Frequency of supplement delivery to cows on corn residue

Michael Undi[1], Bryan W. Neville[1], Fara A. Brummer[1] and Stephanie M. Gross[1]

Methods of supplementing grazing cattle in winter should aim to reduce winter feed costs, which are the single highest annual cost in a cow-calf operation. This study examined the effect of daily, every third day and every sixth day supplement delivery on the performance of cows grazing corn residue. Supplements such as distillers dried grains with solubles (DDGS) can be fed every third day with no detrimental effects on animal performance.

Summary

This study was conducted to evaluate the effects of the frequency of delivering distillers dried grains with solubles (DDGS) as a supplement to cows grazing corn residue in the northern Great Plains. The 36-day study was conducted in the fall of 2015, with 80 first- and second-calf cows (1,146 ± 76 pounds body weight [BW]) in their second trimester. Ten cows were assigned to one of eight 10-acre paddocks of corn residue. Four treatments with two replications per treatment were: 1) grazing corn residue with no supplementation (control), 2) grazing corn residue plus DDGS delivered daily (daily), 3) grazing corn residue plus DDGS delivered every third day (3 d) and 4) grazing corn residue plus DDGS delivered every sixth day (6 d). The DDGS was fed at 0.35 percent BW per day. Body weight and body condition scores were recorded on two consecutive days at the beginning and end of the study. Gusty winds in excess of 60 mph prior to harvest resulted in approximately 890 pounds/acre of corn grain on the ground. Above-normal temperatures were encountered through the six-week course of the study. Average daily gain was greater ($P < 0.05$) following daily (3.5 ± 0.26 pounds) and every third day supplement delivery (3.6 ± 0.26 pounds) relative to control (2.7 ± 0.26 pounds) or every sixth day supplement delivery (2.6 ± 0.26 pounds). Body condition score change was greater ($P < 0.05$) following daily supplement delivery (0.7 ± 0.08) relative to every sixth day supplement delivery (0.4 ± 0.08). Results show that, under certain conditions such as mild weather and excessive grain drop, cows grazing corn residue may not require supplementation until later in the grazing season. Secondly, supplement can be fed every third day with no detrimental effects on animal performance.

Introduction

Corn residue, which includes dropped ears, leaves and husks, and stalks remaining after the corn harvest, is a readily available feed resource for winter grazing in corn-growing areas of North Dakota (Lardy, 2011), but the low protein and mineral contents of corn residue can lead to poor animal performance. Improving the nutrient supply to cows grazing corn residue can be accomplished by targeted supplementation that provides missing nutrients in corn residue.

For supplements such as distillers grains with solubles (DDGS) that can be fed in loose form, the most common practice is to feed the supplement daily. Producers are interested in supplement delivery methods that reduce labor costs, as is the case when delivering the supplement less frequently.

Reducing supplement delivery frequency can reduce labor and fuel costs, provided animals continue to consume feed and maintain good nutrient status (Schauer et al., 2005). Also, reducing the frequency of supplement delivery may improve forage utilization because animals spend less time at the feeding trough (Brundyn et al., 2005).

Several studies (Brundyn et al., 2005; Schauer et al., 2005; Loy et al., 2007; Canesin et al., 2014; Klein et al., 2014) have demonstrated the benefits of reducing the frequency of supplement delivery to grazing animals. These studies were conducted in warm-weather grazing situations.

Winters in North Dakota, characterized by cold temperatures, low wind chills and freezing rain, offer unique challenges that need to be taken into account when evaluating supplements for winter grazing. This study was conducted to evaluate the effect of frequency of supplement delivery to cows grazing corn residue on animal performance in a northern climate.

Experimental Procedures

Animal handling and care procedures were approved by the NDSU Animal Care and Use Committee. This study was conducted in the fall of 2015 (Nov. 9 to Dec. 16) at

[1] Central Grasslands Research Extension Center, NDSU

the Central Grasslands Research Extension Center. Eighty second- and third-calf cows (1,146 ± 76 pounds BW) in their second trimester were assigned randomly to one of eight 10-acre paddocks (10 cows/paddock) and allowed to graze corn residue for 36 days.

Each paddock subsequently was assigned to receive one of four treatments (two paddocks/treatment): 1) grazing corn residue with no supplementation (control), 2) grazing corn residue plus DDGS delivered daily (daily), 3) grazing corn residue plus DDGS delivered every third day (3 d) and 4) grazing corn residue plus DDGS delivered every sixth day (6 d). Corn residue grazing was controlled using high-tensile electric wire, which allowed access to a quarter of the paddock at a time.

The amount of DDGS (30 percent crude protein; 73 percent total digestible nutrients) delivered as a supplement, 4 pounds/head/day, was based on chemical composition of corn residue samples collected randomly from paddocks and was determined using CowBytes (v 5.31; Alberta ARD, 2012). Cows had ad libitum access to water and a mineral lick.

Body weights and body condition scores were measured at the start and end of the study. The amount of corn left in the field (bushels/acre) postharvest was estimated in four paddocks by counting the number of ears in three different 100-foot strips in each paddock (Rasby et al., 2014).

Results and Discussion

The nutrient content of corn residue was generally poor (Table 1). Components with the highest nutrient content were the grain and leaf. The husk was low in protein but had a good energy profile, while the cob was poor in protein and energy.

We found that daily gains and body condition score (BCS) changes were positive for all cows, including those that were not supplemented. Daily or every third day supplement delivery resulted in greater (P = 0.02) daily gains relative to control and every sixth day supplement delivery (Table 2). Body condition score change was less (P = 0.04) following every sixth day supplement delivery relative to daily supplement delivery. We found no difference in BCS changes among control, daily and every third day supplement delivery.

The low nutrient content of corn residue fed shows that the initial premise of the study that cows grazing corn residue require supplementation was justified. Indeed, studies (Gustad et al., 2006; Warner et al., 2011) have shown beneficial effects of supplementing cattle grazing corn residue. We attributed positive daily gains and BCS changes in this study to nutrient content of corn residue, corn residue grazing management and environmental conditions.

The excessive amount of downed ears in this study was unexpected, with estimates before the start of the study indicating a minimum of 16 bushels of corn grain. Winds in excess of 60 mph, which occurred just before corn harvest, were responsible for most of this grain.

Compared with other components of the corn plant, the grain has a high nutrient content, with adequate protein and energy (Table 1) to meet nutrient requirements of overwintering cows. Cattle prefer downed ears, as well as leaf and husk material, and cows will start

Table 1. Composition (DM basis) of corn residue.

		Component				
	Whole[1]	Grain	Leaf	Husk	Cob	Stalk
CP, %	3.0	9.4	7.1	2.6	2.4	2.8
TDN, %	57	89	56	60	17	55
NDF, %	75.1	8.7	68.3	80.3	83.2	71.6
ADF, %	44.8	2.4	45.5	40.6	43.0	46.4
Ca, %	0.1	0.04	0.9	0.1	0.05	0.1
P, %	0.05	0.3	0.09	0.04	0.05	0.07
K, %	0.6	0.3	0.2	0.4	0.4	1.7
Mg, %	0.2	0.1	0.4	0.2	0.09	0.1
S, %	0.04	0.1	0.1	0.04	0.03	0.04

[1]Includes all components except grain.

Table 2. Effect of supplement delivery frequency on cow performance.

		Delivery frequency				
	Control[1]	Daily	3 d	6 d	SE	*P*-value
Initial BW, lb.	1,158	1,142	1,164	1,135	17.6	0.63
Final BW, lb.	1,255	1,267	1,293	1,229	19.4	0.15
ADG, lb./day	2.7[b]	3.5[a]	3.6[a]	2.6[b]	0.26	0.02
Initial BCS	4.7	4.6	4.8	4.9	0.073	0.06
Final BCS	5.3	5.3	5.4	5.3	0.075	0.57
BCS change	0.5[ab]	0.7[a]	0.6[ab]	0.4[b]	0.078	0.04

[1]Grazing corn residue with no supplementation.
[ab]Means in the same row followed by a different letter differ (P < 0.05).

with downed ears upon getting into a field, then clean up leaves and husks before moving on to cobs and, finally, to stalks (Lardy, 2011).

Movement of the electric fence in this study may have been too frequent and did not allow cows to graze the corn residue down to stalks. As a result, the nutrient profile of consumed feed was probably greater than the analyzed nutrient profile of whole-corn residue shown in Table 1.

The fall of 2015 had greater than normal temperatures. Normal high and low temperatures are 38 F and 19 F for November and 27 F and 6 F for December, respectively. Average maximum and minimum temperatures during our study were 43 F and 19 F for November and 27 F and 14 F for December, respectively. This trend in temperature was consistent throughout the grazing period (Figure 1).

Based on these yearly temperature differences, planned supplementation strategies may have provided more energy and protein than was required to meet animal needs. The amount of DDGS fed in this study was designed to meet nutrient shortfalls expected from feeding corn residue during the cooler part of the year in the northern Great Plains.

Results suggest that under certain conditions such as mild weather and excessive grain drop, supplementation may not be required until later in the grazing season. Secondly, with excessive grain drop, grain intake should be limited by delaying access to new corn residue areas until cows are forced to graze other residue components. Further, when necessary, DDGS can be fed as a supplement every third day to reduce winter labor costs, with no detrimental effects on animal performance.

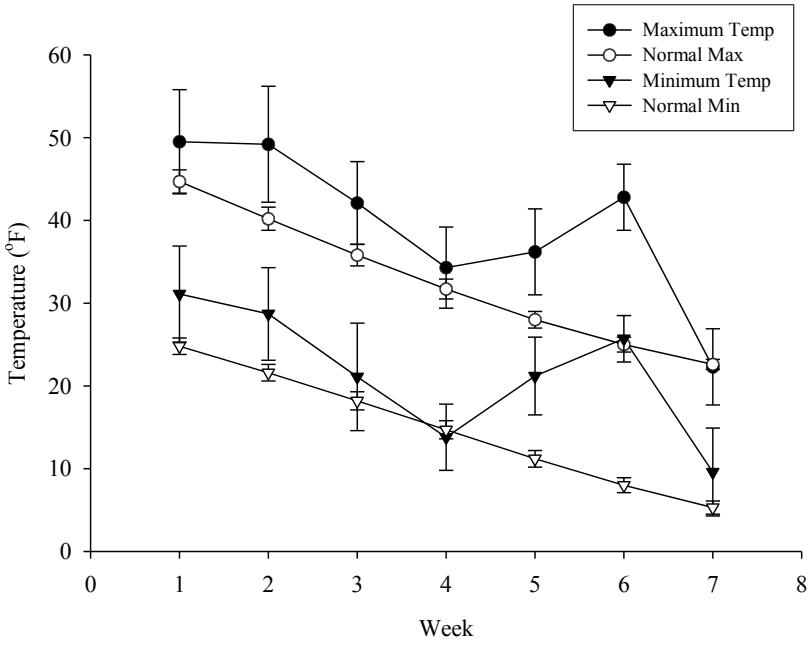

Figure 1. Weekly temperatures (mean ± SD) for November and December 2015 at CGREC.

Week 1 = Mean temperature for Nov. 1 to 7, etc. Data source: North Dakota Agricultural Weather Network. https://ndawn.ndsu.nodak.edu

Literature Cited

Alberta Agriculture, Food and Rural Development (Alberta ARD). 2012. CowBytes Beef Ration Balancer, v. 5.31. Alberta Agriculture, Food and Rural Development, Edmonton, AB.

Brundyn, L., T.S. Brand, A.V. Ferreira, B.B. Aucamp and A. Durand. 2005. The effect of frequency of supplementation on the production of South African Mutton Merino ewes grazing wheat stubble. SA-Anim. Sci. 6: 13-18. www.sasas.co.za/effect-frequency-supplementation-production-south-african-mutton-merino-ewes-grazing-wheat-stubble

Canesin, R.C., T.T. Berchielli, A. de Vega, R.A. Reis, J.D. Messana, F. Baldi and A.G. Páscoa. 2014. Reducing supplementation frequency for Nellore beef steers grazing tropical forages. Sci. Agric. 71 (2): 105-113.

Gustad, K.H., T.J. Klopfenstein, G.E. Erickson, K.J. Vander Pol, J.C. MacDonald and M.A. Greenquist. 2006. Dried Distillers Grains Supplementation of Calves Grazing Corn Residue. Nebraska Beef Cattle Reports. http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1113&context=animalscinbcr

Klein, S.I., P.L. Steichen, A. Islas, R.S. Goulart, T.C. Gilbery, M.L. Bauer, K.C. Swanson and C.R. Dahlen. 2014. Effects of alternate day feeding of dried distiller's grain plus solubles to forage-fed beef cows in mid- to late-gestation. J. Anim. Sci. 92:2677-2685.

Lardy, G. 2011. Utilizing corn residue in beef cattle diets. NDSU Extension Service. North Dakota State University. www.ag.ndsu.edu/pubs/ansci/beef/as1548.pdf

Loy, T.W., J.C. MacDonald, T.J. Klopfenstein and G.E. Erickson. 2007. Effect of distillers grains or corn supplementation frequency on forage intake and digestibility. J. Anim. Sci. 85: 2625-2630.

Rasby, R.J., M.E. Drewnoski and A. Stalker. 2014. Grazing crop residues with beef cattle. University of Nebraska-Lincoln Extension. http://extensionpublications.unl.edu/assets/pdf/ec278.pdf

Schauer, C.S., D.W. Bohnert, D.C. Ganskopp, C.J. Richards and S.J. Falck. 2005. Influence of protein supplementation frequency on cows consuming low-quality forage: performance, grazing behavior, and variation in supplement intake. J. Anim. Sci. 83:1715-1725.

Warner, J.M., J.L. Martin, Z.C. Hall, L.M. Kovarik, K.J. Hanford and R.J. Rasby. 2011. The effects of supplementing beef cows grazing cornstalk residue with a dried distillers grain based cube on cow and calf performance. Prof. Anim. Sci. 27:540 – 546.