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Effect of duration of restricted-feeding on nutrient excretion, animal performance, and carcass characteristics of Holstein × Zebu finishing steers

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Economic analysis

Material and Methods

Economic analysis included daily feed cost ($/animal/d), cost of carcass gain ($/kg carcass), and net return ($/steer) variables. Diet cost ($/kg DM) was estimated considering the diet ingredients prices: Corn silage = $0.11/kg DM; Dry ground corn = $0.16/kg DM; Soybean meal = $0.35/kg DM; Urea = $0.45/kg DM; Ammonium sulfate = $0.07/kg DM; and Minerals = $1.09/kg DM. Feedstuff prices were obtained from market prices reported in Brazil, during the period of June to August 2016. Daily feed cost ($/steer/d) was evaluated during d 1 to 28, d 29 to 42, d 43 to 84, and d 1 to 84 periods, and was estimated by multiplying average DMI of each period evaluated (kg/d) by diet cost ($/kg DM). Cost of carcass gain was estimated as daily feed cost ($/steer/d; d 1 to 84) divided by carcass gain (kg/d). Net return ($/steer) was estimated as MRS ($) minus PC ($), TFC ($), and OC ($), where MRS = money received per steer, estimated as Final HCW × $2.98/kg of carcass; PC = purchase cost, estimated as Initial HCW × $2.98/kg of carcass; TFC = total feed cost, estimated by multiplying total DMI (kg, d 1 to 84) by diet cost ($/kg DM); OC = operational costs, represented $34/steer (COAN, 2017).

Results and discussion

Cost of the total mixed ration, fed to all cattle, was $ 0.17/kg DM (Table S1). As a consequence of DMI, daily feed cost ($/animal/d) was affected ($P < 0.01$) by duration of restricted-feeding. Daily feed cost was greater ($P < 0.05$) for AL84 steers compared to R28, R42, and R84 steers when these steers were restricted to 85% of the *ad libitum* intake. However, when transitioned to *ad libitum* feeding, R28 and R42 steers had similar ($P > 0.05$) daily feed cost compared to AL84 steers. Overall daily feed cost (d 1 to 84) was

greatest ($P < 0.05$) in steers fed AL84 and R28 whereas steers fed R84 had the least ($P < 0.05$) overall daily feed cost; steers fed R42 were intermediate and different ($P < 0.05$) from all other treatments. Considering the 84-d feedlot period, steers fed R42 and R84 spent $ 0.18 and $ 0.30 less per day in feed, respectively, compared to steers fed for AL84. Therefore, results suggest a savings in feed cost of $ 15.12 and $ 25.20 per steer, respectively, when steers are fed for R42 and R84 in relation to steers fed for AL84.

Cost of carcass gain ($/kg carcass) and net return ($/steer) were not affected by treatments ($P \geq 0.82$); however, the numerical differences calculated may be economically relevant on larger groups of cattle. For example, the cost of carcass gain for steers fed for R28, R42, and R84 was 0.07, 0.08, and 0.12 $ less per kg of carcass produced when compared to steers fed for AL84. Changes in both money received per steer and feed costs among the treatments resulted in a greater numerical net return of 15.10 and 3.30 $/steer for steers restricted for 28 and 84 d, respectively, and a lower numerical net return of 0.90 $/steer for steers restricted for 42 d, when compared to steers fed AL84. However, similar to the cost of carcass gain, these values for net return were not different ($P = 0.82$). Hill *et al.* (1996) also reported reduction in feed cost, and numerically greater net returns for restricted compared to *ad libitum*-fed feedlot steers.

The lack of difference in our economics could be caused by the small sample size and high variability of the data, which can increase the probability of type-II errors. Unfortunately, a greater sample size was not available for this study. Sample size was established according to the recommendations of the Ethic Commission in Use of Production Animals of the Universidade Federal de Viçosa, and was in agreement with the Ethical Principles for Animal Research established by the National Council of Animal Experimentation Control (CONCEA) and with actual Brazilian legislation.

References

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Table S1. Effect of duration of restricted-feeding period on feed and carcass costs, and return per steer

Means in the same row with no letters after them or with a common letter following them are not significantly different (P < 0.05)

Item	Treatment[A]				SEM[B]	*P-value*
	AL84	R28	R42	R84		
No. animals	5	5	5	5	-	-
Daily feed cost ($/animal)[C]						
d 1-28	1.65a	1.42b	1.39b	1.41b	0.030	<0.01
d 29-42	1.61a	1.67a	1.28b	1.29b	0.049	<0.01
d 42-84	1.75a	1.84a	1.67a	1.41b	0.054	<0.01
d 1-84	1.69a	1.67a	1.51b	1.39c	0.034	<0.01
Cost of carcass gain ($/kg)[D]	2.22	2.15	2.14	2.10	0.137	0.90
Net return ($/steer)[E]	26.7	41.8	25.8	30.0	13.47	0.81

[A]AL84 = Steers fed *ad libitum* for 84 d; R28 = Steers restricted (intake restricted to 85% of *ad libitum* DM intake [DMI], based on AL84 steers intake of the last 3 d) for 28 d then fed for *ad libitum*-intakes for 56 d; R42 = Steers restricted for 42 d then fed for *ad libitum*-intakes for 42 d; R84 = Steers restricted for 84 d.

[B]Standard error of mean.

[C]Diet cost = $ 0.17/ kg DM was calculated considering the diet ingredients prices: Corn silage = $0.11/kg DM; Dry ground corn = $0.16/kg DM; Soybean meal = $0.35/kg DM; Urea = $0.45/kg DM; Ammonium sulfate = $0.07/kg DM; Minerals = $1.09/kg DM. Feedstuff prices were obtained from market prices reported in Brazil, during the period of June to August 2016. Daily feed cost ($/steer/d) was calculated as DMI of each period evaluated (kg/d) × diet cost ($/kg DM).

[D]Cost of carcass gain ($/kg) was calculated as Daily feed cost ($/steer/d; d 1 to 84)/ Carcass gain (kg/d).

[E]Net return was calculated as MRS ($) - PC ($) - TFC ($) - OC ($), where MRS = money received per

steer, estimated as Final hot carcass weight × $2.98/kg of carcass; PC = purchase cost, estimated as Initial hot carcass weight × $2.98/kg of carcass; TFC = total feed cost, estimated by multiplying total DMI (kg, d 1 to 84) by diet cost ($/kg DM); OC = operational costs, represented $34/steer (COAN, 2017).