



The color of nuts can be an important indicator of taste and quality. Image Source: Pexels user Tookapic

Nuts have served as an important food source across the world for thousands of years. While the consumption of wild nuts is believed to have been common in a number of ancient cultures, nuts were also “one of the earliest cultivated foods,” playing an important part in the move toward agricultural societies and serving as a stable nutrient source for early civilizations.<sup>1</sup> In some cultures, the value of nuts was so great that they came to be regarded as sacred symbols and spiritual nourishment.

Today, it can be easy to forget the critical historical and cultural roles nuts have played. However, they still serve as a desirable food source due to their delicious taste and nutritional value, making them attractive to both health-conscious consumers and those craving a treat. In fact, the popularity of some nuts, particularly almonds, is growing due to the spread of vegetarianism and veganism as well as changing perceptions of the healthiness of fat.<sup>2</sup>

But while nuts are widely sought after, producers must take steps to ensure the best taste, quality, and visual appeal in order to attract and keep customers. This requires rigorous quality control protocols that can detect undesirable raw materials and incorrect processing, particularly in roasted and cooked nuts. Spectrophotometric color measurement plays an essential role in the implementation of such quality control measures, providing operators with the critical information necessary to create the best possible products.



Spectrophotometric color measurement at appropriate processing points is critical to obtaining meaningful color data. Image Source: Unsplash user Annie Spratt

#### How and When to Measure the Color of Roasted and Cooked Nuts

The color of nuts can be an important indicator of taste, quality, and correctness of processing. However, visual assessment of color is not sufficient for reliable evaluation. Instead, spectrophotometers are necessary to produce reliable, objective color data that can be used to determine conformation to color standards. But nut color is not necessarily meaningful or efficient at all stages of processing. As such, [integrating spectrophotometric instrumentation](#) at the most critical points of processing will yield the best results. Let's take a look at the appropriateness of color measurement at various stages of processing:

- **Before cleaning:** Color measurement at this stage is not particularly useful, due to the impact of a variety of external factors with no effect on the quality of the nut.
- **After cleaning:** Color measurement may yield more meaningful data at this point because shell discoloration could potentially indicate compromised quality. However, color data may not reliably correlate with quality, making color measurement of limited use.

- **After blanching:** Depending on the specific product and use of byproducts, the color impact of blanching may or may not be valuable to assess.
- **After roasting:** Measuring the color of nuts after roasting is an invaluable part of the quality control process, as color data will provide important information about correctness of processing. For example, unwanted color variation can indicate improper roasting temperature or roasting time, allowing operators to take corrective action. Color analysis after roasting is also critical to optimizing sensory appeal, including taste and overall appearance.
- **After flavoring and coating:** Color should always be measured after the addition of flavorings and coatings to ensure adherence to visual standards. The color of flavorings and coatings themselves may also be measured prior to application to determine quality and prevent costly errors.

In addition to spectrophotometric color measurement, some researchers are also experimenting with using spectral data to create [optical sorting systems of raw nuts](#). However, such systems are not yet in widespread use.



On-line spectrophotometers like HunterLab's SpectraTrend HT provide continuous color monitoring for the highest level of quality control. Image Source: Shutterstock user kuvona

#### Selecting the Right Spectrophotometer

While the timing of spectrophotometric color measurement matters, so too does the specific spectrophotometer used to perform such color measurement. In order to obtain meaningful data, you must choose a high-quality instrument that comes with [advanced color measurement software](#) that will allow you to easily capture, analyze, share, and store color information. You must also choose a spectrophotometric format appropriate for your needs.

[Portable](#) and [benchtop](#) spectrophotometers may be used to perform spot checks or time interval-based QC assessment. Both formats can be useful for nut manufacturers and provide important insight into nut quality, provided that the spectrophotometer is equipped with appropriate technologies. Instruments that are designed to accommodate irregular samples, have rapid sampling capabilities, and offer an appropriate sample area view will ensure the most efficient and accurate color measurements.

While portable and benchtop spectrophotometers can play valuable roles in the QC process, on-line spectrophotometers, like HunterLab's [SpectraTrend HT](#), take color quality control to the next level by offering continuous, real-time color monitoring at critical points of processing, such as after roasting. With extraordinary color measurement accuracy and [integrated height measurement](#) to accommodate irregular and textured samples, the SpectraTrend HT can instantly detect unwanted color variation. This allows operators to quickly quarantine products and evaluate process variables to identify the cause of the variation and take corrective action. [This means that](#) "plant operating costs can ultimately be reduced and overall product quality can be improved." Additionally, "on-line measurements can result in reduced laboratory labor and material sampling costs as the laboratory quality control function can be reduced to less frequent color auditing and final color approval." As a result, you are not only better able to improve process correctness and consistency, but realize meaningful gains in processing efficiency.

#### HunterLab Innovation

HunterLab has been a pioneer in spectrophotometric color measurement for over 60 years. Today, we offer a comprehensive lineup of [portable, benchtop, and on-line instruments](#) designed to meet the needs of our customers. Our technologies provide innovative and reliable solutions to color measurement challenges, allowing you to implement robust quality control protocols that enhance your products and your processes. [Contact us](#) to learn more about our renowned spectrophotometers, customizable software packages, and world-class customer support services.

1. "The History of Nuts", [http://www.nutcrackermuseum.com/history\\_nuts.htm](http://www.nutcrackermuseum.com/history_nuts.htm)
2. "The Rise of the American Almond Craze is One Nutty Chart", August 6, 2014, [https://www.washingtonpost.com/news/wonk/wp/2014/08/06/the-rise-of-the-american-almond-craze-in-one-nutty-chart/?utm\\_term=.f666bdec087a](https://www.washingtonpost.com/news/wonk/wp/2014/08/06/the-rise-of-the-american-almond-craze-in-one-nutty-chart/?utm_term=.f666bdec087a)