

# EFFECTS OF TEMPERAMENT ON CARCASS AND MEAT QUALITY CHARACTERISTICS OF NELORE CATTLE

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**Abstract – The aim of this study was to evaluate the impact of temperament on carcass and meat quality traits of Nelore (*Bos indicus*) feedlot steers. Forty-four steers were evaluated for temperament at feedlot entry (d 0). Temperament was assessed by chute score and exit velocity. Furthermore, individual exit score was calculated by dividing exit velocity results into quintiles and assigning steers with a score from 1 to 5 (exit score: 1=slowest steers; 5=fastest steers). Temperament scores were calculated by averaging chute score and exit score. Steers were also classified for temperament type according to temperament score [ $\leq 3$  = adequate temperament (ADQ) or  $> 3$  = aggressive temperament (AGR)]. Steers were slaughtered on d 109, and carcasses were evaluated for backfat thickness, LM area, final pH, and incidence of bruising. Samples from the LM were collected and analyzed for Warner-Bratzler shear force. Carcasses from AGR steers had greater ( $P = 0.05$ ) incidence of bruising compared to ADQ carcasses (1.3 vs. 0.6 bruising/carcass). No differences between ADQ and AGR steers were detected for the remaining carcass traits. In conclusion, aggressive steers had impaired carcass quality compared to cohorts with adequate temperament.**

**Key Words – chute score, exit velocity, incidence of bruising**

## I. INTRODUCTION

Beef cattle with aggressive temperament, besides being dangerous during handling, often have impaired productivity [1, 2, 3]. Assessments of temperament are based on observation of animal behavior during human handling and interaction, and animals with aggressive temperament often present a greater physical effort due to their agitated behavior [4]. Thus, it is reasonable to

speculate that temperament has the potential to directly and indirectly affect beef quality [5]. Based on this rationale, the hypothesis of the present study is that animals with aggressive temperament have impaired carcass characteristics compared to animals with calm temperament. Therefore, the objective of this study was to verify the effects of animal temperament on carcass and meat quality characteristics of beef cattle.

## II. MATERIALS AND METHODS

The study was conducted from January to May 2011 at the Agencia Paulista de Tecnologia dos Agronegocios – APTA – Colina, Sao Paulo, Brazil. Animals were cared for in accordance with acceptable practices and experimental protocols reviewed and approved by the Ethics Animal Use Committee of the Universidade Estadual Paulista. Forty-four (44) steers were utilized in the study and evaluated for temperament at feedlot entry (d0). Chute score was assessed based on a 5-point scale where: 1=calm with no movement; 2=restless movements; 3=frequent movement with vocalization; 4=constant movement, vocalization, shaking of the chute; and, 5=violent and continuous struggling [6]. Exit velocity was assessed by determining the speed of the steer exiting the squeeze chute by measuring rate of travel over a 2.0-m distance with an infrared sensor (FarmTek Inc., North Wylie, TX). Furthermore, steers were divided in quintiles according to their exit velocity, and assigned a score from 1 to 5 (exit score; 1=slowest steers; 5=fastest steers). Individual temperament scores were calculated by averaging steer chute score and exit score. Furthermore, steers were also classified according to the final temperament score

(temperament type) as adequate temperament (temperament score  $\leq 3$ ) or aggressive temperament (temperament score  $> 3$ ) [7]. Steers were slaughtered on d 109, and carcasses were evaluated for backfat thickness (by digital caliper) and longissimus muscle (LM) area (by digital planimeter) between the 10th and 11th thoracic vertebrae, final pH (24h; by digital pHmeter), and incidence of bruising observed immediately after the removal of the skin. Samples from the LM were collected and analyzed for Warner-Bratzler shear force (TAX-T2 plus texture analyzer; Texture Technologies Corp, Scarsdale, NY) according to the method previously described [8]. All data were analyzed using the MIXED procedure (SAS Inst. Inc., Cary, NC) and the Satterthwaite approximation to determine the denominator degrees of freedom for the tests of fixed effects. The model statement used for all data contained the effects of temperament as well as they were analyzed using steer(temperament) as random variable. Results are reported as least square means. Significance was set at  $P \leq 0.05$ .

### III. RESULTS AND DISCUSSION

Studies have shown that animals with aggressive temperament have impaired carcass characteristics compared to calm animals [9, 10]. King et al. [11] reported that steers with excitable temperament had higher ( $P < 0.05$ ) shear force values compared to calmer steers, but in the present study, no differences ( $P > 0.05$ ) were detected for this variable between AGR and ADQ steers. No temperament differences were also detected ( $P > 0.05$ ) for backfat thickness, LM area, shear force, and carcass pH (Table 1). Similar to our results Gruber et al. [12] reported no LM pH differences among temperament categories (calm vs. restless vs. nervous).

Table 1 Carcass and meat quality characteristics of Nelore steers with aggressive (AGR) or adequate (ADQ) temperament

Item	AGR	ADQ	P-value
Backfat thickness, mm	5.12	4.97	0.80
LM area, cm <sup>2</sup>	78.4	80.5	0.59
Ultimate pH, °C	5.75	5.79	0.43
Shear force, kg cm <sup>-2</sup>	7.53	7.33	0.69

LM=Longissimus Muscle; Significant if  $P \leq 0.05$ .

Differences between temperaments were detected on the incidence of bruises, with a greater ( $P = 0.05$ ) incidence of bruised carcasses in AGR steers compared to ADQ steers (Figure 1). Overall, lesions were observed in the hindquarter; however, in some carcasses bruising was visible in several other regions (data not shown).

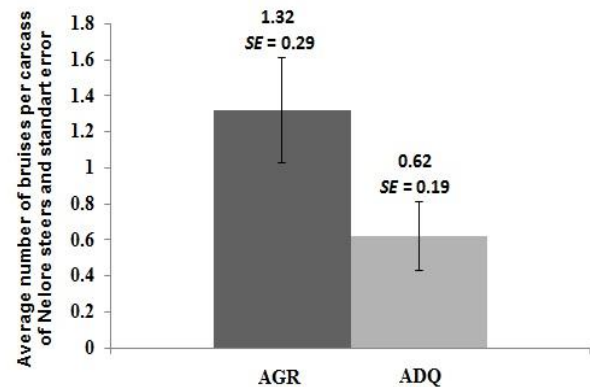


Figure 1. Incidence of bruising on carcasses of Nelore steers with aggressive (AGR) or adequate (ADQ) temperament ( $P = 0.05$ )

### IV. CONCLUSION

In beef cattle, the aggressive temperament increased the carcass bruising but did not impair other carcass and meat quality parameters. Hence, cattle temperament should be taken into account in efforts to increase overall quality of beef products.

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### REFERENCES

1. Cooke, R. F., Arthington, J. D., Austin, B. R. & Yelich, J. V. (2009). Effects of acclimation to handling on performance, reproductive, and physiological responses of Brahman-crossbred heifers. *Journal Animal Science* 87: 3403-3412.

2. Grandin, T. (1997). Assessment of stress during handling and transport. *Journal of Animal Science*, 75: 249–257.
3. Hall, N. L., Buchanan, D. S., Anderson, V. L., Ilse, B. R., Carlin, K. R. & Berg, E. P. (2011). Working chute behavior of feedlot cattle can be an indication of cattle temperament and beef carcass composition and quality. *Meat Science*, 89: 52-57.
4. Grandin, T. (1993). Behavioral agitation during handling of cattle is persistent over time. *Applied Animal Behavior Science*, 36: 1-9.
5. Ferguson, D. M., Johnston, D., Burrow, M. H. & Reverter, A. (2006). Relationships between temperament, feedlot performance and beef quality. In *Australian Beef – the leader! The impact of science on the beef industry*. (161-165), Australia [<http://livestocklibrary.com.au/handle/1234/20112>]
6. Arthington, J. D., Quiu, X., Cooke, R. F., Vendramini, J. M. B., Araujo, D. B., Chase Jr, C. C. & Coleman, S. W. (2008). Effects of preshipping management on measures of stress and performance of beef steers during feedlot receiving. *Journal Animal Science* 86:2016-2023.
7. Cooke, R. F., Bohnert, D. W., Meneghetti, M., Losi, T. C. & Vasconcelos, J. L. M. (2011). Effects of temperament on pregnancy rates to fixed-timed in *Bos indicus* beef cows. *Livestock Science* 142: 108-113.
8. Wheeler, T.L., Koohmaraie, M. & Shackelford, S.D. (2005). Shear Force Procedures For Meat Tenderness Measurement. Clay Center: Roman L. Hruska U. S. MARC. USDA.
9. Vann, R. C. (2006). Relationships between carcass quality and temperament in beef cattle. Pages 69–72 In *Proc. Beef Improv. Fed.*, Chocktaw, MS. <http://www.beefimprovement.org/proceedings.html>. Access in November 2011.
10. Voisinet, B. D., Grandin, T., O'Connor, S. F., Tatum, J. D. & Deesing, M. J. (1997). *Bos indicus*-cross feedlot cattle with excitable temperaments have tougher meat and a higher incidence of borderline dark cutters. *Meat Science*, 46: 367–377.
11. King, D. A., Pfeiffer, C. E. S., Randel, R. D., Welsh Jr., T. H., Oliphint, R. A., Baird, B. E., Curley Jr., K. O., Vann, R. C., Hale, D. S., & Savell, J. W. 2006. Influence of animal temperament and stress responsiveness on the carcass quality and beef tenderness of feedlot cattle. *Meat Science*, 74:546–556.
12. Gruber, S.L., Tatum, J. D., Engle, T. E., Chapman, P. L., Belk, K. E. & Smith, G. C. (2009). Relationships of behavioral and physiological symptoms of preslaughter stress to beef longissimus muscle tenderness. *Journal of Animal Science*, 88:1148-1159.