



Optimization and Commercial Implementation of Freeze/Age Process to Improve Beef Tenderness

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Keywords: aging, beef, freezing, purge loss, tenderness
Meat and Muscle Biology 1(2):66

doi:10.221751/rmc2016.062

Objectives

The effects of freezing/thawing/aging beef steaks can enhance tenderness over postmortem aging alone. The objective of this study was to evaluate the effects of freezing/thawing and various days of postmortem (DPM) aging on beef strip loins and evaluate if this practice could be implemented in a commercial setting to improve tenderness.

Materials and Methods

USDA Select carcasses ($n = 60$) derived from cattle of Angus phenotype (USDA, 1996) that were not predicted tender by VBG2000LED beef carcass grading camera were selected from a commercial beef packing plant. Paired strip loins were collected from each carcass, vacuum packaged and randomly assigned to one of two treatments, Frozen/Thawed/Aged (FRAGE) or a fresh never-frozen control. FRAGE treatment strip loins were frozen at 2 DPM using a blast freezer at -39 to -40°C for 2 h. After freezing strip loins were thawed the following day in water at 4 to 5°C for 2 h then placed on aging racks a 5°C to finish thawing. Carcasses (i.e., paired strip loins) were assigned randomly to either 9, 16, or 23 DPM. Purge loss was determined for each strip loin prior to cutting. After strip loins were aged for the appropriate time, strip loins were cut into 2.5 cm steaks and assigned to various evaluations based on position, including SSF (position 1 to 3), simulated retail display color stability evaluation (position 4), and simulated retail display purge loss evaluation (positions 5–8). The 4 steaks for purge loss evaluation were assigned to display day (1, 4, 7, or 11 d) using a randomized block. Data were analyzed using the GLIMMIX procedures of SAS (Version 9.3; SAS Inst. Inc., Cary, NC) as a split-split plot design. Postmortem ag-

ing (DPM) was the whole plot with treatment (freezing) as the sub plot, display day (when applicable) as the sub-sub plot and their interactions were considered fixed effects. Carcass was considered a random effect.

Results

Steaks from FRAGE strip loins were more tender ($P < 0.01$) than steaks from the control group regardless of postmortem aging (13.1 vs. 15.4 kg). Postmortem aging also influenced SSF values ($P < 0.01$) regardless of freezing treatment. SSF values were similar for strip loins aged 16 DPM (13.1 kg) and 23 DPM (13.7 kg); however, both DPM had lower SSF values ($P < 0.01$) when compared to strip loins aged 9 DPM (15.9 kg). The two-way interaction between treatment and aging was observed ($P < 0.01$) for strip loin purge loss. The least amount of purge loss came from control strip loins regardless of aging time (0.79 vs. 2.52%), FRAGE strip loins aged 9 DPM were intermediate, while FRAGE strip loins aged 16 or 23 DPM had the greatest amount of purge loss ($P < 0.01$). Three different two-way interactions were observed ($P < 0.01$) when evaluating steak purge loss (DPM \times Treatment, DPM \times Display Day, and Treatment \times Display Day). The three-way interactions were not significant ($P = 0.79$). FRAGE steaks produced a greater amount ($P < 0.01$) of purge loss when compared to fresh steaks regardless of display day or aging time (3.50 vs. 1.96%).

Conclusion

The FRAGE process improves tenderness of beef subprimals but also increases the amount of purge from these cuts. Further research is needed to find a way to limit the water loss while still capitalizing on the tenderness benefits. This project was funded, in part, by The Beef Checkoff.