

Coconut water is a multi-billion dollar industry that is expected to expand globally to US\$8.3 billion by 2022.¹ [Consumers have been drawn to coconut water's sweet, refreshing taste and unique chemical composition, similar to blood plasma, which is rich in carbohydrates and important nutrients such as magnesium, calcium, and phosphorus. 1 These nutrients also make coconut water a naturally rehydrating sports drink which has increased market appeal. Fresh coconut water from young, green coconuts is particularly valued for a delicate taste and increased antioxidant benefits.](#)

When first poured from the coconut shell, coconut water is a clear, colorless liquid that can be combined with the interior pulp for additional texture and variety. Color changes can occur in harvesting, cracking, sterilization, and storage processes so the final beverage can fluctuate from translucent white to pale yellow and even bright pink.¹ [Products can also include varying levels of pulp in the liquid depending on geographical region, harvesting practices, pasteurization, and market targeting, such as coconut beverages which are sold with pulp.](#)

Sold coconut water's final product is a combination of the color and pulp concentration, or turbidity of the water. With so many different variables, it can be challenging to maintain a consistent product. However, Hunter Spectrophotometric technology, with innovations in color and haze measurements, can offer innovative solutions for measuring both color and haze in a single reading of coconut water for consistent, reliable production. The Haze measurement can be substituted for a turbidity measurement done on a separate instrument.

DIFFICULTIES OF CONSISTENT COLOR AND HAZE IN COCONUT WATER

When your customer picks up a cooled bottle of coconut water from the store refrigerator, what they see through the plastic is a combination of color, usually light white to pale yellow, and pulp concentration. Strolling down the beverage aisle, there are many different brands of coconut water, each with a reliable, consistent appearance to build brand trust with their customer. But from shell to bottle to store, a consistent appearance isn't so simple, as multiple variables, including chemical properties, harvesting and storage methods, and product differences, influence the final product.

These difficulties begin with the coconut. Since coconut water has a high pH, varying from 5 – 5.4, it is subject to rapid deterioration and fermentation once exposed to oxygen.¹ [Young coconut water, which is harvested one month earlier than mature coconuts, has a lower pH but higher phenolic content, as well as greater polyphenol oxidase \(PPO\) and peroxidase \(POD\) enzyme activity. The increased phenol content raises antioxidant levels and health benefits, but higher PPO and POD also raises the water's susceptibility to oxidation.1 Within minutes of first cracking, yellow, amber, brown, or even pink discoloration can bloom across the harvested water's surface.](#)

To keep the water from spoiling early, whole nuts are gently harvested and stored for up to six days till extraction inside the plant. But new challenges arise with processing. During cracking and harvesting, coconut water can become cloudy from the accidental shell and coconut meat debris, or by adding pulp for a pulped coconut beverage. Once harvested, coconut water must quickly be sterilized and bottled which can also cause changes in the coloring. To prevent this, conventional thermal techniques, as well as cooling, freezing, or adding stabilizing juices such as pineapple, are quickly used to prevent further discoloration.² [In spite of these prevention methods, if the storage space is not properly temperature controlled, then discoloration can occur in storage and transportation to the store.](#)

With all these different variables, the challenges of delivering a consistent coconut beverage can seem high. Consistency and reliability however, are the cornerstone of branding in a saturated market. It is also [distinctly important to have a consistent color and haze for naturally harvested products to develop consumer trust.](#)

MEASURING COLOR AND HAZE IN COCONUT WATER

From harvesting, sterilization, production, and storage, different colors and concentrations of pulp can compose the final coconut water product depending on the batch. To accurately gather the appearance of your coconut water batches for crafting a consistent final product, both color and pulp concentration need to be measured. Using a Turbidimeter is often used in liquids to measure pulp concentration, but with coconut

water, different batches can have different levels of turbidity. These varying levels can interfere with an accurate, consistent color reading.⁴

Haze% measurement is a method that can be used to accurately measure coconut water pulp. Haze% is a proven method to measure light scattering from a translucent liquid, rather than reflectance. Haze% measurement is calculated from the pulp concentration in coconut water, or the particles visible by the human eye, which also captures the clarity of the sample as clarity increases as pulp decreases. This is ideal for coconut water measurement as it allows you to gauge a product based on what your customer actually sees.

Haze% can also be correlated to color, as the color that a customer sees on the shelf is a combination of the color of the liquid and the pulp concentration. Calculating Haze% and correlating to color measurement had reproducible appearance results, which means that a correlation between the two can be established for a consistent brand color-haze standard across different batches. Haze%, and its capacity to measure for optimal visual appeal is an innovative measurement for the most important visual factors in coconut water production.

VISTA: A NEW STANDARD FOR MEASURING COCONUT WATER

HunterLab's Vista is a revolutionary transmission color and haze spectrophotometer uniquely suited for the challenges of measuring coconut water. Vista is designed for the simultaneous measurement of color and haze of transparent liquid and solid sample for valuable correlation insight. Vista's unique design allows or scientifically reproducible results that can be used to help eliminate any variables in coconut water harvesting, production, and sterilization, creating a new industry standard for excellence.

As an advanced transmission spectrophotometer, Vista can measure a variety of sample sizes from standard 1cm x 1cm cuvettes to 10cm by 10cm cells. Vista's EasyMatch Essentials software for Vista includes virtually every transmission color, haze scale, and index available, including the [APHA/Pt-Co-Hazen Color Scale, the Gardner Color Scale, Haze %, Opalescence, Y Total Transmission, CIE Spectral Data, and all 3 Major Pharmacopoeias – US, EU, and Japanese. With storage capacity for thousands of readings and all major color and haze measurements, Vista can be used for a dual color-haze standard for your coconut water brand, a notable advantage for standing out in growing markets.](#)

Full article with photos available here:

<https://www.hunterlab.com/blog/benchttop/consistent-measuring-of-coconut-water-color-and-haze/>