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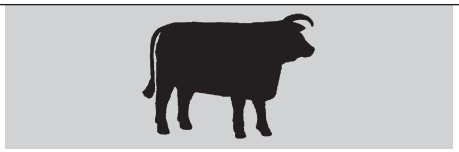

Effects of processing treated corn stover and distillers grains on total-tract digestion and performance of growing cattle[1]

J. L. Gramkow, C. J. Bittner, M. L. Jolly, D. B. Burken, G. E. Erickson, PAS, and J. C. MacDonald,[2] PAS
Department of Animal Science, University of Nebraska, Lincoln 68583-0908

ABSTRACT

Two studies evaluated replacing traditional growing diets with pelleted feed. In Exp. 1, 6 steers were used in a 4 × 6 Youden square evaluating pelleting and harvest method of corn stover on total-tract digestion. Treatments included 2 control diets containing 18% modified distillers grains plus solubles, 18% solubles, and either 60% untreated (NEGCON) or alkaline treated (POSCON) corn stover. Remaining treatments were 1 of 2 pelleted diets containing alkaline treated corn stover, dry distillers grains, solubles, and supplement. Corn stover was harvested by raking and baling (CONV) or a baler pulled behind the combine (MOG). In Exp. 2, a 92-d study used 360 (initial BW = 316 kg) steers to evaluate replacing the NEGCON with CONV pellets on performance. Pellets were either pair fed (PELPF) to NEGCON or fed ad libitum (PELAL). In Exp. 1, MOG had the greatest OM and NDF digestion (75.55 and 63.93%, respectively), whereas NEGCON had the least (67.58 and 54.36%, respectively; P < 0.01). In Exp. 2, there were no differences (P > 0.50) between NEGCON and PELPF treatments in ending BW, DMI, or ADG (1.29 and 1.27 kg/d, respectively). The PELAL treatment had the greatest (P < 0.01) DMI (12.18 kg/d) and ADG (1.63 kg/d). The PELAL (G:F = 0.134) had reduced G:F (P = 0.05) compared with CON and PELPF treatments (G:F = 0.143 and 0.140, respectively). Replacing a traditional growing diet with a complete pelleted feed resulted in comparable or improved digestibility but decreased G:F when cattle were fed ad libitum.

Key words: alkaline treatment, corn stover, harvest method, pelleted feed

INTRODUCTION

Wright and Wimberly (2013) estimated that 626,091 ha of grassland had been converted to soybean or corn fields in the North Central region from 2006 to 2011. Furthermore, it was estimated that 22,258 ha of land had been converted to cropland in Nebraska from 2011 to 2012 (USDA, 2013). This increase in farm land coupled with increased corn yields has resulted in an increase in the amount of corn residue available for cattle producers to use as a feed source (Watson et al., 2015). Corn residue has traditionally been considered a low quality forage because of its low digestibility, which is attributed to the different parts of the corn stover. Watson et al. (2015) reported that the stalk and cob were the least digestible parts of the corn plant; however, they made up the largest portion of the plant DM (60.11%). Advancements in corn harvesting methods have allowed producers to alter which parts of the corn plant are baled as stover. Corn stover harvested using a John Deere 569 round baler with the Hillco single pass round bale system (John Deere, Moline, IL; Hillco Technologies Inc., Nezperce, ID) has resulted in improved feed efficiency when fed to growing steers compared with stover from traditional harvesting methods (Updike et al., 2015b).

In addition, calcium oxide (CaO) may be used to chemically treat corn residue to improve the digestibility of the residue (Shreck et al., 2015b). Reducing the particle size before chemical treatment may further improve the response to chemical

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[2] Corresponding author: jmacdonald2@unl.edu

treatment (Shreck et al., 2015a). Pelleting improves handling of small particles and can overcome storage and transportation issues associated with bulky roughages such as corn stover. Commercial processes have been developed to reduce the particle size and add value to corn stover by producing a complete pelleted feed. The resulting feed can be shipped and stored like a grain mixture. In addition, feeding a complete pelleted feed eliminates the need to mix growing rations. Peterson et al. (2015) reported that feeding a complete pelleted feed containing primarily alkaline treated corn stover and dried distillers grains (**DDG**) plus solubles resulted in increased ending BW, ADG, and DMI compared with similar diets in which the stover was not treated. However, pelleting negatively affected G:F compared with the nonpelleted diet. Additionally, there was a 6% improvement in G:F due to chemical treatment in a complete pelleted feed and only a 1% improvement due to chemical treatment in a similar, unpelleted diet (Peterson et al., 2015). New processes to produce pelleted feeds that contain corn residue and distillers by-products have developed. The objective of these experiments was to evaluate the effects of harvesting method, chemical treatment, and processing on total-tract digestibility and performance of growing cattle.

Table 1. Diets (DM basis) fed to growing steers to evaluate the effects of replacing a traditional growing diet with a CaO treated stover and dried distillers grains (DDG) pelleted complete feed on total-tract digestibility in Exp. 1

Item	NEGCON[1]	POSCON[1]	CONV[2]	MOG[3]
Ingredient, % DM				
MDGS[4]	18	18	—	—
Solubles	18	18	—	—
Corn stover	60	—	—	—
CaO treated corn stover	—	60	—	—
Pellet A[2]	—	—	100	—
Pellet B[3]	—	—	—	100
Supplement[5]	—	—	—	—
Fine ground corn	2.408	3.524	3.524	3.524
Limestone	1.116	—	—	—
Salt	0.300	0.300	0.300	0.300
Tallow	0.100	0.100	0.100	0.100
Beef trace minerals[6]	0.050	0.050	0.050	0.050
Vitamin A-D-E[7]	0.015	0.015	0.015	0.015
Rumensin-90[8]	0.011	0.011	0.011	0.011
Nutrient composition[9]				
DM, %	64.55	46.32	86.60	85.90
OM, %	91.36	88.01	90.47	90.28
NDF, %	61.24	55.42	48.26	48.22
CP, %	15.47	15.18	21.46	20.55

[1]Contained 18% modified distillers grains plus solubles, 18% solubles, and either 60% untreated (NEGCON) or alkaline treated (POSCON) corn stover.

[2]Contained 60% CaO treated corn stover, 18% DDG, 18% solubles, and 4% supplement. Corn stover was harvested using a conventional square baler (CONV).

[3]Contained 60% CaO treated corn stover, 18% DDG, 18% solubles, and 4% supplement. Corn stover was harvested using a single pass round baler (MOG).

[4]MDGS = modified distillers grains plus solubles.

[5]Supplement supplied at 4% of dietary DM with the supplement included within the CONV and MOG pellets.

[6]Premix contained 10% Mg, 6% Zn, 4.5% Fe, 2% Mn, 0.5% Cu, 0.3% I, and 0.05% Co.

[7]Premix contained 1,500 IU of vitamin A, 3,000 IU of vitamin D, and 3.7 IU of vitamin E per gram.

[8]Formulated to supply 200 mg/head per day monensin (Elanco Animal Health, Greenfield, IN).

[9]DM basis.

MATERIALS AND METHODS

All animal care and management procedures were approved by the University of Nebraska–Lincoln Institutional Animal Care and Use Committee.

Exp. 1

The digestibility of complete pelleted feeds containing CaO treated corn stover, DDG, and solubles compared with traditional growing diets was evaluated. Six steers (initial BW = 358 kg, SD = 7 kg) were used in a 4 × 6 Youden square with 4 treatments fed each period (Table 1). Steers were assigned randomly to 1 of the 4 treatments using a row × column transformation. The negative control (**NEGCON**) consisted of 60% untreated corn stover, 18% modified distillers grains plus solubles (**MDGS**), 18% distillers solubles, and 4% supplement. The positive control (**POSCON**) contained 60% CaO treated corn stover, 18% MDGS, 18% distillers solubles, and 4% supplement. The third treatment (**CONV**) was a complete pelleted feed containing CaO treated corn stover, solubles, DDG, and supplement in the same proportion as the control diets. The fourth treatment (**MOG**) was also a complete pelleted feed containing CaO treated corn stover, solubles, DDG, and supplement in the same proportion as the control diets. The difference between the CONV and MOG treatments was the harvesting method used to collect the corn stover within the pellet.

The corn stover used in the CONV pellet was gathered following corn