INFLUENCE OF WEIGHT GAIN DURING REARING ON THE LONGISSIMUS MUSCLE AREA OF BEEF CATTLE

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I. INTRODUCTION

The intensification of beef cattle production systems is a trend that has been applied over the last few decades. This intensification aims to improve the productivity, sustainability and profitability of beef production. In tropical regions, improving productivity is proving to be an important tool for reducing methane gas emissions [1]. In tropical systems, the longest production phase is usually rearing, so it is crucial to increase the performance of cattle during this phase in order to reduce rearing time, thereby reducing the age at slaughter of cattle.

However, the consequences that improved performance during rearing has on finishing and the system as a whole are not yet fully understood. Increase weight gain in the rearing phase economically improves the production system as a whole [2]. In relation to finishing phase, it was observed that greater performance during rearing reduced the final weight, weight gain and intake of the cattle and did not alter their feed efficiency during finishing [3]. Weight gain during rearing did not affect subcutaneous fat deposition, but Longissimus muscle area (LMA) and carcass weight were higher in steers with better performance during rearing [4]. Therefore, the aim of the study was to evaluate the effect of weight gain during rearing on the LMA of Nellore cattle.

II. MATERIALS AND METHODS

This study was carried out at FZEA/USP on the Fernando Costa Campus and was approved by the Animal Research Ethics Committee (under protocol #1960131223) in accordance with the guidelines of the National Council for the Control of Animal Experimentation (CONCEA). A total of 64 weaned Nellore steers were used in this study. Initially the animals had an average weight of 261.5±14.1kg and 7.1±0.4 months of age and were randomly distributed in a completely randomized design in four nutritional treatments (16 animals per treatment) based on weight gain during the rearing phase (8 months). The treatments were: T1 – Low gain (109.6 kg), T2 – Marginal gain (118.7 kg), T3 – Average gain (145.3 kg), and T4 – High gain (164.1 kg). The steers were housed in paddocks with *Urochloa brizantha* cv Marandu pastures and were supplemented for different performance.

The animals were weighed every 28 days in a handling center equipped with electronic scales Ultrasound carcass analyses were carried out at the beginning, mid and at the end of rearing to assess the LMA between the 12^{th} and 13^{th} ribs. This will be done using an Aloka SSD500 ultrasound equipped with a 17.2 cm linear transducer at a frequency of 3.5 MHz (Aloka Co. Ltd., Wallingford, CT, USA).

The data was analyzed using analysis of variance (ANOVA) in the “aov” function of statistical environment R (version 4.3.1). The residuals were tested for normality (Shapiro-Wilk test) and for homogeneity of variance (Levene’s test). The significant variables ($p \leq 0.05$) were submitted to pairwise mean comparisons using the Tukey-Kramer test. The treatment and sire were considered in the linear model. To assess the effect of the treatments throughout the time, a repeated measures over time analysis was carried out. To this analysis, we have included “Time” and “Time x Treatment” interaction in the linear model.

III. RESULTS AND DISCUSSION

There was a significant effect between treatments for LMA in rearing of Nellore cattle. In addition, the effect of time and the treatment x time interaction was significant for LMA. Treatments Average (T3) and High (T4) had higher LMA compared to Low (T1) and Marginal (T2) at the end of rearing and the same was observed for LMA gain during rearing (Table 1).

Table 1 – Longissimus muscle area (initial, mid, final and gain) of Nellore cattle of different performance during rearing.

Traits†	Treatments				*P-Values*		
	T1 Low	T2 Marginal	T3 Average	T4 High	Treatment	Time	Treatment x Time
Initial LMA, cm^2	49.9±3.7	50.8±3.9	51.4±5.1	54.1±3.3	0.07		
Mid LMA, cm^2	64.8±5.6	67.4±7.2	68.8±6.7	68.7±5.0	0.25	<0.001	<0.001
Final LMA, cm^2	70.8±4.8^a	70.6±3.5^a	76.1±5.8^b	84.3±6.5^c	<0.001		
Gain LMA, cm^2	20.9±5.2^a	19.7±4.3^a	24.67±5.2^b	30.2±6.1^c	<0.001		

†LMA = Longissimus muscle area. Superscript lowercase letters represent significant contrasts between treatments.

Increasing rearing performance is crucial in the search for more precocious animals and for the production of meat with greater tenderness. Tropical systems tend to have long rearing periods, which can make them less efficient financially and environmentally.

The results of this study showed that better gains during rearing increased LMA, which corroborates other studies [4,5]. However, this higher LMA in animals with better performance may be a reflection of the higher live weight of the animals at the end of rearing, and not necessarily greater LMA gain per unit of live weight [5]. Therefore, more studies are needed to better understand the effects of performance during rearing on muscle growth.

IV. CONCLUSION

Performance during rearing changes the Longissimus muscle area. More intensive systems with higher gains during rearing can increase muscle deposition in the carcass of *Bos indicus* beef cattle in tropical production systems.

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