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PROGRESS REPORT

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The Effect of Percentage of Concentrate in Limit-Fed Growing Diets on Feed Intake, Average Daily Gain, and Feed Efficiency During the Finishing Period[1]

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Following the receiving phase of a typical feeding program, calves enter the growing phase and are grown to approximately 750 pounds before finishing. With the increased use of limit feeding to grow cattle, the percentage of roughage needed in limit-fed growing diets has been questioned. Some feeders believe that cattle should be grown on a diet with a medium level of roughage (25 to 50%). The bulkiness of such diets might increase gut capacity, subsequently allowing the calves to consume more feed during finishing. However, this premise is inconsistent with the current theories of intake regulation that the intake of diets with a high digestibility is not regulated by the gut volume, but rather by metabolic load. Hence, gut capacity should not affect intake during the finishing phase.

One-hundred and eight crossbred calves (British x Continental) were used to evaluate the effect of concentrate level in the growing diet on finishing-phase performance. All calves had been adapted to a limit-fed 90% concentrate diet for 28 days after receiving. Calves were weighed on two consecutive days at the start of the trial and assigned randomly to one of three treatments. The treatments were 60, 75, and 90% concentrate diets that were formulated to contain 82.1, 89.3, and 96.1 Mcal of NEm/100 lb of DM, respectively and 14% crude protein (Table 1). All diets were limit fed so cattle would gain 2.25 lb/day for 92 days. In an attempt to equalize gastrointestinal fill before final weights of the growing phase were recorded on days 91 and 92, cattle fed the 60 and 75% concentrate diets were stepped up to the limit-fed 90% concentrate diet (starting on day 77) over the last 2 weeks of the growing phase. After completion of the growing phase, steers were finished on a 90% concentrate diet for a 140-day period (Table 1). Steers were fed once daily in quantities sufficient to ensure ad libitum consumption, weighed at 28-day intervals, and were weighed on the last 2 days of the finishing period. Steers had been implanted with Synovex-S 4 weeks before the growing phase started; hence, steers were reimplanted on day 91 of the growing phase and on day 84 of the finishing phase. Steers also were revaccinated with 8-way clostridial on day 28 of the finishing phase. After the finishing phase, steers were shipped to a commercial slaughter plant and hot carcass weight, rib eye area, percentage kidney-pelvic-heart fat (KPH), backfat thickness, USDA yield grade, and marbling score were recorded.

Table 1. Composition of growing and finishing diets

Diet type	Growing			Finishing
Concentrate, %	60	75	90	90
Ingredient	% of dry matter			
Sudangrass hay	14.17	8.83	3.53	–
Alfalfa hay	25.28	15.73	6.27	10.09
Whole corn	7.75	12.34	14.92	15.64
Steam-flaked milo	40.65	48.71	58.92	62.12
Soybean meal	–	2.28	4.29	–
Molasses	5.03	5.01	5.00	5.01
Fat	1.99	1.99	1.98	2.00
Limestone	1.04	1.04	1.03	1.00
Dicalcium phosphate	.67	.67	.66	.65
Salt	.31	.31	.31	.50
Urea	.50	.49	.49	.49
Ammonium sulfate	.52	.52	.52	.50
Premix[a]	2.09	2.08	2.08	2.00

[a]Hominy feed-based premix supplied trace mineral mixture (.1% of diet), Rumensin (28 g/ton of diet), Tylan (10 g/ton of diet), Vitamin A (1,144 IU/lb of diet), and Vitamin E (6.8 IU/lb of diet). Trace mineral composition: 4.4% Mn, 12% Zn, 6.6% Fe, 1.3% Cu, .3% I, .2% Co, and 20% Mg.

[1]We thank Elanco Products Co. for supplying the Rumensin and Tylan, Syntex Anim. Health, Inc. for supplying Synovex-S implants, and Dr. Ted Montgomery for collecting the carcass data.

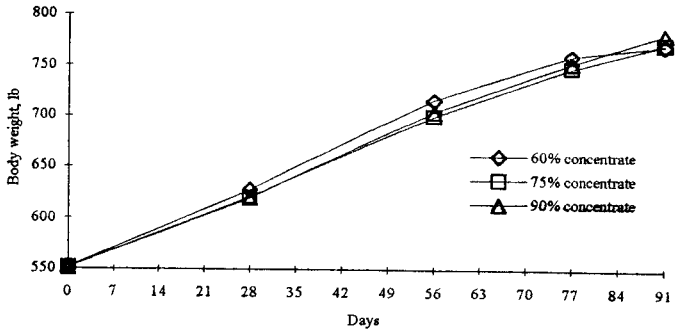

Figure 1. The body weight of steers during the 92-d growing phase fed diets differing in percentage of concentrate, limit-fed to grow at similar rates.

During the growing phase, daily gain did not differ (P = .24) among treatments (Figure 1). Cattle gained approximately 2.5 ± .1 (mean ± SE) lb/day, which was 11% more than the targeted gain of 2.25 lb/day. Previous research has

Table 2. Performance by steers during the finishing period that had previously been grown for 92 days on diets containing either 60, 75, or 90% concentrate

	Growing diet					
	% concentrate				Contrast[a]	
Item	60	75	90	SE[b]	L	Q
Initial BW, lb	770	772	782	13.9	.92	.05
Final BW, lb	1,202	1,238	1,224	20.8	.09	.04
Days 0 to 140						
BW gain, lb/d	3.1	3.3	3.2	.09	.39	.02
DM intake, lb/d	17.7	18.5	18.4	.33	.16	.33
Feed-to-gain	5.7	5.5	5.8	.08	.39	.05

[a]Observed significance level for linear (L) and quadratic (Q) contrasts; probability of a difference is less than the value indicated.

[b]Standard error of the means, n = 3 pens (12 steers each) per treatment.

Table 3. Carcass characteristics of steers that had been grown for 92 days on diets containing either 60, 75, or 90% concentrate followed by a 140-day finishing period

	Growing diet					
	% concentrate				Contrast[a]	
Item[b]	60	75	90	SE[c]	L	Q
Hot carcass wt, lb	733	733	793	24.1	.14	.36
Dressing percentage	60.5	60.1	65.4	2.0	.16	.32
Rib eye area, in^2	13.9	13.2	14.5	.48	.57	.24
KPH, %	2.3	2.3	2.4	.09	.42	.91
Backfat thickness, in	.38	.49	.50	.04	.02	.19
Marbling score[d]	3.7	3.7	4.0	.17	.10	.35
USDA yield grade	2.1	2.5	2.6	.16	.02	.24

[a]Observed significance level for linear (L) and quadratic (Q) contrasts; probability of a difference is less than the value indicated.

[b]Final weight was used as a covariate in the statistical analysis.

[c]Standard error of the means, n = 3 pens (12 steers each) per treatment.

[c]3 = slight; 4 = small; 5 = modest. Scores of greater than 4 = Choice grade; scores of 3 to 4 = Select grade.

indicated that limit-fed cattle are more efficient than predicted by net energy equations (NRC, 1984) and thereby grow at a faster rate than prescribed (Lake, 1987; McLean et al., 1990).

Starting the finishing phase, cattle grown on the 60 and 75% concentrate diets weighed less (P = .05) than the other cattle; however, because the cattle grown on the 75% concentrate diet grew at a faster rate (P = .02), they were heavier (P = .04) than cattle grown on the 60% concentrate diet at the end of the 140-day finishing period (Table 2). Dry matter intake tended (P = .16) to increase linearly with percentage of concentrate in the growing diets (Table 2). The tendency for cattle grown on the 60% concentrate diet to consume less feed probably was responsible their lower (P = .02) rate of gain and higher (P = .05) feed-to-gain ratio than cattle grown on the 75% concentrate diet.

Cattle grown on the 90% concentrate diet yeilded carcasses that tended (P = .14) to be heavier than carcasses from cattle grown on diets containing more roughage (Table 3). The tendency for a higher carcass weight with the 90% concentrate growing diet (Table 3) and the quadratic response in final weight (Table 2) resulted in cattle fed the 90% concentrate growing diet tending to have the greatest (P = .16) dressing percentage (Table 3). Rib eye area and KPH did not differ (P > .24) among concentrate levels (Table 3). The higher percentage concentrate in the growing diet increased (P < .10) backfat thickness, marbling score, and yield grade (Table 3). McCarthy et al. (1985) reported that cattle grown on low-roughage diets (61.2 Mcal of NEm/100 lb of DM) yielded carcasses with more backfat, more marbling, and higher yield grades than cattle grown on medium-roughage diets (46.3 Mcal of NEm/100 lb of DM), which is consistent with our results.

The trend toward heavier, fatter carcasses from cattle fed the 90% concentrate growing diets may explain the tendency for these cattle to have a higher feed-to-gain ratio than cattle fed the 75% concentrate diet. More NEg is required per unit of fat gain than per unit of protein gain (NRC, 1984). The lower performance by cattle grown on the 60% concentrate diets was most likely a result of lower feed intake.

Based on the results of this study, cattle grown on a limit-fed 90% concentrate diet from approximately 550 to 775 lb, then finished, produced heavier carcasses, with a higher quality grade than cattle grown at a similar rate of gain on diets containing less concentrate.

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