Feedlot performance and rumen morphometrics of Nellore cattle differing in phenotypic residual feed intake

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Introduction and Objective

The residual feed intake (**RFI**) is one of the efficiency measures for animals, which can be influenced by physiological mechanisms, such as tissue metabolism and feed digestibility. Improvements in feed efficiency directly lead to cost reduction, which may have impact on the rumen epithelium as well. Therefore, the objective this study was evaluate the effect of ranking Nellore bulls according to residual feed intake (RFI) on feedlot performance and rumen morphometric variables.

Materials and Methods

Twenty-seven 18-mo-old Nellore bulls (425.5 ± 20.1 kg) were randomly allocated in 27 pens (one animal per pen) and fed for 107 days. The multiple step-up diets program consisted of ad libitum feeding of diets with the concentrate level increasing from 70% to 86% concentrate. At harvest, rumen epithelium samples were collected from cranial for rumen morphometric measurements. The RFI was calculated by the difference between the predicted DMI values [DMI = $(0.0544*BW^{0.75}) + (2.9659*ADG)$] and observed DMI. Then, Nellore bulls were distributed into RFI groups: High (0.5 SD above the mean; n=8), Medium (±0.5 SD of the mean; n=9) and Low (0.5 SD below the mean; n=10).

Results

Table 1. Effect of different residual feed intake (RFI) groups on rumenitis and rumen morphometrics of Nellore yearling bulls consuming high-concentrate diets

| | RFI Group | | | | |
Variable	High	Medium	Low	SEM	P-value
n	8	9	10		
Rumenitis score	0.88	0.67	0.80	0.164	0.675
Number of papillae, no.	75.16	58.21	58.23	6.001	0.281
Absorptive surface area (ASA), cm²	43.31[a]	31.27[b]	32.95[b]	3.953	0.096
Papillae area, cm²	0.59	0.53	0.55	0.042	0.609
Papillae area,% of ASA	97.77	96.72	97.06	0.361	0.150

Table 2. Effect of different residual feed intake (RFI) groups on feedlot performance and carcass characteristics of Nellore yearling bulls consuming high-concentrate diets

| | RFI Group | | | | |
Variable	High	Medium	Low	SEM	P-value
n	8	9	10		
Feedlot Performance					
RFI, kg/d	0.75[a]	-0.07[b]	-0.55[c]	0.074	0.001
Initial BW, kg	434.65	421.38	421.89	6.436	0.293
Final BW, kg	562.32	552.52	564.37	8.180	0.541
Daily DMI, kg	10.24[a]	9.10[b]	9.01[b]	0.284	0.012
Daily DMI, % BW	2.06[a]	1.89[b]	1.84[b]	0.050	0.013
ADG, kg	1.28	1.19	1.30	0.076	0.541
G:F, kg/kg	0.125[b]	0.130[b]	0.142[a]	0.005	0.040
Hot carcass weight, kg	306.02	297.20	308.06	4.678	0.270
Dressing percentage	54.62	53.69	54.50	0.456	0.245
Carcass characteristics					
Initial LM area, cm²	69.48	69.24	70,58	1.553	0.798
Final LM area cm²	83.26	82.42	81,58	1.209	0.621
LMA daily gain, cm²	0.13	0.12	0,11	0.011	0.611
Initial 12th rib fat, mm	3.14	3.11	3,02	0.151	0.779
Final 12th rib fat, mm	5.55	4.86	5,40	0.294	0.241
12th rib daily gain, mm	0.02	0.02	0,02	0.003	0.241
Initial P8 fat thickness, mm	4.29	4.37	4,03	0.243	0.485
Final P8 fat thickness, mm	7.47	6.76	6,86	0.336	0.306
P8 fat daily gain, mm	0.03	0.02	0,03	0.003	0.306
Initial Marbling	2.09	2.33	2,09	0.210	0.653
Final Marbling	2.37	2.51	2,39	0.213	0.879

Conclusion

Thus, Low-RFI Nellore bulls improved feed efficiency without promoting any positive effects on carcass traits and rumen morphometrics.