

## Labrox® multimode plate reader:

# Profiling of different types of alcoholic beverages using the Labrox reader

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## Introduction

The beverage industry, namely of alcoholic drinks, creates new products at a very fast speed. At the same time, it is susceptible to the attack from counterfeiters, that would adulterate in some way these products. It is extremely important for the producers to have reliable, easy, fast and relatively inexpensive methods of checking not only their products quality but also detecting possible adulterations. There are several processes of checking beverages quality, but most of them are time consuming, requiring complicated or expensive equipment, and do not provide complete or totally reliable results (1).



**Figure 1. Sample of the vast array of alcoholic drinks available in the market.**

Alcoholic drinks fall into different types: fermented beverages, distilled spirits or spirits, fortified drinks or generous, and liqueurs and creams.

Fermented beverages are those who are achieved with a fermentation process. Among the most popular of those beverages we find wine and beer. Distilled beverages, also called spirits, have a very extensive range, and are products of the distillation of fermented juices or liquids already fermented.

Among the main spirits we find whiskey, vodka, tequila, rum, gin, brandy and cognac. Liqueurs and creams are drinks made with a combination of water, alcohol, sugar and fruits, spices or herbs. This classification is the most extensive since diversity is almost as diverse as geography is; each region or area in the world has a liqueur or cream. Each type of alcoholic drink has a specific fingerprint which can be easily determined by UV-visible absorbance measurement. Typically absorbance spectra are recorded from about 220 to 450 nanometers and a notable feature for many spirits is a broad band centered at about 280 nanometers, whose amplitude changes according to the type of spirit and brand. Over time a library of product fingerprints can be generated which can help in maintaining product quality, and detecting adulteration of the product.

In this application note, we demonstrate that the Labrox reader can determine the UV-Visible fingerprint profiles of several samples of alcoholic drinks of different types at the same time, by measuring their absorbance spectra in 96 well microplates, in a fast and precise manner.



**Figure 2. Labrox multimode plate reader.**

## Materials

- Different alcoholic beverages samples, of different categories: white wine, single malt scotch, cognac, whiskey, rum, brandy, tequila, vodka, Campari, Cointreau, Cachaça, Chinese whiskey, Chinese liqueur, etc.
- Lonza AccuGENE™ Molecular Biology Water cat. BE51200
- 96 well UV transparent plates I(Greiner bio-one, 96 well UV-Star®, F-bottom, chimney well, µClear®)
- Micropipettes and tips
- Labrox Multimode Plate Reader

## Methods

Alcoholic beverages were examined undiluted and using small volumes, which allow for very short path-lengths, an especially important criterion when studying darker colored or complex spirits and liqueurs.

The samples (100 µl/well) were placed in the appropriate wells of a 96 well plate and a full absorbance spectrum was performed and the curves registered. When needed (when the OD values were too high, being out of scale) samples were diluted in pure water. Also in these cases, smaller volumes of the samples were added to the wells (50 µl).

Instrument settings:

Wavelength Settings: Spectra

Wavelength Range: 220-1000 nm

Scan Resolution: 2 nm

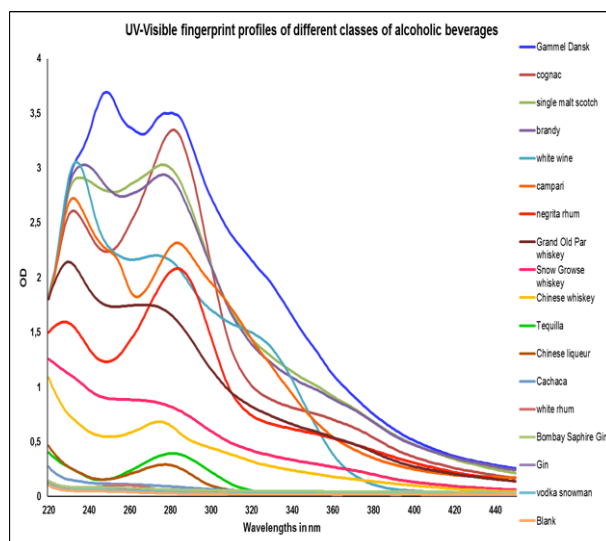
Number of flashes: 50

Results were exported to Excel and analyzed.

## Results

The typical spectral profiles for several types of alcoholic drinks are presented in Fig. 3. The measured spirits represented a wide range of alcoholic beverages from different types.

It is obvious from these results that each type of drink presents a very specific fingerprint profile. Typically drinks presented a peak at around 280 nm, with a few exceptions: the vodka Snowman, the gin and the white rum samples showed a peak at around 250-260 nm and no peak at 280 (Fig. 4). Some samples presented too high OD values when undiluted. In these cases, we diluted the samples 1:2 in pure water and also used lower sample volumes to try to get the full fingerprint profile. Results obtained with one example sample are shown in Fig. 5.



**Figure 3. UV-Visible fingerprint profiles of different types of alcoholic beverages.**

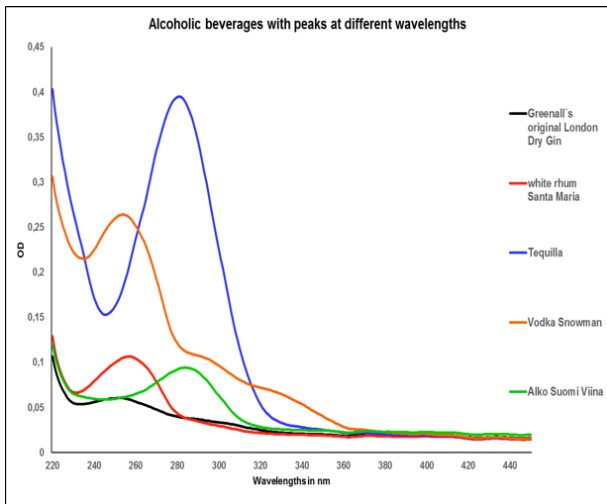


Figure 4. Samples presenting peak at a different wavelength.

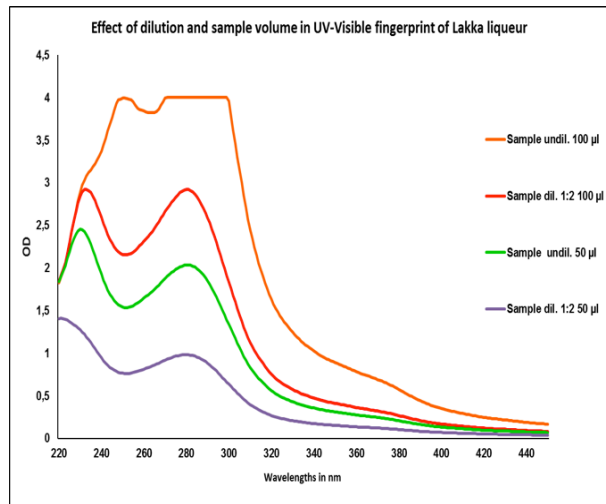


Figure 5. Effect of sample dilution and sample volume in the UV-Visible fingerprint profile of an alcoholic drink (Lakka liqueur).

## Discussion and Conclusions

UV-Visible spectroscopy is very useful in brand authentication and in detection of adulterations. We have shown in this application note the ability of the Labrox reader to accurately measure full absorbance spectra of alcoholic beverages, allowing to achieve the UV-Visible fingerprint profiles of the different drinks. The measured samples presented each a very specific fingerprint profile. The Labrox reader can handle multiple samples at the same time in the 96 wells microplates, so one can obtain data on many samples simultaneously, in a very short time. The sample volumes needed for the measurements are very small (50-100  $\mu$ l), and

samples normally do not require any preparation. However, when the pure drink presented too high OD values, we verified that either by diluting the sample in water or by decreasing the volume of the measured sample, we could obtain the full spectra and get the full fingerprint profile for those drinks.

## References

1. <http://www.alcbevtesting.com/wp-content/uploads/2009/05/Basic-Quality-Control-Testing-in-the-Craft-Distillery.pdf>



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