MEDIUM VOLTAGE ELECTRICAL STIMULATION AND PELVIC SUSPENSION AS TOOLS TO IMPROVE MEAT TENDERNESS IN NELORE CATTLE

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I. INTRODUCTION

Beef plays a critical role in human nutrition, serving as a rich source of high biological value nutrients. However, it must also meet consumer expectations regarding its physical and chemical properties. Tenderness is the most important qualitative attribute of meat, as demonstrated by consumer acceptance tests [1]. Tenderness, however, is a multifactorial characteristic resulting from the interaction of pre- and post-slaughter factors. Electrical stimulation (ES) of carcasses has been reported as a highly efficient tool for accelerating *post mortem* muscle metabolism and can play a crucial role enhancing the production of tender beef in *Bos indicus* cattle. Additionally, various hanging methods have been tested as a means of manipulating tenderness. Carcass suspension by the pelvic bone (*Tenderstretch*) is a low-cost technique that improves meat quality compared to the Achilles tendon method. Therefore, this study was developed to evaluate the isolated or combined effect of medium voltage ES and carcass suspension method on the shear force (SF) of beef fabricated from *Longissimus* and *Biceps femoris* muscles in Nelore cattle.

II. MATERIALS AND METHODS

Twenty-four carcasses from twelve Nellore steers were used, and randomly assigned 30 minutes post-exsanguination to the following treatments: Achilles tendon suspension without ES (AT_NE; n=4); Achilles tendon suspension with ES (AT_ES; n=4); Pelvic suspension without ES (PS_NE; n=4); and Pelvic suspension with ES (PS_ES; n=4). ES was performed using an electro stimulator (model UFX7 NR-12; Fluxo Equipamentos Eletrônico Ltda; Chapecó, Santa Catarina, Brazil), set to apply an alternating current square wave (AC) at 15 Hz with a voltage of 300 V. The total application period was 78 seconds, consisting of 10 seconds of stimulation (pulse) followed by 3 seconds of rest, with 6 cycles total. Two electrodes were positioned, one at the Achilles tendon region and the other at the *Trapezius* muscle, ensuring the electrical current passes through the entire carcass. The pelvic suspension treatment consisted of hanging by the obturator foramen of the pelvic bone. At the time of deboning (24 h post-slaughter), a section of the *Longissimus* muscle between the 9th and 13th ribs and the *Biceps femoris* were removed; steaks were fabricated, vacuum packaged and aged for 0 and 14 days. After each period of aging the SF was analyzed according to the methodology proposed by [2]. The experimental design was a completely randomized 2 × 2 × 2 factorial arrangement (stimulated vs. non-stimulated; pelvic suspension vs. Achilles tendon suspension; 0 vs. 14 days of aging) with 4 replicates per treatment. The effect of the main factors on the SF was evaluated by analysis of variance using the MIXED procedure of SAS 9.3 software.

III. RESULTS AND DISCUSSION

For the *Longissimus*, an interaction was observed between the ES and the different suspension methods (p<0.001). Specifically, carcasses subjected to ES and suspended by the pelvic bone exhibited lower SF, resulting in a more tender cut (Figure 1). There was no statistical significance observed for the suspension method alone, nor was there an interaction between the treatment (ES or CON) and the aging time (0 or 14 days). Additionally, no interaction was found between the treatment, suspension, and aging time for the *Longissimus*.

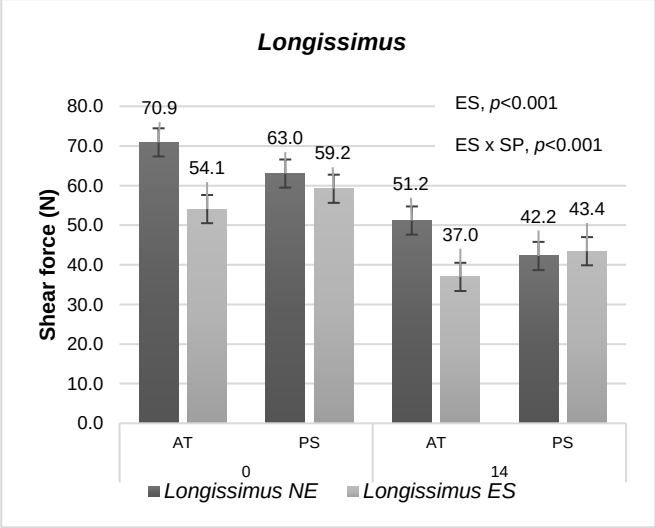

Figure 1. Shear force in the *Longissimus* of electrical stimulated (ES) and non-stimulated carcasses at 0 and 14 days of aging.

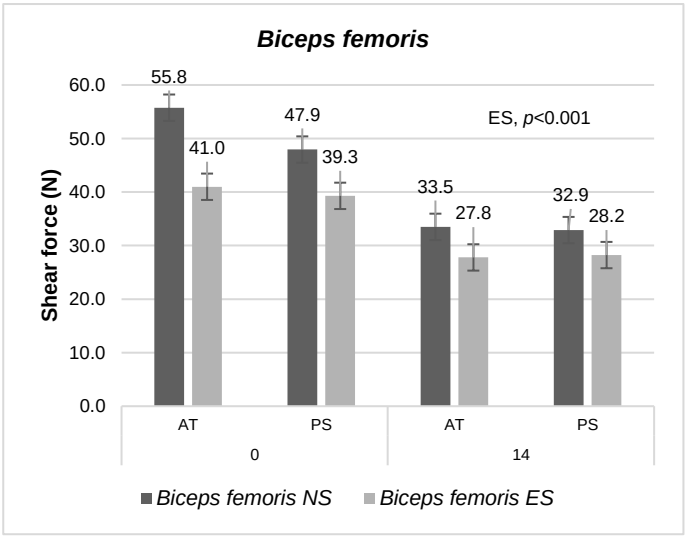

Figure 2. Shear force in the *Biceps femoris* of electrical stimulated (ES) and non-stimulated carcasses at 0 and 14 days of aging.

For the *Biceps femoris*, carcasses that underwent ES also effect (p<0.001) as measured by SF (Figure 2). There was no statistical significance for SF based solely on the suspension method. In both cuts, a significant effect of aging time was observed.

IV. CONCLUSION

For the *Longissimus* muscle, applying electrical stimulation and suspension by the pelvic bone were efficient to improve tenderness. In this same cut, it was observed that electrical stimulation alone also resulted in tender beef. The pelvic bone suspension method also resulted in greater tenderness in the *Biceps femoris*. Pelvic bone suspension may be more efficient when combined with carcass electrical stimulation, and beef tenderness is enhanced after a 14-day aging period.

ACKNOWLEDGEMENTS

Thanks to company Fluxo Equipamentos for the loan of the equipment used to research.

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