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Impact of Withholding Feed on Performance and Carcass Measurements of Feedlot Steers

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Story in Brief

To determine how live weight, shrink, and carcass measurements change during fasting, feed was either not withheld or withheld for 24 h prior to transit of steers to the packing plant. Three pens with about 190 steers per pen were subjected to each treatment. Withholding feed saved one day's feed cost but decreased live and carcass weights of steers. Surprisingly, dressing percentage was increased only slightly, and marbling scores were not reduced by withholding feed. Incidence of carcasses with lean classified as fully dark cutting was nearly tripled by withholding feed. Economically, the reduced carcass weight and higher dark cutting incidence outweigh current advantages in reduced costs for feed and waste disposal.

(Key Words: Feed Withdrawal, Carcass Measurements, Dark Cutting Beef.)

Introduction

Although the amount of waste material present in the rumen can be reduced by withholding feed from cattle prior to harvest, feed withdrawal may have adverse effects on carcass weight or quality. Surprisingly little information is available on the impact of feed withdrawal on carcass characteristics. One study of feed withdrawal, conducted over 20 yr ago by researchers at Kansas State University (Carr et al., 1969), detected no reduction in carcass quality with feed withdrawal for up to 48 h. However, the number of steers in that study was limited for appraising carcass quality effects. Feed withdrawal never became popular commercially because traditionally cattle have been sold on a live weight basis and feed withdrawal should reduce live weight. With more cattle today being sold on a carcass weight instead of a live weight and cattle being purchased by the packing plant up to 7 d prior to delivery, live weight could be measured before feed withdrawal. To meet formula specifications, some feedlots withhold feed in an attempt to increase dressing percentage. Feed withdrawal should have appeal to packing plants because the quantity of organic matter and chemical oxygen demand of ruminal contents is reduced by feed withdrawal (Janloo et al., 1998). The objective of this study was to determine the impact of withholding feed for 24 h on live and carcass characteristics of steers using large pens of feedlot steers.

Materials and Methods

Because a large number of cattle were needed for this research, effects of feed withdrawal on carcass merit was accomplished thanks to extensive cooperation from a cattle feeding facility[6] and a processing plant[7]. Effects of feed withdrawal for a 24-h period on 1) carcass weight and 2) economically important carcass and meat quality traits were measured using six pens of finished steers (1,138 steers). Steers having similar background and feedlot history were marketed on consecutive weeks during November and December. On alternate weeks, feed was either withdrawn for 24 h or not withdrawn prior to transporting the steers to the packing plant. Live weights were measured at the time cattle were loaded on trucks and on the trucks at arrival at the packing plant approximately 200 miles away. Weight loss (shrink) during transport, hot carcass weights, marbling scores, and dark cutting incidence was determined.

Results and Discussion

Results are presented in Table 1. Based on feedlot records, mean feedlot entry weight averaged 6.5 lb less for steers marketed during the weeks that feed was withdrawn prior to slaughter. Final full weight was 23.9 lb less for these cattle. The difference was less (14.6 lb) at arrival at the packing plant but remained at 9.4 lb in carcass weight. Using a mean dressing percentage of 63.68%, the live weight difference at slaughter should have been 14.8 lb, quite close to the difference in weight at arrival (14.6 lb) at the packing plant. This means that total feedlot

weight gain (live basis) was approximately 8.3 lb less (14.8 minus 6.5) for groups of cattle that had feed withdrawn. This equates to 5.3 lb in carcass weight. At $1/lb carcass weight (or $64/cwt live weight), this is equivalent to $5.30 less return from cattle that had feed withdrawn 24 h prior to marketing.

Transit shrink was lower for cattle that had feed withdrawn prior to marketing. Dressing percentage, calculated from a pencil shrunk final feedlot weight, tended to be greater with feed withdrawal when calculated based on feedlot shrunk weight but not when based on plant arrival weights. This differences was not as large as producers often anticipate. Although the 14.8 lb difference in arrival weight at the slaughter plant (1.3%) might be attributed to differences in gut fill, the lower carcass weight implies that withholding feed results in a substantial loss of carcass weight (5.3 lb or 0.8%).

Live weight loss of cannulated cattle during a 24-h feed withdrawal period ranged from 0 to 20 lb (0 to 3.4%) with decreased weight of ruminal contents being responsible for a maximum of 15.5 lb of this weight loss (Janloo et al., 1998). Because water tends to replace dry matter that disappears from the rumen during fasting, withholding water probably would increase dressing percentage more than simply withholding feed. A loss of 5.3 lb of carcass tissue per animal would not be expected to occur in 24 h. This suggests that this weight loss is partly attributable to reduced retention of fluids in tissues. Reduced fluid retention could be due to decreased concentrations of intracellular ions and fasting would decrease tissue glycogen. Glycogen is stored in tissue with about six times its weight of water so a decrease in muscle glycogen from 1% to 0.7% could be responsible for a carcass weight loss of 2.1% (1.8% + 0.3%) of muscle weight; this would equal 0.84% of a carcass that is 40% muscle or 5.6 lb from a 700 lb carcass. This supports the concept that reduced glycogen and water retention in muscle might account for the difference in carcass weight with feed withdrawal observed in this study.

Withholding feed for the final 24 h reduced total feed intake over the final 5 d by 20.2 lb. At a cost of $170 per ton of feed, this would result in a savings of $1.72/steer.

Carcass grade and yield grade both tended to increase with feed withdrawal although these changes were not significant statistically (Table 2). These changes might reflect a slight decrease muscle fluid retention. Although the total incidence of all classes of dark cutters was not altered, the incidence of full dark cutting carcasses was nearly tripled (1.04 vs .35%) by feed withdrawal. This again may reflect loss of muscle glycogen during the feed withdrawal period. Though not significant statistically, such an increase represents a substantial economic penalty from feed withdrawal. With a $35/cwt penalty for dark cutting carcasses, this increase prorated among all animals represents a loss of about $1.80 per animal fed. Ignoring the slight increase in quality grade associated with feed withdrawal, the total cost associated with feed withdrawal equals about $7.10 per animal ($5.30 for reduced carcass weight + $1.80 for more dark cutters).

Savings from feed withdrawal would include a feed savings discussed earlier of $1.72 per steer and a potential slight reduction in transport cost. With 24 lb less weight to transport, perhaps one more finished steer could be hauled per truck, or if trucking charge is based on cattle weights, trucking cost might be reduced by 2% by withholding feed for 24 h. If transit distance were 200 miles and cost per loaded mile were $2, this savings would equal about $8 per load or, if 40 steers were hauled, $0.20 per animal if the truck were loaded to capacity or if the trucking charge were based on weight, not simply on mileage.

Overall, these figures indicate that carcass penalties to the cattle feeder and packing plant from feed withdrawal overshadow the potential savings in feed and trucking. For every steer withheld from feed for 24 h prior to transport, the beef industry probably loses about $5 ($7.10 - $1.72 - $0.20).

Previous studies indicated that waste disposal requirements would be reduced by nearly half by withholding feed from finished steers for 24 h prior to harvesting. However, withholding feed decreased live and carcass weights and increased the incidence of dark cutting beef carcasses substantially. It seems unlikely that the reduction in the amount of waste at packing plants would justify the economic losses associated with withholding feed from finishing steers for 24 h prior to marketing.

Literature Cited

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Table 1. Effects of feed withdrawal prior to marketing on steer weights and feed intakes.

			Difference		Probability
Feed withdrawal time, h	0	24	Numeric	%	P <
Cattle, no	563	575			
Pens, no	3	3			
Mean weight, lb					
Initial into feedlot	697.4	690.9	-6.5	-.93	.64
Final full, feedlot exit	1224.0	1200.1	-23.9	-1.95	.94
Final, shrunk 6%	1175.1	1152.1	-23.0	-1.96	.25
Arrival at packing plant	1193.9	1179.3	-14.6	-1.22	.43
Hot carcass	745.6	736.2	-9.4	-1.26	.38
Daily gain, lb	2.76	2.67	-.09	-3.26	.19
Feed intake, lb/head					
Last 5 d	111.2	91.0	-20.2	-18.2	.08
Last day	15.1	0.5	-14.6	-96.69	.01
Transit shrink, %	2.46	1.73	-.73	-29.67	.03
Dressing percentage					
Of shrunk lot weight	63.46	63.90	.44	.69	.10
Of plant arrival weight	62.45	62.430	-.02	.00	.99

Table 2. Effects of feed withdrawal prior to marketing on carcass characteristics of feedlot cattle.

			Numeric	Percentage	Probability
Feed withdrawal time, hr	0	24	Difference	Difference	P <
Marbling score	412	425	13.0	3.16	0.39
USDA Quality grade	3.37	3.59	0.22	6.53	0.17
USDA Quality class					
Prime, %	1.24	1.22	-0.02	-1.61	.95
Premium choice, %	14.25	17.85	3.60	25.26	.38
Low choice, %	31.84	34.73	2.89	9.08	.56
Select, %	49.29	44.95	-4.34	-8.81	.60
Standard, %	3.39	1.07	-2.32	-68.44	.11
Lean maturity	151	155	4.0	2.65	.38
A maturity, %	98.05	97.42	-.63	-.64	.78
B maturity, %	1.95	2.58	.63	32.31	.78
Dark cutting carcasses					
All types, %	1.68	1.75	.07	4.17	.84
Full dark, %	.35	1.04	.69	197.14	.11
Blood splash, %	1.61	2.26	.65	40.37	.52
KPH percentage	1.76	2.00	.24	13.64	.31

Fat thickness, in	.50	.53	.03	6.00	.27
Ribeye area					
Square in	14.22	14.21	-.01	-.07	.99
Square in/cwt.	1.91	1.94	.03	1.57	.71
Yield grades					
Preliminary	3.16	3.23	.07	2.22	.31
Adjusted preliminary	3.24	3.34	.10	3.09	.27
USDA Yield Grade	2.41	2.58	.17	7.05	.15
Calculated	2.38	2.49	.11	4.62	.67
USDA YG >3, %	4.11	5.27	1.16	28.22	.68

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