1988

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BEEF REPORT

EFFECT OF DIFFERENT GROWTH PATTERNS ON FEEDLOT PERFORMANCE AND CARCASS TRAITS OF MODERATELY LARGE FRAMED FEEDER CALVES

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CATTLE 88-6

Summary

Dry matter intake of Charolais and Limousin sired crossbred steers was restricted to allow three distinctly different postweaning growth patterns. Growth patterns represented were LL--allow 2.8 lb ADG throughout the feeding period; LH--same as LL until 80% of slaughter weight, then allow ad libitum DMI; or HH--ad libitum feed intake throughout. Ad libitum fed steers consumed 23% more dry matter (P<.001) had higher ADG (3.81 vs 3.09 lb/head/day; P<.01) than steers on restricted feed intake up to 80% of slaughter weight. Feed efficiency was similar regardless of feeding rate in the early growth curve. Steers switched from restricted to ad libitum feed intake exhibited compensatory gains (P<.01), while DMI did not differ from steers previously fed ad libitum. While feeding program affected cumulative feedlot ADG and DMI (P<.05) and days on feed, feed efficiency and total dry matter consumed were not affected. LL feeding resulted in lower marbling scores and a lower percentage choice grade in carcasses of similar weights. Growth pattern had no effect on carcass composition estimated from 9-10-11 rib section when adjusted to a common carcass weight.

(Key Words: Growth Pattern, Feedlot, Steers, Gain, Efficiency, Carcass Composition.)

Introduction

Increased emphasis is being placed upon carcass specifications of fed cattle. As specifications become more defined, it is apparent that consistency within a group of cattle will become important to the beef producer. Theoretically, genetic selection is the tool of first choice for improving consistency among carcass traits for beef cattle. Unfortunately, there is only limited selection control available for feedlot operators. Management techniques that will help minimize carcass variations and help meet specifications will be valuable in the future.

The typical gain curve for feedlot cattle involves very rapid gains during the initial feeding period and very poor gains and feed efficiencies in the last weeks before slaughter. Rapid gains of growing calves are associated with excess subcutaneous fat depositions when caloric intake exceeds lean growth potential. Later in the feeding period high dry matter intakes can lead to poor feed utilization and have led some researchers to promote restricting intake of finishing cattle by 5 to 8%. Both of these observations are of concern when we try to get moderately large framed cattle ready for slaughter at 12 to 14 months of age. This study was designed to consider the effects of using controlled growth rates on the feedlot performance and carcass traits of moderately large framed crossbred steers.

Materials and Methods

Ninety Charolais x Limousin cross steer calves (613 lb) were used to evaluate the effects of growth pattern on feedlot production efficiencies and carcass traits. Calves arrived in the feedlot 4 to 6 weeks prior to initiating this study. Vaccines were administered for IBR, BVD, PI_3, H. somnus and BRSV and ivermectin was used for parasite control. A corn silage and cracked corn diet containing decoquinate was fed during the receiving period.

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Feed and water were withheld for 16 hours prior to determining initial weights. Weight and breed cross were stratified in each of 12 pens. Six pens contained 8 head and six pens contained 7 head of steers. Allotment of treatments to 7 or 8 head pens was random. Treatments included controlling dry matter intake throughout the feeding period to achieve a constant ADG of 2.8 lb (LL); controlling dry matter intake allowing 2.8 lb ADG until calves reach 80% of slaughter weight and then allowing ad libitum feed intake (LH); or allowing ad libitum feed intake throughout the feeding period (HH). One common diet was used (Table 1). For controlled growth treatments, dry matter intakes were adjusted at 28-day intervals to provide appropriate amounts of NEm and NEg for 2.8 lb ADG.

TABLE 1. COMPOSITION OF DIET USED FOR RESTRICTED AND AD LIBITUM INTAKE STEERS

Item	Percentage[a]	Formulated value
Corn silage	20.00	
Whole shelled corn	23.55	
Whole high moisture corn	47.10	
Molasses	2.00	
Soybean meal, 44%	6.05	
$CaCO_3$	1.00	
Trace mineralized salt	.30	
Crude protein		11.98
NEm, Mcal/cwt		92.3
NEg, Mcal/cwt		61.0

[a] Dry matter basis.

Slaughter weight was assigned at 1170 lb to provide 725 carcasses. Slaughter for all steers on a treatment was scheduled for the projected date that final weight would be reached. Feed and water were withheld for 24 hours prior to obtaining final weights. Steers were slaughtered 24 hours after final weights were determined. Cattle had access to feed and water between final shrunk weight and slaughter.

Carcass weights are hot carcass values. Rib fat and rib eye area were measured following a 24-hour chill. Marbling scores and percentage kidney, pelvic and heart fat were assigned at this time by the federal grader working at the slaughter plant. Rib sections were randomly selected from 16 carcasses in each treatment group for determination of 9-10-11 rib composition. Whole rib sections were uniformly separated into 9-10-11 rib portions. Bone was removed and remaining soft tissue was chopped and blended into a homogenous sample for chemical analysis. Water was considered weight loss following 48 hours drying at 50 ^{o}C in a vacuum oven. Protein was Kjeldahl N content * 6.25.

Feedlot data were analyzed as a completely random design experiment with pen representing the experiment unit. Mean per head data were used for pen analysis with no adjustment made for unequal head counts/pen. Carcass data were analyzed with carcass representing the experimental unit. All AOV and means separation tests were accomplished using GLM procedures and Duncan's option of SAS.

Results and Discussion

Ad libitum fed steers consumed 23% more dry matter ($P<.001$) during phase 1 than LL and LH steers (Table 2). Gains reflected DMI differences and were higher ($P<.01$) for HH steers. Mean F/G during phase 1 was 4.98 and was not affected by intake level. Obviously, restricted intake steers were not full. If restricted feeding had contributed to subacute digestive or metabolic disorders, poorer feed efficiency would be expected. Feed efficiency was not affected and no evidence of acute digestive upset occurred during the study. HH steers were heavier ($P<.05$) than restricted intake steers at the conclusion of phase 1. Gains of LH and LL steers were higher than projected (2.8 vs 3.08 lb/day). In part, this may be because of the long interval (28 days) used in NE calculations.

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TABLE 2. FEEDLOT PERFORMANCE OF STEERS FED AD LIBITUM OR RESTRICTED AMOUNTS OF A FINISHING DIET

Item	Treatment LL	LH	HH	SEM
Phase 1				
Initial weight	616	613	611	2.5
ADG[c]	3.07	3.10	3.81	.11
DMI[d]	15.05	15.05	19.45	.39
F/G	4.95	4.87	5.11	.20
Phase 2				
Initial weight	917	916	984	5.8
ADG[b]	3.22	3.91	3.14	.20
DMI[c]	18.65	22.23	22.53	.69
F/G[a]	5.81	5.73	7.31	.46
Cumulative				
Initial weight	1175	1170	1154	7.8
ADG[a]	3.14	3.42	3.57	.11
DMI[d]	16.67	17.91	20.54	.48
F/G	5.34	5.25	5.77	.24
Days on feed	178	163	152	

[a] Treatment effect P<.10.
[b] Treatment effect P<.05.
[c] Treatment effect P<.01.
[d] Treatment effect P<.001.

During phase 2, LH steers were switched to ad libitum intake and exhibited compensatory growth. Feed intake was similar for LH and HH steers, but LH steers had higher ADG (P<.05) and lower F/G (P<.05) than HH steers. LL steers consumed less feed than ad libitum fed steers but gained similarly to HH steers. Feed efficiency during phase 2 was similar for LL and LH steers in spite of differences in DMI.

Overall HH steers had higher ADG (P<.05) than LL steers and consumed more dry matter daily (P<.05) than LL or LH steers. Feed efficiency tended to be poorer (P<.10) when steers were fed ad libitum throughout the feeding period. It was intended that steers would be slaughtered at a similar final weight. Although final weights differ numerically, differences were not significant. Days required to reach slaughter weight were 178, 163 and 152 for LL, LH and HH groups, respectively. Total dry matter consumed while in the feedlot did not differ between groups.

Carcass weights averaged 705 lb and were similar between groups. Dressing percent was affected by feeding program being higher (P<.01) for HH than LH and LL steers (Table 3). Rib fat tended to be (P<.10) thicker for HH than LL carcasses and kidney pelvic and heart fat was higher in HH carcasses. These increases in carcass fat may explain differences in dressing percent noted. Marbling scores were higher (P<.05) in HH than LL carcasses and percentage of carcasses grading choice was lower (P<.10) for LL carcasses. The number of carcasses with Sm$^-$ to Sm$^+$ marbling scores was similar between groups. Fewer carcasses from restricted growth steers had marbling scores of modest$^-$ or greater. More carcasses from the LL group had marbling scores lower than Sm$^-$. Analysis of soft tissue of the 9-10-11 rib section indicated no differences in water or ether extract content. Protein content was lower (P<.05) in HH than LH steers which would be consistent with indications of external fat. However, when carcass weight was included as a covariate in the analysis of variance no differences in carcass composition attributable to feeding program were noted. Bartlett's test for homogeniety of variance indicated variation was

similar among treatment groups. This was interpreted to indicate that feeding programs did not alter the uniformity of carcasses produced.

TABLE 3. CARCASS TRAITS OF STEERS FED AD LIBITUM OR RESTRICTED AMOUNTS OF A FINISHING DIET

Item	Treatment group LL	LH	HH	SEM
Carcass weight, lb[f]	702	706	707	10.9
Dressing percent[f]	59.94	60.35	61.26	.25
Rib eye area, in^2[d]	13.25	13.17	12.96	.22
Rib fat, in[g]	.32	.34	.38	.02
KPH, %[g]	2.35	2.34	2.77	.08
Marbling score[ae]	3.74	4.06	4.29	.14
Percent choice	56.7	80.0	80.0	
Carcass protein, %[bc]	14.28	14.24	13.95	.23
Carcass water, %[b]	52.92	52.79	51.91	.68
Carcass fat, %[b]	30.70	31.52	32.24	.86

[a] 3.3 = Sl^+, 3.7 = Sm^-, 4.0 = Sm^o, 4.3 = Sm^+, 4.7 = Mt^-.
[b] Least-square means corrected for carcass weight.
[c] Estimated using 9-10-11 rib section as in Hankins and Howe.
[d] Treatment effect (P<.10).
[e] Treatment effect (P<.05).
[f] Treatment effect (P<.01).
[g] Treatment effect (P<.001).

In this facility, restricting intake of a high grain diet was an effective means of manipulating cattle growth rates. This tool would allow accurate targeting of marketing dates. Although growth restriction did not affect carcass composition, it appears that restricted growth is a primary factor affecting marbling scores.