



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.

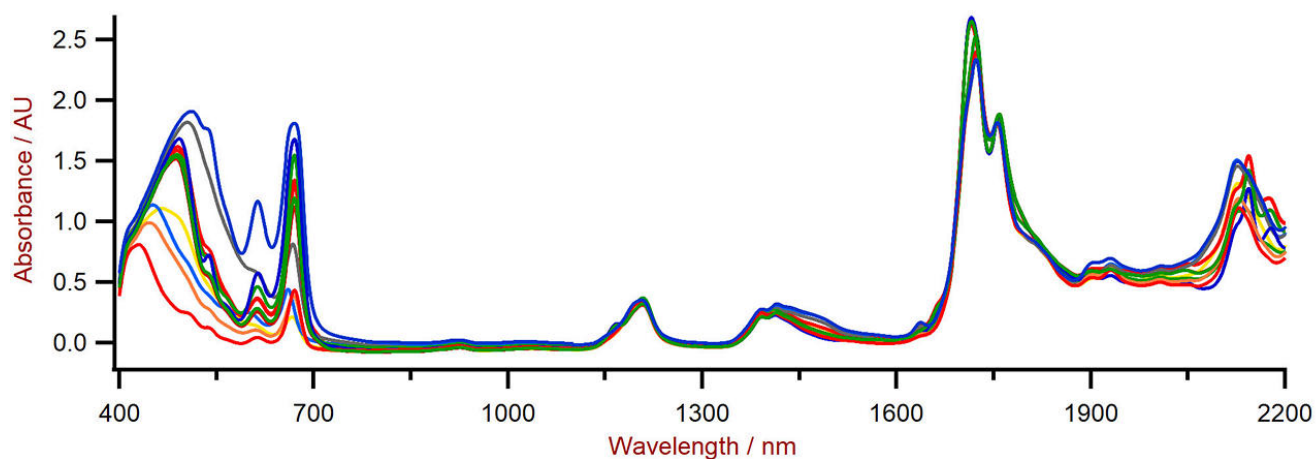
**Table 1.** Hardware and software equipment overview

| 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     |

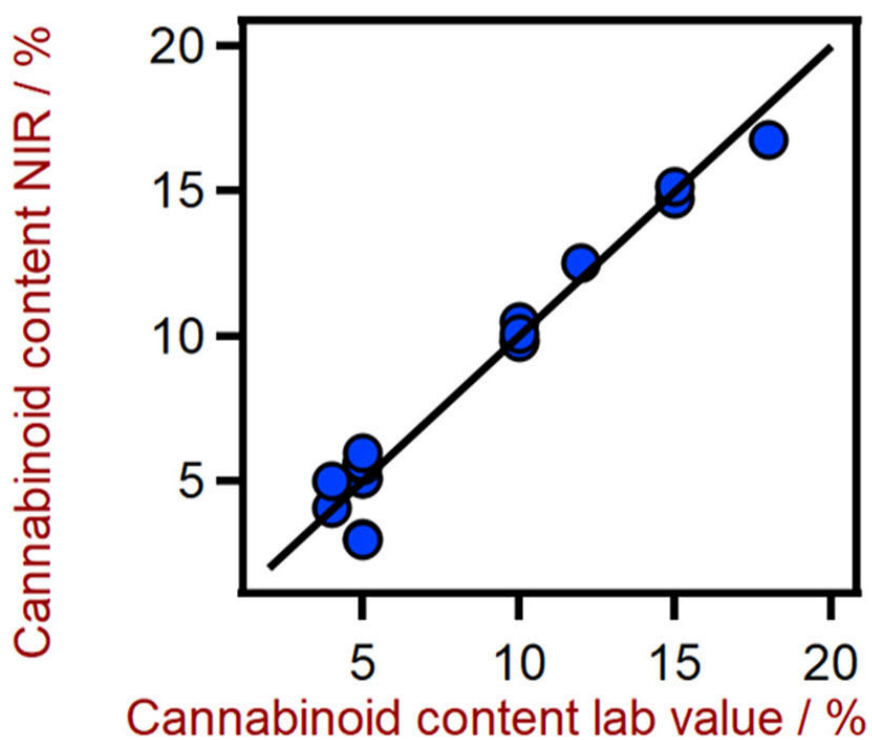
## RESULTS

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

Metrohm Portugal  
R. Frei Luis de Granada 14G  
1500-680 Lisboa

[vendas@metrohm.pt](mailto:vendas@metrohm.pt)