Application Note AN-NIR-088

Quality Control of CBD oils

Fast and easy determination of cannabinoid content

Cannabidiol (CBD) is a popular natural remedy used in many pharmaceutical, food, and cosmetic products. CBD is just one of over 100 chemical compounds found in the cannabis plant. Unlike tetrahydrocannabinol (THC), CBD is not psychoactive. This characteristic makes CBD an appealing option for those who are looking for relief from pain and other symptoms without the mind-altering effects associated with consuming marijuana or resin concentrates. CBD oil is made by extracting the compound from the plant, then diluting it with a carrier oil (e.g., coconut or hemp seed oil).

The standard HPLC method requires 45 minutes to perform by highly trained analysts. In contrast to the primary method, Vis-NIR spectroscopy is a cost-efficient and fast analytical solution for the determination of cannabinoid content in oils.

EXPERIMENTAL EQUIPMENT

17 samples of three different CBD carrier oils (hemp, fish, and MCT (medium-chain triglycerides) oil) were measured in transmission mode with a DS2500 Liquid Analyzer. The built-in temperature control was set to 40 °C to acquire reproducible spectra. For convenience, disposable vials with a path length of 8 mm were used, which made cleaning of the sample vessels unnecessary. The Metrohm software package Vision Air Complete was used for all data acquisition and prediction model development.

Figure 1. DS2500 Liquid Analyzer and a sample filled in a disposable vial.

Table 1. Hardware and software equipment overview

Equipment	Metrohm number
DS2500 Liquid Analyzer	2.929.0010
DS2500 Holder 8 mm vials	6.7492.020
Disposable vials, 8 mm	6.7402.000
Vision Air 2.0 Complete	6.6072.208

RESULTS

All 17 measured Vis-NIR spectra (Figure 2) were used to create a prediction model for quantification of the cannabinoid content. The quality of the prediction models was evaluated using cross-validation, which display a very high correlation between Vis-NIR prediction and primary method values. The respective figures of merit (FOM) display the expected performance of a prediction during routine analysis.

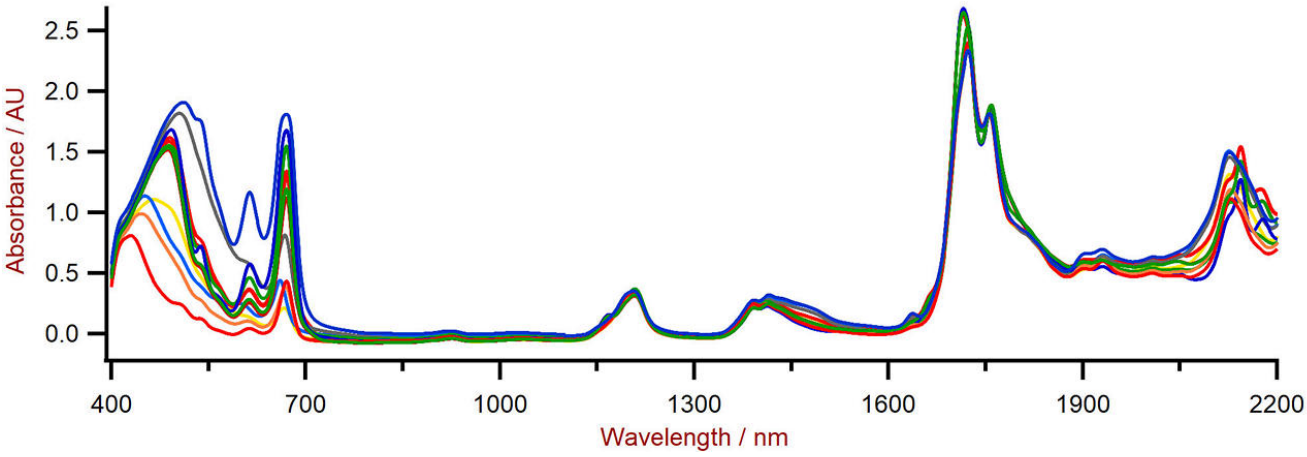

Figure 2. Vis-NIR spectra of CBD oils with varying cannabinoid content measured on a DS2500 Liquid Analyzer.

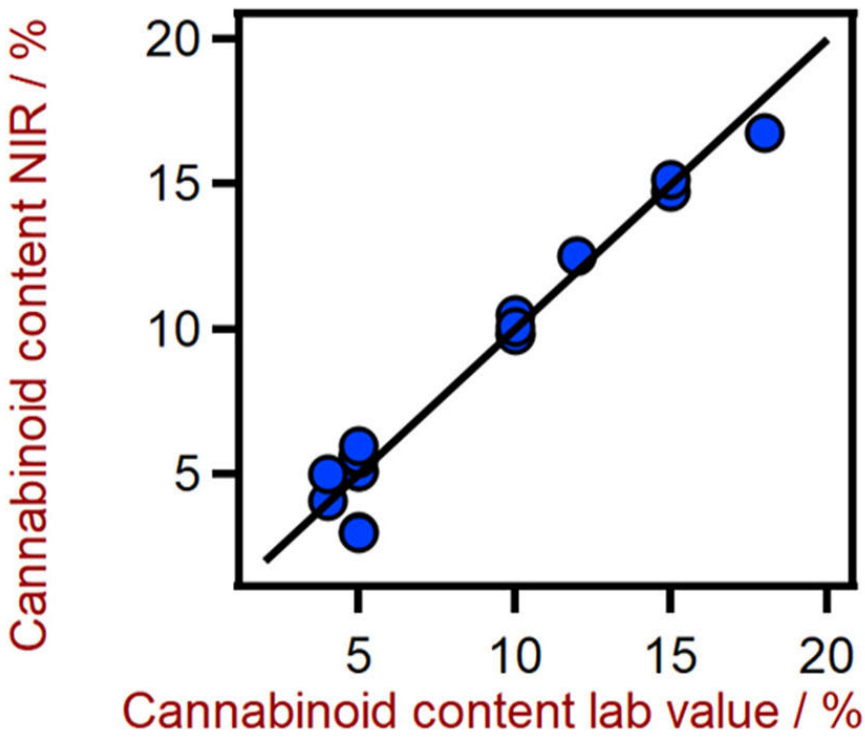

Figure 3. Correlation diagram for the prediction of cannabinoid content in CBD oils using a DS2500 Liquid Analyzer.

Table 2. Figures of merit for the prediction of cannabinoid content in CBD oils using a DS2500 Liquid Analyzer.

Figures of Merit	Value
R^2	0.959
Standard error of calibration	0.99%
Standard error of cross-validation	1.21%

CONCLUSION

This application note demonstrates the feasibility of the DS2500 Liquid Analyzer for the determination of cannabinoid content in CBD oils. In comparison to the HPLC method (Table 3), the time to result is a major advantage of NIR spectroscopy, since a single measurement is performed within one minute.

Table 3. Time to result for the cannabinoid content determination in CBD oils using HPLC method.

Parameter	Method	Time to result and workflow
Cannabinoid content	HPLC	5 min (preparation) + 40 min (HPLC)

CONTACT

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DS2500 Liquid Analyzer

Robust near-infrared spectroscopy for quality control, not only in laboratories but also in production environments.

The DS2500 Liquid Analyzer is the tried and tested, flexible solution for routine analysis of liquids along the entire production chain. Its robust design makes the DS2500 Liquid Analyzer resistant to dust, moisture and vibrations, which means that it is eminently suited for use in harsh production environments.

The DS2500 Liquid Analyzer covers the full spectral range from 400 to 2500 nm, heats samples up to 80°C and is compatible with various disposable vials and quartz cuvettes. The DS2500 Liquid Analyzer is thus adaptable to your individual sample requirements and helps you obtain accurate and reproducible results in less than one minute. The integrated sample holder detection and the self-explanatory Vision Air Software also ensure simple and safe operation by the user.

In the case of larger-sized sample quantities, productivity can be considerably increased by using a flow-through cell in combination with a Metrohm sample robot.

DS2500 Holder 8 mm vials

Intelligent holder for disposable glass vials with 8 mm diameter

Vision Air 2.0 Complete

Vision Air - Universal spectroscopy software.

Vision Air Complete is a modern and simple-to-operate software solution for use in a regulated environment.

Overview of the advantages of Vision Air:

- Individual software applications with adapted user interfaces ensure intuitive and simple operation
- Simple creation and maintenance of operating procedures
- SQL database for secure and simple data management

The Vision Air Complete version (66072208) includes all applications for quality assurance using Vis-NIR spectroscopy:

- Application for instrument and data management
- Application for method development
- Application for routine analysis

Additional Vision Air Complete solutions:

- 66072207 (Vision Air Network Complete)
- 66072209 (Vision Air Pharma Complete)
- 66072210 (Vision Air Pharma Network Complete)