Kansas Agricultural Experiment Station Research Reports

Volume 1
Issue 1 *Cattlemen's Day*

Article 7

January 2015

Evaluation of Calcium Hydroxide-Treated Stover (Second Crop) in Receiving and Growing Diets and Effects on Cattle Performance

T. Spore
Kansas State University, tjspore@ksu.edu

S. Montgomery
Corn Belt Livestock Services, cattlenutritionist@gmail.com

C. Vahl
Kansas State University, vahl@ksu.edu

See next page for additional authors

Recommended Citation

Spore, T.; Montgomery, S.; Vahl, C.; Oleen, B. E.; Hollenbeck, W. R.; Waggoner, J. W.; Hill, J.; and Blasi, D. A. (2015) "Evaluation of Calcium Hydroxide-Treated Stover (Second Crop) in Receiving and Growing Diets and Effects on Cattle Performance," *Kansas Agricultural Experiment Station Research Reports*: Vol. 1: Iss. 1. https://doi.org/10.4148/2378-5977.1021

Evaluation of Calcium Hydroxide-Treated Stover (Second Crop) in Receiving and Growing Diets and Effects on Cattle Performance

Abstract

Production of ethanol from corn as an alternative fuel source has significantly affected the pricing landscape for corn as an energy source for livestock. As ethanol usage has become more prevalent, corn prices have become more volatile, especially in critical corn-growing areas that have been affected by drought. Consequently, many beef cattle feeders have become interested in alternative energy sources in an effort to control cost of gain. Second Crop (ADM Corp., Decatur, IL) is a process in which calcium hydroxide is added to fibrous crop residues, such as wheat straw and corn stover. When applied to low-quality roughages, calcium hydroxide disrupts the chemical bonds between lignin and hemicellulose, thus improving digestibility of the fiber by ruminal microbes. Treatment of low-quality forage with the Second Crop process could improve the energy value of forages, effectively decreasing reliance on cereal grains as sources of supplemental energy.

Keywords

calcium hydroxide-treated stover, Second Crop, receiving and growing diet, performance

Authors

T. Spore, S. Montgomery, C. Vahl, B. E. Oleen, W. R. Hollenbeck, J. W. Waggoner, J. Hill, and D. A. Blasi

K-STATE Research and Extension

CATTLEMEN'S DAY 2015

Evaluation of Calcium Hydroxide-Treated Stover (Second Crop) in Receiving and Growing Diets and Effects on Cattle Performance

T. Spore, S. Montgomery[1], C. Vahl[2], B. Oleen, W.R. Hollenbeck, J. Waggoner, J. Hill[3], and D.A. Blasi

Introduction

Production of ethanol from corn as an alternative fuel source has significantly affected the pricing landscape for corn as an energy source for livestock. As ethanol usage has become more prevalent, corn prices have become more volatile, especially in critical corn-growing areas that have been affected by drought. Consequently, many beef cattle feeders have become interested in alternative energy sources in an effort to control cost of gain. Second Crop (ADM Corp., Decatur, IL) is a process in which calcium hydroxide is added to fibrous crop residues, such as wheat straw and corn stover. When applied to low-quality roughages, calcium hydroxide disrupts the chemical bonds between lignin and hemicellulose, thus improving digestibility of the fiber by ruminal microbes. Treatment of low-quality forage with the Second Crop process could improve the energy value of forages, effectively decreasing reliance on cereal grains as sources of supplemental energy.

Experimental Procedures

Three semi-loads containing 245 head of medium-large frame Continental × English or English crossbred beef steers were acquired from sale barns in Oklahoma (89 head) and Texas (156 head) during a 24-hour period (November 12–13, 2013) and transported to the Kansas State University Beef Stocker Unit. Upon arrival, animals were weighed and individually identified with numbered ear tags. After initial processing, steers were placed into temporary pens, with each truck representing one string of pens (8). Cattle were give free-choice access to native grass hay (1.5% of body weight) and water through automatic waterers. The morning after arrival, calves were vaccinated for common viral and clostridial diseases (Vision 7, Merck Animal Health, Summit, NJ; BoviShield Gold 5, Zoetis, Exton, PA; Super Poly Bac B, Texas Vet Lab), dewormed (Safeguard, Merck Animal Health), and implanted (Ralgro, Merck Animal Health). Animals were then blocked by load and randomly assigned to pens based on average arrival weight.

[1] Corn Belt Livestock Services, Papillion, NE.
[2] Kansas State University Department of Statistics.
[3] ADM Corp., Quincy, IL.

There were 24 pens of equal size divided into 3 separate blocks, each consisting of 8 pens and representing a single load of cattle. All calves were observed twice daily for symptoms of sickness or lameness. Experimental treatments consisted of a standard receiving and growing diet (control), a diet containing 20% Second Crop-treated stover (20%CaOH), and a diet containing 40% Second Crop-treated stover (40%CaOH). Diets (Table 1) were formulated to include comparable amounts of energy needed for growing and receiving diets based on NRC (7th revised edition, 1996).

Daily feed calls were determined twice daily, with approximately 60% of total daily feed delivery taking place in the morning and 40% in the evening. Feed bunks were evaluated as required to maintain free-choice intake of feed without accumulation of excess unconsumed feed. Calves were fed their respective diets for 112 days, followed by a 7-day common diet period to equalize ruminal fill. Weights were recorded on days 0, 28, 56, 84, 112, and 119. Dry matter intake, average daily gain, and feed efficiency were calculated after each weighing and recorded per pen.

Results and Discussion

Performance results are presented in Table 2. On the 112th day of the study, final weights differed among all three test groups ($P < 0.0001$). Following a 7-day period, however, it became evident that these differences were owing to the significantly higher amount of gut-fill in the control group. At the conclusion of the study (day 119), there were no statistically significant differences ($P > 0.05$) between the growth of the 20% group and the control. These results suggest that feeding 20% Second Crop stover will yield performance equal to that of a more traditional growing diet containing prairie hay and alfalfa. We observed that cattle fed treated corn stover were more likely to sort diet components, perhaps suggesting that the calcium hydroxide product was less palatable than other forages. Cattle appeared to adapt to the treated stover over time, however, as differences in intake were less pronounced by the end of the experiment.

Implications

Adding calcium hydroxide-treated corn stover at up to 20% of a backgrounding diet resulted in acceptable growth performance. When fed at 40% of the diet, the same forage decreased feed intakes, ultimately resulting in poorer gain and efficiency.

Table 1. Experimental diets on a 100% dry matter basis

	Treatment		
Ingredient	Control	20%CaOH	40%CaOH
Dry-rolled corn	30.00	29.00	25.00
Supplement	5.00	5.00	5.00
Molasses	5.00	-	-
Alfalfa hay	15.00	8.00	-
Prairie hay	15.00	8.00	-
Second Crop[1] corn stover	-	20.00	40.00
Distillers dried grains	30.00	30.00	30.00
Total	100.00	100.00	100.00
Calculated nutrient content			
Dry matter, %	86.3	75.9	67.1
Protein, %	18.63	17.81	16.69
Calcium, %	1.01	0.97	1.64
Phosphorus, %	0.41	0.41	0.39
Salt, %	0.32	0.32	0.32
Potassium, %	1.13	1.03	1.03
Magnesium, %	0.18	0.25	0.30
Fat, %	5.36	4.82	4.48
Acid detergent fiber, %	18.05	20.46	22.00
Net energy maintenance, Mcal/cwt	80.63	79.81	78.93
Net energy gain, Mcal/cwt	51.69	51.68	51.64

[1] ADM Corp., Decatur, IL.

Table 2. Growth performance of beef calves fed Second Crop[1] corn stover

Item	Treatment			SEM	PR > F	20%CaOH vs. control	40%CaOH vs. control
	Control	20%CaOH	40%CaOH				
Body weight, lb							
Day 0	559	559	559	38.2	0.79	0.97	0.55
Day 28	640	639	619	50.8	<0.01	0.66	<0.01
Day 56	721	712	686	51.1	<0.01	0.09	<0.01
Day 84	812	798	772	55.9	<0.01	0.16	<0.01
Day 112	875	856	827	60.6	<0.01	0.04	<0.01
Day 119	860	860	836	64.6	0.03	0.95	0.02
Average daily gain, lb							
Days 1–28	2.90	2.85	2.16	0.497	<0.01	0.71	<0.01
Days 1–56	2.88	2.72	2.26	0.278	<0.01	0.10	<0.01
Days 1–84	2.78	2.63	2.34	0.233	<0.01	0.15	<0.01
Days 1–112	2.82	2.65	2.39	0.231	<0.01	0.04	<0.01
Days 1–119	2.53	2.53	2.33	0.245	0.03	0.95	0.02
Dry matter intake, lb/day							
Days 1–28	13.78	13.89	13.24	0.637	0.41	0.83	0.30
Days 1–56	16.93	17.51	16.53	0.789	0.32	0.375	0.53
Days 1–84	18.03	18.45	17.59	0.865	0.45	0.53	0.52
Days 1–112	18.57	19.17	18.29	0.905	0.52	0.44	0.72
Days 1–119	18.35	18.89	18.07	0.900	0.53	0.46	0.71
Feed:gain							
Days 1–28	5.21	5.22	6.51	1.062	<0.01	0.96	<0.01
Days 1–56	6.00	6.57	7.43	0.620	<0.01	0.10	<0.01
Days 1–84	6.54	7.12	7.63	0.513	0.02	0.11	<0.01
Days 1–112	6.64	7.35	7.73	0.501	0.02	0.05	<0.01
Days 1–119	7.33	7.65	7.87	0.574	0.42	0.43	0.20

[1] ADM Corp., Decatur, IL.