# COLOR MUSE COLORIMETER AS AN ALTERNATIVE METHOD FOR MEASURING COLOR IN MEAT

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## I. OBJECTIVES

Among all the visual qualities of meat, color is often described as the most important factor influencing meat purchasing decisions. Color is used by consumers as the first indicator of product freshness and wholesomeness. Thus, it is important to have the ability to objectively measure color in order to understand a consumer's threshold for acceptance of meat products. However, purchasing a reliable colorimeter may be a challenge for some researchers and processors due to the high cost. Therefore, an alternative product that is cost-effective, accurate, and precise would benefit both researchers and industry workers who are interested in measuring meat color. The Color Muse (Variable, Inc., Chattanooga, TN; illuminant $D_{65}$, aperture size 4 mm, observer angle 0°) colorimeter is a small, cost-effective, handheld device that is coupled with a smartphone and can measure a variety of color space models such as CIE *L*a*b**, sRGB, and XYZ. However, the use of Color Muse in the food industry has not yet been explored, as it was originally designed for matching color in paint, textiles, flooring, and home décor products. Therefore, the aim of this study was to understand the efficacy of Color Muse in color measurements on various meat products. We hypothesized that Color Muse measurements of CIE *L**, *a**, *b** values would be reproducible and similar to other colorimeters specialized for meat color evaluation.

## II. MATERIALS AND METHODS

In this study, we compared color measurements between Color Muse and a Minolta Chroma Meter CR-400 (Minolta, Inc., Ramsey, NJ; illuminant $D_{65}$, aperture size 8 mm, observer angle 2°). CIE *L**, *a**, and *b** measurements were collected on a variety of retail purchased meats, including chicken breasts, beef sirloin, top round steaks, pork loin chops, and salmon ($n = 4$ per sample). In order to evaluate the reproducibility of these measurements, coefficients of variation for each measurement were also compared between instruments. Collected data were analyzed using a Student *t* test and considered significant at $P \leq 0.05$.

## III. RESULTS

Our results showed no significant differences in *L** values for salmon and chicken breasts, while measured *L** values for beef sirloin steaks and beef top round steaks were 8.3% and 14.3% higher ($P < 0.05$), respectively, when using the CR-400 compared to Color Muse. On the other hand, pork loin chop *L** values measured with Color Muse were 7.2% higher ($P < 0.05$) than CR-400 measurement. *a** values measured using Color Muse were 28.5%, 139%, 9%, 25.1%, and 60% higher ($P < 0.05$) in salmon, chicken breast, beef sirloin, round steaks, and pork loin chops, respectively. Similarly, *b** values measured by Color Muse were 14.8%, 104%, 20.6%, and 78.1% higher ($P < 0.05$) in salmon, chicken breasts, beef round steaks, and pork loin chops, respectively, with no difference in sirloin steaks. For both colorimeters, coefficients of variation were <5% across all measurements.

## IV. CONCLUSION

Although the Color Muse colorimeter generally measured higher *a** and *b** values—which may be due to differences in illuminant, aperture size, and observation angle between both instruments—the results indicate high reproducibility. Thus, it suggests that Color Muse could be an alternative colorimeter for researchers and industry workers, especially when comparing meat samples from the same species.

Keywords: color, color muse, colorimeter