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Heat Mitigation Strategies for Finishing Beef Cattle During the Summer in the Southeastern United States Reduces Heat Load and Improves Weight Gain, but does not Influence Meat Quality

W. M. Sims[1]*, R. W. McKee[1], M. Rigdon[1], J. R. Segers[2], L. Stewart[1], C. Thomas[1], and A. M. Stelzleni[1]

[1]Animal and Dairy Science, University of Georgia, Athens, GA, USA
[2]Animal and Dairy Science, University of Georgia, Tifton, GA, USA
*Corresponding author. Email: wms79439@uga.edu (W. M. Sims)

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Objectives

The objective of this research was to determine the effect of heat mitigation strategies on meat quality when finishing cattle under heat stress conditions.

Materials and Methods

Forty-five Angus crossbred steers (446 ± 23 kg) were blocked by weight and randomly assigned to 1 of 3 finishing environments: shaded with fan (CWF), shaded without fan (CNF), or outside no shade (OUT). For 92 d steers were individually fed a corn-based total mixed ration and were weighed every 3 wk. Environmental monitors (Kestrel Instruments) were used to quantify heat load index (HLI) and accumulated heat load units (AHLU). When the first treatment group averaged 613 kg all steers were harvested. Carcass quality and yield data were collected 24 h postmortem. Strip loins were removed from the right side of each carcass at 24 h postmortem, vacuum packaged, and aged (2 ± 1°C) for 5 d. Strip loins were then fabricated into 2.54-cm steaks anterior to posterior. The first steak was designated for proximate analysis, followed by two steaks for slice shear force (14 and 21 d aging), two steaks for other analyses, and the remaining 7 steaks were randomly assigned to shelf life (SL) for 6 d following 28 d of wet aging. Steaks were vacuum packaged and held (2 ± 1°C) for their respective days of aging. After 28 d, shelf life steaks were opened, placed in Styrofoam trays with PVC overwrap, and placed in retail display cases (1 ± 2°C). Steaks were frozen (–20°C) once they reached their assigned day of wet aging or simulated shelf life. Objective color L* (lightness), a* (redness), b* (yellowness), and isobestic wavelengths were recorded daily (± 2 h). Hue, chroma, DE, and deoxymyoglobin (%Dmb), oxymyoglobin (%Omb), and metmyoglobin (%Mmb) were calculated. Data were analyzed using a mixed model (JMP v.13; SAS) and means were separated using LSmeans at $a = 0.05$.

Results

Environmental monitors showed that CWF and CNF had lower HLI and AHLU ($P < 0.01$) than OUT. Final weights were greater for CWF than OUT ($P = 0.02$) while CNF was similar ($P \geq 0.17$) to both. Similar results were observed for hot carcass weights where CWF > OUT ($P = 0.03$), and CNF was similar to both ($P \geq 0.23$). Treatment differences were not observed for USDA yield grade ($P = 0.38$), dressing percent ($P = 0.93$), kidney pelvic heart fat ($P = 0.89$), ribeye area ($P = 0.47$), backfat thickness ($P = 0.49$), marbling score ($P = 0.71$), overall maturity ($P = 0.92$), or subjective lean color ($P = 0.16$). No differences in fat color scores were observed between CNF and OUT ($P = 0.95$) while CWF were whiter ($P \leq 0.04$) than both. Protein analysis showed CWF had more protein than OUT ($P = 0.01$) while CNF was similar to both ($P \geq 0.90$). No differences were observed for lipid content ($P = 0.99$), ash ($P = 0.39$), or moisture ($P = 0.92$). Treatment nor day of aging effected slice shear force ($P = 0.45$ and $P = 0.53$, respectively). While treatment differences were not observed for a*, b*, hue, chroma and DE ($P = 0.51$, $P = 0.65$, $P = 0.18$ $P = 0.57$, and $P = 0.57$, respectively). Treatment values for L* were lighter for CNF than CWF ($P = 0.04$), while OUT was similar to both ($P \geq 0.14$). There were no differences for %Dmb, %Omb, and %Mmb ($P = 0.24$, $P = 0.32$, and $P = 0.39$, respectively) among the treatments.

Conclusion

Results indicate that heat stress mitigation is a viable method to improve weight, however, does not impact the quality of the meat.