RELATIONSHIPS BETWEEN FEED EFFICIENCY AND PERFORMANCE IN FEEDLOT FINISHED NELLORE CATTLE

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I. INTRODUCTION

Feed efficiency (FE) is very important for animal production since it is a measure correlated to factors such as feed intake, physiological state of animal, live weight, weight gain, age, sex, and environmental conditions, in addition to intrinsic factors, such as absorption and digestion rates, efficiency of energy use and metabolisable protein by animals [1]. Within this context, animals classified as efficient can reach productive indices similar to those obtained by the non-efficient ones, with lesser feed intake. This fact reflects the lower demand for environmental resources and provides greater profitability for the beef production system [2,3]. This study aimed to evaluate FE classification of Nellore animals, based on three different measures, and its effects on feedlot performance and carcass traits.

II. MATERIALS AND METHODS

A total of 52 non-castrated Nellore males were classified at the finishing stage as efficient or non-efficient based on three measures of FE - residual feed intake (RFI), residual weight gain (RWG), and residual intake and body weight gain (RIG). The RFI and RWG were calculated using regression equations as a function of metabolic body weight, dry matter intake (DMI), and average daily weight gain (ADG) [4,5,6]. The RIG was calculated using the RFI and RWG values, standardised to a variance of 1 [7]. Of the total number of experimental animals, 23 bulls were classified as totally efficient (negative RFI: RFI<0; positive RWG: RWG>0, and positive RIG: RIG>0) and 29 bulls as totally non-efficient (positive RFI: RFI>0; negative RWG: RWG<0, and negative RIG: CGR<0). The animals started the finishing period at 508 ± 13 days of age and 355 ± 6.43 kg body weight. They were slaughtered when ultrasonographic measurements of the subcutaneous fat thickness of the carcass in the Longissimus muscle reached a minimum of 4 mm. Productive traits were analysed in a completely randomised design with PROC MIXED from SAS, considering the fixed effect (efficiency class), covariate (age at slaughter), and random effect (year). Differences between means were verified using the F test with α=0.05 and trends when α=0.10.

III. RESULTS AND DISCUSSION

Table 1 shows the analysis of variance for the feed efficiency measures (RFI, RWG, and RIG) that enabled the identification of efficient and non-efficient Nellore animals. Likewise, the productive results of the comparison between animals of different efficiency classifications are presented in Table 2.

Table 1. Analysis of variance for the feed efficiency measures

Parameter	Nellore animals (Mean ± SEM)[1]		Pr > F
	Efficient: RFI (-) / RWG (+) / RIG (+)	Non-efficient: RFI (+) / RWG (-) / RIG (-)	
RFI	-0.99 ± 0.169a	0.85 ± 0.158b	<0.0001
RWG	0.27 ± 0.045a	-0.13 ± 0.042b	<0.0001
RIG	1.26 ± 0.198a	-0.98 ± 0.186b	<0.0001

Means followed by different letters on the row differ according to the F test (P < 0.05).
[1]SEM = Standard error of the mean, RFI = Residual feed intake, RWG = Residual weight gain, RIG = residual intake and body weight gain.

Nellore animals classified as efficient according to RFI, RWG, and RIG had similar initial and final body weight (IBW; FBW), hot carcass weight (HCW), and backfat thickness (BFT) compared to non-efficient animals. During the finishing period, there was a trend towards lower DMI by efficient animals compared to non-efficient animals (P=0.0608). Bulls classified as efficient had higher ADG (P=0.0038), better feed conversion ratio (FCR; P=0.0001), and greater rib eye area (REA; P=0.0189), with 22.3% higher ADG, 32.3% lower FC and 4.63% less REA compared to the non-efficient ones. Therefore, with the results of the three efficiency measures (RFI, RWG, and RIG), it is possible to identify animals that gain weight faster, based on more efficient feed use, reducing the classification of slow-growing animals as efficient.

Table 2. Analysis of variance for the productive traits of Nellore animals classified by feed efficiency indices

Parameter	Nellore animals (Mean ± SEM)[1]		Pr > F
	Efficient: RFI (-) / RWG (+) / RIG (+)	Non-efficient: RFI (+) / RWG (-) / RIG (-)	
DMI, kg/d	6.98 ± 0.373	8.09 ± 0.349	0.0608
ADG, kg/d	1.43 ± 0.058a	1.11 ± 0.054b	0.0038
IBW, kg	355 ± 11.071	350 ± 10.362	0.7460
FBW, kg	458 ± 11.087	442 ± 10.377	0.3063
FCR, kg/kg	4.93 ± 0.235b	7.29 ± 0.220a	0.0001
HCW, kg	265 ± 6.873	269 ± 6.432	0.6704
REA, cm²	73.5 ± 1.079b	77.1 ± 1.001a	0.0189
BFT, mm	4.13 ± 0.330	4.83 ± 0.309	0.1541

Means followed by different letters on the row differ according to the F test. (P < 0.05).
[1]SEM = Standard error of the mean, DMI = Dry matter intake, ADG = Average daily weight gain, IBW = Initial body weight, FBW = Final body weight, FCR = Feed conversion ratio, HCW = Hot carcass weight, REA = Rib eye area, BFT = Back fat thickness.

IV. CONCLUSION

Nellore animals classified as efficient based on the association between RFI, RWG, and RIG did not negatively impact traits of economic interest for beef cattle production system. In addition, identifying these animals makes possible to obtain high weight gains using feed efficiently.

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