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Understanding the Quality of Atypical Dark Cutting Beef from Heifers and Steers

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Objectives

Studies have indicated that dark cutting beef with pH > 6.0 has glucidic potential lower than normal beef but can be as or more tender. Dark cutting beef with pH < 6.0 has glucidic potential approaching that of normal beef but increased toughness whereas the latter can also be linked to cattle gender. The objective of this study was to investigate relationships between beef quality, pH and glucidic potential of normal (Canada AA) and dark cutting (Canada B4) heifer and steer carcasses.

Materials and Methods

Beef rib (*longissimus thoracis,* LT) muscles from Canada B4 (n = 40) and AA (n = 24) heifer and steer carcasses were collected, in 2 batches, from a commercial beef abattoir after grading. Within 96 h post-mortem, each LT was measured for pH and subsampled for glucidic potential and sarcomere length while the remainder was cut into equal halves (anterior and posterior) that were packaged under vacuum and randomly assigned to aging for 7 or 21 d at 4°C. Canada B4 muscles were sorted into atypical (pH < 5.9, AB4, n = 20) or typical (pH > 5.9, TB4, n = 20) and after aging, muscles were assessed for color (L*, a*, b*; Commission Internationale de L'Eclairage), drip loss, cooking loss, Warner-Bratzler shear force (WBSF), and crude fat and protein. Statistical analyses were performed using the Statistical Analysis System (SAS Inst. Inc., Cary, NC) Version 9.3. The glucidic, sarcomere and carcass data were analyzed using the MIXED procedure where animal gender, grade and their interaction served as fixed effects while batch was random. Ante-mortem lairage time, post-mortem sampling time, hot carcass weight, rib-eye area and fat depth were individually tested as covariates for glucidic analysis. Beef quality data were analyzed as a split-plot, where gender and grade were tested in the main plot and aging in the sub-plot.

Results

Results indicated that reduced lactate and glucidic potential were accompanied by increased pH and reduced L*, a*, and b* values. Mean LT glucidic potential was lowest (P < 0.0001) for TB4, but the mean values for AB4 were theoretically sufficient to attain normal beef pH. Grades and gender interaction approached significance (P = 0.056) for mean residual glycogen concentration, which was lowest for TB4 LT from both genders while heifer AB4 had mean values similar to AA. In contrast to AA and TB4, the pH for AB4 continued falling during aging, implying a slow glycolysis in AB4. Gender had no effect on WBSF (P = 0.18); however, mean WBSF of AB4, unlike that of TB4, remained higher than that of AA muscles even after 21 d aging. Sarcomere length was not different (P = 0.37) between the grades, and was unrelated (r = –0.20, P = 0.102) to WBSF. Mean LT crude fat was greatest (P = 0.003) for AB4 while treatments were not different for mean carcass rib-eye area (P = 0.35) or fat depth (P = 0.93).

Conclusion

Results confirmed AB4 as the toughest LT within the Canada B4 dark cutting grade irrespective of carcass gender and phenotype, substantiating the significant financial penalty applied to dark cutting carcasses.