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Byproducts with Low Quality Forage to Grazing Cattle

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Summary

Sixteen cows grazing smooth bromegrass pasture were unsupplemented or supplemented a 35:65 Synergy:straw mixture. Grazed forage intake was replaced about 50% with supplementation, with no differences in cow performance. In a second experiment conducted over two summers, yearling steers grazing native range were fed a mixture of 70:30 or 60:40 hay:WDGS or 60:40 straw:WDGS. During the first year, all steers fed byproduct-forage mixtures had greater ADG than control steers. During the second year, steers supplemented with byproduct-hay mixtures had similar gains as control while steers supplemented byproduct-straw mixtures gained less. Supplementing WDGS and low quality forage reduced forage intake by 17 to 22% in Experiment 2.

Introduction

Crop residues on farms with cool-season pastures are economical sources of fiber to feed during the summer to replace grass consumption. To complement this, purchasing and/or storing byproducts, such as wet distillers grains plus solubles (WDGS), during summer also may be economical for producers. Mixing WDGS with low quality forages has been shown to increase the palatability of the forage; and the bulk from the forage may potentially have a fill effect that will reduce grazed forage intake. This was illustrated when 1.0 lb of native range was replaced for every 1.0 lb of 70:30 straw:WDGS and fed to cow-calf pairs (*2010 Nebraska Beef Cattle Report,* p. 19). The objective of the following experiments was to determine the effect of supplementing low quality forage-byproduct mixtures to cattle grazing either smooth brome pasture or native Sandhills range on forage intake.

Procedure

Experiment 1

Nonpregnant, nonlactating cows (n=16, initial BW = 1,270 lb) grazed smooth bromegrass pastures at the University of Nebraska–Lincoln Agricultural Research and Development Center near Mead, Neb., for 138 days from late April to mid September. Cows were limit fed at 2% of BW for five days prior to and at the conclusion of the grazing period to minimize variation due to gut fill. Initial and final BW was an average of three consecutive day weights. Cows were assigned randomly to one of two treatments, with four cows/paddock and two replications. Treatments consisted of: 1) 1.8 ac/cow with no supplementation (CON); or 2) 0.9 ac/cow with supplementation (SUP). Supplementation consisted of a 35% synergy (40% WCGF and 60% MDGS) and 65% wheat straw mixture (DM basis), which was fed daily in feed bunks. An ensiled mixture (46.6% DM) was fed from late April to mid-August (111 days), and a fresh mixture (30.7% DM; mixed at feeding time) from mid-August to mid-September (27 days). Cows were supplemented at 0.56% of BW at experiment initiation, with supplementation level increasing throughout the grazing period to achieve 2.25% of BW at trial conclusion. It was expected that grazed forage intake would be greatest early in the growing season and would decline as cool-season grass matured. Therefore, supplement intake was lower at initiation and increased as forage quality declined. Predicted total DMI was calculated using 2.12% of BW (*2009 Nebraska Beef Cattle Report*, p. 13) and the number of days to change BCS with the NRC.

Experiment 2

Forty yearling steers (712 ± 33 lb in 2009 and 721 ± 33 lb in 2010) were stratified by BW and assigned randomly to treatment paddocks, using five steers/treatment in each of two blocks. Experimental unit was a set of five paddocks consisting of mostly warm season grasses that were assigned to a treatment within a block and rotationally grazed once during the experimental period of 68 days from June 18 to August 26 in 2009 and from June 17 to August 25 in 2010 at the University of Nebraska–Lincoln Gudmundsen Sandhills Laboratory located near Whitman, Neb. The first paddock was grazed for 12 days, and the remaining four paddocks were grazed for 14 days. Treatments were: 1) control (CON) at the recommended stocking rate (0.68 AUM/ac), 2) double stocked (1.3 AUM/ac supplemented with a mixture consisting of 60: 40 straw:WDGS (STRAW)), 3) double stocked supplemented with 60: 40 hay:WDGS (LOW), and 4) double stocked consuming a supplement made of 70: 30 hay:WDGS (HIGH). Cattle were supplemented daily with a targeted intake of 1.15% BW on a DM basis, representing 50% of their daily intake. Mixtures (50% DM) were ensiled 30 days prior to trial initiation. Beginning and ending BW were measured on three consecutive days after a five-day limit fed period to reduce fill effects. Esophageally fistulated cows were used to determine forage quality (IVODMD, CP, NDF). Standing crop and forage utilization were determined by clipping five 0.25 m^2 quadrats post-grazing. Pre-graze forage availability was calculated by adding an estimated amount of forage intake to the amount of forage remaining in the control paddocks at the end of the grazing period.

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Results

Experiment 1

Initial and final BW and ADG (Table 1) were not different between treatments ($P > 0.35$). In this experiment, the Synergy:straw mixture reduced intake of smooth brome by 48%. Supplement at about 12 lb/DM/day replaced grazed forage at nearly a 1:1 ratio.

Synergy and straw mixed fresh (at feeding time) may be as palatable as ensiled material. As days of the experiment progressed, it appeared that the ensiled material was not getting fed fast enough, and quality deteriorated in the bag. The fresh mixture was then fed. It appeared to have the same or better palatability as the higher quality ensiled mixture fed early in the grazing period. Mixture with a moisture content greater than 50% enhanced palatability, with optimum moisture content at 65 to 70%. Additionally, it may be necessary to feed a greater proportion of byproducts (up to 50%) to encourage cows to eat the supplement mixture early in the grazing season.

Table 1. Performance cows grazing smooth bromegrass pasture and supplemented a byproduct:forage mixture.

Variable	CON[1]	SUP[2]	SEM	*P*-value
Initial BW, lb	1268	1273	2.9	0.35
Ending BW, lb	1566	1587	26.3	0.62
ADG, lb/day	2.16	2.28	0.2	0.68
Forage intake, lb	26.5	13.8	—	—
Supplement, lb	—	12.1	—	—

[1]Cattle grazed at recommended stocking rate and received no supplementation.
[2]Cattle grazed at double the recommended stocking rate and received 50% of estimated daily intake of 35:65 synergy:wheat straw mixture.

Table 2. Performance of yearling steers grazing native range and supplemented a byproduct:forage mixture.

	Treatment					
	CON[1]	HIGH[2]	LOW[3]	STRAW[4]	SEM	*P*-value
Initial BW, lb	721	719	725	712	6.42	0.92
Ending BW, lb	798[a]	792[a]	816[a]	782[b]	12.05	0.02
ADG, lb/day (2009)	1.06[a]	1.12[a]	1.41[b]	1.39[b]	0.07	0.03
ADG, lb/day (2010)	1.17[a]	1.01[a]	1.23[a]	0.71[b]	0.04	<0.01
Forage intake, lb[5]	17.4[a]	13.7[b]	13.6[b]	14.3[b]	0.31	0.03
Supplement intake, lb[6]	—	7.39	7.37	6.17	0.2	0.17
Total DM intake, lb[7]	17.4	21.1	20.9	20.5	0.46	0.10

[1]CON (Control) = Cattle grazed at the recommended stocking rate (0.68 AUM/ac).
[2]HIGH=Cattle grazed at double the recommended stocking rate (1.3 AUM/ac) and supplemented with 70: 30 grass hay:WDGS at estimated 50% of daily DM intake.
[3]LOW=Cattle grazed at double the recommended stocking rate and supplemented with 60:40 grass hay:WDGS at estimated 50% of daily DM intake.
[4]STRAW=cattle grazed at double the recommended stocking rate and supplemented with 60:40 wheat straw:WDGS at estimated 50% of daily DM intake.
[5]Average amount of range forage intake.
[6]Average amount of supplement intake during the experimental period.
[7]Amount of total DM intake. Calculated by adding forage intake and supplement intake.
[a,b]Different letters represent differences between treatments ($P < 0.05$).

Experiment 2

Final BW was greater ($P = 0.02$; Table 2) for the CON, HIGH, and LOW treatments compared to the STRAW group. In 2009 there was greater ADG (P=0.03) for supplemented steers consuming a 40:60 WDGS: low quality forage mix, compared to the CON and HIGH (30:70 WDGS: grass hay). In 2010, steers on CON, HIGH, and LOW treatments achieved the same gains, while those consuming the 30:70 WDGS:straw mix were significantly lower ($P < 0.01$), most likely due to lower intake of the supplement. Supplementation with low-quality harvested forage and WDGS reduced intake of range forage by 17.8, 21.6, and 22.2% for the STRAW, LOW, and HIGH treatments respectively, compared to the CON. In general, doubling the stocking rate for supplemented treatments did not negatively affect performance. Supplementing a byproduct and low-quality forage mixture can replace forage intake without sacrificing animal performance.

Utilizing mixtures of low-quality forage and ethanol byproducts to reduce pasture intake was more successful on bromegrass pasture in Eastern Nebraska than on upland range in the Sandhills. Overgrazing in the Sandhills because of lower grazed forage replacement by the mixtures would likely have greater consequences long-term on range/pasture condition than similar overgrazing of brome pasture. Furthermore, crop residues for making the byproduct:residue mixtures are more readily available at minimal cost on farms with cool-season grass pastures.

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