ENERGY SUPPLEMENTATION OF STEERS GRAZING EARLY-SEASON, NATIVE RANGE: EFFECTS ON GRAZING AND SUBSEQUENT FINISHING PERFORMANCE AND CARCASS MERIT[1]

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Summary

Crossbred beef steers (n = 328, initially 495 lb) were used to determine the effects of energy supplementation on grazing and subsequent finishing performance of steers grazing early-season, native range. Treatments consisted of either no supplemental energy or access to feeders containing a free choice, grain-based energy supplement. On the first day of the grazing period, steers were weighed and randomly allotted among eight pastures, providing four replications per treatment. Stocking density was 34% higher for supplemented than for unsupplemented pastures. At the end of the grazing period, steers were transported to a commercial feedlot and allowed ad libitum access to a common finishing diet for an average of 171 days. Supplement intake averaged 5.4 ± 1.1 lb/day (dry matter basis) or approximately 0.90% of body weight during the grazing period. Supplementation increased ($P<0.01$) grazing period gains from 1.47 to 2.20 lb/day. Supplementation also increased ($P<0.01$) ribeye area, back fat, and rump fat at the end of the grazing period. Supplementation did not affect subsequent finishing performance or carcass merit, but it reduced ($P<0.01$) time required for finishing by 18 days. Energy supplementation of steers grazing early-season, native range resulted in more pounds of gain per acre due to improved grazing performance as well as a 34% increase in stocking density.

Introduction

Providing supplemental energy to stocker cattle grazing early-season, native range increases grazing period gains without negatively affecting subsequent finishing performance. However, due to high forage quality, gain efficiencies of energy supplements fed to stocker cattle during the grazing period may be marginal. Energy supplementation of stocker cattle grazing winter wheat pasture allows for increased stocking densities and weight gains and, therefore, greater gain efficiencies per acre. Our objective was to evaluate the effects of energy supplementation on the performance of stocker cattle grazing early-season, native range at an increased stocking density and subsequent effects on finishing performance and carcass characteristics.

Experimental Procedures

Three hundred twenty-eight preconditioned crossbred beef steers of Southeast origin initially weighing 495 ± 35 lb were used. Real time ultrasound measurements of ribeye area, rib fat, and rump fat of steers were obtained 6 days prior to the steers' arrival in

[1]Sincere appreciation is expressed to the Cargill Ranch of Medicine Lodge, KS for their cooperation.
[2]Collingwood Grain, Pretty Prairie, KS.
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Kansas. Upon arrival in Kansas, steers were implanted with Component TE-G® and allowed ad libitum access to a receiving diet consisting of grass hay and 5.1 lb (as fed) of a pelleted commercial receiving supplement for 10 days.

The grazing period was initiated on April 27 and terminated on August 3, 2002. On day one of the grazing period, steers were weighed and randomly allotted among eight pastures, providing four pastures per treatment, with pasture serving as the experimental unit. The predominant grass species in pastures were big bluestem (*Andropogon gerardii*) and little bluestem (*Andropogon scoparius*). Treatments consisted of no supplement or access to covered self-feeders containing a mixture of Accuration® and dry-rolled corn provided free choice. Stocking density was 34% higher for supplemented pastures.

Composition of the Accuration concentrate is shown in Table 1. Supplement intake was controlled by manipulating the percentage of Accuration concentrate and dry-rolled corn over the grazing period. Accuration in the total supplement was increased by approximately 10% each time feeders were refilled in order to limit consumption. Dry matter inclusion rates of Accuration were 40% of the total supplement at the beginning of the grazing period and 80% at the end of the grazing period. Supplement intake was targeted for 0.65 to 0.90% of body weight on a dry matter basis. Supplement intake was measured weekly using a portable weighing system to weigh each self-feeder and its entire contents in the pasture. A commercial mineral mixture was provided free choice to all steers, and mineral feeders were weighed throughout the grazing period to measure mineral intake.

On days 55 and 97, steers were weighed and real time ultrasound measurements were again taken with the data representing interim and final grazing period measurements, respectively. At the conclusion of the 97-day grazing period, steers were transported approximately 200 miles to a commercial feedlot facility in western Kansas.

Table 1. Composition of Accuration Added to Dry-Rolled Corn to Provide the Energy Supplement Offered Free Choice to Steers During the Grazing Period

Nutrient	%
Dry matter	87.5
	% of Dry Matter
Crude protein	22.9
Crude fat	5.7
Acid detergent fiber	10.4
Calcium	1.1
Phosphorus	1.1
Salt	5.7
Total digestible nutrients, calculated	76.0
NEm, Mcal/lb, calculated	0.87
NEg, Mcal/lb, calculated	0.54

Steers received a Ralgro® implant within 24 hours of arrival at the feedlot and were fed a common finishing diet for an average of 171 days. Each pasture of steers was finished in a separate feedlot pen. The final finishing diet contained 52% high-moisture corn, 32% steam-flaked sorghum, 3% sorghum silage, 3% fat, and 10% of a commercial protein supplement, and it was provided once daily for ad libitum consumption. On day 81 of the finishing period, steers were implanted with Component TES®. Visual appraisal of steers was used to determine marketing date of each pen, at which time steers were transported to a commercial slaughter facility where carcass data were collected following a 36-hour chill. Final body weight was calculated by dividing

hot carcass weight by a common dressing percentage of 65.39%.

Forage quantity was estimated by hand clipping forage inside 40 quadrats of 2.7 square feet randomly distributed in pastures on April 25 and May 25. Grass clippings were obtained approximately every 14 days throughout the grazing period. Grass clippings were dried at 55°C for 48 hours, ground through a 1-mm screen, and analyzed for dry matter, crude protein, and acid detergent fiber.

Results and Discussion

Intakes of the energy supplement by steers during the grazing period averaged 5.4 ± 1.1 lb/day (dry matter basis) and corresponded to approximately 0.90% of body weight, with little variation among periods (Table 2). This suggests that increasing the ratio of Accuration to dry-rolled corn successfully limited intake to targeted levels (Figure 1) in spite of a decline in forage quality due to increasing forage maturity (Figure 2). Energy- supplemented cattle consumed less ($P<0.01$) free choice mineral during the grazing period. Energy supplementation increased ($P<0.01$) grazing period gains of steers. Interestingly, gains for both the control and supplemented steers were greater during the latter part of the grazing period. This increase in gain may partially be the result of an increase in gastrointestinal tract fill caused by increasing forage maturity and subsequent fiber content, which would reduce forage digestibility and passage rate. Energy supplemented steers tended ($P<0.09$) to demonstrate greater weight loss due to shrink during transportation to the feedlot.

Energy supplementation tended ($P<0.09$) to increase forage quantity measured in pastures following 30 days of grazing (Table 2), even though stocking density was increased by 34%. This effect on pasture forage quantity suggests that energy supplementation reduced forage intake by the steers. Energy supplementation increased ($P<0.01$) ribeye area, rib fat, and rump fat during the grazing period (Table 3). Such effects are attributed to increased energy intake of supplemented steers, which would allow for increased deposition of protein and fat during the grazing period. Energy supplementation did not affect subsequent finishing performance or carcass merit (Table 4); however, energy supplementation did reduce ($P<0.01$) the amount of time required during the finishing period by 18 ± 3 days.

Energy supplementation of stocker cattle grazing early-season, native range can be inefficient if stocking rates are not increased. In our study, energy supplementation of stocker cattle grazing early-season, native range allowed for stocking density to be increased by 34% while increasing grazing period average daily gain. When evaluating the economic effectiveness of the supplementation program that we tested, producers should consider pasture and supplementation costs (direct and indirect) in addition to the buy-sell margin of the cattle.

Table 2. Grazing Performance of Steers Offered no Supplement (Control) or Allowed Free Choice Access to a Grain-Based Energy Supplement (Energy) While Grazing Early–Season, Native Range

Item	Control	Energy	SEM	P-value[a]
No. of steers	140	188	-	-
No. of pastures	4	4	-	-
Initial weight, lb	495	495	0.26	0.82
Final weight, lb	638	706	11.2	0.01
Stocking density, acres/steer	5.9	4.3	-	-
Forage quantity, lb dry matter/acre				
April 25	155	229	158	0.75
May 25	1059	1367	122	0.09
Supplement intake, lb/day dry matter				
day 1 to 55	-	5.0	0.61	-
day 56 to 97	-	5.6	0.39	-
day 1 to 97	-	5.4	0.50	-
Supplement intake, % of body weight				
day 1 to 55	-	0.93	0.005	-
day 56 to 97	-	0.87	0.011	-
day 1 to 97	-	0.89	0.008	-
Mineral intake, oz/day				
day 1 to 55	1.4	0.5	0.26	0.04
day 56 to 97	3.1	1.0	0.27	< 0.01
day 1 to 97	2.4	0.7	0.27	0.01
Daily gains, lb				
day 1 to 55	1.17	1.87	0.16	0.02
day 56 to 97	1.91	2.60	0.12	0.01
day 1 to 97	1.47	2.20	0.11	0.01
Supplement conversion[b]				
day 1 to 55	-	7.5	1.6	-
day 56 to 97	-	9.9	1.6	-
day 1 to 97	-	8.0	1.6	-
Off truck weight, lb[c]	607	662	12.5	0.02
Shrink, %	4.9	6.1	0.41	0.09

[a]Probability that effects observed were due to random chance.
[b]Calculated as supplement intake on a dry matter basis divided by increase in daily gains.
[c]Body weight upon arrival at feedlot.

Table 3. Real Time Ultrasound Measurements of Steers Offered No Supplement (Control) or Allowed Free Choice Access to a Grain-Based Energy Supplement (Energy) While Grazing Early–Season, Native Range

Item	Control	Energy	SEM	P-value[a]
No. of steers	140	188	-	-
No. of pastures	4	4	-	-
Ribeye area, inch^2				
day (-16)	6.2	6.2	0.01	0.15
day 56	6.9	7.7	0.13	0.01
day 97	7.0	7.9	0.13	0.01
Rib fat, inch				
day (-16)	0.06	0.06	0.001	0.28
day 56	0.08	0.09	0.002	0.01
day 97	0.08	0.10	0.003	0.01
Rump fat, inch				
day (-16)	0.07	0.07	0.001	0.29
day 56	0.10	0.11	0.003	0.02
day 97	0.10	0.14	0.005	0.01

[a]Probability that effects observed were due to random chance.

Table 4. Finishing Performance of Steers Offered no Supplement (Control) or Allowed Free Choice Access to a Grain-Based Energy Supplement (Energy) While Grazing Early–Season, Native Range

Item	Control	Energy	SEM	P-value[a]
No. of steers	140	188	-	-
No. of pens	4	4	-	-
Initial weight, lb	623	684	11.9	0.01
Final weight, lb[b]	1272	1272	10.8	0.98
Dry matter intake, lb/day	21.1	21.3	0.35	0.90
Average daily gain, lb	3.61	3.61	0.051	0.95
Gain:feed	0.170	0.170	0.002	0.95
Days on feed	180	162	2.5	0.01
Hot carcass weight, lb	832	832	7.0	0.99
Dressing percent[c]	65.7	65.1	0.25	0.15
Ribeye area, inch^2	12.7	12.9	0.17	0.38
Fat thickness, inch	0.72	0.67	0.020	0.16
Yield grade 1, %	1	2	0.8	0.49
Yield grade 2, %	10	12	2.9	0.65
Yield grade 3, %	76	72	4.0	0.53
Yield grade 4 & 5, %	13	14	2.7	0.77
Marbling score	Small^{75}	Small^{93}	8.3	0.19
USDA Prime, %	3	7	1.3	0.09
USDA Choice, %	84	73	4.9	0.16
USDA Select, %	13	20	4.9	0.33

[a]Probability that effects observed were due to random chance.
[b]Calculated as hot carcass weight ÷ common dressing percent of 65.39%.
[c]Dressing percent = hot carcass weight ÷ (live weight × 0.96).

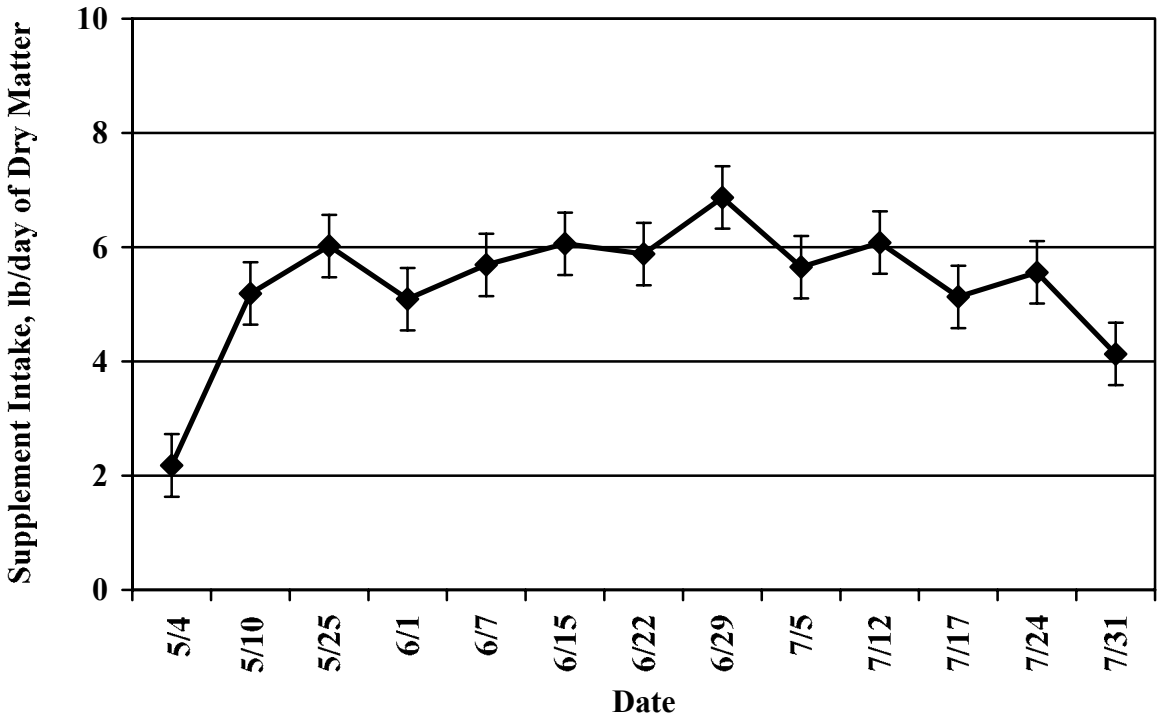

Figure 1. Intake Throughout the Grazing Period of a Free-Choice Grain-Based Energy Supplement by Steers Grazing Early-Season, Native Range.

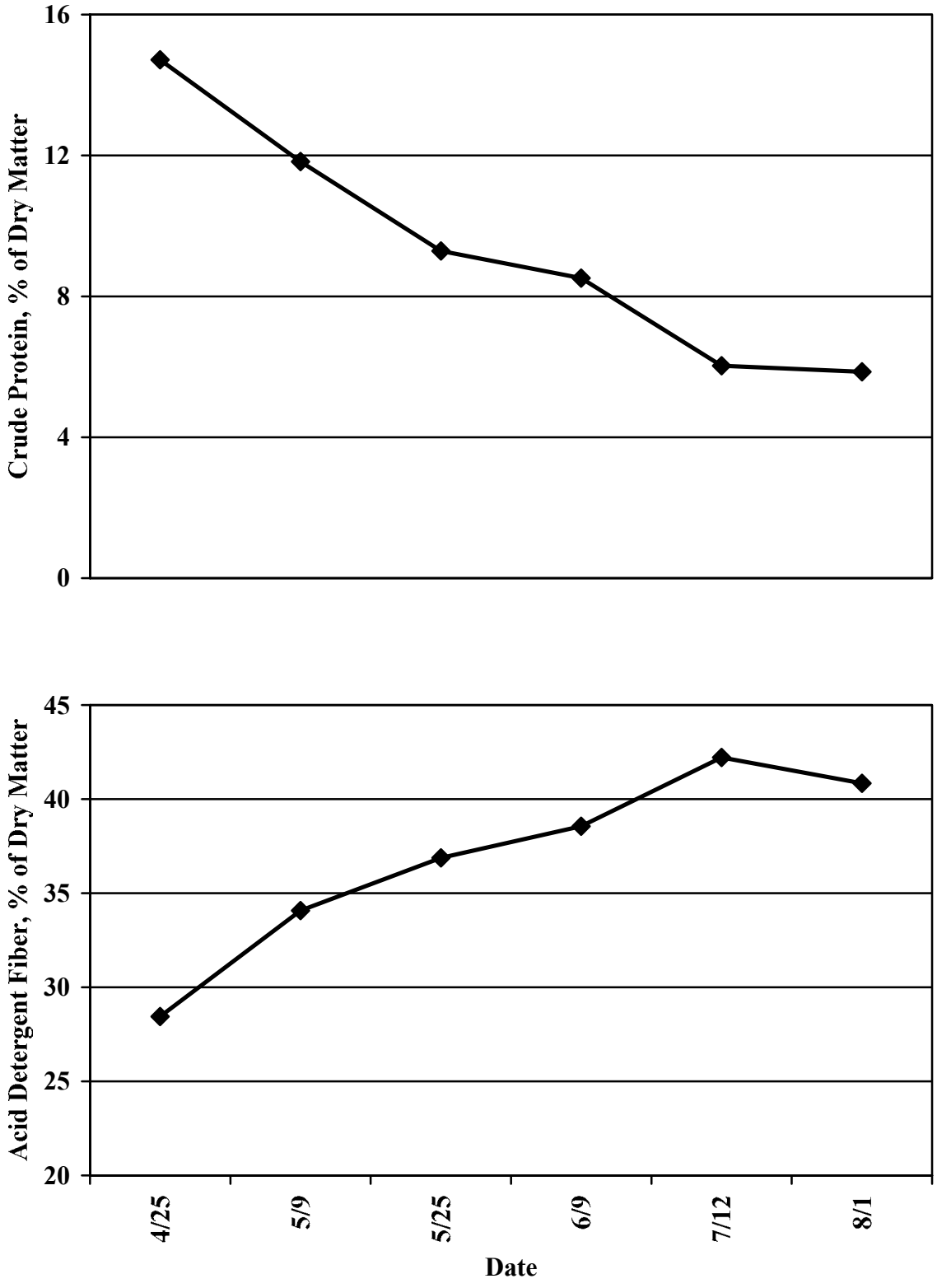

Figure 2. Crude Protein and Acid Detergent Fiber Content of Forage Sampled from Pastures During the Grazing Period.