EFFECT OF SLAUGHTER DATE ON PERFORMANCE AND CARCASS QUALITY OF FEEDLOT STEERS

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Story in Brief

Two hundred and fifty-six (256) crossbred yearling steers initially weighing 725 lb were used to study the effect of slaughter date on live performance and carcass characteristics. Steers were divided into four slaughter groups (64 steers) and fed for either 105, 119, 133 or 147 days. Daily gains (carcass adjusted basis) tended to increase in a quadratic manner while feed intake increased linearly as cattle were fed more days. Efficiency of feed conversion (carcass adjusted basis) greatest for steers fed 119 days. Carcass weight, subcutaneous fat thickness, KPH, overall carcass maturity, and yield grade increased linearly with slaughter date. Marbling score and the percentage of cattle grading U.S. Choice increased with time. Although performance and carcass traits increased with time on feed, feeding cattle more than 133 days did not appear to enhance performance or carcass quality.

(Key Words: Feedlot Steers, Days on Feed, Carcass Quality.)

Introduction

The length of time cattle are fed high concentrate diets is dependent primarily upon the economics associated with seasonal changes in feed and cattle costs. Longer feeding periods for cattle of a given starting weight will increase final live weight, hot carcass weight, longissimus area, subcutaneous fat thickness, yield grade and quality grades (Hicks et al., 1987 and Dolezal et al., 1982), only some of which increase the value of cattle. Increases in subcutaneous fat thickness and yield grade are not conducive to increases in carcass quality and consumer interest. The objective of this experiment was to examine the effects of days on feed on performance and carcass quality.

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Materials and Methods

Two hundred and fifty-six crossbred steers (725 lb) were selected from a larger group (n=570) based on uniform size, weight and breed-type. Steers with greater than 25% Bos Indicus or Angus characteristics were removed, leaving steers of primarily British x Continental breed-type. Steers were processed routinely and implanted with an estrogenic implant (24 mg estradiol; Compudose®) at a commercial feedlot prior to arrival at Panhandle State University in Goodwell, OK. Upon arrival, steers were individually weighed, identified, and blocked into 4 weight groups based on initial weight. Sixteen steers from each weight group were randomly assigned to pens (8 steers/pen) and pens were assigned to specific slaughter dates. Eight pens (2 from each weight group) were assigned to be fed for a different number of days. Steers were fed for either 105, 119, 133 or 147 days.

Steers were given ad libitum access to their high concentrate diets for the entire feeding period. Diet compositions and analyses are shown in Table 1. Cottonseed hulls and chopped alfalfa, used as roughage sources, were removed stepwise from the diet to adapt cattle to their final diet. Steers were receiving their final ration by day 19 of the study.

Cattle were weighed initially directly off the truck; these weights were used for allocation. Weight gain and feed efficiency were calculated based on initial shrunk weight and final live weights which were calculated from hot carcass weight /.6495, the mean dressing percentage for all cattle. Diet net energy values were calculated for each treatment using the 1977 yearling steer equation as reported by Hays et al. (1986). Cattle were slaughtered at a commercial plant. At slaughter, livers were examined for the presence and severity of abscesses. Carcass data for all slaughter groups were obtained approximately 48 hr postmortem; yield and quality grades were determined (USDA, 1989).

Beta-hydroxy-β-methyl butyrate (HMB), a metabolite of leucine, was imposed across this experiment to evaluate the effects of HMB on performance and carcass characteristics. Data were analyzed on a pen basis using least squares analysis (SAS ,1988) with a linear model that included effects of HMB (df = 1), weight block (df = 3), slaughter date (df = 3) and all two way interactions. Carcass data was regressed against the mean carcass weight and subcutaneous fat thickness. When a slope was significant, but the interaction was not significant, the adjusted means were reported . Least squares means were calculated and slaughter group means were compared using T-tests and orthogonal contrasts.

Results and Discussion

The effects of slaughter date on performance are presented in Table 2. Final live weight increased ($P<.05$) resulting in a linear (L) increase ($P<.01$)

Table 1. Composition of diets (dry matter basis).

	Diet Sequence				
Ingredient	1	2	3	4	Final
	(%)				
Corn, rolled	40.20	50.20	60.20	70.20	82.20
Alfalfa hay, pelleted	25.00	20.00	15.00	10.00	4.00
Cottonseed hulls	25.00	20.00	15.00	10.00	4.00
Molasses, cane	4.00	4.00	4.00	4.00	4.00
Pelleted supplement[a]	5.80	5.80	5.80	5.80	5.80

Calculated Composition:

	Final Diet	
Nutrients	DM %	As Fed %
Dry matter, %	100.00	87.80
NEm, Mcal/kg	2.09	1.84
NEg, Mcal/kg	1.33	1.17
Crude protein, %	11.90	10.45
K, %	.70	.62
Ca, %	.54	.48
P, %	.32	.28

[a]Supplement composition: Cottonseed meal, 65.9%; calcium carbonate, 17.1%; urea, 9.49%; salt, 6.04%; dicalcium phosphate, 1.25%; vitamin A, D, E, .20%; Manganese Dioxide .02%.

across slaughter group, but weight increased at a decreasing rate giving a quadratic (Q; P<.03) response. Hicks et al. (1987) fed steers of similar weight for either 100, 114, 128 or 142 d, and reported similar L increases in final live weight. Carcass adjusted ADG (Table 2) was the greatest for steers fed 119 d, being 5.7 % greater (P<.05) than steers fed for 105 d but not significantly different from ADG of steers fed for 133 or 147 d. Daily feed intake of steers increased (L; P<.03) with days on feed. Steers fed 105 d consumed less (P<.05) feed than steers fed 133 d. Because feed intake generally is lower the first month than thereafter (Hicks et al. 1990), longer feeding times will dilute this effect and give a higher mean feed intake for the total feeding period. Steers fed for 119 d had superior (P<.05) feed efficiency (carcass adjusted basis) as

Table 2. Effects of days on feed on performance of feedlot steers.[a]

	Days on feed				
	105	119	133	147	SEM
No. of Pens	8	8	8	8	
No. of Steers	61	63	64	64	
Initial wt., lb	727	727	725	725	.10
Final wt., lb[b]	1041^{c}	1105^{d}	1138^{e}	1175^{f}	5.03
ADG, lb	3.00^{c}	3.17^{d}	3.11^{cd}	3.11^{cd}	.02
Feed Intake, lb./day	21.9^{c}	22.0^{cd}	22.9^{d}	22.7^{cd}	.11
Feed/Gain	7.30^{d}	6.97^{c}	7.38^{d}	7.31^{d}	.18
Calc. energy in diet					
ME, Mcal/lb DM	2.73^{c}	2.83^{d}	2.76^{ce}	2.81^{de}	.02
NEm, Mcal/cwt DM	77.6^{c}	81.7^{d}	78.9^{ce}	80.7^{de}	.91
NEg Mcal/cwt DM	50.8^{c}	54.0^{d}	52.2^{ce}	53.5^{de}	.45

a Least squares means; SEM n = 8.
b Calculated as hot carcass weight/.6495 (average dressing % for all steers).
c,d,e,f Means within a row with different superscripts differ (P<.05).

compared to all other groups (Table 2). Dietary calculated net energy tended to increase (L; P<.08) with slaughter groups.

The effects of time on feed on carcass traits are illustrated in Table 3. Hot carcass weights increased L (P<.01) but at a decreasing rate, resulting in a Q (P<.06) response across slaughter group. Dressing percentage was not altered by slaughter group in this study. Although carcass weights increased, ribeye area was not altered by slaughter group. Subcutaneous fat thickness (Table 3), however, increased (L; P<.01) together with mean USDA yield grades and percentage of yield grades of 4 or greater (P<.07). The percentage of kidney, pelvic and heart fat (KPH) increased (L; P<.01) with time on feed; with steers fed for less than 119 d having less (P<.05) KPH than steers fed more than 133 d (Table 3).

The overall maturity of steer carcasses (Table 3) was greater (P<.05) for steers fed 119 d or greater than steers fed 105 d. Overall maturity increased at a decreasing rate, producing both L (P<.01) and Q responses (P<.08). When overall carcass maturity was adjusted to a mean fat thickness, the effect of slaughter group became C (P<.04), this is difficult to explain. The percentage of condemned livers was not affected by slaughter group.

Table 3. Effects of slaughter group on carcass characteristics.[a]

	Days on Feed				
	105	119	133	147	SEM
No. Pens	8	8	8	8	
No. Steers	61	63	64	64	
Carcass wt., lb.[b]	679^{g}	717^{h}	739^{i}	765^{j}	7.36
Dressing, %[c]	65.1	65.3	64.8	65.6	.25
Ribeye area, in^2.	12.80	13.00	13.31	13.14	.03
Subcutaneous Fat, in	$.34^{i}$	$.39^{hi}$	$.43^{gh}$	$.46^{g}$	.02
KPH, %	1.48^{h}	1.61^{h}	2.03^{g}	1.98^{g}	.02
Maturity[d]	138^{g}	145^{h}	148^{h}	149^{h}	1.47
Maturity[de]	138^{g}	146^{gh}	148^{h}	144^{gh}	2.12
Marbling Score[f]	377^{g}	433^{h}	452^{h}	446^{h}	11.48
Marbling Score[fe]	391^{g}	442^{h}	436^{h}	410^{g}	8.16
Prime, %	0	1.79	0	0	.89
Choice, %	33.93^{g}	58.93^{h}	68.75^{h}	68.75^{h}	5.52
Select, %	52.46^{g}	39.29^{gh}	31.25^{h}	29.69^{h}	4.45
Standard, %	13.62^{g}	0^{h}	0^{h}	1.56^{h}	1.47
USDA Yield Grade	2.12^{i}	2.36^{hi}	2.53^{gh}	2.75^{g}	.09
Percent YG4	1.56^{h}	0^{g}	1.56^{h}	9.38^{h}	2.76
Condemned liver, %	12.72	10.94	9.38	12.50	5.39

a Least square means; SEM n = 8.
b Carcass weight adjusted for trimloss.
c Calculated by dividing final live weight by carcass weight.
d Calculated by averaging lean and skeletal maturity.
e Adjusted for fat thickness as a covariate.
f 300-399, slight; 400-499, small
g,h,i,j Means within a row with different superscripts differ (P<.05).

As time on feed is extended, marbling scores and percentage of U.S. Choice cattle are expected to increase. In this present study, marbling scores and the percentage of cattle grading choice (Table 3) increased (L; P<.01) across slaughter group, but the values were not highest for steers fed 147 d; consequently we detected a Q (P<.02) response. Steers fed for 105 d were lower (P<.05) in both marbling score and percentage of cattle grading U.S. Choice than any other slaughter group. Inversely, the percentage of steers grading U.S. Select and Standard decreased (L; P<.01) with increased time on feed. Steers used by Hicks et al. (1987) were of similar breed-type, weight and slaughter dates; their results are very consistent with ours for marbling score and percent U.S. Choice cattle. When marbling scores were adjusted to a mean fat thickness, marbling scores were the greatest ($P<.05$) for steers fed between 119 and 133 d. Steers in our population, similar to those of Hicks et al. (1987), continued to deposit fat subcutaneously, but did not deposit an increased amount of intramuscular fat after 133 days on feed. When marbling scores were adjusted for s.c. fat thickness, there was no advantage of feeding steers more than 119 d. Thus, steers in both studies may have reached their genetic potential to grade U.S. Choice between 119 and 133 d. Many performance and carcass traits increase with increasing time on feed; however, in this study feeding cattle greater than 133 d did not appear to enhance performance or carcass quality.

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