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EFFECTS OF RESTRICTING INTAKE ON CARCASS TRAITS OF YOUNG STEERS

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Summary

Feedlot performance and carcass characteristics were compared when steer calves were fed energy dense diets ad libitum (AL) or restricted (RI) to achieve constant growth rates. AL steers grew more rapidly ($P < .10$) than RI steers, 2.93 vs 2.74 lb per head per day. For the period from 98 days to slaughter (AL = 89 days, RI = 99 days), AL steers consumed more dry matter daily than RI steers. Restricting intake did not affect feed conversions or total dry matter consumed while in the feedlot. Steers were slaughtered at similar final weights. Intake level did not affect carcass weight, rib fat thickness or rib eye area. RI resulted in depressed ($P < .05$) marbling scores and increased ($P < .05$) percentage KHP. Failure to achieve maximal rates of gain appears to be a primary factor affecting marbling scores in steers 13 to 14 months of age.

(Key Words: Steer Calves, Feedlot, Dry Matter Intake, Carcass, Marbling.)

Introduction

One of the challenges facing the beef industry today is to produce trim carcasses (<.4" rib fat) that will consistently have a minimum quality grade of low choice. This is particularly difficult when cattle achieve slaughter weight at 14 months of age or younger. In an earlier experiment, we found that, if steers were fed to produce similar carcass weights, restricting intake to achieve a constant growth rate resulted in lower marbling scores, although rib fat thickness and 9-10-11 rib composition did not differ. Gain of restricted growth steers was 3.14 lb per day over 178 days. Those data suggest that managing calves for good rather than maximal growth rates may be a principal limitation to producing choice carcasses in young cattle. Since

marbling scores are sensitive to many variables, we felt it was important to repeat those comparisons.

Materials and Methods

The Simmental and Angus-sired crossbred calves used in this study were weaned off cows at Ft. Meade in late October and shipped directly to Brookings. Calves were vaccinated using a combination modified live virus vaccine including IBR, BVD, PI₃, BRSV and a 7-way clostridia vaccine. Ivermectin was administered for parasite control. Synovex-C implants were administered in August so implanting was delayed until calves had been on feed 98 days. Calves were individually weighed 36 hours after arriving at the feedlot and allotted to restricted intake (RI) or ad libitum (AL) groups based upon weight, age and breed of sire. The 56 calves, mean weight 595 lb, were placed in four pens of 14 head each.

The receiving diet (Table 1) was fed for 21 days. The switch to the finishing diet was abrupt. Dry matter intake was limited to 8 lb per head per day for 3 days and then gradually increased. Steers in the AL group were fed to appetite. Feed delivery for the RI group was based upon diet NE content and steer weight using the NRC equation for large framed steer calves. The ADG target was 3.3 lb per day. Intake was adjusted at 14-day intervals and was based on actual weights obtained at the same intervals. At 98 days, steers were implanted with Synovex-S⁴ separated into smaller pens containing 7 head each. Feeding was scheduled to end when a treatment group averaged 1,145 lb. The AL group was fed for 187 days and the RI group was fed for 197 days. Hot carcass weights were recorded. Rib eye area, rib fat thickness, percent kidney, pelvic and heart fat and marbling score were determined 24 hours after cattle were slaughtered. Calf

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⁴Provided by Syntex Corp., Des Moines, IA.

TABLE 1. RECEIVING AND FINISHING DIETS^a

Ingredient	Receiving ^b	Finishing ^c
Cracked corn	54.10	
Whole shelled corn		23.55
High moisture corn		47.10
Brome-alfalfa hay	40.00	
Corn silage		20.00
Molasses	3.00	2.00
Soybean meal, 44%	2.50	6.05
Limestone		1.00
Trace mineralized salt ^c	.40	.30
Composition ^e		
Crude protein	13.60	11.98
NEm, Mcal/cwt	82.0	92.3
NEg, Mcal/cwt	50.1	61.0

^a Percentage dry matter basis unless otherwise noted.

^b Provided >1500 IU vitamin A⁵/lb and 37.5 g lasalocid/T diet.

^c Provided >1000 IU vitamin A⁵/lb and 26 g monensin⁶/T.

^d Contains 97% NaCl, .007% I, .24% Mn, .24% Fe, .05% Mg, .032% Cu, .011% Co, .032% Zn and .5% Ca.

^e Estimated from tabular data.

weight gains and carcass data were statistically analyzed using calf as the experimental unit. Intake and feed conversion data were analyzed on a pen basis for data after 98 days on feed.

Results and Discussion

Overall, steers did not perform as expected. Cumulative ADG of 2.84 ± .0576 lb was well below the projected rate and tended (P<.10) to be higher among the AL group (Table 2). The AL steers consumed more (P<.05) dry matter daily but did not consume more feed while in the feedlot. Feed conversion was not affected (P>.10) by feeding program. Interim body weights were heavier for AL steers, but this weight

advantage had diminished by 182 days on feed. Final live weights were not affected by management group. Restricting intake slightly has been recommended by some researchers as a means to improve feed efficiency during high grain feeding. In this experiment restricting intake merely prolonged the time necessary to reach slaughter weight. Bunk maintenance during incimate weather is simplified by restricting feed intake, but no other production efficiencies were evident.

Carcass weight, rib fat thickness and rib eye area were not affected (P>.10) by treatment (Table 3). The percentage kidney, pelvic and heart fat was estimated to be higher and marbling score lower for the RI group (P<.05). The percentage of carcasses grading low choice or better was not affected by management when Chi square analysis was used. The difference in the two statistical evaluations occurred because of those carcasses that had at least small marbling scores, the AL group had higher scores. In the previous experiment, we may have slaughtered cattle at a slightly lower degree of fatness based upon rib fat thickness (.393 vs .347 in.) which could have a significant impact on percentage choice data.

Most previous research has involved feeding relatively higher roughage diets when considering energy intake effects on quality grades and it is generally recognized that energy dense diets are necessary to produce choice cattle. These experiments indicate that the relative intake level of high grain diets is also important. Management that does not allow for adequate caloric intake will result in lower marbling scores. Cumulative ADG of 2.8 or 3.0 lb per day which is generally considered to be a good level of performance may not be adequate to ensure choice grades in some cattle unless the feeding period is extended. The steers in this experiment averaged 391 days of age at slaughter and produced 693-lb carcasses. Including regraded carcasses, there were 78% choice carcasses and 78% yield grade 2 carcasses. By feeding adequate energy levels, it is feasible to produce choice carcasses from cattle less than 14 months of age without causing them to be overly fat.

⁵Provided by Hoffman-LaRoche, Nutley, NJ.

⁶Provided by Elanco, Indianapolis, IN.

TABLE 2. FEEDLOT PERFORMANCE OF STEERS FED AT AD LIBITUM OR RESTRICTED LEVELS OF INTAKE

Item	Treatment		SEM
	Restricted	Ad libitum	
Number of steers	27	29	
Initial weight, lb	594	597	6.6
Final weight, lb	1,133	1,145	10.4
Days fed	197	187	
Average daily gain, lb ^{a,c}	2.74	2.93	.06
Daily dry matter intake, lb ^{b,d}	19.57	21.25	.31
Feed/gain ^b	7.15	7.27	.24

^a Entire feeding period.

^b Includes only data after 98 days on feed.

^c Means differ ($P < .10$).

^d Means differ ($P < .05$).

TABLE 3. CARCASS TRAITS OF RESTRICTED INTAKE AND AD LIBITUM INTAKE STEER GROUPS

Item	Treatment		SEM
	Restricted	Ad libitum	
Carcass weight, lb	689	697	10.9
Rib fat thickness, in.	.390	.395	.023
Rib eye area, in. ²	12.29	12.32	.20
KPH, % ^a	2.61	2.11	.069
Marbling score ^b	12.22	12.47	.119
Choice, %	74	83	
Yield grade	2.68	2.61	.10

^a Means differ ($P < .05$).

^b Means differ ($P < .01$); 12.0 = Sm°, 13.0 = Modest°.