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ENERGY AND PROTEIN LEVELS FOR FINISHING STEERS[1,2]

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At times during past years it has been necessary to feed light-weight calves to finish in the feedyard. This has involved long feeding periods resulting in reduced efficiency and increased costs of gain. With an increased cost of feed ingredients and cattle it has become necessary to evaluate existing feeding practices and nutrient requirements. Preston (1972) has shown that supplemental protein is not required in the ration after cattle have been on feed for 56 days when fed corn based rations. Fox et al. (1972) evaluated the compensatory gain phenomenon as a method to improve protein and energy utilization during long feeding periods. Epley et al. (1971) studied the relationships of protein:energy ratios of diets to carcass composition to ascertain optimum levels of each nutrient in the diet. The objectives of this trial were to determine the effect of changing energy levels and the removal of all supplemental nitrogen from finishing rations at 385 kg on the performance of long-fed (250 days) steers in the feed-yard.

Experimental Procedure

One hundred sixty eight steers weighing approximately 250 kg were randomly assigned to the following treatments.

Experimental Design

HE	11.5% CP	385 kg	HE	11.5% CP	Finish
HE	11.5% CP	385 kg	HE	8.0% CP	Finish
HE	11.5% CP	385 kg	ME	11.5% CP	Finish
HE	11.5% CP	385 kg	ME	8.0% CP	Finish
ME	11.5% CP	385 kg	HE	11.5% CP	Finish
ME	11.5% CP	385 kg	HE	8.0% CP	Finish

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The high (HE) and medium energy (ME) rations (table 1) were formulated to contain 1.06 and 0.94 megcal/kg of productive energy, respectively. Crude fiber levels were adjusted to obtain the desired energy levels while crude protein levels were standarized at 11.5 and 8.0%

Table 1. Experimental Rations.

Ingredient	Energy - protein level[1]			
	HE-HP	ME-HP	HE-LP	ME-LP
	---------- % ----------			
Steam flaked milo	74.5	69.5	78.5	74.0
Cottonseed meal	4.0	4.5	0	0
Cottonseed hulls	12.5	20.0	12.5	20.0
Fat	3.0	0.0	3.0	0.0
Premix[2] (mineral, vitamin, and antibiotics)	6.0	6.0	6.0	6.0
Composition:				
Crude protein, %	11.6	11.6	8.0	8.0
Crude fiber, %	9.0	12.5	8.6	12.0
E.N.E. production (megcal/100 lb of feed)	1.06	0.94	1.06	0.94

[1]HE-HP = high energy - high protein
ME-HP = medium energy - high protein
HE-LP = high energy - low protein
ME-LP = medium energy - low protein.

[2]Premix - HP premix contained urea.
- LP premix devoid of urea.

Cattle were individually identified, implanted with 30 mg of diethylstilbestrol, given routine vaccinations, individually weighed, and allotted to treatments. Animal performance was measured by 28 day weights, feed consumption and feed per kg of gain, and individual carcass characteristics. The cattle were fed for 250 days beginning in May and finishing in February. Data were analyzed by analysis of variance.

Results and Discussion

The effect of energy and protein level on performance and carcass traits is presented in tables 2 and 3. Feed per kg of gain was significantly ($P < .01$) reduced for the HE group with higher daily gain and lower feed consumption. There was a reduction in dressing percent, fat thickness, U.S.D.A. quality grade and lower yield grade for cattle fed ME rations for feeding during the second period indicating less finish; however, there were no significant difference for any of the carcass traits. Differences in total energy intake was not sufficient to effect a significant influence of carcass traits.

Table 2. Effect of Energy and Protein Level on Performance Traits.

Energy treatment	Crude protein	Daily gain	Feed consumption	Feed per kg of gain
	%	kg	kg	kg
HE	11.5	1.10	8.47	7.70[a]
HE	8.0	1.11	8.65	7.79[a]
HE-ME	11.5	1.06	8.80	8.30[b]
HE-ME	8.0	1.05	8.80	8.38[b]
ME-HE	11.5	1.05	8.76	8.34[b]

[a,b]($P < .01$).

Table 3. Effect of Energy and Protein Level on Carcass Traits.

Energy treatment	Crude protein	Hot carcass weight	Dressing percent	Fat thickness	Carcass[1] grade	Yield[2] grade
	%	kg	%	in.		
HE	11.5	332	63.4	0.59	11.9	3.1
HE	8.0	331	63.1	0.55	11.9	3.0
HE-ME	11.5	323	62.8	0.49	11.8	2.8
HE-ME	8.0	315	61.5	0.47	11.5	2.5
ME-HE	11.5	323	63.0	0.47	11.9	3.2
ME-HE	8.0	327	63.2	0.51	12.1	3.4

[1]High good = 11; low choice = 12.

[2]Yield grade 2 = 52.3% of carcass weight in boneless, closely trimmed, retail cuts from round, loin, rib and chuck; yield grade 3 = 50.0%.

These data are supported by those presented by Epley et al. (1971) when studying protein:energy ratios in steer rations.

Cattle fed the ME ration gained slightly more per day, consumed significantly ($P < .05$) more feed and were less efficient in feed conversion during Period I (table 4). During Period II, HE cattle increased in rate of gain and maintained their advantage in feed efficiency. Switching cattle to either a higher or lower energy feed during the final 140 days on feed appeared to have little effect on the overall performance when comparing traits studied (table 5). It is interesting to note the similarity in performance between the HE-ME and ME-HE treatments.

Data are summarized by energy levels for performance traits in table 6. Lower gains, higher feed consumption and significatly ($P < .05$) poorer feed convervions were noted for treatments fed two energy levels during the finishing period. Energy and fiber levels for the HE group in this trial

Table 4. Effect of Energy on Performance Traits - Period I (110 days).

Energy treatment	Daily gain	Feed consumption	Feed per kg of gain
	kg	kg	kg
HE	1.23	7.10[a]	5.77
ME	1.25	7.49[b]	5.99

[a,b](P<.05).

Table 5. Effect of Energy Level on Performance Traits Period II (140 days).

Energy treatment	Crude protein	Daily gain	Feed consumption	Feed per kg of gain
		kg	kg	kg
HE	11.5	1.00[a]	10.00	10.00
HE	8.0	1.00[a]	10.02	10.02
ME	11.5	0.93[b]	10.30	11.06
ME	8.0	0.91[b]	9.86	10.48
HE	11.5	0.90[b]	9.97	11.03
HE	8.0	0.93[b]	9.70	10:47

[a,b](P<.05).

Table 6. Performance Traits Summarized by Energy Levels.

Energy treatment	Daily gain	Feed consumption	Feed per kg of gain
	kg	kg	kg
HE	1.10	8.56	7.79[a]
HE-ME	1.05	8.86	8.43[b]
ME-HE	1.06	8.64	8.15[ab]

[a,b](P<.05).

are similar to those routinely fed in Southwest feedyards while energy in the ME ration is too low to promote maximum performance. Switching rations varying in this magnitude of energy and fiber does not appear feasible, where in a previous trial (Klett, 1973), differences in energy and fiber were smaller and tended to have a stimulatory effect.

The comparison of 11.5 and 8.0% protein from 385 kg to finish, appeared to be little effect on performance (table 7). The reduction of protein levels offers possibilities in reducing feed costs since protein sources are a high cost item in feedlot rations. These results corresponds closely with recent data reported for corn by Preston, 1972.

Table 7. Performance Traits Summarized by Protein Levels.

Protein level	Daily gain	Feed consumption	Feed per kg of gain
%	kg	kg	kg
11.5	1.07	8.68	8.11
8.0	1.08	8.78	8.13

Summary

A study was conducted to evaluate the effect of an energy and protein change at 385 kg on the performance of long-fed steers in the feedyard. Rations used in the trial contained 1.06 (HE) and 0.94 (ME) megcal/kg of productive energy and 11.5 and 8.0% crude protein. Performance of cattle fed the HE ration during the duration of the trial was superior to those changed at 110 days to either a HE or ME ration. Feed per kg of gain was significantly reduced for the HE group with higher daily gain and lower feed consumption. The reduction of ration protein at 385 kg did not affect performance or carcass traits.

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