71st ICoMST
GIRONA - CATALONIA - SPAIN
3rd-8th August - 2025

ASSOCIATION OF TEMPERAMENT WITH TENDERNESS AND MEAT QUALITY TRAITS IN NELLORE CATTLE

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I. INTRODUCTION

Problems associated with meat quality, such as dark meat, high pH, and tenderness are often associated with inadequate pre-slaughter handling. Cattle with a more excitable temperament are prone to exhibit those problems [1;2]; in addition, *Bos indicus* animals are more likely to have a more excitable temperament [3] and slower myofibrillar proteolysis [4]. The stress of pre-slaughter handling may be intensified in excitable animals, making them more agitated. As a result, muscle glycogen reserves can be extensively used, reducing its concentration *post mortem*, which may not be sufficient to allow ideal ultimate pH, affecting meat quality. Studies on the effect of temperament and meat quality analysis of zebu animals still have contrasting results; however, it is expected that excitable animals will have lower meat quality when compared to calm animals. The aim of present study was to verify the association of Nellore temperament and meat quality parameters.

II. MATERIALS AND METHODS

The study was approved by the Institutional Animal Care and Use Committee (IACUC #9222010623). Fifty-one non-castrated Nellore males (500.5±38 kg; 18±2 months of age) were housed in an experimental feedlot comprising three collective pens, each equipped with electronic feeders (Ponta Agro, Betim, MG, Brazil). The animals were fed for a total of 94 days, with a diet containing 25% forage and 75% concentrate. Each animal was considered an individual experimental unit.

Temperament assessment was performed at the onset of the feeding period using a temperament index (TI), calculated from the arithmetic mean of chute score (CS) and flight speed (FS). The CS was evaluated while animals were restrained in the chute, assigning scores from 1 (calmest) to 4 (most excitable). The FS was measured by recording the time required for each animal to cover a distance of 5.4 meters immediately after exiting the chute. Based on the calculated mean and standard deviation, animals were classified into two temperament categories: excitable (EXC; $TI \geq \mu + 1\sigma$; n = 11), intermediate (INT; $\mu - 1\sigma < TI < \mu + 1\sigma$) or calm (CAL; $TI \leq \mu - 1\sigma$; n = 8). Carcass temperature and pH were measured at 1, 3, 6, 9 and 24-hours *post-mortem* between the 12th and 13th ribs. Steaks (2.54 cm thickness) from the Longissimus muscle, obtained between the 11th and 13th ribs, were vacuum-packed and aged for 0, 7, 14, and 21 days. After each ageing interval, color analyses (L*, a* and b*) and Warner-Bratzler shear force (WBSF) were conducted according to standardized methods [5, 6]. The experimental data were analyzed using a completely randomized design with repeated measurements over ageing periods. Temperament (calm and excitable) and ageing periods were treated as fixed effects. All statistical analyses were conducted using the MIXED procedure of SAS software (SAS Inc., Cary, NC, USA).

III. RESULTS AND DISCUSSION

No significant interaction between temperament and post-mortem time was observed for any trait. Temperament groups did not significantly affect pH (Figure 1) or carcass temperature decline. However, Warner-Bratzler shear force (WBSF) was significantly higher (P = 0.002; Figure 2) in the excitable group ($\mu_{ex}c$ = 68.21 N) compared to the calm (μc_{al} = 61.9 N) and intermediate (μ_{int} = 60.8 N) groups, which did not differ from each other. In contrast, no significant differences were found among temperament groups for cooking losses (Figure 3), lightness (L*; Figure 4), redness (a*; Figure 5), or yellowness (b*; Figure 6). The difference in WBSF aligns with previous studies linking excitable temperament to reduced proteolytic activity [1,2,3], likely due to elevated calpastatin levels that inhibit the calpain system responsible for post-mortem tenderization. Despite behavioral differences, early post-mortem glycolytic activity and thermal kinetics remained unaffected by temperament.

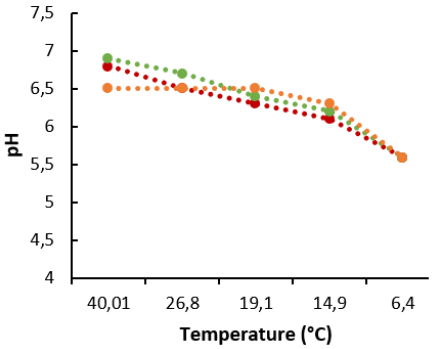


Figure 1. pH and temperature decline of excitable, intermediary and calm animals.

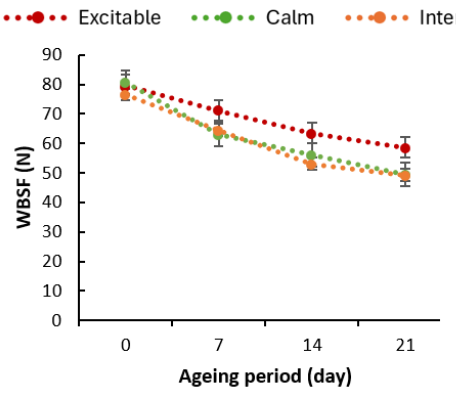


Figure 2. WBSF of excitable, intermediary and calm animals according to ageing period.

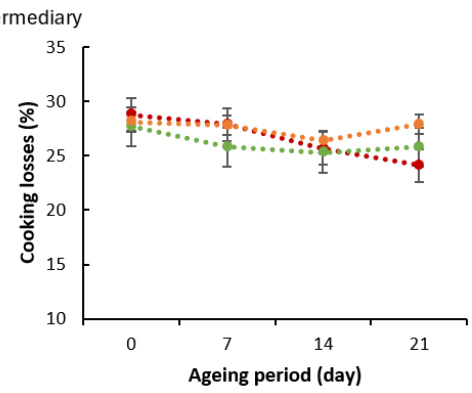


Figure 3. Coocking losses of excitable, intermediary and calm animals according to ageing period.

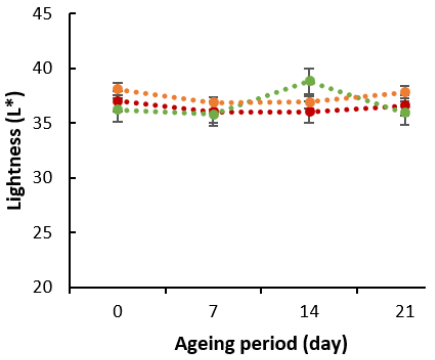


Figure 4. Lightness (L*) of excitable, intermediary and calm animals according to ageing period (day).

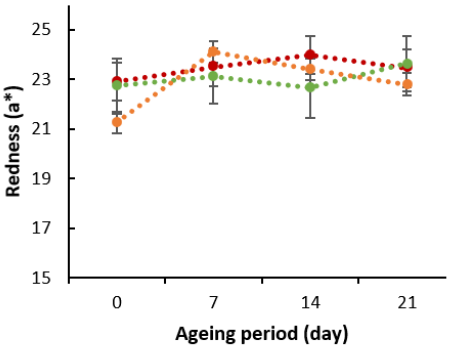


Figure 5. Redness (a*) of excitable, intermediary and calm animals according to ageing period (day).

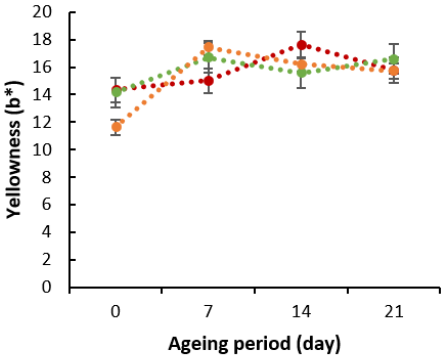


Figure 6. Yellowness (b*) of excitable, intermediary and calm animals according to ageing period (day).

IV. CONCLUSION

The results of this study suggest that, although excitable Nellore cattle do not differ in post-mortem metabolic traits such as pH or temperature decline, they produce tougher meat. This is likely due to stress-related physiological mechanisms that impair muscle proteolysis. These findings underscore the importance of considering temperament traits in both genetic selection and management practices to improve beef tenderness in *Bos taurus indicus* herds.

ACKNOWLEDGEMENTS

Acknowledgements to the Brazilian Federal Agency for Support and Evaluation of Graduate Education (CAPES)

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