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PROGRESS REPORT

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Effects of Time of Day and Frequency of Feeding on Performance by Programmed-Fed Beef Steers¹

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Recent experiments with both limit- and full-fed cattle suggest that time of feed delivery during the day might influence daily gain and feed efficiency. Cattle offered feed once daily in the afternoon and evening hours have typically gained faster and more efficiently than those offered feed only in the morning, with intermediate results for cattle fed twice daily in the morning and afternoon (Pritchard and Knutsen, 1995). Differences in gastrointestinal fill, however, might influence the results of such studies (Pritchard and Knutsen, 1995). To further investigate the effects of the time of day when feed is offered and frequency of feeding, we conducted an experiment with growing steers that were limit-fed to a programmed rate of gain.

Ninety-six, crossbred (British x Continental) calves were used in the experiment. These calves had been consuming an 85% concentrate diet for several weeks and had been implanted with Synovex S approximately 1 month before the experiment began. On June 8, 1995, all cattle were weighed and assigned randomly to one of four treatments. The 24 calves in each of the four treatment groups were then sorted to one pen per treatment and limit-fed an 85% concentrate diet until the experiment began. On June 19 at 1600, cattle in each treatment group were withheld from feed and water until June 20 at 0745, at which time an individual shrunk body weight measurement was obtained. Cattle within each treatment were sorted to one of three pens that had been previously assigned based on their body weight on June 8. Hence, there was a total of three pens per each of the four treatments and eight steers per pen. Treatments consisted of time of day of feed delivery and frequency of feeding and included: 1) feed offered once daily at 0800 (AM); 2) feed offered once daily at 1700 (PM); 3) feed offered twice daily at 0800 and 1700 (2X); and 4) feed offered three times daily at 0800, 1230, and 1700 (3X). The 85% concentrate diet was fed in quantities sufficient to provide for a daily gain (based on the average body weight of each pen and NRC [1984] equations for a medium-framed steer) of 2.65 lb/d. New feed allotments were calculated every 28 days on the basis of average pen body weight. The diet contained (dry matter basis): 7.31% sorghum sudangrass hay, 7.56% alfalfa hay, 10.12% whole shelled corn, 60.69% steam-flaked corn, 2.47% soybean meal, 4.89% molasses, 2.99% yellow grease, .74% limestone, .50% dicalcium phosphate, .35% salt, .89% urea, .5% ammonium sulfate, and .99% premix. The wheat middlings-based premix supplied vitamins A and E, trace minerals, Rumensin (30 g/ton), and Tylan (8 g/ton). The analyzed chemical composition of the diet was: 13.9% moisture, 5.42% ash, 13.24% crude protein, 8.66% acid detergent fiber, and .61% calcium. The trial lasted 84 d, with intermediate weights (non-shrunk) taken at 28-day intervals at approximately 0730. As with the initial body weight measurement, the final body weight measurement

was obtained after the cattle in each treatment group were withheld from feed and water for a 15.5-hour period; this was accomplished by feeding the cattle in all treatment groups their prescribed allotment of feed at 0800 on day 84. One steer in the 3X treatment died during the first 28 days of the trial; the apparent cause of death was bloat. Data were analyzed by analysis of variance for a completely random design with pen as the experimental unit.

Overall performance data for the experiment are shown in Table 1. Time of day and frequency of feeding did not affect ($P > .10$) daily gain or feed efficiency for the 84-day feeding period, and the cattle gained very close to the gain projected from NRC (1984) equations. Daily dry matter intake was greater ($P < .02$) for cattle fed two or three times daily than for those fed once daily, but this small difference would not be of biological significance and probably reflects differences in dry matter offered based on non-shrunk average pen body weights taken at intermediate points during the trial. The slightly greater dry matter intake and gain by 2X and 3X cattle than by AM and PM cattle was reflected in a greater body weight at day 84 for 2X and 3X than for AM and PM cattle ($P < .03$).

Our results suggest little effect of time of day or frequency of feeding on performance by limit-fed beef steers during the summer. Results might vary under different environmental conditions but generally suggest that differences between once-daily morning or afternoon feeding reported by other workers may have resulted, in part, from differences in gastrointestinal fill. In our experiment, use of non-shrunk body weights would likely have altered conclusions. For example, from days 0 to 56 (shrunk weight on day 0 and non-shrunk weight on day 56), PM cattle gained 5.9% faster ($P < .13$) than AM cattle; however, gain from days 57 to 84 (non-shrunk body weight on day 56 and shrunk body weight on day 84) was greater ($P < .11$) by AM cattle than by PM cattle, suggesting greater fill for PM than for AM cattle when weighed non-shrunk in the morning.

In summary, under our conditions, time of day and frequency of feeding did not have a major effect on performance by programmed-fed, growing beef steers. Furthermore, the impact of gastrointestinal fill on non-shrunk body weight measurements should be considered when evaluating the effects of such treatments.

Literature Cited

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- Pritchard, R. H., and J. S. Knutsen. 1995. Feeding frequency and timing. In: Symposium: Intake by Feedlot Cattle. Oklahoma Agric. Exp. Sta. P-942:162.

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Table 1. Effect of time of day and frequency of feeding on performance by programmed-fed beef steers

Item	Treatment ^a				SE ^b	Contrast ^c
	AM	PM	2X	3X		
Initial body weight, lb	497.3	493.9	502.2	491.3	3.68	NS
Day 84 body weight, lb	703.7	697.1	715.3	714.1	5.11	F (P < .03)
Daily gain, lb ^d	2.46	2.42	2.54	2.63	.08	NS
Dry matter intake, lb/steer daily	11.9	11.9	12.0	11.9	.03	F (P < .02)
Feed:gain	4.83	4.93	4.74	4.56	.15	NS

^aAM = fed once daily at 0800; PM = fed once daily at 1700; 2X = fed twice daily at 0800 and 1700; 3X = fed three times daily at 0800, 1230, and 1700.

^bPooled standard error of treatment means; n = three pens/treatment (eight steers/pen).

^cOrthogonal contrasts. F = frequency; average of AM and PM vs average of 2X and 3X. NS = P > .10. Other contrasts evaluated included AM vs PM and 2X vs 3X.

^dInitial and day 84 body weight measurements were taken after the cattle had been withheld from feed and water for 15 to 16 hours. Hence, daily gain is shrunk body weight gain.



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