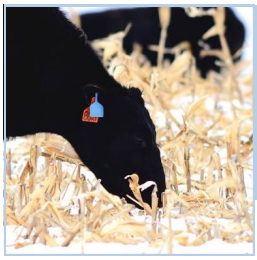

Frequency of Feeding Distiller's Dried Grains with Solubles as a Supplement to Beef Cows Grazing Corn Residues in the Northern Great Plains

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Methods of supplementing grazing cattle in winter should aim to decrease winter feed costs, which are the single highest annual cost in a cow-calf operation. This initial study is part of a larger long-term study to evaluate cost-effective methods of supplementing cows that are partially overwintered on corn residues. The study examines the effect of daily, every third day and every sixth day supplement delivery frequency on animal performance. Supplement delivery at a lower frequency reduces fuel and labor cost associated with winter feeding by reducing pasture visits to feed cows.

Summary

This study evaluated the frequency of feeding supplements to young cows grazing corn residues. Cows in their second and third trimester were fed dry distiller's grains with solubles (DDGS) at one of three supplement delivery frequencies: daily, every third day or every sixth day at a rate of 4 pounds/ head/day. A fourth group was not supplemented and served as a control. Another group of cows was kept in a dry lot and fed grass hay to simulate dry lot management.

Cows were weighed and body condition scored at the beginning and end of the study. Cows in all treatments had positive weight gains and body condition score (BCS) change. Daily and every-third-day DDGS supplementation resulted in greater average daily gains relative to other treatments. In comparison, average daily gains were lowest for the control cows and cows supplemented every six days. Final body condition scores were not influenced by treatment.

However, BCS change was lowest in cows fed DDGS every six days relative to other treatments. Also, BCS change tended to be lower in cows fed DDGS every six days relative to every third-day feeding, and significantly lower than those fed daily.

Our results show that under certain conditions, such as mild weather and high grain drop, cows grazing corn residues may not require supplementation. A decision to supplement cows should be made only after estimating the amount of corn grain yield on the ground. Secondly, when supplementation is necessary, cows can be fed supplement every third day to reduce frequency of delivery from daily feeding, with no detrimental effects to animal performance.

Introduction

The abundance of corn residues in North Dakota gives beef producers a readily available feed resource to graze cattle in the winter. However, the low nitrogen and mineral content of corn residues can limit ruminant intake and digestion, ultimately leading to poor animal performance when corn residues are fed as a sole feed (ARC 1980).

Improving the nutrient supply to cows grazing corn residues can be accomplished by targeted supplementation, which can provide the missing nutrients in corn residues. For example, protein supplementation improves utilization by improving microbial growth and fermentation, and increasing dry matter intake (Köster *et al*. 1996).

Common energy and protein sources that can be utilized as supplements for grazing animals include urea/molasses, cottonseed meal and distiller's grains with solubles (Brundyn *et al*. 2005; Schauer *et al*. 2005; Bernier *et al*. 2012; Canesin *et al*. 2014). Currently, corn DDGS is a highly competitive supplement in North Dakota, and is a high protein and high energy source for ruminants.

If a supplement is utilized to improve nutrient supply to overwintering cows, fuel and labor savings can be realized by reducing the frequency at which a supplement is fed to grazing animals. The ideal situation would be to feed the supplement daily because this ensures a continuous nutrient supply. Reducing supplement delivery frequency is a viable

option only if grazing animals continue to consume forage and maintain good nutrient status (Schauer *et al*. 2005).

An added advantage of less frequent supplement delivery may be improvement in 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) have shown the benefits of lowering the frequency of supplement delivery to grazing animals. These studies, however, were conducted in warm-weather grazing situations. Winters in North Dakota, which are characterized by cold temperatures, low wind chill 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 frequency of feeding supplements to cows grazing corn residues in a northern climate. Effective supplement delivery frequency, as part of a sustainable system, should take into account the effects on animal performance and economics of supplement delivery.

Procedures

The study was conducted at the CGREC with 100 second- and third-calf cows from Nov. 9 to Dec. 16, 2015. Eighty cows were kept in eight 10-acre corn residue paddocks with 10 cows/paddock, providing two replications per treatment.

Twenty cows grazed corn residues with no supplementation and served as a control group. Another 20 cows were fed corn DDGS daily, 20 were fed DDGS every third day, and the remaining 20 were fed DDGS every six days. The amount of DDGS fed, 4 pounds/head/day, was based on corn residue chemical composition and was determined using CowBytes (v 5.31; Alberta ARD, 2012) as a ration-balancing tool.

Each paddock was divided into quarters, and access to each quarter was controlled using high-tensile electric wire. Twenty cows were kept in a dry lot and were fed grass hay to simulate dry lot management. Body weights and body condition scores were measured at the start and end of the study.

The composition of DDGS and grass hay fed in the dry lot are shown in Table 1. Nutrient composition of corn residues is shown in Table 2.

Cows had *ad libitum* access to water and a mineral lick throughout the study. Animal handling and care procedures in this study were approved by the NDSU Animal Care and Use Committee. Environmental conditions were monitored throughout the study period.

Table 1. Composition (dry matter basis) of corn DDGS used as a supplement and hay fed in a dry lot.

	Corn DDGS	Grass hay[1]
Crude protein, %	29.9	8.4
Total digestible nutrients, %	73.3	52.9
Neutral detergent fiber, %	32.3	67.3
Acid detergent fiber, %	16.8	46.2
Ash, %	7.4	7.9
Calcium, %	0.2	0.3
Phosphorus, %	0.9	0.2
Potassium, %	1.1	1.9
Magnesium, %	0.3	0.2
Sulfur, %	0.8	0.1
Copper, ppm	1	2
Zinc, ppm	45	18
Manganese, ppm	18	63
Iron, ppm	281	175

[1]Fed to cows confined in a dry lot

Table 2. Composition (dry matter basis) of corn residues.

	Whole[1]	Grain	Leaf	Husk	Cob	Stalk
Crude protein, %	3.0	9.4	7.1	2.6	2.4	2.8
Total digestible nutrients, %	57	89	56	60	17	55
Neutral detergent fiber, %	75.1	8.7	68.3	80.3	83.2	71.6
Acid detergent fiber, %	44.8	2.4	45.5	40.6	43.0	46.4
Ash, %	3.4	1.2	13.0	2.9	1.3	4.3
Calcium, %	0.1	0.04	0.9	0.1	0.05	0.1
Phosphorus, %	0.05	0.3	0.09	0.04	0.05	0.07
Potassium, %	0.6	0.3	0.2	0.4	0.4	1.7
Magnesium, %	0.2	0.1	0.4	0.2	0.09	0.1
Sulfur, %	0.04	0.1	0.1	0.04	0.03	0.04
Copper, ppm	1	1	3	1	1	1
Zinc, ppm	21	19	22	23	31	17
Manganese, ppm	42	9	151	37	12	15
Iron, ppm	98	59	228	110	215	65

[1]Includes all components except grain.

Table 3. Effect of frequency of DDGS supplementation on beef cow performance at CGREC, Nov. 9 to Dec. 16, 2015.

	Supplementation frequency						
	Control[1]	Daily	Three days	Six days	Dry lot	SE	*P*-value
Initial BW[2], lbs.	1,158	1,142	1,164	1,135	1,140	-	-
Final BW[2], lbs.	1,255	1,267	1,293	1,229	1,264	19.7	0.258
ADG[2], lbs./day	2.70[b]	3.45[a]	3.58[a]	2.63[b]	3.45[a]	0.264	0.022
Initial BCS	4.7	4.6	4.8	4.9	4.7	-	-
Final BCS	5.3	5.3	5.4	5.3	5.3	0.07	0.697
BCS change	0.53[ab]	0.66[a]	0.58[ab]	0.39[b]	0.66[a]	0.079	0.089

[1]Grazing corn residues with no supplementation.
[2]Preliminary results; not adjusted for calf weight. Final results will be reported after calving.
[ab]Means in the same row followed by a different letter differ significantly ($P < 0.05$).

Results

Final body weights were similar ($P = 0.258$) among treatments (Table 3). Average daily gains, however, were lower ($P = 0.023$) in cows that received no supplementation and cows fed DDGS every six days relative to other treatments (Table 3). Daily and every-third-day DDGS supplementation resulted in weight gains similar to cows kept in a dry lot.

Final body condition scores were similar ($P = 0.697$) among treatments (Table 3). However, BCS change was lower ($P = 0.016$) in cows fed DDGS every six days relative to cows fed DDGS daily or cows kept in a dry lot. Also, BCS change tended ($P = 0.097$) to be greater in cows fed DDGS every third day relative to every-sixth-day feeding (Table 3).

Weekly average temperatures during the study are shown in Figure 1.

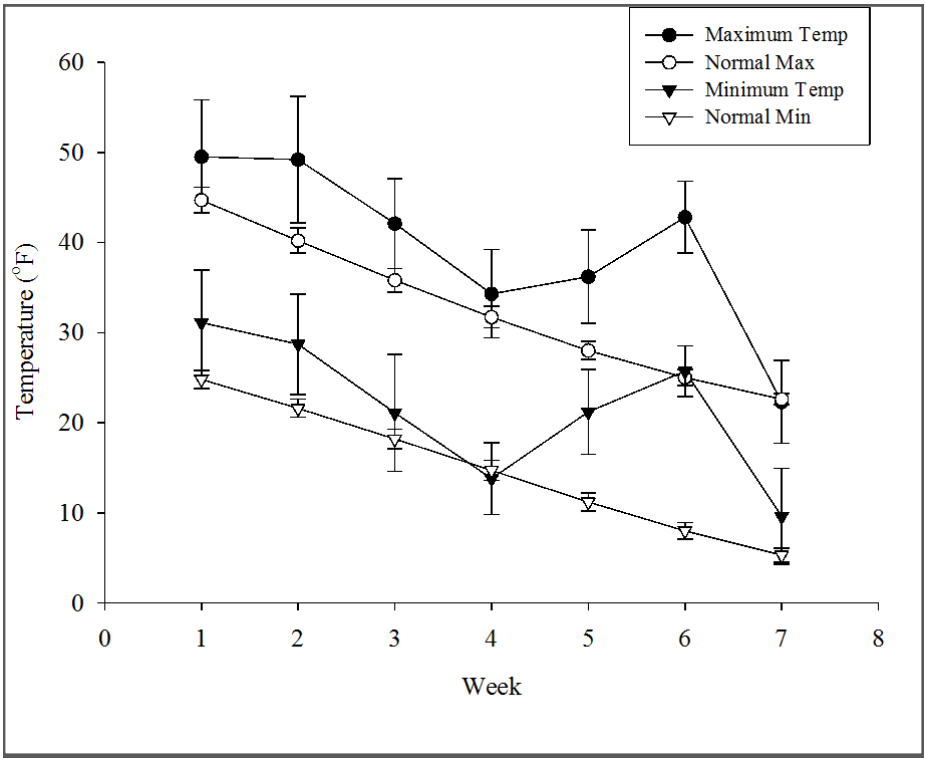

Figure 1. Weekly temperatures (mean ± SD) for November and December 2015. Week 1 = Mean temperature for Nov. 1 to 7, etc. Data source: North Dakota Agricultural Weather Network. https://ndawn.ndsu.nodak.edu

Discussion

This study investigates the frequency of feeding supplements to cows grazing corn residues. Results show that under certain conditions, such as mild weather and high grain drop, cows grazing corn residues may not require supplementation.

Secondly, when supplementation is required, cows can be fed DDGS every third day with no negative effects on animal performance. This is important for a producer's savings on labor and fuel costs associated with delivery. Positive daily gains and BCS changes recorded in this study can be attributed mainly to environmental conditions, as well as the nutrient content of corn residues.

The amount of DDGS fed in this study was designed to meet the nutrient shortfall expected from feeding corn residues during a cooler part of the year in the northern Great Plains. However, the fall of 2015 had higher than normal temperatures.

Normal high and low temperature averages 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 on a weekly average (Fig. 1). Based on these yearly temperature differences, planned supplementation strategies may have provided more energy and protein than was required to meet animal needs.

Nutrient content of corn residues is generally poor (Table 2). Components with the highest nutrient content are the grain and the leaf. The husk is low in protein but has a good energy profile, while the cob is poor in both protein and energy. As such, supplementation with a high protein and energy source such as DDGS would be warranted in order to maintain overwintering cows.

The low nutrient content of corn residues fed in this study (Table 2) shows that the initial premise of the study that cows grazing corn residues require supplementation was justified. Indeed, some studies (Gustad *et al*. 2006; Warner *et al*. 2011) have shown the beneficial effects of supplementing cattle grazing corn residues.

However, in this study, the huge amount of grain on the ground was unexpected, with estimates before the start of the study indicating a minimum of 16 bushels of corn grain on the ground. High winds in excess of 60 mph, which occurred just before corn harvest, were responsible for this grain.

Compared to other components of the corn plant, the grain has a high nutrient content, with adequate protein and energy (Table 2) to meet nutrient requirements of overwintering cows grazing corn residues. This grain availability in our study resulted in positive daily gains and BCS changes in the grazing animals.

In conclusion, this study shows that supplementing cows grazing corn residues may not be necessary when the cows have access to corn grain. This conclusion is specific to this one-year study, given the unseasonably warm temperatures encountered during the course of the study. Environmental and other conditions at corn harvest will vary on a yearly basis and more definitive recommendations can be made only after a multi-year study.

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Photos by Rick Bohn, CGREC

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