



SmartExtraction and Photometric Evaluation with ScanDrop² and Butterfly Cuvette for the Detection of Genetically Modified Organisms and Food Pathogens

Introduction

Quality control of food is an important topic worldwide, the importance of which will only continue to increase in the years to come. Detection of genetically modified organisms and of food pathogens plays an important role in food quality control and is carried out every day all around the world. In order to be able to detect the substance of interest, it must first be isolated and then evaluated.

The amount of available starting material can sometimes lead to challenges. Sometimes the required amount of starting material for testing, as given by various regulations, is greater than the quantity that can be handled with a standard extraction kit. In other cases, the amount of starting material is limited, and it is important to extract the maximum quantity of the target DNA possible. This is critical, as a sufficient volume is needed for the proper evaluation of the quality and concentration of the sample, then a sufficient volume is needed for the detection of the substance of interest (target DNA) and a minimum volume must also remain available as a retention sample.

Analytik Jena offers a solution by combining the novel SmartExtraction Technology [1] and the ScanDrop² spectrophotometer with the unique Butterfly Cuvette.

Challenge

Reliable and optimized DNA extraction from varying amounts of starting material, followed by fast, reliable detection and evaluation of the extracted DNA

Solution

Combination of SmartExtraction Technology with the ScanDrop² and Butterfly Cuvette for reliable DNA evaluation.

Smart Extraction makes it possible to start with a higher amount of material resulting in a higher yield of extracted DNA, as compared to standard extraction techniques. The ScanDrop² with the Butterfly Cuvette requires only micro volumes, down to 2 μL , of the extracted material to properly and reliably evaluate the concentration and purity of the extracted sample.

The Butterfly Cuvette has the additional benefit of allowing 8 samples to be measured in parallel with one reference, increasing throughput and saving time. Furthermore, the small path length of 0.5 mm makes it possible to detect high concentration of the target solution without the need for additional dilution [2]. Because no consumables are needed, further cost and time savings are possible.

Materials and Methods

Samples and Reagents

- 100 mg chicken breast, native sample (elution volume of 200 μL)
- Smart DNA prep (m) (Analytik Jena)

Instrumentation

The DNA extraction was performed with the Analytik Jena smart DNA prep (m) using SmartExtraction Technology. ScanDrop² with the FlashSoftPro² software, and the Butterfly Cuvette were used to make the photometric measurements.

- ScanDrop² Software: FlashSoft Pro², Version 1.0
- ScanDrop² parameters: Measurement position: Butterfly-Cuvette
Module Bio
Accumulation: 16
- Method: DNA purity, dsDNA concentration

Results and Discussion

The results of the photometric measurement made with the ScanDrop² and Butterfly Cuvette are shown in Table 1 and Figure 1 (Absorbance vs. Wavelength) below. The deposition of the sample to be measured onto the Butterfly Cuvette is depicted in Fig. 2.

The photometric measurements show that the extracted samples have high concentrations, with a yield of 22 μg , and with very good quality as indicated by the DNA purity value of >2.1 for all 4 samples.

The spread of values as seen in Table 1 is due to the fact that the chicken breast was a native sample, with some pieces containing smaller or greater amounts of fatty tissue. These variations influence the concentration and purity values.

Table 1: Results of the photometric measurement using ScanDrop²

Name	DNA purity	dsDNA concentration [ng/ μL]	Path length	Volume [μL]
Reference	-		0.5 mm	2
Sample 1	2.11	530.47	0.5 mm	2
Sample 2	2.10	458.53	0.5 mm	2
Sample 3	2.18	537.64	0.5 mm	2
Sample 4	2.18	590.99	0.5 mm	2

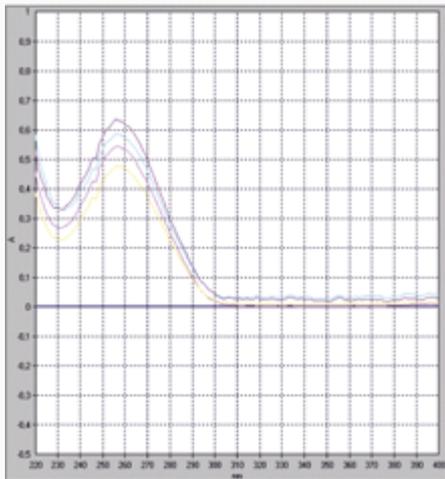


Fig. 1: Spectra of the chicken samples measured with Butterfly Cuvette (Absorbance vs Wavelength)



Fig. 2: Filling the Butterfly Cuvette

Conclusion

Analytik Jena offers a novel and unique solution for optimizing the extraction and evaluation of material required for the quality control of food. By combining the novel SmartExtraction Technology and the ScanDrop² spectrophotometer with the unique Butterfly Cuvette, the amount of starting material necessary for measurement is optimized, the amount needed for evaluation is in the micro liter range, and the necessity for additional dilution is eliminated.

The concentration measurements show that SmartExtraction Technology can offer a better alternative to common methods, such as spin filter or magnetic particles. SmartExtraction allows the user to start with a higher amount of starting material: 100 mg with the smart DNA prep (m) kit from Analytik Jena, compared with 40 mg with a standard kit.

The higher amount of starting material, which is sometimes required by various regulations, results in considerably higher DNA concentrations. In order to be able to measure these higher concentrations, according to the Lambert-Beer-Law, it is necessary to either dilute the sample, or decrease the measurement path less.

The use of the ScanDrop² with the novel Butterfly Cuvette with a path length of 0.5 mm, eliminates the need for dilution. This, combined with the fact that it is possible to measure 8 samples in parallel and that no consumables are required, makes this combination both time and cost efficient. The best choice for a routine lab.

References

- [1] Kelm, M. ; Ludwig, M.; *Plattformunabhängige Isolierung hochmolekularer Nukleinsäuren.* BIoSpectrum 2016, 05, pages 501-502
- [2] Taubert, N.; *Nanovolumen Spektrophotometer.* GIT 2017, 10, S. 55

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