Replacement of Grazed Forage and Animal Performance when Distillers Grains are Fed in a Bunk or on the Ground on Summer Range

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Summary

Forage savings and supplement loss caused by feeding on the ground were estimated when spayed yearling heifers were fed modified distillers grains with solubles (MDGS) while grazing Sandhills summer range. Across two years, heifers fed 0.6% BW MDGS had 1.39 lb greater ADG and consumed approximately 17% less forage than non-supplemented heifers. Calculated loss of MDGS when fed on the ground was 5.6%. Supplementing MDGS decreased forage consumption approximately 17% and increased summer gains.

Introduction

Distillers grains, a byproduct of the corn milling industry, fits well into forage-based diets as it contains a highly fermentable fiber source which does not hinder forage digestion, and also supplies undegradable intake protein (UIP) to meet metabolizable protein deficiencies common in grazing situations (*2004 Nebraska Beef Cattle Report,* pp. 25-27).

Distillers grains supplementation has been shown to increase growing cattle ADG while reducing forage intake in a forage-based system *(2005 Nebraska Beef Cattle Report,* pp. 18-20). Forage intake was reduced 0.5 lb for each 1.0 lb of distillers grains fed, as summarized from six distillers grains supplementation studies (2007 *Nebraska Beef Cattle Report*, pp. 10-11). Distillers grains loss when fed on the ground appears to be affected by distillers grain form, animal type, and grazing situation. Wet distillers grains with solubles (WDGS) fed to yearling steers on Sandhills winter range resulted in a 13-20% loss (*2010 Nebraska Beef Cattle Report,* pp. 17-18), while dried distillers grains with solubles (DDGS) fed to calves on a subirrigated meadow resulted in a 36-41% loss (*2012 Nebraska Beef Cattle Report*, pp. 51-52). Thus, the objectives of this study were to determine forage replacement rate and performance of spayed yearling heifers when supplemented with MDGS at 0.6% BW while grazing native Sandhills summer range, and calculate MDGS loss that resulted from ground feeding.

Procedure

Each year for two years, 24 spayed yearling heifers were stratified by initial BW (620 ± 57 lb) and assigned randomly to treatment. Treatments were: 1) no supplementation (control), 2) MDGS supplementation fed at 0.6% of BW daily in a bunk, and 3) MDGS supplementation fed at 0.6% of BW daily on the ground. There were two replications per treatment, with four heifers per replication. Treatments were assigned randomly to an east and west grazing block to minimize potential differences in plant species and topography. Heifers grazed upland Sandhills summer range 120 days at the Gudmundsen Sandhills Laboratory near Whitman, Neb., beginning May 18, 2011 (year 1) or May 23, 2012 (year 2). Year 2 data were collected during a severe drought.

Heifers in each replication rotated through six, 2.47-acre paddocks twice throughout the grazing season. Paddocks were stocked at 0.8 AUM/acre. Grazing days per paddock were increased during the second grazing cycle to account for additional forage growth. Based on previous research that has shown distillers supplementation results in a 17% forage replacement rate, paddocks were stocked for equal grazing pressure between treatments by allowing control cattle to graze each of their paddocks for 17% less time than supplemented cattle. This was achieved by moving control cattle one day earlier than supplemented cattle during a six-day grazing cycle from their grazing paddock to a pasture of similar forage species composition and moving control cattle 2 ½ days earlier during the 14-day cycle. Therefore, control cattle were managed separately until rotating into their next paddock on the same day that supplemented cattle rotated.

Forage diet samples were collected using esophageally fistulated cows at the midpoint of each grazing rotation during the first, third, and fifth rotations of both grazing cycles, for 12 total collections. Forage quality (CP, NDF, and IVDMD) was analyzed from extrusa samples. *In vitro* organic matter digestibility was adjusted to *in vivo* values. Unlike year 1 diet collections, in year 2, solid bottom bags, rather than screen bottom bags, were used during diet collection and CP, NDF, and IVOMD analyses were calculated to account for solid and liquid proportion of sample in year 2 analyses.

Gains were estimated throughout the summer at 1.5 lb per day and MDGS feeding amounts were adjusted monthly to account for cattle gain. Samples of MDGS were collected twice per month to calculate DM and used to adjust feeding amount to target 0.6% BW on a DM basis. A MDGS composite sample was analyzed to determine supplement nutrient composition (31% CP, 12% fat, 25% NDF).

At the conclusion of grazing each paddock during the first, third, and

Table 1. Forage quality of diet samples from the experimental paddocks over grazing season.[1]

Sample dates	5/25-26	6/6-7	6/18-19	6/28-29	7/26-27	8/23-24
CP%	9.5	9.0	7.4	6.4	6.4	6.3
NDF%, on OM basis	63.1	64.0	62.4	67.0	60.9	58.4
IVOMD%	66.9	66.4	66.2	65.4	64.0	61.6

[1]Sequence of grazing paddocks over summer, from May 25 through Aug. 24, 2012 (year 2).

Table 2. Performance response of heifers to distillers grains.

	Treatment				
	Control[1]	Ground-fed[2]	Bunk-fed[3]	SEM	P-value
Initial BW (lb)	623	623	618	3.3	0.82
ADG (lb) Year 1	1.17[a]	2.51[b]	2.39[b]	0.08	< 0.01
ADG (lb) Year 2	0.73[a]	2.18[b]	2.31[b]	0.09	< 0.01
ADG (lb) Year 1 & 2	0.95[a]	2.27[b]	2.40[b]	0.15	< 0.01
Ending BW (lb)	741[a]	911[b]	922[b]	7.7	< 0.01

[1]Control = Cattle grazed with no MDGS supplement.
[2]Ground-fed = Cattle supplemented with MDGS daily at 0.6% BW, fed on the ground.
[3]Bunk-fed = Cattle supplemented with MDGS daily at 0.6% BW, fed in a bunk.
[ab]Means with different superscripts differ ($P < 0.05$).

Table 3. Residual forage post-grazing (lb/ac)[1] (Year 1 and 2).

	Treatment			
	Control[2]	Bunk-fed[3]	Ground-fed[4]	SEM
Total live[5]	737	920	844	421
Standing dead	562	531	572	94
Litter	1211	1062	1145	301

Means with different superscripts differ (P-value < 0.01).
[1]Average post-grazing values from six paddocks per treatment over three clipping dates (early July, late July, late August).
[2]Paddocks grazed by control cattle.
[3]Paddocks grazed by bunk-fed cattle.
[4]Paddocks grazed by ground-fed cattle.
[5]Total live represents live grass, forbs, and shrubs.

fifth rotation of the second grazing cycle, 10 quadrats (2.69 ft^2), were hand clipped at ground level. Forage was sorted into live material, standing dead, litter, forbs, shrubs, and cactus categories. Samples were dried in a forced-air oven for 48 hours at 140°F, weighed, and residual forage per acre was calculated to verify forage replacement and evaluate the equal grazing pressure hypothesis between treatments.

The 1996 NRC model was used to estimate range forage intake based on cattle performance and supplement intake. The model was also used to retrospectively calculate the MDGS intake difference between bunk and ground-fed treatments.

All data were analyzed using the GLIMMIX procedure of SAS (SAS Institute, Inc., Cary, N.C.)

Results

During the grazing season, diet samples averaged 10% CP, 63% NDF, and 61% IVDMD during year 1 (*2013 Nebraska Beef Cattle Report*, pp. 27-28). In year 2, during drought, diet samples averaged 7.5% CP, 69.4% NDF, and 65.1% IVOMD (Table 1). Across years, there was a general forage quality decline throughout the grazing season, as CP and IVDMD or IVOMD decreased, and there was a general increase in NDF as forages matured.

Supplemented cattle gained more per day (2.34 lb/day vs. 0.95 lb/day; $P < 0.05$) and had greater ending weights (917 lb vs. 741 lb; $P < 0.05$) than control cattle (Table 2). Heifers supplemented on the ground gained 0.13 lb/day less than those fed in bunks, a difference that was not statistically significant ($P = 0.16$). However, using the 0.13 lb/day difference, retrospective analysis estimated 5.6% of offered MDGS was lost when ground-fed.

Through use of the NRC model, a 15.9% forage replacement rate was calculated in year 1. In year 2, forage growing conditions were under severe drought which resulted in poor gains of non-supplemented controls. Thus, it was inappropriate to estimate forage intake using the NRC, so forage savings were only estimated from residual forage clip data in year 2.

There were no differences ($P = 0.31$) in residual forage among paddocks grazed by different treatment groups in either year (Table 3). This illustrates similar grazing pressure by supplemented and unsupplemented heifers, as grazing days had been adjusted based on a 17% forage savings hypothesis when supplementing MDGS at 0.6% BW to yearlings in a range situation. Numerically, supplemented cattle had more total live forage, so 17% forage savings estimate may be conservative.

Supplementing MDGS to spayed yearling heifers at 0.6% BW daily effectively increased summer gains and final BW and reduced forage needs approximately 17%. There was little performance advantage to bunk feeding over ground feeding but we speculate approximately 5% loss.

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