CARCASS AND MEAT QUALITY TRAITS OF NELLORE YOUNG BULLS AND STEERS FED A HIGH OR LOW CONCENTRATE DIET THROUGHOUT FATTENING

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I. INTRODUCTION

Castration has been widely applied in beef production to improve meat quality characteristics. Compared to bulls, steers generally have higher carcass fat [1], higher marbling content [2], and increased meat postmortem tenderization rate [3]. On the other hand, under the same feeding conditions, bulls have higher feed efficiency and heavier carcasses than steers [4]. Therefore, the objective of this study was to evaluate the effect of castration on carcass and meat quality traits of Nellore bulls and steers fed a high or low-concentrate diet throughout fattening.

II. MATERIALS AND METHODS

A total of 28 young Nellore cattle, averaging 295.6 ± 8.05 kg of body weight and 8.0 ± 0.07 months of age, were used in this study. Half of the calves were randomly selected for surgical castration one week after weaning. Post-weaning, calves were confined for rearing and subsequently adapted to two finishing diets with different roughage:concentrate ratios: 50:50 and 15:85. Therefore, four experimental groups were generated: Steers 50:50, N=7; Steers 15:85, N=7; Bulls 50:50, N=7; and Bulls 15:85, N=7. The animals were slaughtered after 122 days of feedlot trial, with an average weight of 454.4 ± 30.0 kg. After harvest, data on hot carcass weight (HCW) and cold carcass weight (CCW) were obtained. After 24 hours of chilling, *Longissimus lumborum* (LL) samples were collected for meat quality analysis. The subcutaneous fat thickness (SFT) was measured in the *Longissimus lumborum* (LL) muscle using a digital caliper, and the Warner-Bratzler shear force (WBSF) was determined following American Meat Science Association guidelines [5]. Sarcomere length was estimated according to the laser diffraction technique [6]. The myofibrillar fragmentation index (MFI) was assessed by measuring the turbidity of homogenized samples in a standardized protein concentration [7]. All data were analyzed as a completely randomized design following a 2x2 factorial arrangement of treatments (2 sex conditions and 2 roughage to concentrate ratios). Analysis of variance (ANOVA) was performed to evaluate the effect of main factors and interaction on carcass and meat traits, using the GLM procedure of SAS. Once detected significant effect ($P \leq 0.05$) for sex at diet or interaction, treatments were compared by Tukey's test. Also, tendency was assumed when $0.05 < P \leq 0.10$.

III. RESULTS AND DISCUSSION

There was a strong tendency for sex variation in hot carcass weight (HCW) ($P = 0.064$) and cold carcass weight (CCW) ($P = 0.069$). Interaction between sex and diet was observed for HCW ($P = 0.023$) and CCW ($P = 0.024$). The pH of the bull group tended to be higher than the pH of the steer group ($P = 0.082$). A strong tendency towards a sex x diet interaction was observed for meat pH ($P = 0.058$). The WBSF was not affected by diet and sex ($P > 0.05$). On the other hand, there was a difference in SFT ($P = 0.048$) and MFI ($P = 0.041$) among sex treatments. Steer carcasses showed higher SFT than bull carcasses similar results were previously reported [8]. These results suggest that when castrated at weaning and fed in an intensive feeding system, Nellore steers show greater fat deposition. The higher MFI of steers can be explained by increased lipid uptake and lipogenesis, and decreased lipolysis, compared to bulls [9]. Tenderness is considered one of the most important characteristics of meat quality, but it is also highly variable [10].

Table 1 – Carcass and meat quality traits of Nellore young bulls and steers fed a high or low concentrate diet throughout fattening.

	Steers		Bulls			*P- value*		
	50:50	15:85	50:50	15:85	SEM	Sex	Diet	Sex*Diet
HCW, kg	126.43^{A}	128.01^{A}	133.29^{A}	138.81^{B}	2.80	0.064	0.398	0.023
CCW, kg	124.24^{A}	125.96^{A}	130.96^{A}	136.43^{B}	2.74	0.069	0.398	0.024
Sarcomere, µm	1.40^{A}	1.30^{A}	1.30^{A}	1.31^{A}	0.02	0.875	0.090	0.100
SFT, mm	7.99^{A}	6.90^{A}	6.42^{A}	5.65^{B}	0.49	0.048	0.076	0.455
WBSF, N	27,68^{A}	30.60^{A}	30.30^{A}	29.53^{A}	0.65	0.228	0.284	0.883
MFI, %	39.66^{A}	30.08^{AB}	28.11^{B}	31.41^{AB}	2.54	0.041	0.067	0.577

SEM: Standard error of the mean; For each variable, within a row, means without a common superscript letter are significantly different. Significant differences at 5% probability ($P \leqslant 0.05$). Tendency was assumed when $0.05 < P \leq 0.10$. HCW: Hot carcass weight (kg); CCW: Cold carcass weight (kg); SFT: Subcutaneous fat thickness (mm); WBSF: Warner-Bratzler Shear Force (V); S: Sarcomere (µm) MFI: Myofibrillar fragmentation index (%).

IV. CONCLUSION

This study indicates that castration improved carcass quality regardless of diet during fattening by improving fat deposition. However, it did not influence meat tenderness.

ACKNOWLEDGEMENTS

We are grateful to the Universidade Federal de Viçosa, Brazil (UFV) for providing the facilities for the conduction of the experiments and data analysis. This work was supported by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), #443718/2018–0; #311545/2017–3; #152108/2022-0 and # 153153/2024-5.

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