Application Note AN-NIR-019

Human stool analysis by near-infrared spectroscopy

Determination of moisture, fat, and nitrogen

Several diseases like pancreatic insufficiency or hepatic disorders cause malabsorption or maldigestion. The resulting changes in stool composition (e.g., in moisture, nitrogen content, or fat content) provide important information for medical diagnostics.

Time-consuming lab methods which require a significant amount of sample preparation can be replaced by near-infrared spectroscopy (NIRS) for fast screening of human stool samples with no sample preparation. The NIRS method is easy to use – no chemicals are required and results are given for several parameters within one minute.

EXPERIMENTAL EQUIPMENT

522 human stool samples were analyzed on a Metrohm DS2500 Solid Analyzer with a modified DS2500 Holder for petri dishes (**Figure 1**). Stool samples were positioned into the petri dishes for the analysis in diffuse reflection mode. Reference values for moisture, fat, and nitrogen content were obtained with the respective primary methods.

Figure 1. DS2500 Solid Analyzer with human stool samples.

Equipment	Metrohm number
DS2500 Solid Analyzer	2.922.0010
DS2500 Holder	6.7430.040
Vision Air 2.0 Complete	6.6072.208

The obtained Vis-NIR spectra (**Figure 2**) were used to create prediction models for the different reference parameters. The data set was split into calibration and validation sets to verify the quality of the prediction models. Correlation diagrams which display the relation between the Vis-NIR prediction and the reference values are shown in **Figures 3–5** together with the respective figures of merit (FOM).

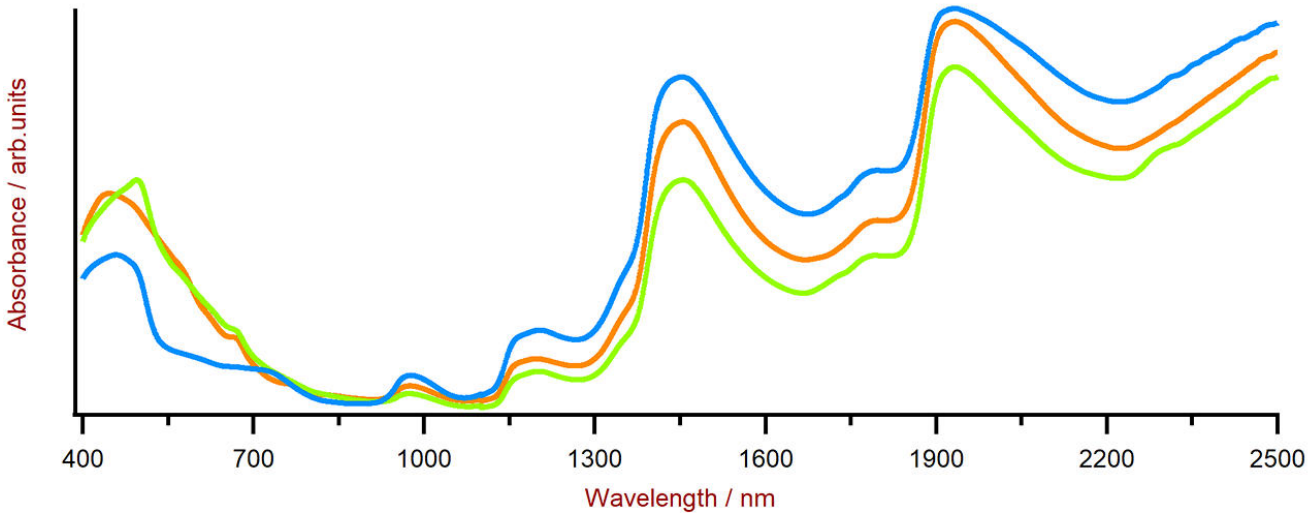
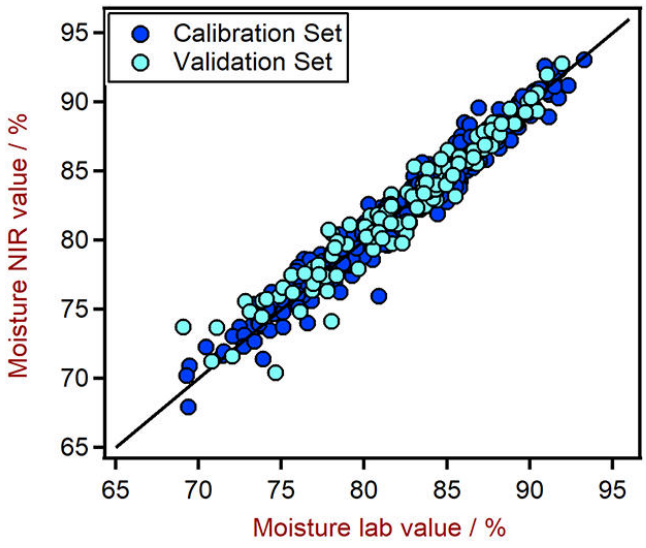


Figure 2. Selection of Vis-NIR spectra of human stool samples. Data was obtained with a DS2500 Solid Analyzer.

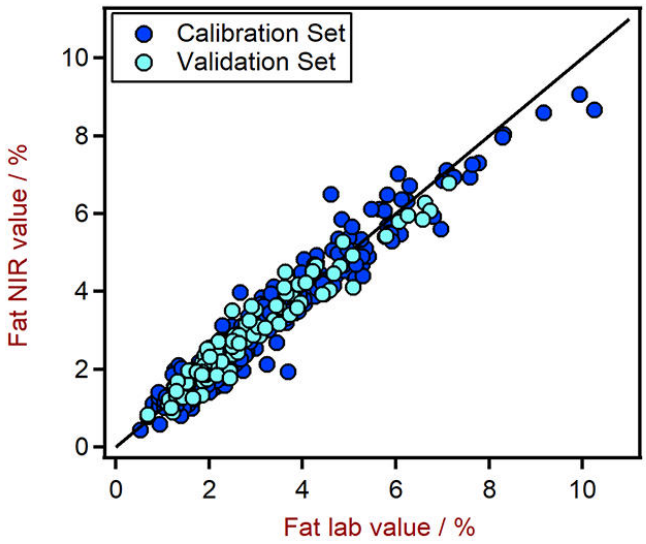
RESULT MOISTURE IN HUMAN STOOL



Figures of Merit	Value
R^2	0.962
Standard Error of Calibration	0.979%
Standard Error of Cross-Validation	1.103%
Standard Error of Prediction	1.266%

Figure 3.

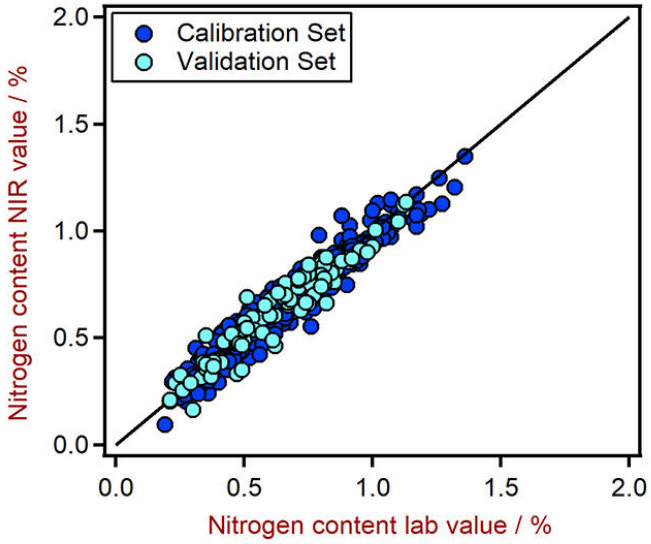
RESULT FAT IN HUMAN STOOL



Figures of Merit	Value
R^2	0.942
Standard Error of Calibration	0.3696%
Standard Error of Cross-Validation	0.3811%
Standard Error of Prediction	0.3523%

Figure 4.

RESULT NITROGEN IN HUMAN STOOL



Figures of Merit	Value
R^2	0.936
Standard Error of Calibration	0.057%
Standard Error of Cross-Validation	0.060%
Standard Error of Prediction	0.061%

Figure 5.

CONCLUSION

This Application Note shows the feasibility of NIR spectroscopy for the analysis of moisture, fat, and nitrogen content in human stool samples by NIRS, which can be conducted without chemicals or sample preparation.

CONTACT

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CONFIGURATION

DS2500 Solid Analyzer

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DS2500 , DS2500 Analyzer ,

DS2500 400 2500 nm ,DS2500 Analyzer ,

,,:,, MultiSample Cup , 9

DS2500

:

- (6.7402.030)
- DS2500 Iris (6.7425.100)

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