Influence of Grazing Management and Supplementation of Steers on Old World Bluestem on Subsequent Feedlot Performance and Carcass Merit

P.D. Kircher, H.T. Purvis II, G.W. Horn, C.J. Ackerman, and T.N. Bodine

Story in Brief

One hundred-twenty steers that grazed Plains Old World bluestem during 2000 were placed in the feedlot following their respective grazing treatment, fed to a constant degree of finish, and then slaughtered to determine subsequent steer performance and carcass merit. Treatments while on pasture were 1) intensive early stocking (IES; stocking density of 1200 lb BW/ac and a 67d grazing season), 2) half intensive early stocking (HIES; 600 lb BW/ac, 67d of grazing), 3) season long (SL; 600 lb BW/ac, 136d of grazing), and 4) season long supplemented (SLS; same stocking density as SL and fed approximately 1 lb/steer/d of a 40% CP supplement prorated for 3x/week feeding from July 20 to Sept. 26). Average daily gain was similar across all treatments, however IES, HIES, and SL had .31, .19, .36 lb/d greater gain than SLS steers. Dry matter intakes were similar for IES and HIES. Dry matter intakes for IES were similar to SLS steers and less than SL. Season long and SLS steer intakes were similar for the feeding phase. Intensive early stocked steers feed conversions were similar to HIES and SL steers, but were greater than SLS steers. Season long grazed steers also had greater gain/feed ratios than SLS steers. Carcass weights were similar for IES, HIES, SL, and SLS treatments. Percent Choice and Select in each treatment as determined through a Chi-square test observed no differences between treatments. Yield grades were similar for all treatments. Intensive early stocking and season long grazing provide different management options for cattle on grass without impacting feedlot performance or carcass merit.

Key Words: Old World Bluestem, Feedlot, Carcass, Growing Steers

Introduction

Different growing programs for stocker cattle result in various levels of gain and maturity. The differences created on grass can subsequently impact feedlot performance and carcass merit. Perry et al. (1971) determined that increasing amounts of energy supplementation on cool season grasses decreased ADG in the feedlot and also decreased the number of days on feed. Gill et al. (1991, 1992) reported that steers and heifers that grazed an intensive early stocking program were more efficient in the feedlot than cattle grazed season long (5.8 vs 6.9 lb feed/ lb gain for heifers and 6.1 vs 6.9 lb feed/ lb gain for steers). Various rates of gain on grass can also impact carcass characteristics. Gill et al. (1991, 1992) determined regardless of sex, cattle that grazed season long had heavier end weights and therefore heavier carcass weights than cattle grazed on an intensive early stocked program. Lake et al. (1974) found that carcass traits were not affected by level of energy supplementation and when fed at increasing amounts it decreased the number of days on feed for the feeding period. Klopfenstein et al. (2000) reported in three summer grazing trials that when ADG varied by .1 kg/d or less during the grazing phase there were no differences observed in the carcass. Yet, if ADG varied by more than .46 kg/d, the slower gaining cattle had greater days on feed, higher marbling scores, and greater percent choice carcasses. The objective of our study was to evaluate the effects of intensive early stocking and

late season protein supplementation on Old World bluestem and assess subsequent feedlot performance and carcass merit.

Materials and Methods

Study Site. The feeding phase of this study occurred only in yr 2 and was conducted at the Willard Sparks Beef Research Center located west of Stillwater, OK. The pens were 15 ft wide by 30 ft long with an automatic waterer placed in the fenceline between every other pen. The pens have a one-time capacity of five head that allows each animal 3 ft of bunk space.

Cattle and Feed. Prior history of the cattle used in this trial was discussed in a companion paper in this research report. Ten steers from each pasture for total of 30 head from each treatment were selected to enter the feedlot. The initial selection criterion was individual weight and average daily gain (ADG) relative to the pasture average. The IES and HIES treatments were processed on July 20, 2000 and the season long grazed steers were processed on September 28, 2000. At processing the steers received a Revalor-S® implant, a four-way respiratory vaccine, a seven-way clostridial vaccine, horns were tipped, and tails bobbed. Initial feedlot weights were off trials weights for the grazing phase of the trial. Steers were fed 48% of daily feed call at 0700 and 52% of feed call at 1400. Diets consisted of whole shell corn, cottonseed hulls, alfalfa pellets, a protein supplement, and blended yellow grease (Table 1). Cattle received diet 1 for 7 d along with a decreasing amount of bermuda grass hay. Hay was fed at 3 lb^{-1}·$steer^{-1}$·day^{-1} on d 1 and decreased by .5 lb^{-1}·day^{-1}·$steer^{-1}$ until completely taken out of the diet by d 7. Steers were moved up through three step up diets in order to reach the finishing diet that was fed for the remainder of the trial. Steers were moved up to the next ration when they had reached a target intake based on 70%, 85%, and 95% of their calculated mean feed intake for the entire feeding period for diets 1, 2, and 3. If the target intake was not reached within 7 d the steers were bumped on the seventh day to the next diet in order to achieve a timely adaptation to the finishing diet. Ration 4 consisted of 79% whole corn, 9% protein supplement, 6.1% cottonseed hulls, 2.9% alfalfa pellets, and 3% yellow grease. Bunks were evaluated between 1900 and 2100 hours over the course of the trial. Bunks were scored on a system of 0 to 5 and the next day's feed call was adjusted according to the prior evenings bunk score. Monthly samples of ration and ration ingredients were taken to determine dry matter, ash and nitrogen content.

Table 1. Ingredient and nutrient content of feedlot diets (DM basis)

Item	Ration 1	Ration 2	Ration 3	Ration 4
Ingredient composition				
Whole shell corn, %	60.00	70.00	79.00	79.00
Cottonseed hulls, %	15.00	10.00	5.00	6.10
Alfalfa pellets, %	15.00	10.00	5.00	2.90
Supplement, B110, %	8.00	8.00	8.50	9.00
Blended yellow grease, %	1.00	2.00	2.50	3.00
Nutrient composition[a]				

Crude protein, %	13.84	13.67	13.80	13.78
NE_m, Mcal/lb	.85	.92	.97	.98
NE_g, Mcal/kg	.51	.56	.63	.64
Fat, %	4.35	5.49	6.13	6.59
Crude fiber, %	12.68	9.18	5.69	5.68
Potassium, %	1.09	.95	.83	.81
Calcium, %	.69	.61	.56	.55
Phosphorus, %	.33	.34	.36	.36
Magnesium, %	.15	.14	.14	.14
Sulfur, %	.16	.16	.16	.15
Cobalt, ppm	.39	.39	.40	.42
Copper, ppm	23.8	23.1	23.6	24.7
Iron, ppm	135.4	117.8	103.9	103.4
Manganese, ppm	49.6	42.4	36.6	38.6
Selenium, ppm	.18	.17	.15	.15
Zinc, ppm	66.9	66.1	68.4	71.3

[a]Except for premixes and supplements, crude protein of ingredients was analyzed using AOAC (1996) procedures; remaining diet composition was calculated from ingredient analysis based on NRC (1984) values.

Carcass. Intensive and half intensive early stocked steers were shipped on January 8 and the SL and SLS steers were shipped February 13. Two pens of IES and HIES steers were weighed and ultrasounded on January 5. The average IES ultrasound fat measurement was compared to a two pen season long average measurement taken on February 2, 2001. The comparison was used as a gauge to estimate the additional number of days needed by the season long cattle to achieve a similar end point to the IES steers. Both sets of cattle were shipped 240 miles to IBP Corp., Emporia, KS and slaughtered on the same day they were shipped. Carcass data were collected after a 24-h chill by the Kansas State University carcass data collection service. Hot carcass weights, marbling scores, quality grades, KPH, external fat thickness, ribeye areas, and final yield grade values were collected for both sets of steers. Quality grades and marbling scores were converted to a numerical scale in order to analyze results. The quality grade "Small" Choice equaled 400 to 499 and Select equaled 300 to 399. To be considered upper two-thirds Choice a carcass equaled 500 or greater. Final live weights for both groups of steers were determined as the hot carcass weight divided by a common dressing percentage of 62.5%.

Statistical Analysis. All data were analyzed as a complete randomized design with PROC MIXED of SAS (SAS Inst. Inc., Cary, NC) with treatment included in the model. Pen was

considered the experimental unit in the feedlot. Least significant difference was used to separate treatment means when a significant (P<.05) F-value was observed.

Results and Discussion

Feedlot Performance. Pen conditions deteriorated as the fall progressed into winter with the added influx of winter precipitation and freezing conditions. Pen conditions were quite unfavorable from mid-December until the end of the trial.

Intensive early stocked steers were lighter than all other treatments (P<.03; Table 2) at the initiation of the trial. Half intensive early stocked steers were also lighter than SL and SLS (P<.001). Season long steers weighed less than the SLS steers (P<.05) at the initiation of the feeding phase. Final weights were not different (P=.21) between any of the treatments but IES and HIES were lighter than SL and SLS steers. Season long steers gained more weight than SLS steers and were able to make up the 26 lb weight difference that existed at the beginning of the feeding phase and then surpass the SLS steers to weigh 24 lb more at the end of trial.

Weight gain varied between treatments as would be expected with different ages and weights at placement. Intensive early stocked steers gained more total weight over the course of the feeding period than all other treatments, however IES and HIES steers were not different in total amount of weight gained (P=.31). Intensive early stocking and HIES both gained more weight (P<.004) than SL and SLS. Season long steers gained more weight (P<.03) than SLS steers. Average daily gain was similar across all treatments (P=.07), however IES, HIES, and SL had .31, .19, .36 lb/d greater gain than SLS steers. Increased performance during the late summer tended to impair gain and efficiency in the feedlot for SLS steers.

Dry matter intakes were similar (P=.11) for IES and HIES, although IES consumed 1.0 lb/d more than HIES. Intensive early stocked steers also consumed similar amounts of feed as SLS steers (P=.23) and less than SL (P<.02). Half intensive early stocked steers had lower DMI than SL and SLS steers (P<.006). Season long and SLS steer intakes were similar (P=.20) for the feeding phase. Half intensive early stocked steers had similar (P=.22) gain/feed ratios as compared with IES and SL steers but had greater gain/feed ratio (P<.002) than SLS steers. Intensive early stocked steers gain/feed ratio was greater (P<.003) than SLS steers. Season long grazed steers also had greater a gain/feed ratio (P<.05) than SLS steers.

Table 2. Feedlot performance of steers that grazed Old World bluestem prior to finishing

	Treatments[a]				
	IES	HIES	SL	SLS	SE
Steers/treatment	30	30	25	30	
Days on feed	173	173	139	139	
Weight, lb					
Initial[b]	654[c]	681[d]	796[e]	822[f]	8.2
Final	1157	1163	1207	1183	16.6
Total gain/steer, lb	503[c]	482[c]	411[d]	362[e]	14.4
ADG, lb/d	2.91	2.79	2.96	2.60	.09
Total DMI/steer, lb	3741[c]	3569[c]	3221[d]	3107[d]	63.5
DMI·steer^{-1}·d^{-1}, lb	21.6[cd]	20.6[c]	23.2[e]	22.4[de]	.41

Gain/feed	.135[c]	.135[c]	.128[c]	.116[d]	.004

[a]Treatments: IES – Intensive early stocking; HIES – Half intensive early stocking; SL – Season long grazing; SLS – Season long grazing and protein supplemented during the late summer.
[b]Initial weights: IES and HIES - July 17; SL and SLS - September 25, 2000, and final weights: IES and HIES - January 8; SL and SLS - February 13, 2001.
[c,d,e,f]Means within row with different superscripts differ (P<.05).

Carcass Performance. Carcass weights were similar (P=.20; Table 3) for IES, HIES, SL, and SLS treatments. Marbling scores were similar for all treatments (P=.94). Percent Choice and Select in each treatment as determined through a Chi-square test observed no differences (P=.28) between treatments; however, when analyzed for early vs late placement there was a strong trend (P<.06) for season long grazed steers to have a greater percent Choice than early grazed steers. Late season steers had fewer percent Premium Choice than early season steers (1.8 vs 11.7 %, respectively). Early season steers were on feed longer and had more Premium Choice carcasses whereas season long steers were older and heavier at placement in the feedlot had more total Choice carcasses. Increased marbling scores also occurred with greater days on feed as demonstrated by the lower percent Choice and higher marbling scores for early grazed steers that were on feed for 34 additional days as compared to the season long grazed steers. Differences in carcass quality grades were due to differences in age and weight at placement.

All treatments had similar (P=.06) subcutaneous fat depth and ribeye areas, however fat thickness and ribeye areas increased in relation to the amount of time spent on grass. Kidney, pelvic and heart fat demonstrated the greatest amount of variability for any of the carcass traits measured. Intensive early stocked steers had less (P<.05) KPH than all other treatments. Half intensive early stocked steers had a lesser amount (P<.03) of KPH than SL and SLS steers. Season long and SLS steers were similar (P=.29) in KPH, although SLS had numerically higher values than SL. Yield grades were similar for all treatments (P=.90), although IES had the lowest numerical YG of all treatments. Half intensive early stocked, SL, and SLS steers were stocked at the same density on grass and varied in their final yield grade by only .8%.

Table 3. Carcass parameters for steers grazed on Old World bluestem prior to finishing

	Treatments[a]				
	IES	HIES	SL	SLS	SE
No. of steers	30	30	25	29	
Carcass weight, kg	723	727	754	740	10.3
Ribeye area, in^2	12.94	12.91	13.40	13.50	.21
KPH fat, %	1.62[x]	1.78[y]	1.98[z]	2.08[z]	.056
Fat thickness, in	.45	.46	.47	.50	.03
Yield Grade	2.54	2.63	2.65	2.65	.12
Yield grade dist.					

Yield Grade 1, %	20.0	10.0	20.0	17.2	
Yield Grade 2, %	60.0	66.7	48.0	55.2	
Yield Grade 3, %	20.0	23.3	32.0	27.6	
Marbling score[b]	402.0	409.7	404.8	399.0	12.6
Premium Choice, %[c]	10.0	13.3	4.0	--	
Low Choice, %	30.0	30.0	52.0	62.1	
High Select, %[d]	40.0	30.0	32.0	31.0	
Low Select, %[e]	20.0	26.7	12.0	6.9	

[a]Treatments: IES – Intensive early stocking; HIES – Half intensive early stocking; SL – Season long grazing; SLS – Season long grazing and protein supplemented during the late summer
[b]Marbling score: 400 to 499 = "Small" degree, the minimum U.S. Choice; 300 to 399 = "Select" degree
[c]Carcasses with Modest or Moderate degree of marbling (Upper 2/3 Choice)
[d]Carcasses with Slight degree of marbling and marbling score: 350 to 399
[e]Carcasses with Slight degree of marbling and marbling score: 300 to 349
[x,y,z]Means within row with different superscripts differ (P<.05).

Implications

Similar average daily gains and gain/feed ratios for intensive early stocking and season long grazed steers indicated that IES was an effective program for utilizing Old World bluestem and achieving acceptable animal performance. Late summer supplementation on Old World bluestem did not alter average daily gain or dry matter intake but it does appear to affect subsequent animal efficiency in the feedlot. Intensive early stocking and season long grazing provide different management options for cattle on grass without impacting feedlot performance or carcass merit.

Literature Cited

Gill, D.R. et al. 1991. Okla. Agr. Exp. Sta. Res. Rep. MP-134:114.

Gill, D.R. et al. 1992. Okla. Agr. Exp. Sta. Res. Rep. MP-136:223.

Klopfenstein, T.R. et al. 2000. Proc. Am. Soc. Anim. Sci. 1999.

Lake, R.P. et al. 1974. J. Anim. Sci. 39:827.

Perry, T.W. et al. 1971. J. Anim. Sci. 32:744.

Acknowledgements

The authors thank all persons that helped with data collection, especially Kansas State University Data Collection Service for collecting all carcass data. The authors also thank Kerry Wyatt and Fred Ruiz, XIT Feeders, Dalhart, TX, for printing the tags used in the feeding phase.

[2001 Research Report | Animal Science Research Reports | Animal Science]