Supplementing wet distillers grains mixed with low quality forage to grazing cow calf pairs

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Supplementing wet distillers grains mixed with low quality forage to grazing cow calf pairs.

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ABSTRACT: Two consecutive summer grazing studies were conducted to quantify the effect of supplementing cows with wet distillers grains (WDGS) mixed with low quality forage on 1) grazed forage intake and 2) cow and calf performance. During exp. 1, twenty-four three year old lactating cows rotationally grazed for 56 d and were assigned to one of three treatments: 1) the recommended stocking rate of 1.48 AUM/ha with no supplementation (CON1), 2) double the recommended stocking rate (2.96 AUM/ha) and supplemented 6.64 kg/hd daily of 45% grass hay and 55% WDGS (DM) to replace 50% of estimated total intake (SUP), and 3) grazing at 2.96 AUM/ha with no supplementation (2X). In exp. 2, forty two-year old lactating cows rotationally grazed the same paddocks as in exp. 1 for 56 d and were assigned to one of four treatments grazing at: 1) recommended stocking rate (1.48 AUM/ha) with no supplementation (CON2), or double the recommended stocking rate and receiving 5.8 kg/hd daily of wheat straw and WDGS mixed at: 2) 70:30 (LOW), 3) 60:40 (MED), or 4) 50:50 (HIGH). Supplemented groups were fed at 50% of estimated total intake. For both studies forage utilization was determined by clipping twenty, 1-m^2 quadrats pre- and post-grazing. For exp. 1, SUP cows had higher ADG (0.25 kg/d; $P < 0.01$) than CON1 and 2X (-0.45 and –0.52 kg/d, respectively). Calf daily gain was higher for SUP than for CON1 and 2X (1.07, 0.82, and 0.75 kg/d; $P < 0.01$). Forage utilization (% standing green) for CON1 was 51.1 and 68.0% less than SUPP and 2X, respectively ($P < 0.01$). For exp. 2, HIGH cows were the heaviest at the end of the study ($P = 0.04$). Forage utilization was less for CON2 than for HIGH or MED (34.4, 45.9, and 44.3%, respectively; $P < 0.02$), but was similar for CON and LOW (38.4%; $P = 0.18$). Grazing cows supplemented wheat straw and 45% or greater WDGS gained more weight. Grazing intake was reduced the most when wheat straw was 70% of the mix.

KEYWORDS: Grazing, Forage Intake, Supplementation, Lactating Cows

Introduction

Recent research has been successful in mixing and storing WDGS mixed with low quality forages to extend the shelf life of the WDGS (Adams et al., 2008), and in feeding this mixture to growing calves (Nuttelman et al., 2008). Storing WDGS for extended lengths of time can be beneficial to cow/calf producers. Cattle consuming high forage diets eat to a constant fill as determined by NDF (Van Soest, 1965). Mixing WDGS with low-quality forage increases the palatability of the forage, and the additional bulk from the forage can potentially reduce grazed forage intake by supplying fill. Therefore, two consecutive summer grazing studies were conducted to determine the effect of supplementing cows with wet distillers grains (WDGS) that had previously been mixed and stored with low quality forage on 1) grazed forage intake and 2) cow and calf performance.

Materials and Methods

For both studies, the experiment was replicated over two blocks based on location (east and west) due to variation in species composition and topography. Standing crop and forage utilization was determined by clipping 20 1-m^2 quadrats both pre- and post-grazing, and quadrats were sorted by live grass, forbs, standing dead, and litter and then dried and weighed to determine forage availability. Forage disappearance (DIS) was determined for each paddock by calculating the difference in pre-graze forage allowance and the amount of forage that remained following the grazing period. Cow/calf pairs were limit fed meadow hay at 2% of BW for five days prior to and at the conclusion of the grazing period to eliminate variation due to gut fill. At the conclusion of both limit feeding periods, cows and calves were individually weighed for three consecutive days, and the average of the weights were used as the initial and ending BW. Cattle that received supplement (MIX) were supplemented at 50% of their estimated daily intake, and were fed in feed bunks located outside of the grazing paddock to eliminate trampling of forage around the feeding site.

Exp. 1

Twenty-four three-year old, non-gestating, lactating cows with spring born calves at side grazed their assigned paddocks for 56-d during the summer. Paddocks were 1-ha and were assigned randomly to one of three treatments that consisted of: 1) the recommended stocking rate of 1.48 AUM/ha with no supplementation (CON1), 2) double the recommended stocking rate (2.96 AUM/ha) and supplemented 6.64 kg/hd daily of 55% grass hay and 45% WDGS (DM) to replace 50% of estimated total intake (SUP), and 3) grazing at 2.96 AUM/ha with no supplementation (2X). The paddocks that were assigned to the increased stocking rate were divided in half, and cattle were only allowed to graze one-half of the paddocks per grazing period. Cattle were rotated through seven paddocks, and the days of grazing for each paddock were adjusted prior to initiation of the trial to account for stage of plant growth.

Exp. 2

The year following Exp. 1, a second study of similar design was conducted in the same paddocks to compare different mixes of WDGS and wheat straw. Wheat straw was chosen to serve as a source of lower quality forage that contained more NDF than the grass hay used in the previous year. Wheat straw was mixed with WDGS at three different levels consisting of 50:50, 40:60, and 30:70 WDGS:wheat straw on a DM basis, and was stored in an ag bag thirty days prior to initiation of the trial. Water was added during mixing to the two lower levels of WDGS until moisture was equal to the high level of WDGS.

Twenty paddocks were arranged by the previous year's usage and grazing order, and then assigned to one of four treatments: 1) Control (CON2), 2) 50:50 WDGS:wheat straw supplement (HIGH), 3) 40:60 WDGS:wheat straw supplement (MEE), or 4) 30:70 WDGS:wheat straw supplement (LOW). The hypothesis was that the additional straw would provide more bulk and result in a larger replacement rate of grazed forage due to a fill effect. The CON2 was stocked at the recommended stocking rate of 1.48 AUM/ha, and the paddocks assigned to treatments receiving supplementation were grazed at double the recommended stocking rate (2.96 AUM/ha). The paddocks grazed at double the stocking rate were divided in half to decrease the amount of area allowed for grazing. Forty two-year old lactating cows with spring born calves at side were utilized and assigned to paddock rotation. Cattle within block grazed the assigned paddock in the experimental pastures for seven days. When cattle were not grazing the experimental pastures, they were moved to a pasture of similar forage species composition and managed separately. They continued to be supplemented with the mix to measure differences in animal performance.

Results and Discussion

Exp. 1

Initial BW (Table 1) was not different for the individual cow, or the individual calves ($P > 0.89$). Final BW was not different ($P > 0.13$), but SUP cows and calves were numerically heavier than non-supplemented counter parts. Cows receiving SUP gained 0.70 and 0.77 kg more per d ($P < 0.01$) than CON1 and 2X, respectively. Non-supplemented calves gained 0.25 and 0.32 kg per d less than supplemented calves ($P < 0.01$). The extra gain for supplemented calves can be a result of increased milk production from the dam or the direct consumption of the MIX by the calves, or a combination of the two. The calves were at the bunk and appeared to be eating each d, however it is not possible to determine the actual amount of MIX that the calves consumed.

Percent utilization was determined by dividing the amount of forage that disappeared during the grazing period by the amount of available forage prior to grazing. The double stocked treatments had higher percent utilization than CON1 (33.1%; $P < 0.01$). There was no difference ($P = 0.15$) between SUP (52.0%) and 2X (57.8%) treatments. Grazed forage disappearance was determined by dividing the amount of forage that disappeared by the number of cow/calf pairs and the number of days each paddock was grazed. There were no differences ($P = 0.44$) for DIS between CON1, SUP, or 2X (12.6, 11.1, and 11.6 kg, respectively).

Exp. 2

Initial BW (Table 2) was not different among treatments for Exp. 2 ($P > 0.27$). Ending

BW was affected by supplementation (*P* = 0.04). Cattle receiving HIGH supplement were heavier at the conclusion of the study when compared to CON2, LOW, and MED (944, 875, 899, and 906 kg, respectively). Cattle on MED treatment tended (*P* = 0.09) to be heavier than CON2 at the end of the study. Average daily gain tended (*P* = 0.06) to be different between cows. Calf ending BW (*P* = 0.63) and ADG (*P* = 0.46) were different.

Cattle on CON2 had significantly less utilization than HIGH and MED (34.4, 46.0, and 44.3 %, respectively; *P* = 0.02). However, CON2 (34.4%) and LOW (38.4%) were not different (*P* = 0.27). The CON2 cattle had greater DIS than supplemented treatments ($P < 0.01$), but there was no difference for DIS for HIGH, MED, and LOW treatments ($P > 0.11$). For the supplemented treatments, the amount of forage that disappeared during the grazing period in addition to the DMI of the supplement was similar to the DIS of the CON2 (*P* = 0.12). This suggests that the supplemented cattle had similar DMI as the CON2 cattle. The amount of NDF consumed (not reported) from the grazed forage intake for the CON2 was compared to the NDF intake of the treatments that received supplement. The combined NDF intake from the grazed forage intake and the supplement was similar to the CON2 NDF intake (7.1 and 7.0 kg NDF/d; *P* = 0.89). This suggests the fibrous nature of most range diets limit VDMI by physical conditions and agrees with Balch and Campling (1962) and Ellis (1978) who reported the capacity of the reticulo-rumen limits voluntary intake by rate of disappearance of digesta from this organ. Similarly, Van Soest (1965) reported NDF to be the most influential chemical measure in relation to regulating VDMI.

In conclusion, cattle receiving higher levels of WDGS in the supplement resulted in improved performance during the grazing season. Supplementing low-quality forage mixed with WDGS can reduce grazed-forage intake. The percent NDF of the low quality forage appeared to determine the replacement rate of grazed forage intake by supplying a fill affect.

Literature Cited

Adams, D.R., M.F. Wilken, B.L. Nuttelman, L.M. Kovarik, J.R. Benton, M. A. Greenquist, G.E. Erickson, T.J. Klopfenstein, R.J. Rasby. 2008. Nebraska Beef Rep. MP91-:23-25.

Balch, C.C., and R.C. Campling. 1962. Regulation of voluntary intake in ruminants. Nutr. Abstr. And Review. 32:669-686.

Ellis, W.C. 1978. Determinants of grazed forage intake and digestibility. J. Dairy Sci. 61:1828-1840.

Nuttelman, B.L., T.J. Klopfenstein, G.E. Erickson, W.A. Griffin, M.K. Luebbe. 2008. The effects of supplementing wet distillers grains mixed with wheat straw to growing steers. Nebraska Beef Rep. MP91:29-31.

van Soest, P.J. 1965. Symposium on factors influencing the voluntary intake of herbage by ruminants: voluntary intake in relation to chemical composition and digestibility. J. Anim. Sci. 24:834-843.

Table 1. Exp. 1 Animal Performance and Grazing Results.

	Treatment				
	CON1[a]	SUP[b]	2X[c]	SE	*P*-Value
Initial, kg					
Cow	461	461	459	14	0.99
Calf	115	112	112	4	0.89
ADG, kg/					
Cow	-0.45[a]	0.25[b]	-0.52[a]	0.03	< 0.01
Calf	0.82[a]	1.07[b]	0.75[a]	0.01	< 0.01
% Utilization	33.1[a]	52.0[b]	57.8[b]	0.1	< 0.01
DIS kg/d[d]					
Green	12.6	11.1	11.6		
MIX	--	6.7	--		

[a] Cattle grazed at recommended stocking rate and received no supplementation.
[b] Cattle grazed at double the recommended stocking rate and received 50% of estimated daily intake of 45:55 WDGS:Wheat straw mixture.
[c] Cattle grazed at double the recommended stocking rate and received no supplementation.
[d] Calculated by dividing total amount of grazed forage disappearance by number of cow/calf pairs and number of grazing days.

Table 2. Exp 2 Animal Performance and Grazing Results.

	Treatment					
	CON2[c]	LOW[de]	MED[df]	HIGH[dg]	SE	*P*-Value
Initial, kg						
Cow	399	400	405	405	9	0.63
Calf	125	127	121	121	7	0.53
ADG, kg/d						
Cow	-0.03	0.13	0.11	0.42	0.14	0.06
Calf	0.89	0.90	0.89	0.99	0.09	0.46
% Utilization	34.4[a]	38.4[ab]	44.3[b]	46.0[b]	0.3	0.01
DIS, kg/d[h]						
Green	11.5[a]	6.1[b]	7.5[b]	7.4[b]	0.6	< 0.01
MIX	--[a]	5.8[b]	5.7[b]	5.9[b]	0.1	< 0.01

[a,b] Means with different superscripts differ (*P* –Value < 0.05).
[c] Cattle grazed at the recommended stocking rate.
[d] Cattle grazed at double the recommended stocking rate, and received 50% supplement of estimated daily intake.
[e] Cattle supplemented with 70:30 Wheat straw:WDGS mixture.
[f] Cattle were supplemented with 60:40 Wheat straw:WDGS mixture.
[g] Cattle were supplemented with 50:50 Wheat straw:WDGS mixture.
[h] Calculated by dividing total amount of grazed forage disappearance by number of cow/calf pairs and number of grazing days