Kansas Agricultural Experiment Station Research Reports

Volume 3
Issue 2 *Southeast Agricultural Research Center Reports*

Article 2

January 2017

Evaluation of Supplemental Energy Source for Grazing Stocker Cattle

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Abstract

A total of 108 steers grazing smooth bromegrass pastures were used to evaluate the effects of supplemental energy source on available forage, grazing gains, subsequent finishing gains, and carcass characteristics in 2014, 2015, and 2016. Supplementation treatments evaluated were: no supplement, a supplement with starch as the primary source of energy, and a supplement with fat as the primary source of energy. Supplements were formulated to provide the same quantity of protein and energy per head daily. Supplementation with the starch-based or fat-based supplement during the grazing phase resulted in higher ($P < 0.05$) grazing gains than feeding no supplement during all three years. In 2014 and 2016, grazing gains of steers supplemented with the starch-based or fat-based supplement were similar ($P > 0.05$). In 2015, steers supplemented with the fat-based supplement had greater ($P < 0.05$) grazing gains than those that received the starch-based supplement. In 2014, supplementation during the grazing phase had no effect ($P > 0.05$) on finishing gain, feed intake, and feed:gain. Steers supplemented with the starch-based supplement had greater ($P < 0.05$) final finishing liveweight, and greater ($P < 0.05$) hot carcass weight than those that received no supplement. In 2015, steers fed the fat-based supplement had higher ($P < 0.05$) final finishing liveweight, greater ($P < 0.05$) hot carcass weight, and lower ($P < 0.05$) finishing gain than those supplemented with the starch-based supplement or fed no supplement.

Keywords

supplementation, energy, grazing, stocker cattle, finishing, marbling

K-STATE Research and Extension

2017 SEARC Agricultural Research

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Summary

A total of 108 steers grazing smooth bromegrass pastures were used to evaluate the effects of supplemental energy source on available forage, grazing gains, subsequent finishing gains, and carcass characteristics in 2014, 2015, and 2016. Supplementation treatments evaluated were: no supplement, a supplement with starch as the primary source of energy, and a supplement with fat as the primary source of energy. Supplements were formulated to provide the same quantity of protein and energy per head daily. Supplementation with the starch-based or fat-based supplement during the grazing phase resulted in higher ($P < 0.05$) grazing gains than feeding no supplement during all three years. In 2014 and 2016, grazing gains of steers supplemented with the starch-based or fat-based supplement were similar ($P > 0.05$). In 2015, steers supplemented with the fat-based supplement had greater ($P < 0.05$) grazing gains than those that received the starch-based supplement. In 2014, supplementation during the grazing phase had no effect ($P > 0.05$) on finishing gain, feed intake, and feed:gain. Steers supplemented with the starch-based supplement had greater ($P < 0.05$) final finishing liveweight, and greater ($P < 0.05$) hot carcass weight than those that received no supplement. In 2015, steers fed the fat-based supplement had higher ($P < 0.05$) final finishing liveweight, greater ($P < 0.05$) hot carcass weight, and lower ($P < 0.05$) finishing gain than those supplemented with the starch-based supplement or fed no supplement.

Introduction

Supplementation of grazing cattle is most economically feasible when cattle prices are high relative to the price of grain. Energy supplementation of grazing ruminants may reduce forage intake and digestibility, but energy supplementation at low levels (less than 0.4% bodyweight) has been shown to have little effect on forage intake when crude protein was not limiting. Several studies have evaluated the effect of supplementation on stocker cattle gains and forage utilization during the grazing phase, but few have evaluated the effects of supplementation during the grazing phase on subsequent finishing performance and carcass traits. This research seeks to obtain a more thorough understanding of the interactions among grazing nutrition and management, finishing performance, and carcass traits to facilitate greater economic utilization of these relationships.

Experimental Procedures

Steers (108) of predominately Angus breeding were weighed on two consecutive days, stratified by weight, and randomly allotted to nine 5-acre smooth bromegrass pastures on April 9, 2014 (446 lb); April 7, 2015 (488 lb); and April 6, 2016 (444 lb). Three pastures of steers were randomly assigned to one of three supplementation treatments (3 replicates per treatment) and were grazed for 181, 224, and 223 days in 2014, 2015, and 2016, respectively. Supplementation treatments in 2014 and 2015 were: no supplement, 4.25 lb per head daily of a starch-based supplement, or 4.5 lb per head daily of a fat-based supplement. In 2016, the starch-based supplement and fat-based supplement were both fed at 4.25 lb per head daily. Supplements were formulated to provide the same amount of protein (0.7 lb in 2014 and 2015 and 0.4 lb in 2016) and energy (3.3 lb of TDN in 2014 and 2015 and 3.4 lb of TDN in 2016) per head daily. Pastures were fertilized with 100 lb/a of nitrogen (N) on February 24, 2014; February 12, 2015; and February 11, 2016. Pastures were stocked with 0.8 steers/a and grazed continuously until October 7, 2014 (181 days); November 10, 2015 (224 days); and November 15, 2016 (223 days); when steers were weighed on two consecutive days and grazing was ended.

Cattle in each pasture were group-fed supplement in meal form on a daily basis in metal feed bunks, and pasture was the experimental unit. No implants or feed additives were used during the grazing phase. Weight gain was the primary measurement. Cattle were weighed every 28 days. Cattle were treated for internal and external parasites before being turned out to pasture and later were vaccinated for protection from pinkeye. Cattle had free access to commercial mineral blocks that contained 12% calcium, 12% phosphorus, and 12% salt. Forage availability was measured approximately every 28 days with a disk meter calibrated for smooth bromegrass.

After the grazing period, cattle were shipped to a finishing facility, implanted with Synovex S, and fed a diet of 80% whole-shelled corn, 15% corn silage, and 5% supplement (dry matter basis) for 125 and 97 days in 2014 and 2015, respectively. All cattle were slaughtered in a commercial facility at the end of the finishing period, and carcass data were collected. Cattle that grazed these pastures in 2016 were being finished for slaughter at the time that this report was written.

Results and Discussion

Average available forage for the smooth bromegrass pastures during the grazing phase, and grazing and subsequent finishing performance of grazing steers are presented by supplementation treatment for 2014 and 2015 in Tables 1 and 2, respectively. Grazing performance only is presented for 2016 in Table 3. Supplementation treatment had no effect ($P > 0.05$) on the quantity of forage available for grazing in any year. Pastures grazed by supplemented steers might be expected to have greater available forage DM as consumption of supplement by steers grazing these pastures would likely reduce forage intake thereby resulting in more residual forage. However, the levels of supplement fed in this study were likely small enough that they did not affect forage consumption.

Supplemented steers had greater ($P < 0.05$) weight gain, daily gain, and steer gain/a than those that received no supplement in all three years. In 2014 and 2016, grazing

weight gain, daily gain, and gain/a were not different ($P > 0.05$) between steers that were supplemented with the starch-based or fat-based supplement. In 2014, steers fed the starch-based supplement had greater ($P < 0.05$) final finishing liveweight, greater ($P < 0.05$) hot carcass weight, greater ($P < 0.05$) overall (grazing + finishing) gain, and greater ($P < 0.05$) overall daily gain than those that received no supplement. Supplementation during the grazing phase had no effect ($P > 0.05$) on finishing weight gain, feed intake, feed:gain, backfat, ribeye area, yield grade, or marbling score.

In 2015, steers supplemented with the fat-based supplement had greater ($P < 0.05$) grazing gains than those that received the starch-based supplement. Steers supplemented with the fat-based supplement had higher ($P < 0.05$) slaughter weight, higher hot ($P < 0.05$) carcass weight, and lower ($P < 0.05$) finishing gain than those fed no supplement or supplemented with the starch-based supplement.

Under the conditions of this study, supplementation of stocker cattle grazing smooth bromegrass pasture improved grazing performance and increased slaughter weight and carcass weight. Most of the increase in slaughter weight and carcass weight can be attributed to greater gains of supplemented cattle during the grazing phase. Supplemental energy source while grazing had no effect on carcass quality.

Table 1. Effect of supplemental energy source on grazing and subsequent finishing performance of steers grazing smooth bromegrass pastures, Southeast Agricultural Research Center, 2014

	Supplemental energy source		
Item	None	Starch	Fat
Grazing phase (181 days)			
Number of head	12	12	12
Initial weight, lb	446	446	446
Final weight, lb	706a	817b	810b
Gain, lb	260a	371b	364b
Daily gain, lb	1.43a	2.05b	2.01b
Gain/a, lb	208a	296b	291b
Supplement consumption, lb/head per day	0	4.25	4.5
Supplement, lb/additional gain	---	6.9	7.8
Average available forage dry matter, lb/a	7,140	7,128	6,985
Finishing phase (125 days)			
Beginning weight, lb	706a	817b	810b
Ending weight, lb	1241a	1338b	1307ab
Gain, lb	535	522	497
Daily gain, lb	4.28	4.17	3.98
Daily dry matter intake, lb	26.1	27.0	24.7
Feed:gain	6.11	6.49	6.20
Hot carcass weight, lb	769a	830b	810ab
Backfat, in.	0.45	0.50	0.47
Ribeye area, sq. in.	11.2	12.1	12.1
Yield grade	2.8	3.0	2.8
Marbling score[1]	630	648	650
Percentage USDA grade choice	100	100	100
Overall performance (grazing plus finishing; 306 days)			
Gain, lb	795a	892b	861ab
Daily gain, lb	2.60a	2.92b	2.81ab

[1] 600 = modest, 700 = moderate.

Means within a row followed by the same letter are not significantly different ($P < 0.05$).

Table 2. Effect of supplemental energy source on grazing and subsequent finishing performance of steers grazing smooth bromegrass pastures, Southeast Agricultural Research Center, 2015

	Supplemental energy source		
Item	None	Starch	Fat
Grazing phase (224 days)			
Number of head	12	12	12
Initial weight, lb	489	488	488
Final weight, lb	753a	833b	886c
Gain, lb	264a	345b	398c
Daily gain, lb	1.18a	1.54b	1.78c
Gain/a, lb	211a	276b	318c
Supplement consumption, lb/head per day	0	4.25	4.5
Supplement, lb/additional gain	---	11.8	7.5
Average available forage dry matter, lb/a	6,601	6,644	6,484
Finishing phase (97 days)			
Beginning weight, lb	753a	833b	886c
Ending weight, lb	1169a	1208a	1307b
Gain, lb	417a	374b	420a
Daily gain, lb	4.30a	3.86b	4.33a
Daily dry matter intake, lb	26.2	26.0	26.3
Feed:gain	6.09	6.74	6.08
Hot carcass weight, lb	725a	749a	810b
Backfat, in.	0.42	0.46	0.49
Ribeye area, sq. in.	11.7	11.7	12.2
Yield grade	2.3	2.8	2.8
Marbling score[1]	639	631	639
Percentage USDA grade choice	100	100	100
Overall performance (grazing plus finishing; 321 days)			
Gain, lb	681a	719a	818b
Daily gain, lb	2.12a	2.24a	2.55b

[1] 600 = modest, 700=moderate.

Means within a row followed by the same letter are not significantly different ($P < 0.05$).

Table 3. Effect of supplemental energy source on grazing performance of steers grazing smooth bromegrass pastures, Southeast Agricultural Research Center, 2016

	Supplemental energy source		
Item	None	Starch	Fat
Grazing phase (223 days)			
Number of head	12	12	12
Initial weight, lb	445	444	444
Final weight, lb	754a	871b	856b
Gain, lb	309a	426b	412b
Daily gain, lb	1.39a	1.91b	1.85b
Gain/a, lb	247a	341b	329b
Supplement consumption, lb/head per day	0	4.25	4.25
Supplement, lb/additional gain	---	8.2	9.2
Average available forage dry matter, lb/a	7,403	7,402	7,309

Means within a row followed by the same letter are not significantly different ($P < 0.05$).