INCREASED INTERNAL TEMPERATURE IN HEAVY BEEF CARCASSES INFLUENCES PRODUCT QUALITY

S. Egolf[1*], A. Egolf[1], H. Rode[2], L. Hite[1], C. Bakker[1], A. Blair[1], K. Underwood[1], and J. Grubbs[1],

[1]*Animal Science Department, South Dakota State University, Brookings, SD, USA*,

[2]*Tyson Fresh Meat, Tyson Fresh Meat, Dakota Dunes, SD, USA*,

*samantha.egolf@jacks.sdstate.edu

I. OBJECTIVES

Increases in beef hot carcass weights (HCW) the last 30 y in the United States may negatively impact beef quality by slowing carcass chilling. The objectives of this study were to assess the impact of HCW on (1) internal carcass temperature of the chuck, loin, and round in USDA Select (Se) and Low Choice (LC) carcasses and (2) ultimate pH (pH_u), objective color (CIE *L**, *a**, *b**), sarcomere length, Warner-Bratzler shear force, cook loss, and protein degradation of the *serratus ventralis* (SV), *longissimus lumborum* (LL), and *semitendinosus* (ST) from Se and LC carcasses.

II. MATERIALS AND METHODS

Carcasses ($n = 116$) were selected by weight (light [LW] = 295.5–341 kg; middle [MW] = 386.4–431.8 kg; heavy [HW] = 465.9–522.7 kg), and data loggers were placed in the muscle portion of the deep chuck (20.32 cm), loin (10.16 cm), and round (20.32 cm) to record internal temperature for 26 h. Carcass and temperature data were collected following 26 h of chilling, and USDA Se and LC carcasses were selected for fabrication following chilling. Samples from each subprimal were aged for 5, 10, and 14 d for Warner-Bratzler shear force, cook loss, and protein degradation, and 5 d for sarcomere length. Data were analyzed using PROC MIXED in SAS (version 9.4; SAS Institute Inc., Cary, NC) with HCW and Quality Grade as main effects, 12th rib backfat as a covariate, and cooler location and collection day as random effects. A significance level of $\alpha = 0.05$ was used.

III. RESULTS

A QG × HCW interaction was observed for loin and round temperatures ($P < 0.04$). During chilling, Se LW had the lowest temperatures and Se and LC HW had the highest temperatures in both subprimals. At 26 h, Se and LC HW carcasses were highest and Se LW were lowest in the round. No differences were detected in the loin between weight groups at 26 h. Temperature in the chuck was higher for HW throughout chilling and at 26 h. No differences were observed between weight groups for pH_u ($P > 0.05$); however, LC SV had an increased pH_u ($P = 0.01$) compared to Se SV. Increased *L** and *a** values were observed for HW carcasses compared to LW in all muscles ($P < 0.001$). A QG × HCW interaction was observed for sarcomere length in the LL ($P = 0.03$), with LC LW having shorter sarcomeres than Se LW and LC MW. The sarcomere length of the ST was influenced by HCW ($P < 0.01$), with HW having the shortest sarcomeres. Sarcomere length in the SV was not influenced by HCW. Tenderness of steaks from the SV and ST were not impacted by QG or HCW. Tenderness tended to increase in MW and HW in the LL ($P = 0.08$). Increased tenderness was observed in HW LL at 5 d of aging ($P < 0.04$), but no differences were observed at 10 and 14 d ($P > 0.05$). Cook loss was influenced by aging day ($P < 0.03$), but not HCW or QG ($P > 0.05$). A QG × HCW interaction was observed for the 55 kDa desmin product in the LL ($P = 0.04$) and 30 kDa troponin-T product in the SV ($P < 0.01$). Decreased desmin degradation was observed in Se LW LL at 5 d ($P < 0.02$), and increased troponin-T degradation was observed in LC HW at 5 d

in the SV ($P < 0.02$). No differences in proteolysis were observed at 10 and 14 d of aging across the muscles.

IV. CONCLUSION

Heavier carcasses had increased temperatures at the end of the 26-h chilling period in the chuck and round, which may influence product quality. The HW carcasses had brighter, redder muscles, and tenderness was improved at earlier aging times; however, the underlying mechanisms explaining the relationship of HCW with Se and LC beef quality grades require further exploration.

Keywords: beef, beef quality, hot carcass weight, temperature decline