EVALUATION OF FRESH PORK COLOR USING A MINOLTA SPECTROPHOTOMETER, NIX SENSORS, AND SUBJECTIVE SCORING

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I. OBJECTIVES

The objective of the study was to explore the feasibility of using more affordable and portable Nix sensors (Nix Pro II, Nix QC; Nix Sensor Ltd., Ontario, Canada) to measure pork color in comparison with using the Minolta spectrophotometer (Chroma Meter CM-700D Minolta Canada Inc., Ontario, Canada) with common and different combinations of illuminant and observer angle.

II. MATERIALS AND METHODS

Color coordinates from 140 center-loin chops of 5-cm thickness and ham sections were collected in 4 muscles (*longissimus*, *biceps femoris*, *psoas major*, and *rectus femoris*) using 2 sensors of each Nix model (D_{65} illuminant; 10° observer angle; 14 and 15 mm aperture for Nix Pro II and Nix QC, respectively) and 2 Minolta spectrophotometers (C illuminant; 2° observer angle; 8 mm aperture). Another set of 240 center-loin chops of 5-cm thickness (120 commercially classified as poor color and 120 as premium color) were used to compare the Nix sensors (D_{65}; 10°) and Minolta spectrophotometers (D_{65}; 10°). Eight measurements were collected in each muscle. The CIE color space was used with L^* (lightness), a^* (redness), and b^* (yellowness) values. Color of 140 loin and ham samples was also scored using the Japanese subjective color standard. Data were analyzed with PROC CORR and PROC REG of SAS version 9.4 (SAS Institute Inc., Cary, NC) to generate Pearson correlation coefficients and coefficients of determination.

III. RESULTS

Typical settings for Minolta spectrophotometers in meat quality studies are C or D_{65} illuminants and 2° or 10° observer angle. Nix sensors do not offer the illuminant C option, so the D_{65} illuminant and 10° observer angle would be the typical setting in meat quality studies. When the C illuminant and 2° observer angle setting was used for the Minolta and the D_{65} illuminant and 10° observer angle was used for the Nix sensors, a correlation coefficient of 0.7 was observed for L^* and b^* values between the Nix Pro II and QC with the Minolta. For the average a^* value, both Nix sensors presented a strong correlation ($|r| > 0.8$) with the Minolta. When using Minolta L^* and Minolta a^* as dependent variables, regression analysis showed that the Nix Pro II and QC presented a coefficient of determination (R^2) equal to 0.7. When instrumental measurements were compared to subjective scoring, both Nix sensors had slightly stronger correlation ($|r| = 0.8$) for L^* compared with the correlation ($|r| = 0.7$) between Minolta L^* and the subjective standards. Minolta and Nix QC had the same correlation ($|r| = 0.7$) between a^* value and the subjective standard, which was lower than the correlation ($|r| = 0.8$) between Nix Pro II a^* and the subjective standard. For b^* value, Nix Pro II showed the highest correlation ($|r| = 0.7$) with the subjective standard. When both the Minolta and the Nix sensors were used with the D_{65} illuminant and 10° observer angle setting, the results showed that Nix sensors had a strong correlation ($|r| > 0.8$) with the Minolta for all coordinates. When using Minolta a^*

as the dependent variable, regression analysis showed that the Nix Pro II and the Nix QC presented a coefficient of determination (R^2) equal to 0.8.

IV. CONCLUSION

The present study showed the potential of using Nix series sensors (Pro II and QC) to assess fresh pork color. Further data analysis should include evaluations of precision and repeatability. The small size and low price of the Nix devices can lead to the development of automated systems for online pork evaluation.

Keywords: Nix, Minolta, pork color, and CIE coordinates