

EFFECT OF GENDER ON THE MEAT COLOR AND TENDERNESS OF FEEDLOT NELLORE CATTLE

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Abstract – This work was developed to evaluate the effect of gender on meat color and tenderness of the fresh or aged meat. Fifty-eight cattle from the Nellore breed were divided in three groups according to gender: Surgical castrated (SC); Immunocastrated (IM) and non-castrated (NC). Animals were fed to a common diet for 90 days and then harvested. After 24h of chilling, two samples of Longissimus muscle were taken and aged for 0 or 14 days, to measure color attributes (L^* , a^* , b^*) and Warner-Bratzler shear force (WBSF). The NC animals had lower color values than SC and IM ($P<0.05$) while SC and IM did not differ. Fresh meat showed smaller color values than aged meat ($P<0.05$). There was an interaction for the WBSF. In non-aged samples, the NC animals had lower WBSF than IM and SC ($P<0.05$) while IM and SC did not differ. In aged samples the WBSF was not affected by gender. Castrated animals have high color values compared to NC although absolute values were within range for normal meat. The higher meat tenderness observed for NC males can be related to high DFD levels. Method of castration does not affect meat color and tenderness.

Key Words – GnRH Vaccine, *Bos indicus*, castration, meat quality.

I. INTRODUCTION

Meat color and tenderness are the most important factors on the acceptance of the meat by consumers. Castration has been used as an alternative to increase carcass fat deposition and reduce aggressive behavior, and consequently improving meat quality [1]. Recently, a technique

of immunocastration (IM) for cattle by immunization with an analog of the Gonadotropin release hormone (GnRH) was developed. Many studies have assessed the effects IM on meat quality properties of beef cattle, with divergent results. For feedlot finished animals, Miguel et al. [2] and Andreo et al. [3] observed smaller color (L^* , a^* , b^*) values in non-castrated (NC) when compared to IM. On the other hand, Amatayakul et al. [4] reported no differences between NC and IM in meat color attributes. Similar results were found by Amatayakul-Chantler et al. [5] in pasture finished cattle, where color attributes did not differ between IM and SC groups. Divergent results also have been found for tenderness, measured by Warner-Bratzler shear force (WBSF) values. Andreo et al. [3] and Amatayakul-Chantler [4] reported that IM animals had lower WBSF than NC, while Miguel et al. [2] found no differences on WBSF between IM and NC finished in feedlot.

In addition, studies regarding the meat quality attributes of fresh and aged beef of *Bos indicus* cattle still scarce. Therefore, this work was carried out to evaluate the effects of the gender in the tenderness and meat color attributes of fresh or aged meat.

II. MATERIALS AND METHODS

Fifty-eight males (430 ± 36 kg BW; 24 mo old) were divided into three groups in a completely randomized design. The surgical castration (SC) procedure was performed in 15 animals at 12 mo old, whereas 21 animals received two doses of IM. The first dose was performed 30 days prior to the feeding period and the second dose at the beginning of the feeding period. In addition, 22 animals remained intact (NC). The animals were

allotted in individual pens and fed a diet containing 70% concentrate and 30% roughage during 90 and then slaughtered in a commercial and Federal inspected slaughterhouse.

Carcasses were chilled for 24 h (0-2 °C) and then the pH (pH24h) was measured using a digital pH meter model HI99163 (Hanna Instruments, Sao Paulo, Brazil). Following, two samples (2.5 cm thickness) of Longissimus were taken between 12^a and 13^a ribs. One sample was aged (0 ± 2 °C) for 14 d, whereas another one was analyzed immediately. Objective assessment of the meat color (L* a* b*) was obtained after 20 minutes of exposure of the samples to the environment using a portable spectrophotometer (Konica Minolta Brazil - CM2500d model, Sao Paulo, Brazil). Afterward, the samples were cooked in an industrial oven (Fornos Elétricos Flecha de Ouro Ind. e Com. Ltda – F130 / RL model, Sao Paulo, Brazil) to 170 °C until reach internal temperature of 40 °C, when they were turned and remained until the internal temperature reach 71 °C [6]. After that sample were allowed to reach the room temperature (21°C), wrapped in plastic film and cooled (4-6 °C), for 14 hours. Following, 6 to 8 cylinders (1.27 cm diameter) were taken from each sample in the direction parallel to the fibers for WBSF determinations [6].

The data was evaluated as a randomized complete design using the MIXED procedure of SAS 9.3 software (SAS Institute Inc., Cary, NC, USA). Gender, ageing period and the gender x ageing period interaction were considered as a fixed effect. When a significant effect was found (P ≤ 0.05) least-square means were adjusted using Tukey-Kramer method.

III. RESULTS AND DISCUSSION

No gender vs. ageing period interaction was observed for the meat color. The NC animals had lower values of L* (P<0.0001), a* (P = 0.0007), and b* (P<0.0001) when compared to both castration methods (Table 1). In addition, there

was no difference between castration methods for the meat color. Similar to observed in this work, Miguel et al. [2], evaluated the effects of gender (SC, IM and NC) in Nellore and Nellore x Angus crossbred cattle finished on feedlot, and observed smaller L*, a* and b* values in NC in comparison to IM. In the same study SC group did not differ from both IM and NC for L* values, while a* and b* were not affected by castration method, but were greater than NC group. In addition, Andreo et al. [3] found no differences in L* values between IM and NC, but higher a* and b* values were found for IM group.

Amatayakul-Chantler et al. [5] evaluated meat quality attributes of IM and SC Nellore cattle finished on pasture, and found no differences between groups for L* and a* values, but with greater b* values for SC compared to IM.

The meat aged for 14 d had higher L*(P = 0.0374), a*(P = 0.0227) and b* (P = 0.0043) values when compared to the fresh meat.

It was observed a gender x ageing period interaction for WBSF (P=0.0404). In fresh samples NC animals had lower WBSF than SC animals (P=0.0079), whereas castration methods (IM vs SC) did not differ (Figure 1). On the other hand, after 14 d of ageing the WBSF values were smaller when compared to fresh meat (P<0.0001) and there was no difference between genders. Results observed in this work for fresh meat where NC had smaller WBSF when compared to both castration methods were unexpected, because according to Pond and Pond [7] meat from young (under 2 years of age) non-castrated males is less tender and deposit less marbling than steers or heifers in similar ages.

However, according to have Purchas [8] carcass with pH over 6.2 are usually associated to an increase in tenderness, which could lead to bulls have more tender meat if pH is high enough. In this study, the NC animals showed higher final pH value than SC (P=0.0068) and IM (P=0.0290) animals (5.7 vs. 5.4 and 5.5, respectively). However, when 24h pH was grouped in classes

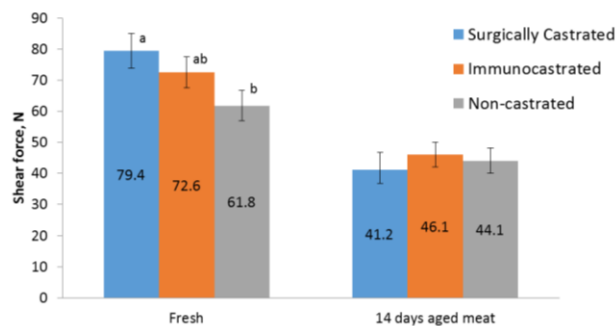
Table 1. Least-square means, standard error of means (SEM) and probabilities of color attributes, according to gender and ageing period.

Traits	Gender			Ageing (d)		SEM	P -value		
	Surgically Castrated	Immunocastrated	Non-castrated	0	14		Gender	Ageing	Gender x Ageing
L*	41.3 ^a	41.3 ^a	38.2 ^b	39.3	41.2	0.33	<0.0001	0.0374	0.3245
a*	14.5 ^a	14.9 ^a	13.0 ^b	13.4	14.9	0.23	0.0007	0.0227	0.3297
b*	12.6 ^a	13.7 ^a	11.4 ^b	12.0	13.8 th	0.25	0.0016	0.0043	0.1596

Means with different letters are significantly different (P < 0.05).

(i.e. normal pH < 5.7; intermediary pH 5.8 to 6.2; high pH > 6.2) it was observed that 22.7% (n=5) of NC had 24h pH over 6.2, with a mean WBSF of 34.3 N while in IM and SC groups had only one animal each within this group (pH over 6.2). Therefore, the smaller WBSF observed for NC males in this study could be due to a high pH_{24h}. Additionally, the meat L*, a* and b* values for high pH_{24h} group were 33.4; 9.2; 7.8, respectively. Based on these results it is possible to say that NC animals showed the lowest values of L*, a* and b* due to the highest percentage of DFD meat.

Figure 1. Effect of sexual condition and aging on tenderness of beef cattle finished in feedlot.



Similar to observed in this work, Amatayakul-Chantler et al. [5], found no difference between IM and SC animals in fresh meat. Likewise, Miguel et al. [2] did not reported difference between the genders on the WBSF in fresh meat. On the other hand, some studies noted NC animals had greater WBSF in fresh meat when compared to IM animals [3, 4].

IV. CONCLUSION

Castrated animals have high values for all meat color attributes compared to non-castrated although absolute values can be considered within range for normal meat.

The higher meat tenderness observed for NC males can be related to high DFD levels.

Method of castration does not affect meat color and tenderness.

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