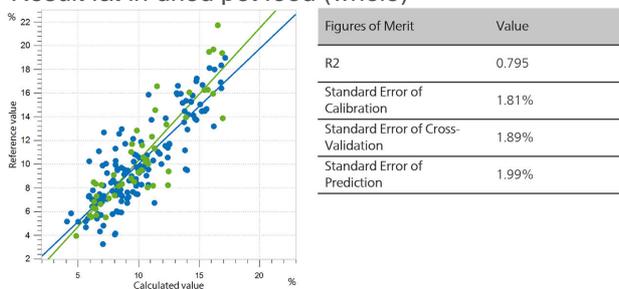


Figure 7. Correlation diagram and the respective FOMs for the prediction of fat in dried pet food (whole) using an OMNIS NIR Analyzer Solid. Blue dots represent calibration samples, green dots represent samples used to validate the model.

Result fat in dried pet food (ground)

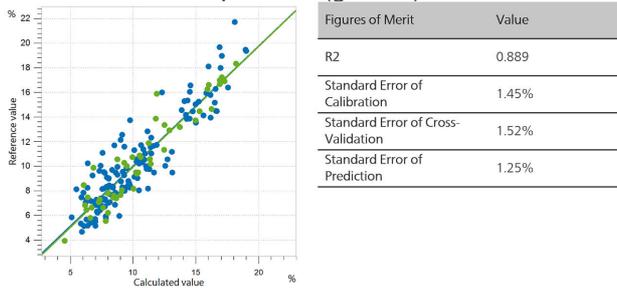


Figure 8. Correlation diagram and the respective FOMs for the prediction of fat in dried pet food (ground) using an OMNIS NIR Analyzer Solid. Blue dots represent calibration samples, green dots represent samples used to validate the model.

Result ash in dried pet food (whole)

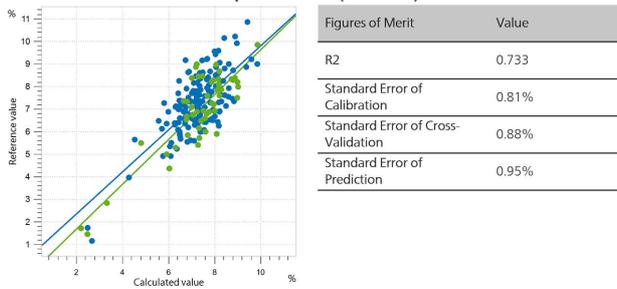


Figure 9. Correlation diagram and the respective FOMs for the prediction of ash in dried pet food (whole) using an OMNIS NIR Analyzer Solid. Blue dots represent calibration samples, green dots represent samples used to validate the model.

Result ash in dried pet food (ground)

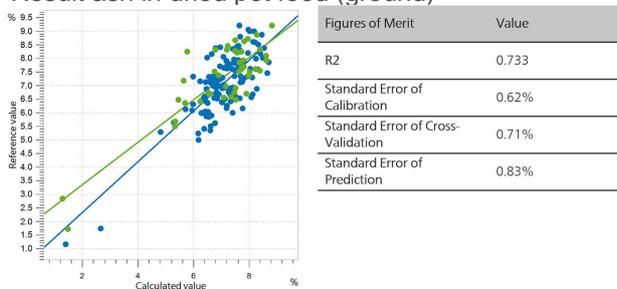


Figure 10. Correlation diagram and the respective FOMs for the prediction of ash in dried pet food (ground) using an OMNIS NIR Analyzer Solid. Blue dots represent calibration samples, green dots represent samples used to validate the model.

CONCLUSION

This Application Note demonstrates the feasibility of using NIR spectroscopy for the analysis of several pet food quality parameters, including protein, moisture, fat, and ash. Results indicate that lower prediction errors can be obtained when grinding pet food samples before their analysis. A comparison between different methods used for the analysis of

pet food clearly highlights the significant time-saving potential of NIR spectroscopy (**Table 1**).

Furthermore, the simplicity of the analysis and the availability of a pre-calibrated instrument, using the **pre-calibration, dry pet food, solid (6.06008.027)**, make both the implementation and the application of NIR spectroscopy with OMNIS NIRS straightforward.

Table 1. Overview of time effort for the analysis of different parameters in pet food by traditional methods and NIR spectroscopy.

Parameter	Standard	Process	Estimated time
Moisture	ISO 6496	Oven drying	2.5 hours
Protein	ISO 5983	Kjeldahl method	4.0 hours
Fat	ISO 6492	Soxhlet extraction	4.0 hours
Ash	ISO 5984	Incineration	4.0 hours
Moisture, protein, fat, ash	ASTM D6122	NIR spectroscopy	1.0 minute

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CONFIGURATION



OMNIS NIR Analyzer Solid 合固体和粘性品的近外光。

OMNIS NIR Analyzer 是一按照瑞士量准和生的近外光 (NIRS) 解决方案,用于整个生的常分析。使用新技和嵌入先 OMNIS Software 反在 NIR 光的速度、可操作性和活使用上。

OMNIS NIR Analyzer Solid 的点概:

- 在 10 秒以内量固体和粘性品
- 自化多位置量,即使在品不均匀,也能得可重的果
- 方便地嵌入自系,或者与其它分析技(滴定)
- 支持大量品容器



OMNIS NIR100 mm

合大品容器的大支架 OMNIS NIR,100 mm (6.07402.110)。

允明地定位品容器和旋品容器。



OMNIS NIR100 mm

用于在不同品位置通反射采集粉末和粒反射光的大品容器。

兼容:

- 大支架 OMNIS NIR,100 mm (6.07402.100)

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