

LOW-LEVEL ENERGY SUPPLEMENTATION OF STEERS GRAZING TALLGRASS PRAIRIE

S.A. Gunter¹ and F.T. McCollum III²

Story in Brief

Two experiments were conducted to evaluate the benefits of a high-energy, low-protein (15% crude protein) supplement (corn based) for growing steers grazing tallgrass prairie. Trial 1 was conducted between May 22 and July 23, 1992. Treatments were control (no supplement), 6.0, or 19.5 lb/head/week of supplement fed 5 days a week. Trial 2 was conducted between July 27 and September 30, 1992. Treatments were control, 7.0 lb/head/week of the 15% crude protein supplement (energy), or 8.1 lb/head/week cottonseed meal (protein) fed 3 days a week. In trial 1, steers supplemented at the lower level gained an additional .3 lb/day while the steers receiving the high level gained an additional .4 lb/day with supplement efficiency of 2.9 and 7.0 lb supplement/lb added gain, respectively. In trial 2, the steers were blocked based on treatments in trial 1. Response to supplement in trial 2 varied depending on the supplement treatment in trial 1. In general, response to supplementation in trial 2 was better for steers that had not been supplemented in trial 1 compared to steers supplemented in trial 1. In trial 2, steers that had received the higher level of supplement in trial 1 did not respond well to energy supplementation in trial 2 but gained an additional .7 lb/day in response to protein supplementation. These data indicate that low-level energy supplementation can increase animal performance economically, but responses to supplementation may be dependent on previous nutritional management.

(Key Words: Supplementation, Beef Cattle, Range.)

Introduction

Several studies have demonstrated the value of feeding protein supplements to stocker cattle grazing tallgrass prairie during the summer.

¹Former Graduate Assistant ²Associate Professor ³We would like to thank B. Karges, S.M. Bauni, and R.A. Schmitt for their assistance

Researchers have hypothesized that protein supplements stimulate microbial fermentation thereby increasing forage intake and microbial protein at the small intestine. If protein flow at the duodenum is limiting intake, then low-level energy supplementation should produce similar results by simulating ruminal microbial protein yield.

The following two trials were conducted as preliminary research to evaluate the feasibility of using low-level energy supplementation to stimulate an economical increase in gain by stocker cattle.

Materials and Methods

On May 22, 1992, 30 crossbred steers were weighed (initial wt. 425 lb) and released on 80 acres of tallgrass prairie (excellent range condition). The steers were randomly assigned to 1 of 3 treatments: (1) no supplement (CONTROL), (2) 6 lb/week (LOW), and (3) 19.5 lb/day (HIGH) of a 15% crude protein supplement (84% corn, 16% cottonseed meal). Supplements were group-fed in prorated amounts 5 days a week (Monday through Friday). This trial ended on July 25, 1992. All weights were obtained after an overnight period without access to feed or water.

Trial 2 began on July 27, 1992. The steers from the first trial were weighed, blocked by previous treatment in trial 1, and assigned to 1 of 3 treatments. Treatments were 1) no supplement (CONTROL), 2) 7 lb/week of a 15% crude protein supplement (ENERGY; 84% corn, 16% cottonseed meal), or 3) 8.1 lb/week of cottonseed meal (PROTEIN). ENERGY and PROTEIN supplements provided similar daily amounts TDN. Supplements were group-fed in prorated amounts 3 days a week (Monday, Wednesday, and Friday). The trial ended September 30, 1992. All weights were obtained after an overnight period without access to feed or water.

Data from experiment 1 were analyzed by a one-way analysis of variance. Data from experiment 2 were analyzed by a two-way analysis with previous supplement treatment and late summer supplement treatment serving as main effects. Least square means were separated using the least significant difference procedure.

Results and Discussion

During experiment 1, steers receiving the HIGH level of supplement gained more ($P=.03$) than CONTROL steers (Table 1) but daily gain was similar ($P=.40$) for the steers receiving the LOW level of supplement. Steers receiving the LOW level of supplement tended ($P=.15$) to gain faster than CONTROL steers (Table 1).

Table 1. Initial weight and weight gain by steers grazing tallgrass prairie supplemented with no supplement (CONTROL), 1.2 lb (LOW), or 3.9 (HIGH) lb of concentrate (15% crude protein) 5 days a week.

Item/treatment	CONTROL	LOW	HIGH	SE ^a
Number of Steers	10	10	10	
Initial body weight, lb	436	442	447	9.2
Total gain, lb	101 ^b	115 ^{bc}	123 ^c	6.8
Added daily gain, lb/day	--	.3	.4	
Supplement efficiency, lb/lb added gain	--	2.9	7.0	

^a SE, n = 10.
^{b,c} Row means with uncommon superscripts differ (P < .05).

The supplement to added gain ratio for the LOW and the HIGH level of supplementation were 2.9 and 7.0, respectively. The relatively high efficiency at the LOW level may be due to increased forage intake as noted by Mieres (1992). The efficiency noted for the steers receiving the HIGH level of supplement would suggest that gain was enhanced by the supplement in the absence of a change in forage intake. Mieres (1992) reported that the relationship between forage organic matter intake (Y, grams/100 grams of body weight) on tallgrass prairie and supplemental corn (X, grams/100 grams of body weight) for cattle of this body weight was $Y = 1.89 + 1.44X - 2.64X^2$ ($R^2 = .37$). Based on this relationship, forage intake for the LOW and HIGH levels of supplementation was 110 and 99%, respectively, relative to the control steers.

Results of trial 2 (Table 2) indicate that gain response to treatments varied as a result of the early summer supplement treatments (P = .02). CONTROL steers gained about 116 lb regardless of previous treatment. However, weight gain by steers receiving the ENERGY supplement in late summer was influenced by the previous treatment. Steers that previously received the HIGH level of supplement gained 54% less weight than steers that were CONTROLS or received the LOW supplement in the early summer. Gains of steers supplemented with PROTEIN in the late summer were not influenced by the early summer supplements.

The performance of cattle in the early summer trial was similar to performance noted in previous OSU trials with similar calves. However, the late summer performance was better than expected and possibly reflects the influence of late summer precipitation and growing conditions as well as some accelerated growth by the calves which had been recovering from castration and dehorning during the early summer trial. The improved performance in the early trial with the LOW treatment supports our previous

Table 2. Initial body weight and weight gain by steers grazing tallgrass prairie supplemented with no supplement (CONTROL), 2.3 lb of concentrate (ENERGY; 15% crude protein), or 2.7 lb of cottonseed meal (PROTEIN; 41% crude protein) 3 days a week.

Item/treatment	Previous treatment	CONTROL	ENERGY	PROTEIN	SE ^a
Number of Steers		10	10	10	
Initial body weight, lb		555	490	553	
Total gain, lb					
	CONTROL ^b	118 ^e	153 ^{df}	178 ^c	2.8
	LOW ENERGY	113	143 ^f	145	2.3
	HIGH ENERGY	117 ^d	68 ^{eg}	161 ^c	3.6
	Mean	116	121	161	
	SE	2.1	3.5	2.4	
Added daily gain, lb/day					
	CONTROL	--	.6	1.0	
	LOW ENERGY	--	.4	.5	
	HIGH ENERGY	--	-.7	.7	
	Mean	--	.1	.7	
Supplement efficiency, lb/lb added gain					
	CONTROL	--	1.7	1.2	
	LOW ENERGY	--	2.5	2.4	
	HIGH ENERGY	--	-1.4	1.7	
	Mean	--	10	1.7	

^a SE n=4.

^b Early summer supplements (experiment 1).

^{c,d,e} Row means with uncommon superscript differ ($P < .10$).

^{f,g} Column means with uncommon superscripts differ ($P < .10$).

observations that low levels of low-protein/high-energy supplements will enhance forage intake. The interaction of early summer supplementation with response to late summer supplementation is interesting and needs further study in order to properly determine the value of supplementation programs across the entire growing season.

In conclusion, experiment 1 showed that low-level energy supplementation may economically increase the body weight gain of steers grazing tallgrass prairie. Experiment 2 indicates that the response to supplementation and the type of supplement needed may depend on previous nutritional management.

Literature Cited

- Mieres, J. M. 1992. Forage intake and digestibility by growing beef cattle supplemented with corn while grazing native range. M. S. Thesis. Oklahoma State Univ., Stillwater.