Heat mitigation strategies for finishing beef cattle during the summer in the southeastern U.S. reduces heat load and improves weight gain, but does not influence meat quality

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TAP TO RETURN TO KIOSK MENU

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Introduction

- Heat stress from late spring to early summer is a significant problem in the SE U.S.
- SE stocker and feeder cattle historically discounted $10-$20/Cwt
- High environmental temperatures coupled with high relative humidity, solar radiation, and low wind speeds can decrease performance of feedlot animals
- Prolonged heat stress may lead to dark cutting beef
- Summer heat has been a major issue for the efficiency of cattle

Objective

- Quantify the effects of long-term heat stress
- Evaluate the effects environmental stress factors have on animal performance, meat and carcass quality, yield, shelf life, and composition

Methods

- 45 crossbred Angus steers were blocked by weight (446±23 kg) in June and assigned to one of three treatments: covered with fan (CWF), covered no fan (CNF), and outside with no shade or fan (OUT)
- Steers slaughtered in September
- Carcass data collected 24 hours postmortem
- Strip loins fabricated for proximate analysis, slice shear force (14 and 21 d aging), and shelf life following 28 d of wet aging
- A colorimeter was used to measure L*a*b* and calculate isobestic wavelengths for %Dmb, %Omb, and %Mmb
- Data analyzed as a Mixed Model using JMP (V13; SAS Inst.)

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Results

Environmental Factors

- CWF and CNF had lower HLI and AHLU (*P*<0.01) than OUT
- Panting scores were different between all three treatments for AM and PM (*P*<0.01)

Interactive: Panting Score 3.5

Growth Factors (Figure 1)

- G:F was similar (*P*=0.22) between CWF and CNF which were greater (*P*<0.01) than OUT
- Final weights were greater for CWF than OUT (*P*=0.02), while CNF was similar (*P*≥0.17) to both

Carcass Yield and Quality (Table 1)

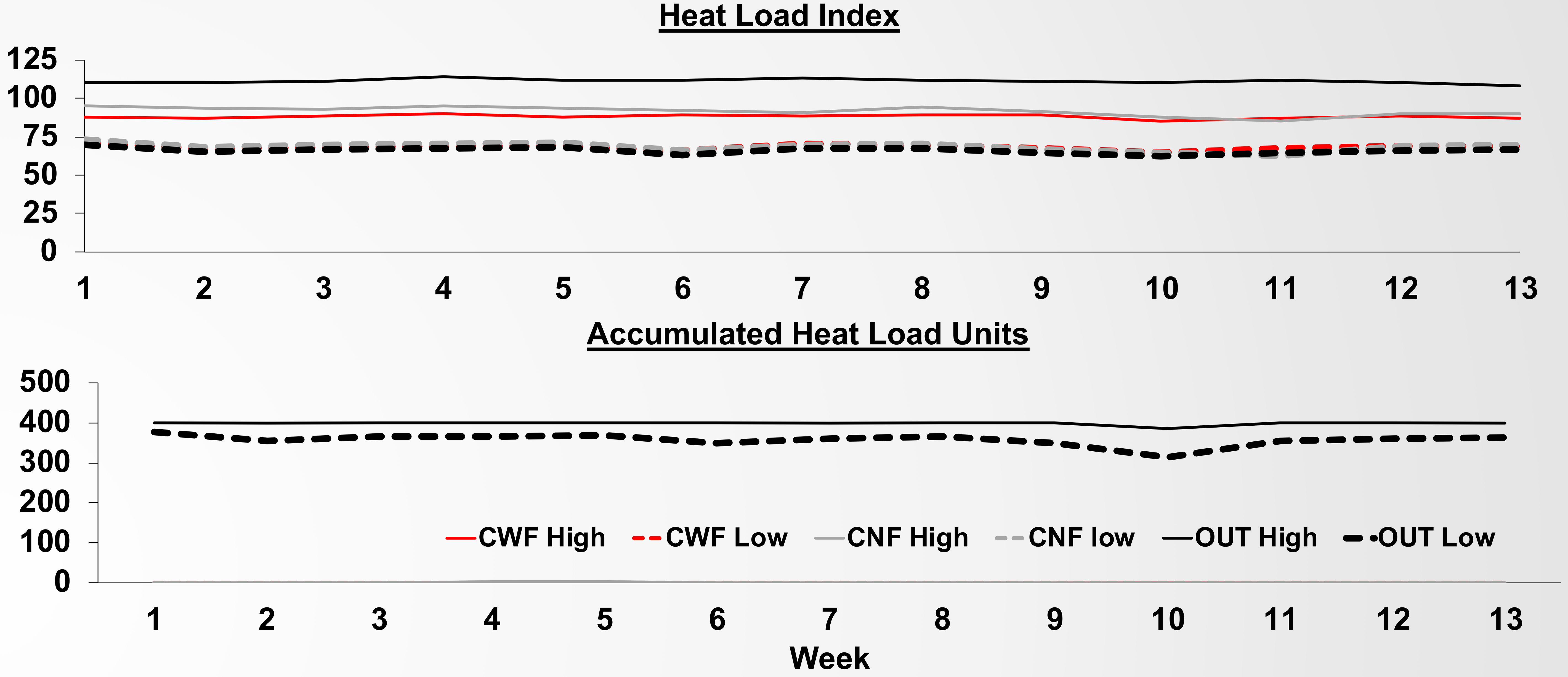
- Treatment differences were not observed for USDA yield grade or quality grade (*P*=0.83, and *P*=0.44)

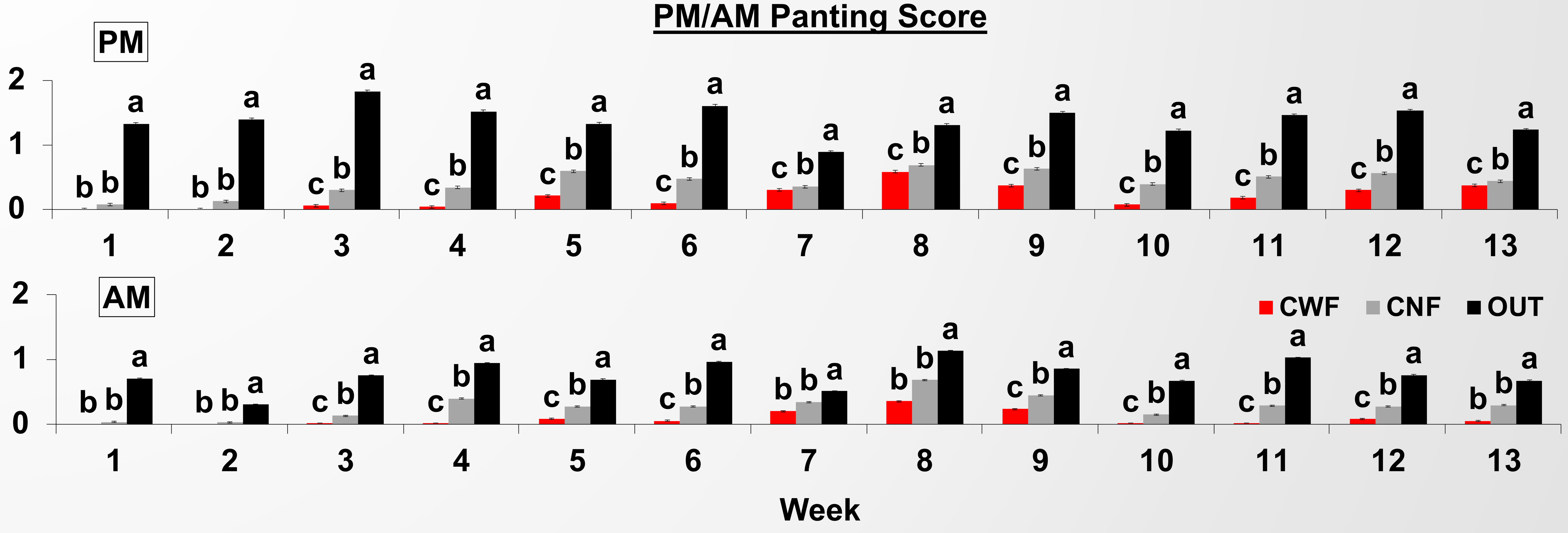
Tenderness and Color (Figure 2)

- Slice shear was not affected by treatment (*P*=0.45) or day of aging (*P*=0.53). Differences in thaw loss were observed between CWF and OUT (*P*=0.02) and CNF was similar (*P*≥0.05) to both. (Table 2)
- Treatment differences were not observed for a*, b*, hue, and chroma (*P*=0.51, *P*=0.65, *P*=0.18, *P*=0.57, and *P*=0.57, respectively). L* values for CNF were lighter than CWF (*P*=0.04), and OUT was similar (*P*≥0.14) to both
- No differences for %Dmb, %Omb, and %Mmb (*P*=0.24, *P*=0.32, and *P*=0.39, respectively)

Composition

- CWF had more protein than OUT (*P*=0.01), while CNF was similar (*P*≥0.90) to both
- No differences were observed for lipid (*P*=0.99), ash (*P*=0.39), or moisture (*P*=0.92)





Conclusions

- Steers finished under cover were more efficient than steers finished in open dry-lots.
- The addition of cooling fans further improved steer gains (ADG)
- Although quality and yield values were not significant, feed efficiency would have delayed the market weight for CNF and OUT steers by 5 to 20 days respectively.

Meat Science and Technology Center
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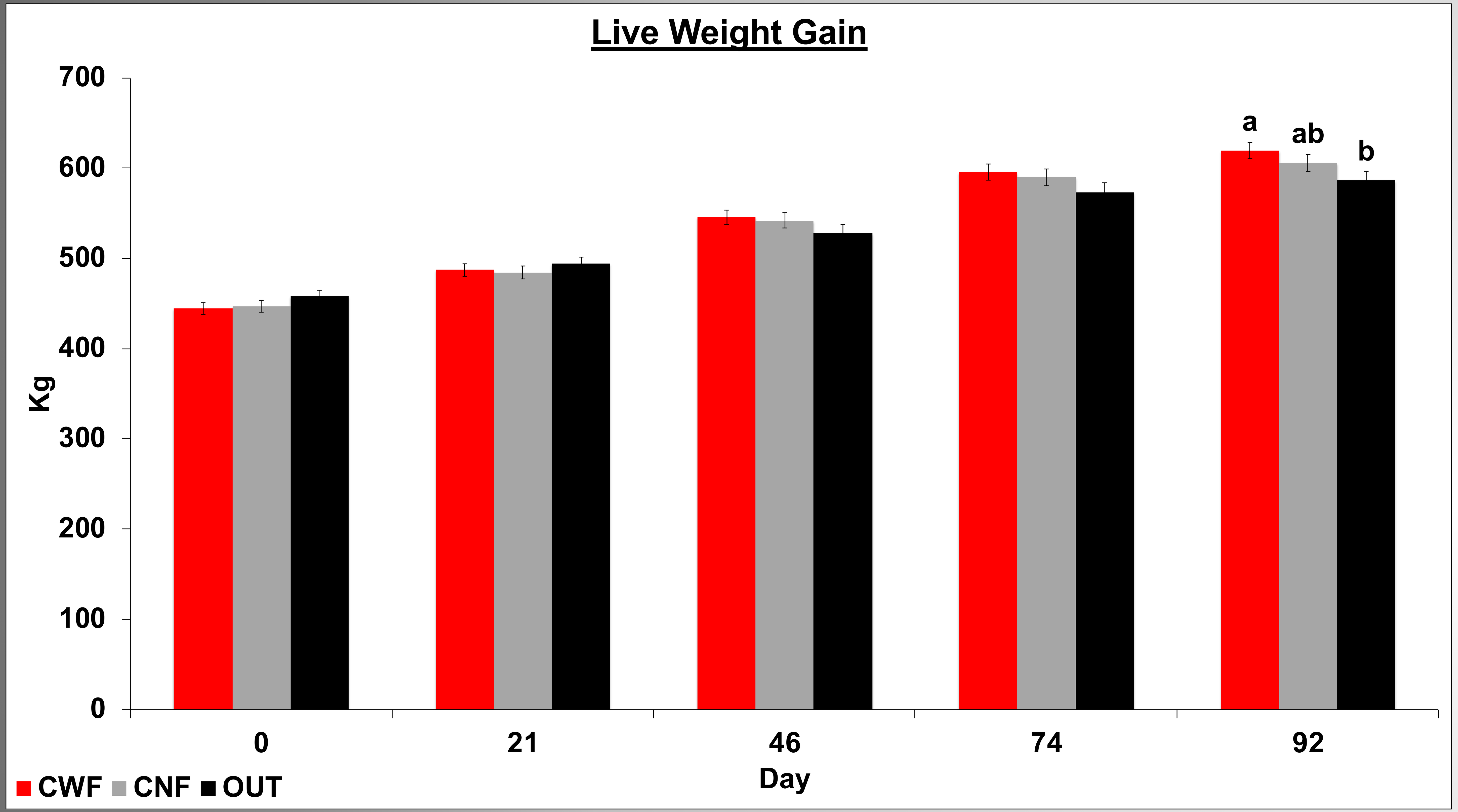

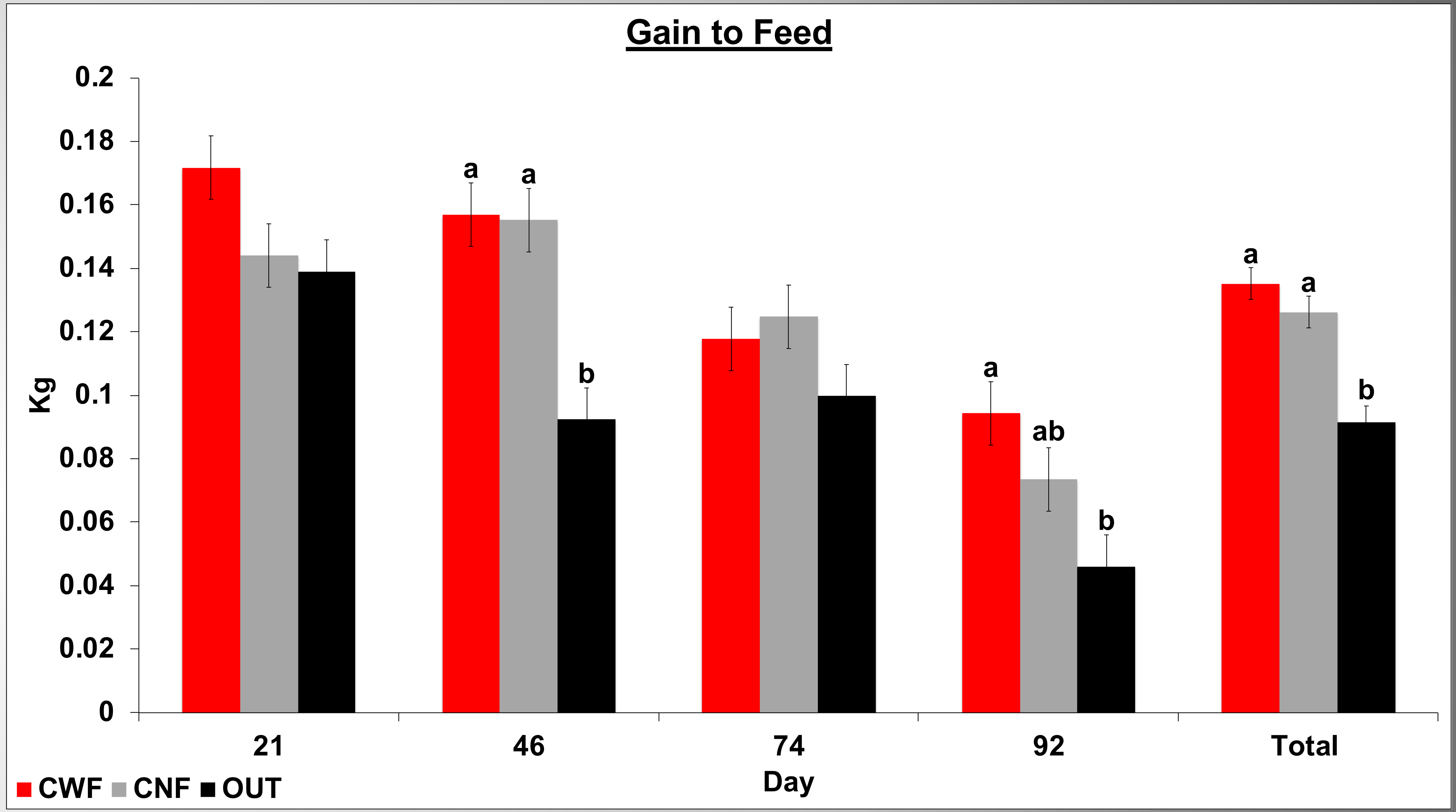

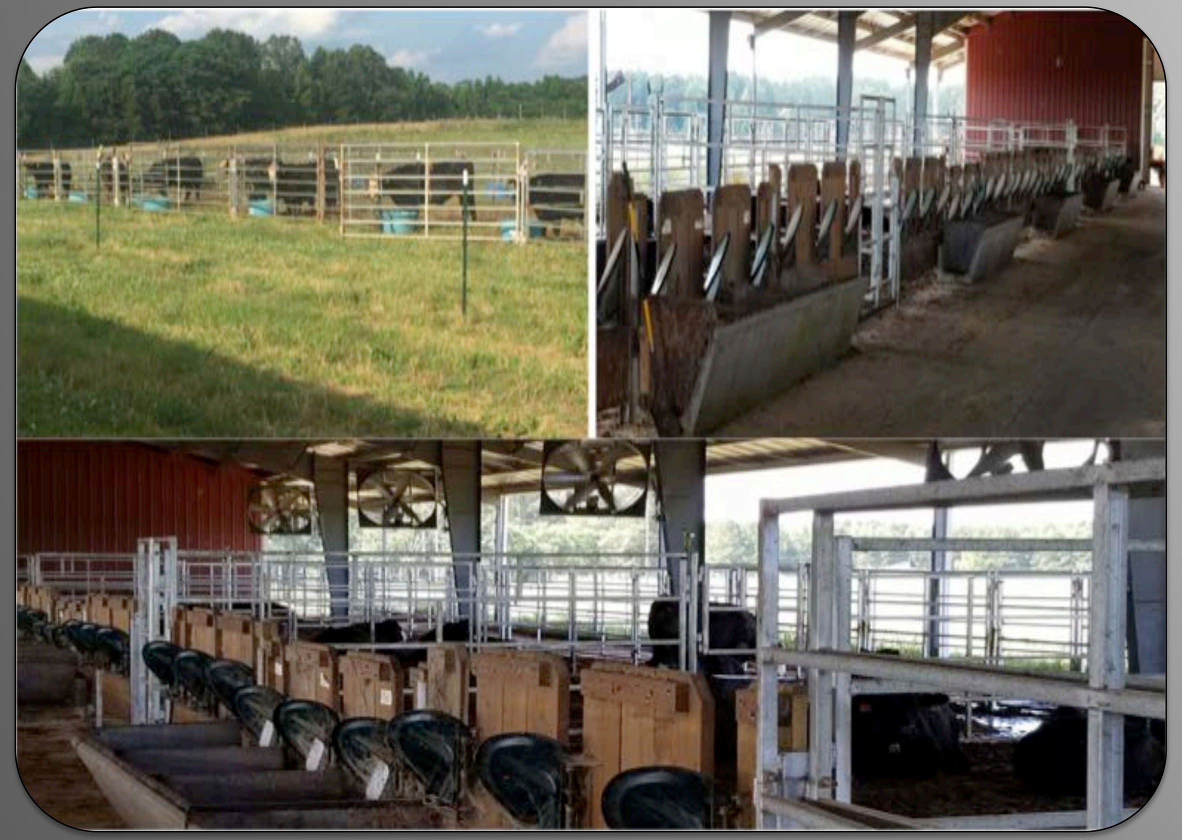

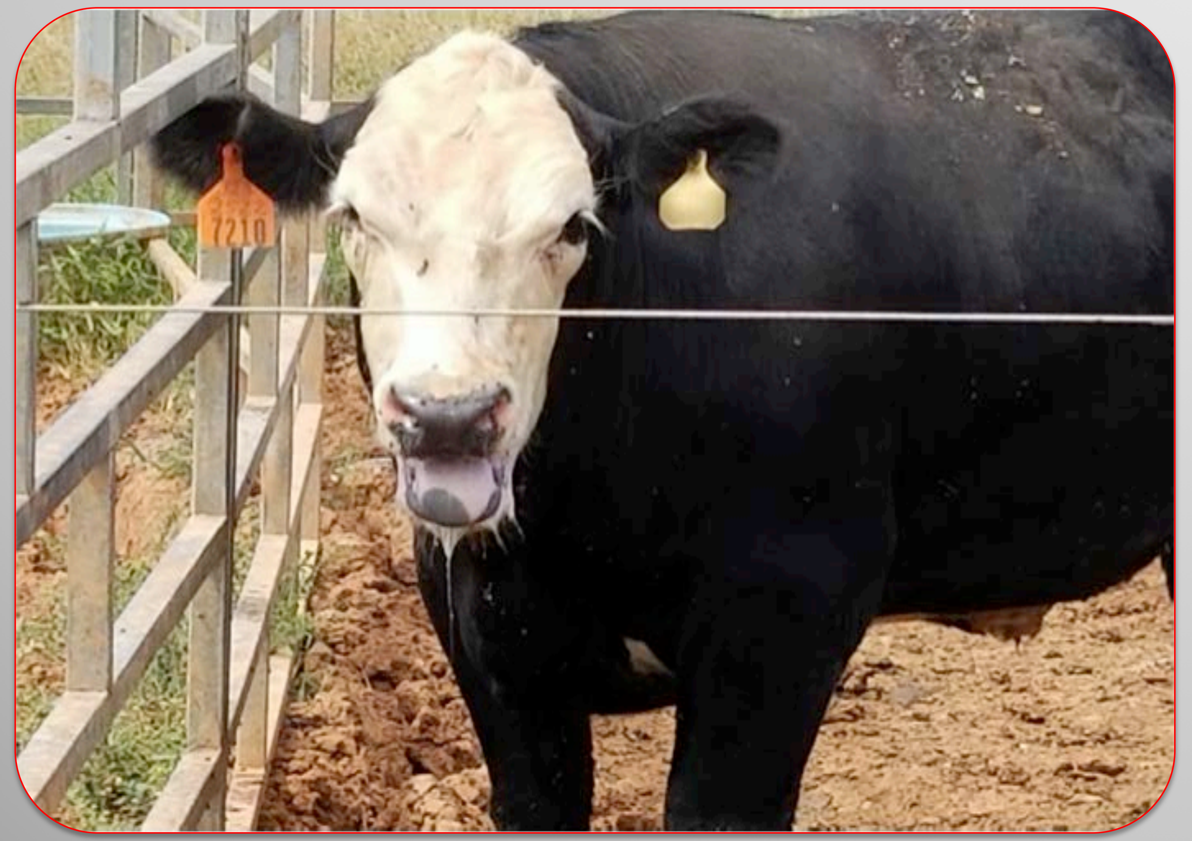

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Table 1. Yield and Quality Data

Trait	CWF	CNF	OUT	*P*-value
HCW, kg	371 ± 6.01^{y}	362 ± 6.23^{yz}	351 ± 6.78^{z}	0.10
DP, %	60.5 ± 0.38	60.3 ± 0.40	60.4 ± 0.43	0.93
KPH, %	2.0 ± 0.19	2.1 ± 0.19	2.0 ± 0.21	0.89
REA, cm^2	87.4 ± 1.99	85.4 ± 2.07	83.7 ± 2.25	0.47
FT, cm	1.1 ± 0.10	1.3 ± 0.10	1.2 ± 0.11	0.49
YG	2.5 ± 0.14	2.77 ± 0.15	2.72 ± 0.16	0.38
Marbling[1]	503 ± 31.79	519 ± 31.79	529 ± 37.62	0.71
O-all Maturity[2]	134 ± 2.72	133 ± 2.72	133 ± 3.22	0.92
Lean Color[3]	2.6 ± 0.31	1.8 ± 0.31	2.2 ± 0.37	0.16
Fat Color[4]	1.3 ± 0.16^{z}	1.8 ± 0.16^{y}	1.8 ± 0.19^{y}	0.06

[1]300 = Slight; 400 = Small; 500 = Modest
[2]100 = A-maturity; 500 = E-maturity
[3]1 = bright cherry red; 7 = dark red
[4]1 = White; 7 = Yellow

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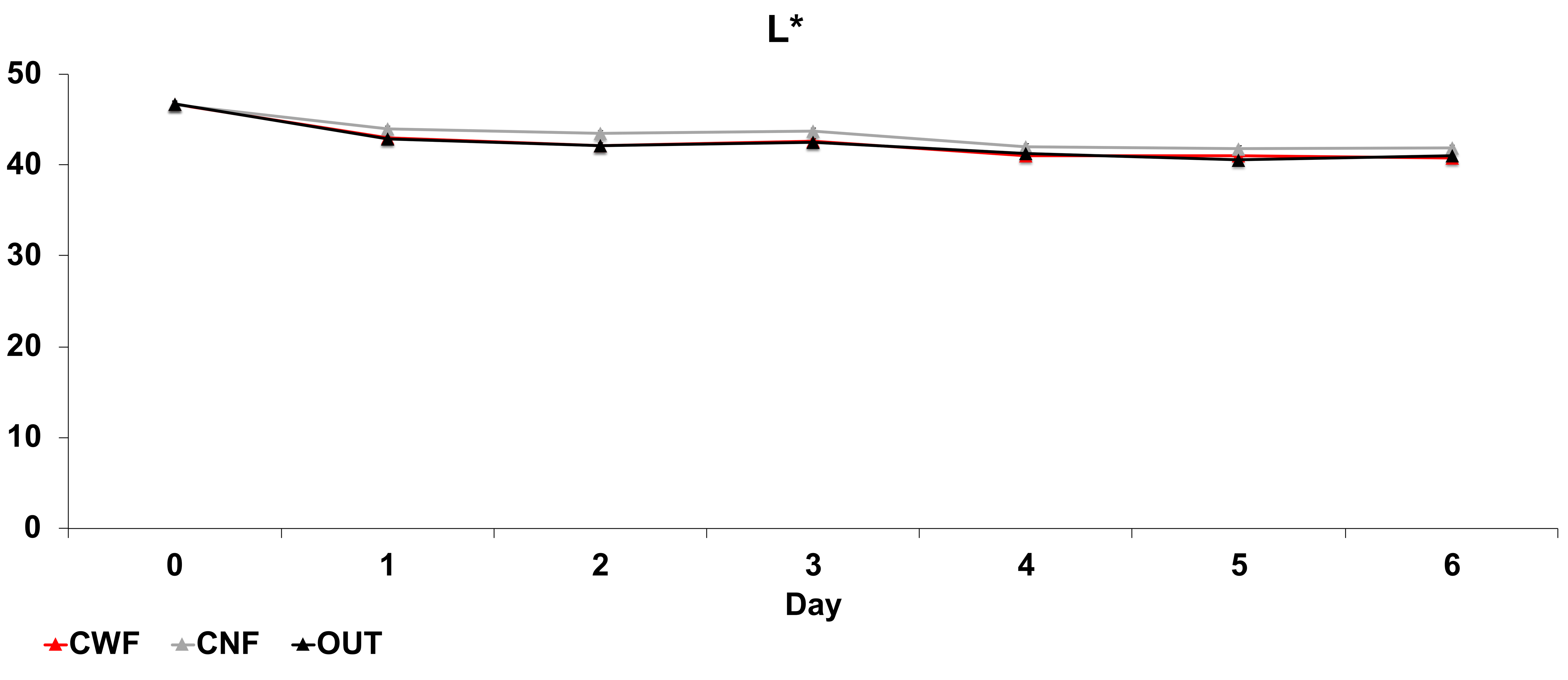

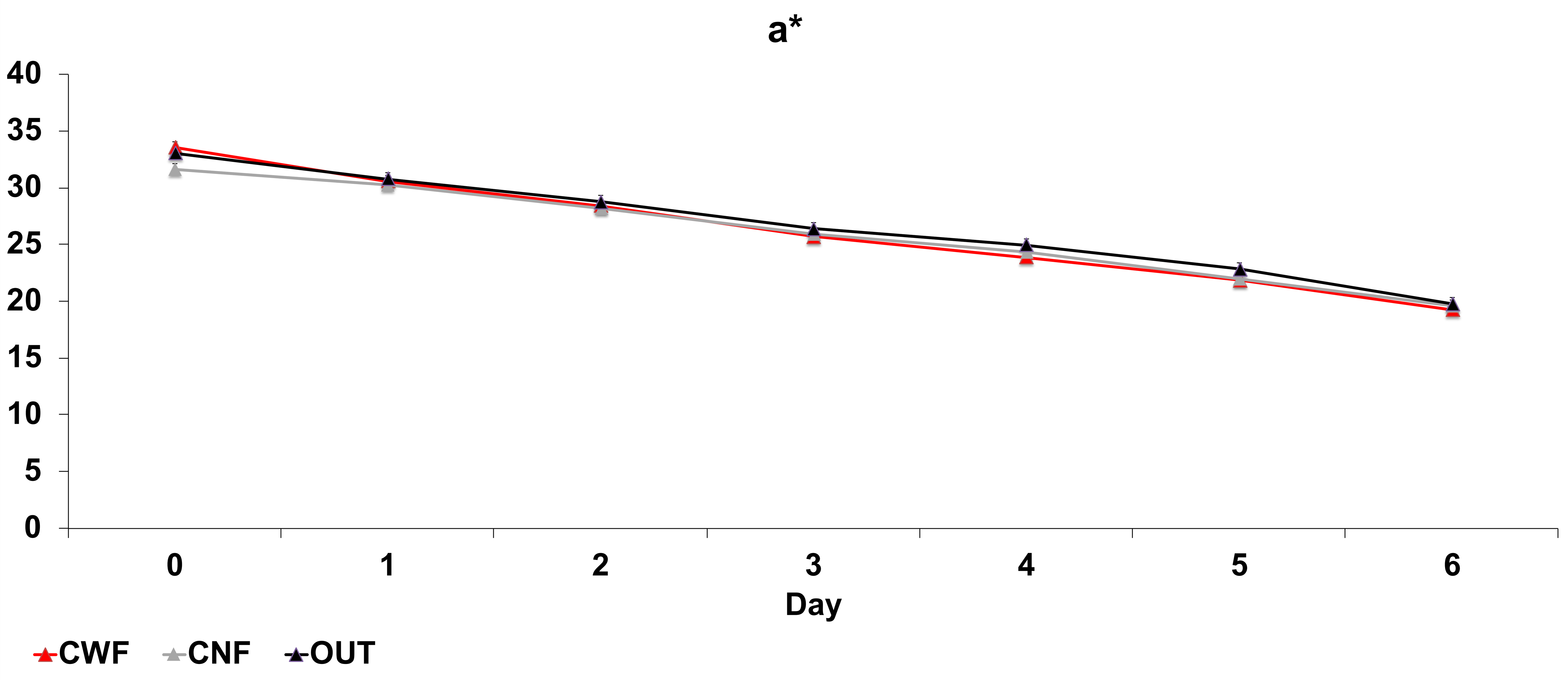

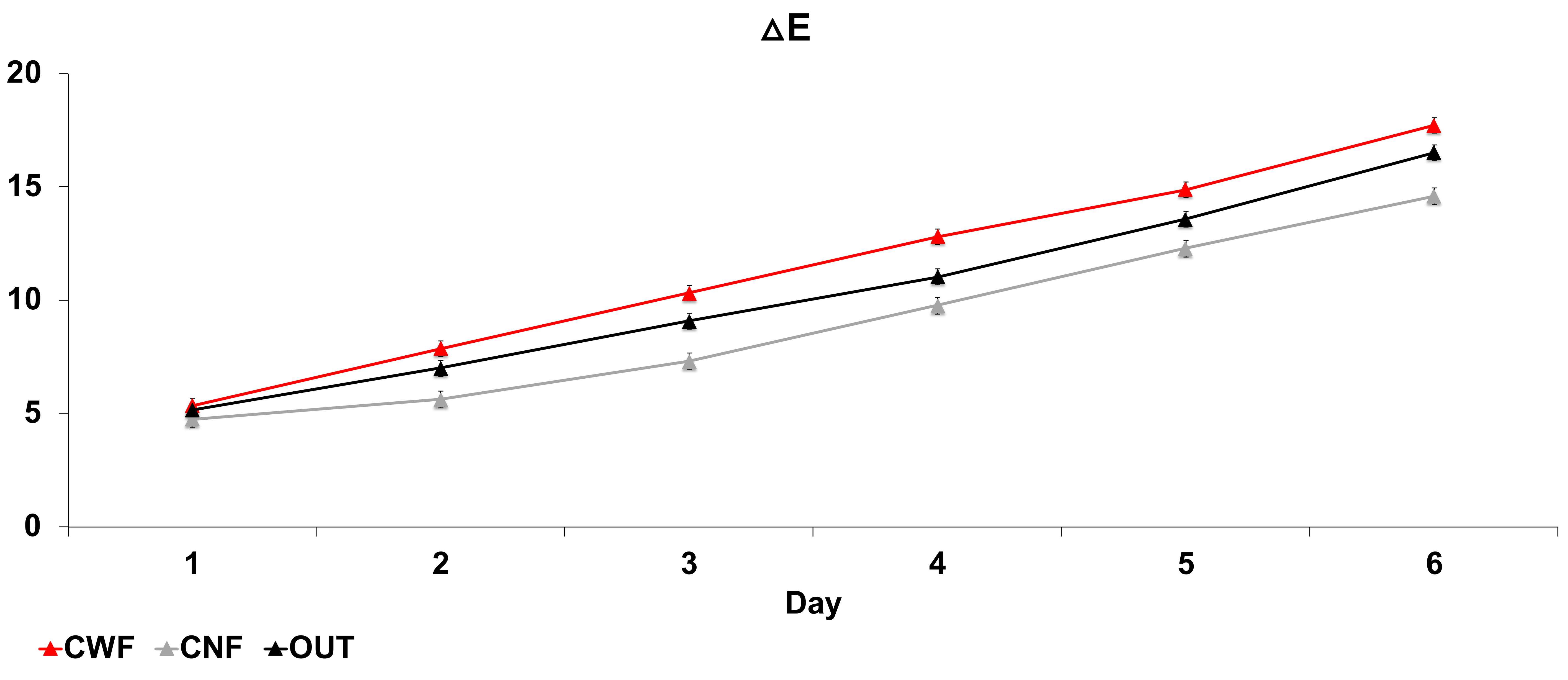

Table 2. Cooking Characteristics and Slice Shear Force

Trait	CWF	CNF	OUT	*P*-value
Thaw Loss, %	2.87[a]	2.55[ab]	1.76[b]	0.02
Cook Loss, %	15.52	16.12	17.20	0.22
SSF 14 d, N	15.89	14.75	14.46	0.58
SSF 21 d, N	15.00	14.39	14.32	0.78