Temperament on feedlot arrival affects performance efficiency and carcass quality in beef cattle

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Abstract – To examine temperament effects on feed efficiency and carcass characteristics, exit velocity (EV) was measured at feedlot arrival in beef heifers (N = 415), and feed intake measured during 3 70-d trials. Heifers were classified as excitable or calm temperament (mean EV ± 0.5 SD). Carcass yield and quality grade data were collected, and Warner-Bratzler shear forces (WBS) measured at 1- and 14-d post-mortem aging. Calm heifers had 12% greater ADG, 10% greater DMI, and 13.9 kg heavier carcasses than excitable heifers. Calm heifers tended to have greater yield grades and had higher percentage tender (< 3.0 kg) carcasses. Based on a quality grade grid that included price adjustments for tenderness, carcass income was $78.56/animal more for calm vs excitable heifers.

Key Words – beef, carcass value, eating quality, feedlot performance, tenderness.

I. INTRODUCTION

Temperament can be defined as the behavioral response of beef cattle to handling by humans. Calm cattle react minimally, while excitable cattle exhibit nervous responses when handled. Burrow et al. [1] developed an objective method of assessing temperament based on an animal's velocity when exiting a handling chute, referred to as exit velocity (**EV**, m/s). Temperament has been associated with stress; adrenal axis activity was positively correlated with temperament in bulls [2] and negatively correlated with ADG and DM intake in calves [3]. Based on taste panel results, Miller et al. [4] defined Warner-Bratzler shear (**WBS**) force values < 3.0 kg at 14-d post-mortem aging as tender, and found that consumers were willing to pay a premium for tender beef. This study was designed to evaluate the effects of temperament measured at feedlot arrival on performance, feed efficiency and feeding behavior traits in heifers. Further, the effects of temperament on carcass USDA quality (**QG**) and yield grades (**YG**), tenderness, and grid-formula carcass values were investigated.

II. MATERIALS AND METHODS

Three trials were conducted with Angus, Braford, Brangus, and Simbrah heifers (n = 415, BW = 279 ± 35 kg). Exit velocity was recorded at feedlot arrival and at the beginning of the trials. Feed intake and feeding behavior traits were continuously measured using electronic feed bunks (GrowSafe®). Heifers were fed a corn-based feedlot ration (3.09 Mcal ME/kg DM). Following the trials, heifers were group fed and slaughtered at a backfat thickness of 1.2 cm. Yield and QG data were collected at harvest, and WBS force measured on top loin steaks 1- and 14-d post-mortem aging. Carcass values were assessed using a marketing grid (Grid #1) based 3-year average price discounts and premiums for YG, QG and hot carcass weight [5]. A second carcass quality grid based on consumer acceptability of tenderness (Grid #2) [4] was also applied. Heifers were classified into calm (< 0.5 SD below mean) and excitable (> 0.5 above mean) EV phenotypes. Data were analyzed with a MIXED model (SAS 9.4) that included breed as a fixed effect, EV as a covariate, breed x EV covariate, and trial and pen within trial as random effects.

III. RESULTS AND DISCUSSION

Heifers were not different in age at feedlot arrival, but initial BW were 6% heavier in calm compared to excitable heifers. Calm heifers gained 12%, consumed 10% more DMI and had 3% more desirable F:G than the excitable heifers (P = 0.002). Additionally, there was a tendency toward a temperament x breed interaction for F:G (P = 0.06), where excitable Brangus and Simbrah cattle were less efficient than their calm counterparts, but Angus and Braford heifers were not different across temperament classification.

Compared to excitable cattle, carcass weights were 5% heavier for calm cattle, and calm heifers had 3% more carcass backfat and a tendency (P = 0.09) toward higher USDA YG than excitable heifers. Quality grades were not different between calm and excitable heifers, however, QG tended (P = 0.10) to be affected by breed, with Angus heifers having higher QG (433) than Braford, Brangus, and Simbrah heifers (USDA QG = 386, 405, and 394, respectively). Brangus tended to have higher QG than Braford, but Simbrah heifers were not different from Brangus or Braford. Angus heifers had the highest percentage of carcasses graded average USDA choice or better (42.9%), with Braford and Simbrah heifers having the lowest proportions (10.3% and 12%, respectively; $\chi^2 < 0.001$). Warner-Bratzler shear force values were 9% lower on 1- and 14-d post-mortem aging for calm heifers compared to excitable heifers ($P < 0.003$, Table 1). Calm heifers were less likely to be tough than excitable heifers (11.4% vs 28.6%; $\chi^2 = 0.003$). A $74.15 per animal difference in carcass income benefited the calm heifers marketed using Grid #1. When the grid was adjusted to include tenderness (Grid #2), calm heifers tended ($P = 0.07$) to have a 14% higher carcass value ($ per kg) than excitable heifers (Table 1), and calm heifers returned $78.56 more ($P < 0.001$) in carcass income than excitable heifers. Much of the difference in carcass income was due to calm heifers producing heavier carcasses than excitable heifers.

Table 1. Effects of temperament classification on performance and carcass characteristics

	Temperament Class			*P*-Value		
Item	Calm	Excitable	SE	Temperament	Breed	Temperament x Breed
Feedlot performance:						
Initial BW, kg	284.5	266.1	6.6	0.001	0.62	0.94
ADG, kg/d	1.61	1.42	0.04	0.001	0.09	0.57
DMI, kg/d	9.55	8.59	0.34	0.001	0.93	0.31
F:G	6.03	6.21	0.12	0.02	0.02	0.06
Carcass Characteristics:						
Hot carcass weight, kg	291.9	278.0	2.6	0.001	0.03	0.41
USDA YG	2.78	2.72	0.07	0.09	0.61	0.73
USDA QG	406	402	4	0.16	0.10	0.22
WBS force (1 d), kg	3.39	3.73	0.07	0.002	0.21	0.09
WBS force (14 d), kg	2.23	2.46	0.04	0.003	0.49	0.35
Carcass Value:						
Carcass value (grid #1)†, $/kg	4.62	4.58	0.02	0.13	0.25	0.20
Carcass income (grid #1), $/animal	1,352	1,278	15	0.001	0.05	0.41
Carcass value (grid #2)†, $/kg	4.73	4.68	0.02	0.07	0.15	0.13
Carcass income (grid #2), $/animal	1,385	1,306	16	0.001	0.04	0.37

†Grid # 1= value adjustments based on USDA QG, YG and carcass weight. Grid #2 = same of Grid #1, plus tenderness.

IV. CONCLUSION

Management systems which utilize temperament phenotype as a sorting criteria for targeted production-outcome groups could reduce within-group variation in production efficiency, thereby improving animal performance predictability and product quality consistency. Such a system would facilitate the selective use of technologies (e.g., implants, feed additives) for targeted production-outcome groups to improve overall production efficiency, reduce marketing risks, and optimize product quality. Further, using temperament as a sorting criteria could improve carcass income when cattle are sold on a grid that accounts for value differences due to carcass tenderness.

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