



Strategies for Supplementing Cattle Grazing Corn Residue

Michael Undi and Stephanie Becker

Central Grasslands Research Extension Center, Streeter, N.D.

Methods of supplementing cattle grazing in winter should aim to reduce winter feed costs, which are the single highest annual cost in a cow-calf operation. Methods that eliminate pasture visits in winter can reduce labor and fuel costs. This study evaluated the use of a cover crop and a grazing lick tub as strategies for supplying extra nutrients to cattle grazing corn residue. In the first year, supplementation with a cover crop or grazing lick tub did not impact animal performance. This is the first year of a long-term study to evaluate these supplementing strategies for cows that are partially overwintered on corn residue.

Summary

Methods of supplementing beef cows grazing corn residue were investigated in a study conducted at the Central Grasslands Research Extension Center near Streeter, N.D. Nonlactating pregnant Angus cows ($n = 90$, body weight [BW] = $1,391 \pm 67$ pounds, body condition score [BCS] = 5.5 ± 0.20) were divided into nine groups of similar total body weight and allowed to graze corn residue treatments as follows: a) corn residue, b) corn residue intercropped with a cover crop and c) corn residue supplemented with a grazing lick tub (Crystalyx – HE-12%).

Two-day body weights were taken at the start and end of the grazing period. Two independent observers assigned BCS using a 9-point system (1 = emaciated, 9 = obese) at the start and end of the period.

Below-normal rainfall severely limited cover crop establishment and growth in the first year of the study. Supplementation with a cover crop or a grazing lick tub did not impact ($P > 0.05$) animal performance. This is the first year of a long-term study to evaluate these strategies for supplementing cows that are partially overwintered on corn residue.

Introduction

The abundance of corn residue in North Dakota gives beef producers a readily available feed resource to graze cattle in the winter. Corn residue is a poor-quality feed, low in protein and minerals, with limited feed intake and digestion when fed as a sole feed. Nutrient supply to cows grazing corn residue can be improved by targeted supplementation.

Supplementation methods that reduce labor and fuel costs by eliminating pasture visits are of interest to beef producers. Providing grazing animals with feeds that possess complementary characteristics can eliminate pasture visits. Poor-quality/good-quality feed combinations such as corn residue and alfalfa hay (Klopfenstein and Owen, 1981) or corn residue and creeping forage legumes (Undi et al., 2001) have been shown to improve performance in beef cattle (Klopfenstein and Owen, 1981) and



sheep (Undi et al., 2001). Cover crops intercropped into corn can be grazed in combination with corn residue after corn harvest.

The benefits of cover crops in improving cropping systems and agricultural sustainability are well-documented (Magdoff and van Es, 2009; Blanco-Canqui et al., 2012; Wortman et al., 2012). Cover crops increase soil organic matter, reduce soil erosion, improve soil physical and biological properties, increase nutrient cycling, suppress weeds, improve soil water availability, supply nutrients to the following crop and break pest cycles (Magdoff and van Es, 2009; Blanco-Canqui et al., 2012; Wortman et al., 2012). Some cover crops are able to break into compacted soil layers, allowing the following crop's roots to develop more fully (Magdoff and van Es, 2009).

An additional benefit of cover crops, which normally receive the least consideration, is the importance of cover crops as a source of livestock feed. For poor-quality feeds such as corn residue, cover crops improve animal performance by supplying the nutrients that are low in residue. Intercropping corn residue with forage legumes improves corn residue quantity and quality (Alford et al., 2003).

This study evaluated methods of supplementing cows grazing corn residue for part of the winter. Methods evaluated included grazing corn residue intercropped with a cover crop and the use of a grazing lick tub as sources of extra nutrients for cattle grazing corn residue.

Procedures

This study was conducted from Nov. 9, 2017, to Dec. 19, 2017, at the Central Grasslands Research Extension Center, Streeter, N.D. The study was conducted on a 90-acre field planted to corn. The field was divided into nine 10-acre paddocks using high-tensile wire electric fencing. One water tank was installed between two paddocks.

A cool-season cover crop (triticale, winter rye, oats, peas, yellow clover, crimson clover and brassicas) was intercropped at 38 pounds/acre into three standing corn paddocks at the V6 to V7 stage. Components of the corn residue and individual cover crops in the cover crop mixture were sampled for nutrient analysis before grazing.

Nonlactating pregnant Angus cows ($n = 90$, BW = $1,391 \pm 67$ pounds, BCS = 5.5 ± 0.20) were divided into nine groups of similar total body weight and allowed to graze one of three corn residue treatments: a) corn residue, b) corn residue intercropped with a cover crop or c) corn residue supplemented with a grazing lick tub (Crystalyx – HE-12%). Cows were allotted a portion of the corn field, and access to new sites was controlled using portable electric fencing.

Windbreaks were placed in each paddock. Cows had *ad libitum* access to fresh water, mineral supplement (6-12+ mineral supplement; CHS Inc. Sioux Falls, S.D.) and salt blocks.

Two-day body weights were taken at the start and end of the study. Two observers assigned BCS using a 9-point system (1 = emaciated, 9 = obese; Wagner et al., 1988; Rasby et al., 2014) at the start and end of the study. Animal handling and care procedures were approved by the NDSU Animal Care and Use Committee.

Results

The nutrient composition of corn residue is shown in Table 1. 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 protein and energy.

The nutrient composition of the cover crop is shown in Table 2. All cover crops have high crude protein (CP) content, but rapeseed and radish have extremely low dry-matter content.

Initial cow BW and BCS were similar ($P > 0.05$) among treatments (Table 3). Supplementation of a cover crop or grazing lick tub did not influence ($P > 0.05$) final BW or daily gains (Table 3). We found no difference ($P > 0.05$) in BCS change among cows on all treatments. Whether on corn residue alone or supplemented, cows maintained weight and BCS.

Table 1. Nutrient composition of whole corn and corn residue components.

	Whole Plant	Residue ¹	Component				
			Grain	Leaf	Husk	Cob	Stalk
Dry matter (DM), %	71.5	67.8	84.1	91.8	85.9	80.3	64.0
Nutrient composition, % DM							
CP ²	9.0	3.0	9.8	8.2	4.1	3.0	3.2
TDN	74.6	56.5	89.1	55.9	60.9	15.9	52.8
NDF	35.1	75.1	8.3	69.4	77.8	85.4	76.3
ADF	18.9	44.8	2.0	45.7	38.6	43.5	50.1
Ca	0.17	0.14	0.04	0.76	0.16	0.06	0.16
P	0.23	0.05	0.24	0.11	0.10	0.05	0.07
K	0.51	0.58	0.26	0.63	0.73	0.37	1.58
Mg	0.16	0.24	0.11	0.87	0.16	0.07	0.14
S	0.09	0.04	0.11	0.11	0.03	0.03	0.04

¹Whole plant minus grain.

²Crude protein (CP), total digestible nutrients (TDN), neutral detergent fiber (NDF), acid detergent fiber (ADF), calcium (Ca), phosphorus (P), potassium (K), magnesium (Mg) and sulfur (S).

Table 2. Nutrient composition of individual crops in the cover crop mix.

	Rapeseed	Radish	Winter Peas	Oats	Winter Rye	Triticale
DM ¹ , %	17	9	63	79	67	66
Nutrient composition, %DM						
CP ¹	21.8	20.1	18.5	10.3	10.9	11.0
TDN	75	73	61	60	61	64
NDF	18.0	25.1	38.0	62.6	56.4	49.2
ADF	16.5	20.2	35.7	37.2	35.7	32.2
Ca	1.6	1.5	2.1	0.3	0.2	0.2
P	0.4	0.4	0.4	0.3	0.3	0.3
K	2.9	3.9	2.9	1.6	1.1	1.1
Mg	0.3	0.3	0.4	0.2	0.1	0.1
S	0.5	0.4	0.6	0.1	0.1	0.1

¹ Dry matter (DM), crude protein (CP), total digestible nutrients (TDN), neutral detergent fiber (NDF), acid detergent fiber (ADF), calcium (Ca), phosphorus (P), potassium (K), magnesium (Mg) and sulfur (S).

Table 3. Performance of cows grazing corn residue.

	Corn Residue	Cover Crop ¹	Tub ²	SE	P-value
Initial BW, lb.	1,398	1,388	1,388	17.5	0.817
Final BW, lb.	1,396	1,402	1,394	22.8	0.930
Daily gain, lb./d	0.03	0.32	0.12	0.32	0.634
Initial BCS	5.5	5.5	5.5	0.05	0.994
Final BCS	5.7	5.6	5.6	0.04	0.814
BCS change	0.20	0.17	0.18	0.04	0.732

¹Corn residue/cover crop. ²Corn residue + grazing lick tub.

Discussion

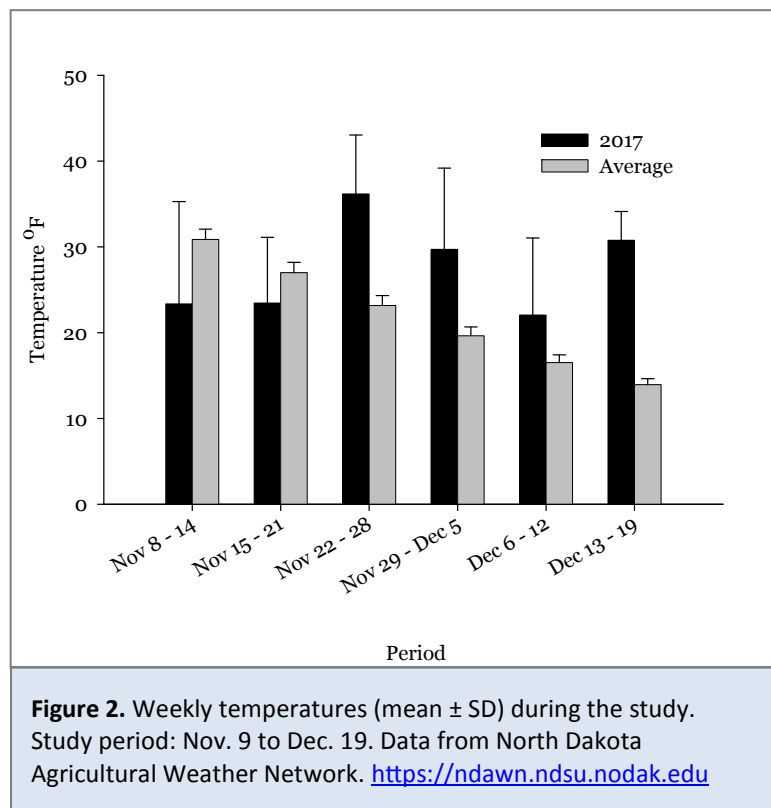
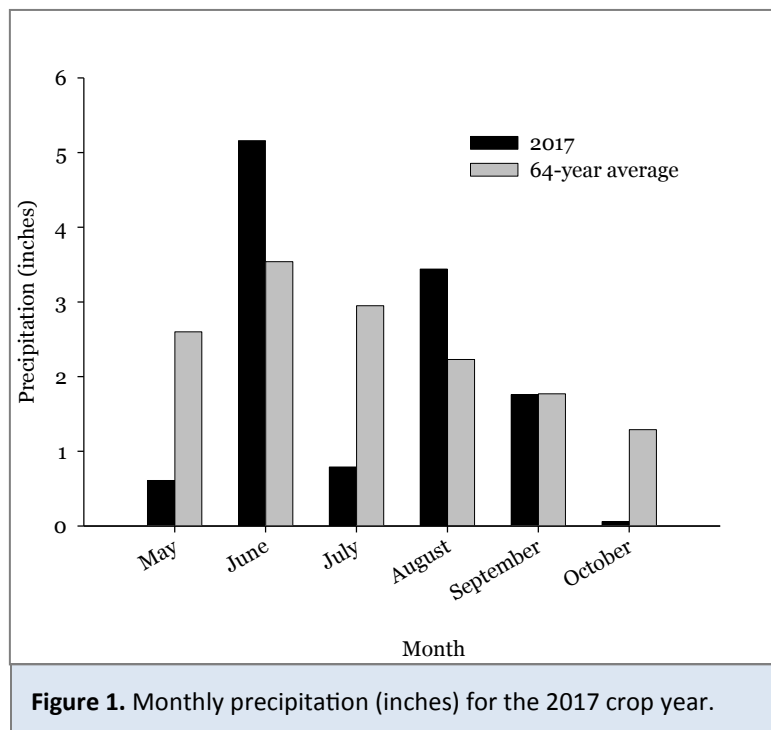
Producers are concerned that intercropping a cover crop into corn fields may reduce corn yields. The cover crop normally is planted when corn is well-established, thus minimizing competition for nutrients; hence, intercropping does not impact corn yield negatively (Scott et al., 1987; Baributsa et al., 2008). Intercropping corn with red clover and ryegrass (Scott et al., 1987) or red clover and vetch (Baributsa et al., 2008) did not impact corn yield negatively.

In cereal-legume mixes, agronomic features such as fertilizer application, sowing time and the proportion of crop mixture are basic determinants of competition among component crops (Belel et al., 2014). Where constituent crops are arranged in rows, the degree of competition is determined by the comparative growth rates, growth duration and proximity of roots of the diverse crops (Belel et al., 2014). The cereal component in a cereal-legume intercrop has a faster growth rate, a height advantage and a more widespread rooting system that gives it an upper hand in competition with associated legumes (Belel et al., 2014).

This study investigated nonvisit methods of supplementing cows grazing corn residue. Due to scheduling issues, corn planting commenced late. The cover crop was intercropped into corn at the corn V6 to V7 stage in early July (July 7-10). Below-normal rainfall (Figure 1) severely limited cover crop establishment and growth in the first year of the study. Temperatures during the study are shown in Figure 2.



Results in the first year show that the use of a cover crop or grazing lick tub as strategies for supplying extra nutrients to cattle grazing corn residue did not impact animal performance. This is the first year of a long-term study to evaluate these strategies for supplementing cows that are partially overwintered on corn residue.



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