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Use of Dried Distiller's Grains to Extend Range Capacity

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Summary

At the University of Nebraska Gudmundsen Sandhills Lab for 60 days from mid-June to mid-August for 2 years (2005 and 2006), 24 paddocks were randomly assigned to one of three treatments. Treatments were control (CON) at the recommended stocking rate and no supplementation, double stocked (2X) or double stocked with 5 lb of DDGS daily (SUP). There was no difference in ADG between the CON and 2X calves; however, SUP calves gained more than the unsupplemented groups. Forage use was not different between SUP (58%) and 2X (62%); however, use was lower for CON group (36%). Distillers dried grains supplementation increased ADG of calves; however, DDGS did not replace or conserve grazed forage such that stocking rate could be increased twofold.

Introduction

The improvement in performance of grazing yearlings when supplemented with DDG has been documented (*2007 Nebraska Beef Cattle Report*, pp 10-11) and studies using harvested feeds to directly measure intake have reported forage replacement rates from 27% to 62%. Findings of these studies suggest that DDGS supplementation may allow for maintained or improved animal performance at increased stocking rates. The objectives of this study were 1) to evaluate the effect of DDGS supplementation on yearlings in heavily stocked situations, and 2) the subsequent effects of heavy stocking rates on range condition.

Procedure

This experiment was conducted at the University of Nebraska Gudmundsen Sandhills Laboratory (GSL) near Whitman, Neb. Twenty-four 2.4 acre paddocks were assigned randomly within two blocks to one of three treatments: 1) control (CON) at the recommended stocking rate (0.6 AUM/acre in 2005 and 0.4 AUM/acre in 2006, adjusted for drought) with no supplementation, 2) double stocked (1.2 AUM/ac in 2005 and 0.8 AUM/acre in 2006; 2X), or 3) double stocked with 5 lb dry matter/head daily of DDGS (SUP). The DDGS pellet was 88% DM, 28% CP, and 11.2% fat.

Paddocks were rotationally grazed once each year for 60 days from mid-June to mid-August, with days of grazing per paddock adjusted for stage of plant growth. The order which pastures were grazed was rotated between years to maximize recovery. Due to drought in 2006, stocking rate was reduced and put-and-take of calves were used to maintain forage removal similar to 2005.

In 2005, 42 summer-born spayed yearling heifers (534 ± 33 lb BW) and in 2006, 24 summer-born yearlings (14 spayed heifers and 10 steers) (505 ± 37 lb BW) were stratified by BW and assigned randomly to treatment paddocks. In addition, six similar yearlings were maintained in 2006 for put-and-take. Calves were limit-fed meadow hay at 2% of BW for five days at the beginning and end of the trial and weighed for three consecutive days.

Paddock species composition was determined prior to grazing each year using step-point analysis (Table 1). Forage use and standing crop were determined by clipping twenty, 1-m^2 quadrats pre- and post- grazing in late June, mid-July and early August (the 2nd, 4th, and 6th paddocks, respectively in a six pasture rotation).

All data were analyzed using the MIXED procedure of SAS (SAS Inst., Inc., Cary, N.C.). Yearling performance was analyzed as a randomized complete block design with treatment, year, and block analyzed as fixed effects. Standing crop data were analyzed with treatment, order grazed, block, year, and clip type (pre or post) as fixed variables, and pasture as a random effect. Orthogonal contrasts were constructed between the control and both double stocked treatments, and between supplemented and un-supplemented double stocked treatments. Least square means were separated using the Least Significant Difference Method when a significant ($P < 0.05$) f-test was detected. Significance of interactions was determined at the $P < 0.1$ level.

Table 1. Species composition of paddocks at the initiation of the trial.

	Block	
Species	West (%)	East (%)
Sedge (*Carex* spp.)	25	23
Prairie sandreed (*Calamovilfa longifolia*)	19	19
Needleandthread (*Stipa comata*)	10	15
Little bluestem (*Schizachrium scoparium*)	8	6
Switchgrass (*Panicum virgatum*)	7	6
Prairie junegrass (*Koeleria macrantha*)	3	4
Sand dropseed (*Sporobolus cryptandrus*)	3	3
Blue grama (*Bouteloua gracilis*)	5	4
Hairy grama (*Bouteloua hirsuta*)	4	3
Sand bluestem (*Andropogon hallii*)	2	3
Western ragweed (*Ambrosia psilostachys*)	6	6
Stiff sunflower (*Helianthus pauciflorus*)	3	3
Other	5	5
Total	100	100

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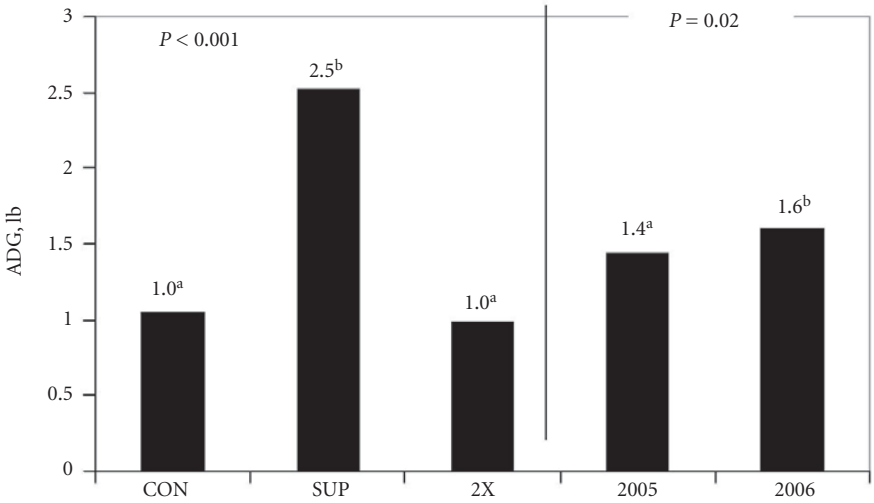

Figure 1. Calf average daily gain at recommended stocking rate, 2X recommended stocking rate and 2X plus distillers dried grains supplement and average daily gain for both years. [a,b]Means with unlike superscripts differ.

Table 2. Live standing crop (lb/ac).

Order:	Late June			Mid-July			Mid-August		
Treatment:	CON[a]	SUP[b]	2X[c]	CON	SUP	2X	CON	SUP	2X
2005									
Pre-graze	1107	1085	977	1228	1125	859	1349	1251	1199
Post-graze	754	486	421	753	428	236	692	414	408
% Utilization[d]	31.9	55.2	95.8	38.7	62.0	72.5	48.7	66.9	66.0
2006									
Pre-graze	874	840	941	1128	1082	1137	1074	1046	1042
Post-graze	738	589	592	702	336	340	598	329	312
% Utilization[d]	15.6	30.0	37.1	37.8	68.9	70.1	44.3	68.5	70.1

[a]Control, .6AUM/ac.
[b]1.2 AUM/ac plus 5 lb DDGS daily.
[c]1.2 AUM/ac.
[d]Control different from SUP and 2X (P <0.001).

Results

No ($P > 0.1$) year by treatment interaction occurred for calf performance (Figure 1). There was no difference between the CON and 2X calves ($P = 0.44$); however, the SUP calves gained (2.5 lb/day) more ($P < 0.001$) than the un-supplemented groups (1 lb/day). There was also a difference in ADG between the two years (Figure 1). This may be a direct result of a lower stocking rate in 2006. While the goal was to maintain similar forage remaining after grazing between the groups, at times there may have been less grazing pressure in 2006 because visual appraisal was used to determine when calves were added or removed.

Because stocking rate differed between the CON and 2X groups, forage intake, and therefore energy intake, should have been different. The lack of difference in ADG between CON and 2X treatments implies energy was not the first limiting nutrient in unsupplemented calves. The lower than anticipated ADG for the CON calves likely was a result of a metabolizable protein (MP) deficiency resulting from the use of young growing calves with a high MP requirement. The NRC (1996) model, using 120% NE adjusters and the average IVOMD and CP for the grazing period, suggests CON and 2X calves were deficient in MP by 147 g/day and had an energy allowable ADG of 1.7 lbs. In contrast, the supplemented calves had a 145 g/day MP excess, and energy allowable ADG of 2.6 lb, which was very near their actual gain. This further supports our hypothesis that digestible undegradable protein was the first limiting nutrient in these calves, and some of the response to DDGS supplementation was likely a response to undegradable protein.

Use of live standing crop is presented in Table 2. Due to significant interactions between years, the standing crop data are presented by year. We did not expect differences in the standing crop components of the 2005 pre-graze standing crop as paddocks had been rested for 8 years; however, even though paddocks were assigned randomly to treatments, some differences existed at the onset of the trial. There were significant interactions between order grazed, treatment, and block ($P < 0.001$) in the amount of live grass. These interactions are caused by variation among pastures, lack of precision in measurement, and low number of replications.

These paddocks consisted of primarily warm-season grasses; therefore, peak yield of grasses did not occur until late in the summer. Live grass standing crop was lower across treatments after grazing. Across all paddocks, CON paddocks had more standing live grass and forbs following grazing ($P < 0.001$) than either of the double-stocked treatments.

Across all treatments, standing crop was lower in 2006 (Table 4), but this is likely due to decreased precipitation and not prior treatment. There was no effect of treatment in live grass ($P = 0.49$); however, order grazed did impact standing crop ($P < 0.001$). Across both years, use averaged 36.4%, 58% and 62% for CON, SUP and 2X treatments, respectively.

Contrary to our hypothesis, no significant reduction in forage removal was induced by the supplementation of DDGS in comparison to the CON or 2X treatments. Klopfenstein et al. (*2007 Nebraska Beef Cattle Report*, pp 10-11) found a forage replacement rate of nearly 50% when DDGS was supplemented to calves fed harvested

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feeds. The DDGS forage substitution in our study is likely quite similar to that seen when DDGS is supplemented to harvested feeds. Extrapolation of the harvested forage data to ours suggests that at our rate of supplementation (5 lb daily), only 2.5 lb daily of forage would have been replaced. If this is accurate, forage replacement may have indeed occurred, but not at a level that could be detected in the design and sampling procedure of this study.

Supplementation of DDGS to calves grazing native Sandhills range increased ADG even when stocking rate was doubled. No apparent reduction in voluntary forage intake was detected in this study due to DDGS supplementation. Some of the laboratory data and visual observations suggest some level of replacement may occur early in the grazing period, but is not sustained throughout a grazing period at these stocking rates. Increasing stocking rate can have detrimental impacts on range condition over time. While the duration of the study was not sufficient to measure this decline, visual appraisals of the double stocked paddocks, along with previous research, warn that the double stocked treatments could decrease range condition. The findings of our study show that DDGS supplementation is an effective tool in increasing ADG of calves grazing native Sandhills range; however, forage replacement is not such that stocking rate can be increased twofold.

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