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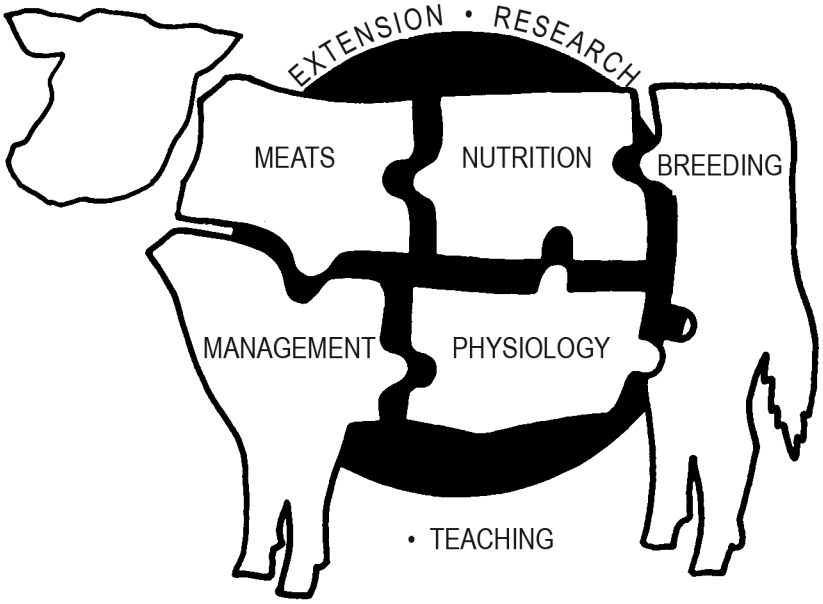

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Effects of Replacing Corn with a Pelleted Treated Corn Stover and Distillers Grains on Performance of Finishing Cattle

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Summary

A finishing study evaluated the effects of replacing 10, 20, or 30% corn (DM basis) with pelleted treated corn stover and distillers grains in a diet containing either 20 or 40% modified distillers grains plus solubles (MDGS) on finishing cattle performance. Steers consuming 10, 20, or 30% of the pelleted feed with 40% MDGS had equal or similar performance to the control diet with 40% MDGS. Cattle consuming 10% pelleted feed with 20% MDGS had similar efficiencies as the control diet; however, feeding the pellet at 20 or 30% of the diet DM with 20% MDGS decreased feed efficiency.

Introduction

Increased cereal grain prices have caused livestock producers to find ways to feed less corn in finishing diets. Increased corn prices have also caused marginal cropland to be converted from forage production to crop production, which has increased the abundance of corn residue available. Therefore, non-traditional feeds such as low quality forages from crop residues are commonly used in beef cattle diets. Pellet Technology USA (Gretna, Neb.) has developed a proprietary pelleted feed consisting of distillers grains (DGS) and treated corn stover to replace corn in finishing diets. Up to 25% of corn in a finishing diet can be replaced with pelleted distillers grains and treated corn stover without altering total tract digestion (*2015 Nebraska Beef Cattle Report,* pp. 83-85). Therefore, the objective of this study was to evaluate the effects of replacing corn with a pelleted feed containing treated corn stover and DGS on finishing cattle performance.

Procedure

A 183-day finishing study was conducted utilizing 336 crossbred steer calves (initial BW = 663 ± 55 lb). All steers were limit-fed a common diet consisting of 50% roughage and 50% byproduct at 2% of BW for five days prior to trial initiation to minimize gut fill. Following five days of limit feeding, steers were weighed two consecutive days. Steers were separated into two weight blocks (Light and Heavy) based on first-day weights, stratified by BW within block, and assigned randomly to pens. Pens were assigned randomly to one of seven treatments. There were eight steers per pen, and six pens per treatment. There were four pen replications per treatment in the light block and two pen replications in the heavy block. Pen was the experimental unit.

The seven treatments were set-up in a 2x3 plus 1 factorial design. The 2x3 factorial contained either 20 or 40% modified distillers grains (MDGS) with either 10, 20, or 30% pelleted treated corn stover and DDG (Table 1). The control diet (CON) consisted of a 50:50 blend of dry-rolled corn (DRC) and high-moisture corn (HMC) and 40% MDGS. All diets contained 5% wheat straw (3 inch grind) and 4% dry meal supplement formulated to provide 330 mg/steer daily Rumensin® and 90 mg/steer daily of Tylan®.

Feeding value of the pellet in diets containing 40% MDGS were calculated using the following equation: (((feed efficiency of pellet treatment-CON feed efficiency)/CON feed efficiency)/concentration of pellet) x 100 + 100. Unfortunately, a control diet containing 20% MDGS was not included in the treatment design. However, using meta-analysis data, we were able to estimate the expected feed efficiency of a control diet containing 20% MDGS. Feeding value of the pellet in diets containing 20% MDGS were calculated using the same equation described previously. Dietary NE_m and NE_g values were calculated for each treatment based on intake and performance of cattle, and analyzed as performance data.

During initial processing steers were vaccinated with Vision 7® and Vista 5®. Calves were also implanted with Revalor®-XS. Steers were pen weighed one day prior to harvest. Steers were harvested on day 184 at Greater Omaha Pack (Omaha, Neb). Carcass characteristics consisting of hot carcass weight (HCW), liver abscesses, USDA marbling score, 12th rib fat thickness, and LM area were collected. For USDA

Table 1. Dietary treatments (DM basis) to evaluate the effects of replacing 10, 20, or 30% corn (DM basis) with a pelleted treated corn stover and DDGS in diets containing 20 or 40% MDGS.

	40				20		
Ingredient	0[1]	10	20	30	10	20	30
DRC:HMC[2]	51	41	31	21	61	51	41
MDGS	40	40	40	40	20	20	20
Pellet	—	10	20	30	10	20	30
Wheat straw	5	5	5	5	5	5	5
Supplement[3]							
Fine ground corn	1.767	2.753	3.507	3.507	2.489	3.257	3.507
Limestone	1.740	0.754	—	—	0.768	—	—
Salt	0.300	0.300	0.300	0.300	0.300	0.300	0.300
Urea	—	—	—	—	0.250	0.250	—
Tallow	0.100	0.100	0.100	0.100	0.100	0.100	0.100
Trace mineral[4]	0.050	0.050	0.050	0.050	0.050	0.050	0.050
Vitamin A-D-E[5]	0.0150	0.0150	0.0150	0.0150	0.0150	0.0150	0.0150
Rumensin-90[6]	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165
Tylan-40[7]	0.0113	0.0113	0.0113	0.0113	0.0113	0.0113	0.0113

[1]Control treatment.
[2]50:50 blend of DRC and HMC.
[3]Supplement formulated to be fed at 4% of dietary DM.
[4]Premix contained 10% Mg, 6% Zn, 4.5% Fe, 2% Mn, 0.5% Cu, 0.3% I, and 0.05% Co.
[5] Premix contained 1,500 IU of vitamin A, 3,000 IU of vitamin D, and 3.7 IU of vitamin E•g-1.
[6]Formulated to provide 300 mg/head/day.
[7]Formulated to provide 90 mg/head/day.

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Table 2. Effects of replacing corn with 10, 20, or 30% (dietary DM) with a pelleted treated corn stover and DDG with either 20 or 40% MDGS along with a control diet that included 5% untreated stalks and 40% MDGS.

	40% MDGS						20% MDGS						*P*-values	
	0[1]	10	20	30	Lin[2]	Quad[3]	10	20	30	Lin[4]	Quad[5]	SEM	F-Test[6]	Inter[7]
IBW, lb	679	681	680	678	0.31	0.11	681	679	678	0.27	0.89	1.2	0.58	1.0
FBW, lb[8]	1452	1461	1470	1448	0.77	0.12	1447	1442	1406	0.22	0.57	16.4	0.20	0.90
DMI, lb/day	23.27^{a}	23.48^{ab}	24.07^{bc}	24.13^{bc}	0.05	0.81	24.00^{b}	24.81^{c}	24.08^{bc}	0.84	0.03	0.28	0.02	0.70
ADG, lb/day	4.22	4.26	4.32	4.21	0.86	0.15	4.19	4.17	3.98	0.24	0.95	0.08	0.21	0.74
F:G	5.51^{a}	5.51^{a}	5.58^{a}	5.73^{ab}	0.04	0.30	5.73^{ab}	6.02^{b}	6.06^{b}	0.22	0.58	0.13	0.02	0.79
NE_m	2.05^{a}	2.04^{a}	2.01^{a}	1.98^{ab}	0.25	0.67	1.98^{ab}	1.93^{b}	1.91^{b}	0.17	0.59	0.03	<0.01	0.86
NE_g	1.38^{a}	1.38^{a}	1.36^{a}	1.33^{ab}	0.25	0.67	1.32^{ab}	1.28^{b}	1.17^{b}	0.17	0.59	0.02	<0.01	0.86
HCW, lb	916^{b}	922^{b}	927^{b}	914^{b}	0.77	0.12	913^{b}	930^{b}	887^{a}	0.03	<0.01	6.6	<0.01	0.73
LM area, in^2	14.0	13.9	14.0	13.7	0.32	0.52	13.9	14.0	13.7	0.44	0.47	0.19	0.80	0.99
12^{th} rib fat, in	0.57	0.56	0.60	0.58	0.82	0.39	0.55	0.62	0.58	0.45	0.04	0.03	0.42	0.77
Marbling	464	478	472	457	0.59	0.16	500	484	469	0.09	0.95	10.70	0.13	0.91
YG	3.42	3.45	3.53	3.52	0.51	0.89	3.40	3.63	3.43	0.85	0.70	0.11	0.72	0.68

[a-d]From the F-test, means with differing superscripts are different ($P < 0.05$).
[1]Control treatment with no pellet.
[2]Linear contrasts for pellets with 40% MDGS.
[3]Quadratic contrasts for pellets with 40% MDGS.
[4]Linear contrasts for pellets with 20% MDGS.
[5]Quadratic contrasts for pellets with 20% MDGS.
[6]Overall F-test statistic comparing the Control (i.e., 0 pellet inclusion) to all other treatments.
[7]MDGS inclusion level by pellet inclusion level interaction.
[8]Calculated as HCW/common dress (63%).

calculated YG, KPH fat was assumed to be 2.5%. Hot carcass weights were used to calculate adjusted final BW by dividing HCW by a common dressing percentage (63%). Yield grade was calculated using the equation: USDA YG = 2.5+ 2.5(12^{th} rib fat thickness, in) – 0.32(LM are, in^2) + 0.2 (KPH fat, %) + 0.0038 (HCW, lb).

Steer performance and carcass characteristics were analyzed as a 2 x 3 plus 1 factorial using the MIXED procedure of SAS (SAS Institute, Inc., Cary, N.C.) as a randomized block design with pen as the experimental unit. Weight block was considered a fixed effect. Orthogonal and linear contrasts were used to determine the response curve of the pellet with in the MDGS inclusion level.

Results

There were no interactions ($P \geq 0.68$) in cattle performance observed (Table 2) for the 2 x 3 factorial. No differences were observed in FBW ($P = 0.20$). However, there was a significant difference ($P = 0.02$) in DMI with the control diet consuming the least amount of feed and the treatment containing 20% MDGS and 20% pellet consuming the most. There was a linear increase ($P = 0.05$) in DMI as pellet inclusion increased in the treatments containing 40% MDGS. Increased intake as pellet inclusion increased would be expected, due to an increased passage rate of the pellet compared to the corn it is replacing, resulting from the small particle size of the pellet. However, DMI had a quadratic response ($P = 0.03$) as pellet inclusion increased in diets containing 20% MDGS. There were no significant differences ($P = 0.21$) in ADG between the control and the remaining six treatments. Cattle consuming diets containing 40% MDGS gained more ($P = 0.05$) than the cattle consuming diets containing 20%. Based on previous research, this was expected.

There was a linear increase ($P = 0.04$) in F:G as the level of pellet increased in diets containing 40% MDGS; however, there was no statistical difference between the control and diets containing 10 and 20% pellet with 40% MDGS. It was estimated that the pellet is 100% the feeding value of corn when fed at 10% of diet, 94% the value of corn when fed at 20% of the diet, and 88% the value of corn when fed at 30% of the diet with 40% MDGS. The control, 10% pellet, 20%, and 30% pellet in diets containing 40% MDGS had a statistically similar NE_m and NE_g.

The 10% pellet/20% MDGS treatment had a similar F:G compared to the 40% MDGS treatments. However, the treatments containing 20 and 30% pellet with 20% MDGS had ($P = 0.02$) greater F:G. Similarly, the calculated NE_m or NE_g were greater for the 10% pellet compared to the 20% and 30% pellet in diets containing 20% MDGS. Using an estimated F:G of 5.65 for a control diet containing 20% MDGS and 0% pellet, the pellet is 83% the feeding values of corn when fed at 10% of the diet, 69% the feeding value of corn when fed at 20% of the diet, and 77% the feeding value of corn when fed at 30% of the diet.

No interactions in carcass characteristics ($P \geq 0.68$) were observed when analyzing the 2 x 3 factorial. Similarly, there were no differences in LM area, 12^{th} rib fat, marbling, or calculated yield grade. However, cattle consuming the treatment containing 30% pellet with 20% MDGS had lower ($P < 0.01$) HCW than all other treatments.

In conclusion, the pelleted DDG and treated corn stover is a viable option to replace corn in finishing diets; however, the level at which corn can be replaced depends on the level of distillers grains being fed. These data illustrate that up to 20% of corn can be replaced with a treated stover/DDG pellet when it is fed with 40% MDGS with no loss in performance. However, when feeding a diet containing 20% MDGS, up to 10% of corn can be replaced with the pellet without negatively impacting performance.

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