Management Strategies and Live Weight Gain of Steers on Old World Bluestem

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Story in Brief

A 2-yr study utilizing at total of 755 crossbred steers (522 ± 55 kg) grazing Plains Old World bluestem were used to determine the effects of various grazing management systems of cattle on animal performance. Treatments 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). Intensive early stocked steers weighed less than all other treatments at the mid point of the trial. Intensive early stocked steers had lower ADG and individual animal gain than all other treatments. Half intensive early stocking, SL, and SLS steers had similar ADG and individual animal gain. In yr 1, early gain/acre (GA) for IES tended to be lower than SL and SLS but was similar to HIES. Half intensive early stocking GA tended to be similar to SL and SLS. During yr 2 early GA for IES was greater than HIES, SL, and SLS. Steers stocked at the lighter stocking density were similar in their GA for the early grazing period. Season long supplemented steers were heavier and had greater ADG and GA at the end of the trial than the SL steers. Intensive early stocking was an effective management tool for maximizing gain/ha during the early grazing period if growing conditions were adequate to provide adequate forage growth.

Key Words: Intensive Early Stocking, Protein Supplementation, Steers, Old World Bluestem

Introduction

Old World bluestem has been used quite extensively in reclaiming marginal farmland and controlling erosion in Oklahoma and Texas (Dewald et al., 1985; Berg, 1993). Old World bluestem provides a great quantity high quality forage in the early summer, yet it declines in nutritive value and digestibility as the growing season progresses (Dabo et al., 1987; Coleman and Forbes, 1998). Evaluating management systems that utilize Old World bluestem throughout its growing season by matching grazing schemes with forage nutritive value would increase the usefulness of this grass. One method that offers potential for harvesting early season growth of Old World bluestem may be intensive early stocking (Coleman and Forbes, 1998). Intensive early stocking works well for grazing systems because animals harvest forages during their greatest nutritive value while still maintaining adequate gains (Owensby et al., 1995). Late season declines in crude protein of Old World bluestem could be addressed by implementing a late summer protein supplementation program. Late summer supplementation programs supply protein to warm season grasses that typically are deficient in protein (Lusby et al., 1982). Although, the protein content of Old World bluestem does not drop as rapidly as native prairie pastures, the decline does occur and protein supplementation on Old World bluestem may be effective in producing additional cattle weight gains (Forwood et al., 1988). The objective of our study was to evaluate intensive early stocking and the effect of late season protein supplementation for steers grazing Old World bluestem.

Materials and Methods

Study Site. The study site was located at the Bluestem Research Range 7 miles southwest of Stillwater, OK. Plains Old World bluestem (*Bothriochloa ischaemum L. Keng*:OWB) was established on the site in 1989. Total precipitation for the months of May, June, July, August, and September was 22.3 inches in 1999 and 16.2 inches in 2000 as compared with the historical average of 21.7 inches for this site. Nitrogen fertilizer was applied at a rate of 92 lb N/ac each year and herbicide (Grazeon P+D®, 2,4-D + Picloram, Dow AgroSciences, Indianapolis, IN) was applied in the spring of 1999. The site consists of 260 acres of OWB that is divided into 12 paddocks that are approximately 21.7 ac in size. A winter grazing study and receiving cattle were used to remove all dormant vegetation and equalize standing crop across pastures.

Cattle and Stocking Rates. Initial weight of the cattle was 522 ± 55 lb pooled across both years. Treatments were 1) intensive early stocking (IES; stocking density of 1200 lb BW/ac and a 67-d grazing season), 2) half intensive early stocking (HIES; 600 lb BW/ac, 67d of grazing), 3) season long (SL; 600 lb BW/ac, 136 d of grazing), and 4) season long supplemented (SLS; same stocking density as SL and fed 1 lb/steer/d of a 40% CP supplement prorated for 3x/week feeding from July 21 to Sept. 28 in yr 1 and 1.25 lb/steer/d of a 32% CP supplement prorated for 3x/week feeding from July 19 to Sept. 24 in yr 2). The supplement was made of 80.5% cottonseed meal, 11.5% soybean meal, and 8% wheat middlings. The trial was initiated on May 12 and final weights for IES and HIES were taken on July 18. The SL and SLS treatments were weighed on July 19 to determine performance on the first half of the trial and on September 26 to determine off trial weights. At initial processing, steers received Dectomax® at 1.5-ml/100 lb of BW, a Synovex-S® implant, and an individual treatment tag. All treatments had ad-libitum access to water and white salt throughout the trial. All cattle weights during the grazing phase were attained after a 12- to16-hr overnight shrink in an attempt to equalize fill across treatments.

Forage Analysis. Diet samples were collected on May 28, July 29, and September 28 and 30 in yr 1 and on June 13 and 14 and August 17 and 18 in yr 2. In yr 1, diet quality samples were taken by hand plucking and yr 2 samples were taken by ruminally cannulated animals. Forage mass was determined by clipping six .1 m^2 quadrats per pasture at the initiation, middle, and termination of the trial during both years. Forage samples were analyzed for DM, ash, IVOMD, CP, and degradable intake protein.

Statistical Analysis. Steers were weighed and allotted in a randomized complete block design to one of four treatments with three replicates per treatment and repeated over 2 yr. All data were analyzed in PROC MIXED of SAS (SAS Inst. Inc., Cary, NC). Model included treatment, year, and treatment x yr interactions. Pasture was the experimental unit on grass and data were pooled across year if no significant ($P<.05$) yr x treatment interactions were observed. Least significant difference was used to separate treatment means when a significant ($P<.05$) F-value was observed.

Results and Discussion

Grazing Performance. No significant treatment x year interactions ($P=.07$; Table 1)) were observed for early ADG and individual animal gain (GAIN) and thus data were pooled and

reported across year. Intensive early stocked steers had lower ADG (P<.001) than all other treatments. Half intensive early stocking, SL, and SLS steers had similar ADG (P=.18). Residual forage mass at the mid point of the trial was 2768 lb/ac lighter for the IES pastures vs the average of all other treatments. Intensive early stocked steers weighed less than all other treatments (P<.001) at the mid point of the trial. Half intensive early stocking, SL, and SLS treatments tended to have similar (P=.07) weights. Season long and SLS steers weighed the same (P=.21). The weight differences present at the midpoint of the trial were more varied than expected because HIES, SL, and SLS steers were all stocked at the same density.

Table 1. Weights and performance of steers that grazed Old World bluestem in 1999 and 2000

			Treatments[a]		
	IES	HIES	SL	SLS	SE
Weight, lb					
Initial	528	515	519	525	4.13
Mid	602[f]	642[g]	648[g]	660[g]	6.62
Final			730[f]	759[g]	6.99
Gain/steer, lb					
Early[b]	73.8[f]	126.4[g]	129.4[g]	135.7[g]	4.73
Late[c]			82.2[f]	99.2[g]	3.53
Total[d]			211.5[f]	234.9[g]	5.59
ADG, lb/d					
Early[b]	1.12[f]	1.92[g]	1.96[g]	2.06[g]	.07
Late[c]			1.21[f]	1.46[g]	.05
Total[d]			1.56[f]	1.74[g]	.04
Gain/ac, lb					
Early[be]					
1999	102.7[x]	118.3[xy]	134.6[yz]	149.4[z]	11.31
2000	230.3[f]	179.7[g]	166.5[g]	168.9[g]	11.31
Late[c]			95.1[f]	116.0[g]	4.23
Total[d]			245.6[f]	275.2[g]	7.84

[a]Treatments: IES: intensive early stocking; HIES: half intensive early stocking; SL: season long grazing; SLS: season long grazed with late summer protein supplementation
[b]Early grazing season for Yr 1: IES and HIES = 68 d, SL and SLS = 69 d; Yr 2: IES and HIES = 65 d, SL and SLS = 66 d
[c]Late grazing season for Yr 1 and 2: 68 d
[d]Total grazing season for Yr 1: 137 d; Yr 2: 134 d
[e]Treatment x year interaction for early gain per acre (P<.05)
[f,g]Means within a row without common superscripts differ (P<.05).
[x,y,z]Means within a row without common superscripts differ (P<.10).

During the late summer, SLS steers gained .24 lb/d more than unsupplemented steers (P<.009). Total ADG favored steers that were fed in the late summer with a high protein supplement as demonstrated by.18 lb/d greater gain (P<.02) than SL steers.

Gain Per Acre (GA). A significant treatment x year interaction (P<.001) was observed for early GA and thus data were not pooled but reported by year. In yr 1, early GA for IES tended to be lower (P<.06) than SL and SLS but was similar to HIES (P=.33). Half intensive early stocking GA was similar to SL (P=.31); yet tended to be less than SLS (P<.07). Season long and SLS GA were similar (P=.36). Residual forage mass for yr 1 revealed no dramatic differences in available biomass and nutritive values were actual greater for the HIES treatment as compared with season long treatments. During yr 2, early GA for IES was greater (P<.006) than HIES, SL, and SLS. Steers stocked at the lighter stocking density were similar (P=.41) in GA for the early grazing period. Year 2 generated results that more closely resembled earlier findings with intensive early stocking.

The treatment x yr interaction resulted from drastic differences in weather encountered over the 2 yr of the trial. In yr 1, growing conditions in the late spring and early summer were cool and wet, which limited the growth of OWB and subsequently were limiting to cattle growth. In yr 2, growing conditions allowed adequate forage production and consequently more acceptable animal performance. Precipitation totals for May, June, and July of yr 1 were 1.1 in more than in yr 2 for the same months, yet timing of rainfall events varied drastically. May, for both years received 4.0 in of rainfall, yet June of 1999 had 4.9 in more than June of 2000. July precipitation patterns were reversed from June with 3.9 in less falling in 1999 than in 2000. Temperatures also varied between year and resulted in the last 9 d of May 1999 having 8.5 and 2.9 °F cooler ambient and sod temperatures, respectively, than May of 2000. Thus cooler May temperatures and the timing of precipitation events in June lead to poorer growing conditions for OWB in 1999, ultimately limiting forage production and, when coupled with heavy stocking rates, restricted cattle performance.

Poor performance of the IES system in yr 1 resulted from inadequate grass growing conditions, which compromised cattle performance, but yr 2 resulted in IES generating 84% of the weight gain of the SL treatment in 67 d of grazing. Late GA was greater for SLS steers with 20.9 lb/ac more than for SL grazed steers (P<.008). Additional weight gain achieved through late summer supplementation allowed SLS steers to gain 23.4 lb/ac more total weight than SL steers (P<.01).

Steers grazing OWB during the late summer in yr 1 gained an additional 17.8 lb and converted at 3.5 lb supplement DM/1 lb of additional gain and in yr 2 steers gained an additional 16.2 lb and converted at 4.9 lb supplement DM/1 lb of additional gain. The differences in year and CP of the supplement could explain part of the supplement conversion differences between the 2 yr. However, steer performance was not dramatically different between yr and response to protein supplementation was still less than typically seen on native forages. Growth pattern and maturation of native prairie vs OWB may prove to be a large portion of the differences seen in cattle performance. In the current study forage CP never fell below 10% in the late season for both years. Therefore, Old World bluestem does not decline in CP and digestibility as early in the growing season as native species. Our trial followed the same feeding schedule as a native prairie supplementation program, yet cattle on OWB may not have been deficient in protein until later in the summer. Therefore starting protein supplementation in mid-July may prove to be too early to achieve economical and efficient weight gain from cattle grazing OWB. Delaying the start date of supplementation would reduce the amount of supplement fed to cattle and possibly improve supplement conversions making supplementation more economically feasible for

OWB. Additional weight can be generated on OWB from supplementation yet not to the same extent as a native prairie supplementation programs.

Implications

Intensive early stocking was an effective management tool for maximizing gain/ha during the early grazing period if growing conditions were adequate to provide adequate growth. Late summer supplementation produces additional weight gain on OWB yet not to the same extent as a native prairie supplementation program. Stocker cattle are an effective tool for harvesting Old World bluestem and offer various management options for utilizing this warm season grass.

Literature Cited

Berg, W.A. 1993. J. Range Manage. 46:421.

Coleman, S.W. and T.D.A. Forbes. 1998. J. Range Manage. 51:319.

Dabo, S.M. et al. 1987. J. Range Manage. 40:10.

Dewald, C.A. et al. 1985. J. Soil and Water Conserv. 40:277.

Forwood, J.R. et al. 1988. Agron. J. 80:135.

Lusby, K.S. et al. 1982. Okla. Agr. Exp. Sta. Res. Rep. MP-112:36.

Owensby, C.E. et al. 1995. J. Range Manage. 48:246.

Acknowledgements

The authors thank all persons that helped with cattle and forage data collection, especially David Cox for his excellent work and energy as herdsman.

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