Meat and Muscle Biology™

Evaluation of Variability of Instruments Used in Pork Loin Quality Assessments

K. Barkley[1]*, D. McKenna[2], H. Rode[2], A. Dilger[1], and D. Boler[1]

[1]Animal Science, University of Illinois, Urbana, IL, USA
[2]Tyson Fresh Meats, Tyson, Dakota Dunes, SD, USA
*Corresponding author. Email: kaylaeb2@illinois.edu (K. Barkley)

Objectives

It has been historically proven that when measuring instrumental color, the magnitude of the color value will differ between instruments types, (i.e., HunterLab and Minolta). However, it is not known whether variability of readings within machine differs between machine type when measuring instrumental color or pH. It is also not known if pH or color values from one machine can be used to predict values from a second machine. The objectives were to (1) evaluate the effect of machine on the variability of instrumental color and pH measurements of boneless pork loins and (2) determine if color or pH measurements from one machine type can be used to predict measurements from a second machine type.

Materials and Methods

Two different sets (n_1 = 253 and n_2 = 294, respectively) of loins from a commercial processing facility were measured for instrumental color analysis. Loins were evaluated on the ventral face at the approximate location of the 10th rib at 22 h postmortem. Instrumental color was measured using a Minolta CR-400 Chroma meter equipped with a D65 illuminant, 2° observer, 8mm aperture, and calibrated with a white tile specific to the machine, but the first set were measured with an open aperture while the second used a closed aperture. The HunterLab was equipped with a 10° observer, 25 mm port and calibrated with a black and white tile specific to the machine for both sets. Ultimate pH was measured on three additional sets of loins (n_1 = 249, n_2 = 170, and n_3 = 285 for each group, respectively) using two separate pH meters. Color and pH data were analyzed using the MIXED procedure of SAS as a 1-way ANOVA with two levels (Minolta and Hunter for color, Meter A and Meter B for pH). Variances for each treatment were calculated using the means procedure and tested for homogeneity using the Levene's test of the GLM procedure. Means and variances were considered different at $P \leq 0.05$. Coefficients of determination (R^2) were calculated using the REG procedure between Hunter and Minolta readings and between pH meters.

Results

Redness, Chroma and hue angle had greater variability ($P < 0.01$) when measured using the open aperture Minolta than HunterLab, while only chroma (P = 0.04) and hue angle ($P < 0.01$) had greater variability when using the closed aperture Minolta compared with the HunterLab. Variability of other traits did not differ between machines. For each set of loins, pH variability was greater for meter B than meter A. R^2 values between the HunterLab and open aperture Minolta were 0.42 for lightness, 0.41 for redness, 0.27 for yellowness, 0.28 for saturation, and 0.18 for hue angle. R^2 values between the HunterLab and closed aperture Minolta were 0.42 for lightness, 0.42 for redness, 0.33 for yellowness, 0.24 for saturation, and 0.04 for hue angle. Meter A was able to predict between 17–21% of variation in Meter B.

Conclusion

Overall, variability was generally not different between color machines, while pH meters had different variabilities between machines and on days of measurement. Neither color instruments nor pH meters were able to predict values from other instruments of different types well enough for practical use.