

SmartNotes

QA

As breweries continue to grow, the importance of beer quality becomes increasingly more significant, and basic microbiological testing is no longer enough to guarantee adequate consistency. Larger breweries who already test for beer quality are always looking for ways to simplify their testing efforts by utilizing different technology to limit the time and expense of quality testing. UV-Visible spectrophotometers are a perfect solution to help breweries meet their quality standards by offering quick, simple and affordable testing as well as the versatility to utilize a large variety of methods compared to more limited instrumentation like a colorimeter.

Beer Color

Color is one of the most important attributes of a beer. It foreshadows taste and governs consumer preference. Assuring consistency in color, aroma and taste is critical to a brand's success. Whether the color ranges from a light yellow Pilsner to a rich dark Porter, it is essential that each brew meets customer expectations.

Analyzing beer color with spectrophotometry is a simple option for assuring your beer's color and quality is consistent from bottle to bottle, batch to batch.



Figure 1: EBC and SRM color chart

Question: How do I analyze beer color using UV-Vis spectrophotometry?

Answer:

Beer color can be measured by a spectrophotometer in multiple ways. A single wavelength measurement of the absorbance at 430 nm on a turbidity-free sample can be used to obtain a color measurement in Standard Reference Method (SRM) units or European Brewing Convention (EBC) units (Figure 1). A measurement at 700 nm is used to confirm the absence of turbidity. There are limitations to this method as certain beer samples having the same color as determined by single-wavelength measurements can differ significantly in appearance.

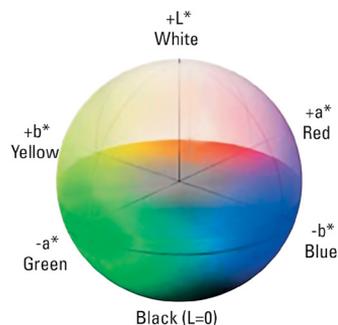


Figure 2: L*a*b* color space

Tristimulus analysis can be used as an alternative to the single wavelength method and provides a better representation of beer color in three-dimensional color space by mathematically transforming %T values measured between 380 nm and 780 nm into the color coordinates L*, a*, and b* (Figure 2).

Materials needed

Thermo Scientific™ GENESYS™ UV-Visible Spectrophotometer with BeerCraft™ Software, beer, reagent water (18Ω resistivity or greater), and 10 mm cuvettes.

Procedure

Beer color

1. Select the Beer Color method on your GENESYS UV-Vis Spectrophotometer. Choose the pathlength conversion factor of 1.27 if using 10 mm cuvettes. Enter the dilution factor of your sample (DF = 1 for undiluted samples, DF =2 for 1:1 dilution, etc.).
2. Fill a cuvette with reagent water and use it to blank the instrument.
3. Fill a cuvette with beer ensuring no air bubbles are present and select Measure to determine the absorbance (A) at 430 and 700 nm.
4. If the beer is not free of turbidity, repeat the measurement after centrifuging or filtering your beer sample.

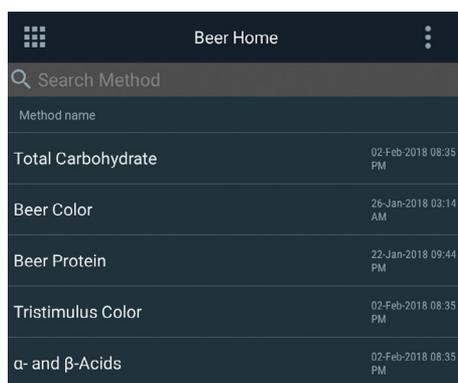
Tristimulus color

1. Decarbonate beer in an Erlenmeyer flask by shaking until gas no longer escapes.
2. Select the Tristimulus Color method on your GENESYS Spectrophotometer.
3. Fill a cuvette with reagent water and use it to blank the instrument.
4. Fill a cuvette with degassed beer and select Measure to determine L*, a*, b* values.



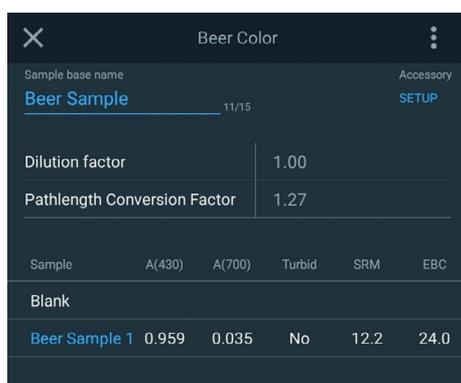
Thermo Scientific™ GENESYS™
150 UV-Vis Spectrophotometer

Easily measure beer color:



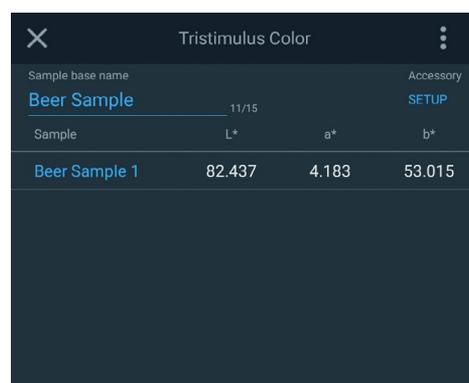
1

In the GENESYS instrument, open the BeerCraft software methods



2

Use the Beer Color method to obtain color measurements in SRM or EBC units



3

Use the Tristimulus Color method to obtain L*, a* and b* color values.

Results

The absorbance of the beer sample at 430 nm and 700 nm measured 0.959 and 0.035 respectively. The sample was turbidity free. The calculations determined that the beer color was 12.2 SRM or 24.0 EBC. The Tristimulus Color method resulted in color coordinates of L*=82.437, a* =4.183, and b*=53.015.

References

1. ASBC Methods of Analysis, online. Beer 10. Spectrophotometric Color Method Approved 1958, rev. 2015. American Society of Brewing Chemists, St. Paul, MN, U.S.A.: 10.1094/ASBCMethod-Beer10
2. ASBC Methods of Analysis, online. Beer 10. Tristimulus Analysis Approved 2002, rev. 2015. American Society of Brewing Chemists, St. Paul, MN, U.S.A.: 10.1094/ASBCMethod-Beer10



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