Feeding Elevated Levels of Corn Silage and MDGS in Finishing Diets

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Summary

A finishing experiment evaluated substitution of corn silage and modified distillers grains with solubles (MDGS) in place of corn. The treatment arrangement was a 2 X 2 + 1 factorial with 15 or 45% corn silage and 20 or 40% MDGS plus a control containing 5% cornstalks and 40% MDGS. There were interactions between corn silage and MDGS for carcass adjusted performance. As corn silage inclusion was increased in the diet, F:G increased when fed with 20% MDGS, however there was no difference when fed with 40% MDGS.

Introduction

Corn silage in beef finishing diets has been shown to be economical especially in times of high priced corn. We previously reported (*2013 Nebraska Beef Cattle Report*, pp. 74-77) that when corn silage partially replaced corn in finishing diets containing distillers grains, ADG and feed efficiency were poorer as corn silage inclusion increased in calf-fed steers. However, despite poorer F:G, feeding elevated corn silage was economical. The objectives of this experiment were to 1) determine the performance effects and carcass characteristics of feeding elevated levels of corn silage and the impact of dietary inclusion of MDGS and 2) assess the feeding values of corn silage and MDGS relative to corn.

Procedure

Crossbred yearling steers (n = 295; BW = 1,030 ± 114 lb) were sorted into six weight blocks and assigned randomly to 30 pens (9 or 10 steers/pen). Treatments were designed as a 2 X 2 + 1 factorial arrangement consisting of 15% or 45% corn silage and 20% or 40% MDGS (15:20 - 15% corn silage, 20% MDGS; 15:40 - 15% corn silage, 40% MDGS; 45:20 - 45% corn silage, 20% MDGS; and 45:40 - 45% corn silage, 40% MDGS) and a control diet consisting of 5% cornstalks and 40% MDGS (Table 1). Elevated levels of corn silage and MDGS replaced a 1:1 blend of dry-rolled corn:high-moisture corn. All steers were fed a supplement formulated for 30 g/ton Rumensin® (DM basis) and a targeted intake of 90 mg/steer daily of Tylan®. Steers were implanted with Revalor®-200 on day 1. One block of steers were harvested after 91 days on feed. Five blocks were harvested after 98 days on feed. Prior to being transported to a commercial abattoir (Greater Omaha Packing Co., Inc., Omaha, Neb.), pens of steers were weighed on a platform scale. A 4% pencil shrink was applied to this weight for final live BW and calculation of dressing percentage. Steers were weighed in the afternoon prior to evening shipping, with slaughter the following morning. On the last day of feeding, pens were fed 50% of the previous day's intake at the normal morning feeding time. Hot carcass weight was obtained the day of harvest. Carcass adjusted final BW, used in calculation of ADG and F:G, was calculated from HCW and a common dressing percentage (62%). Marbling score, 12th rib fat thickness, and LM area were recorded after a 48 hour (one block) or 144 hour (five blocks) carcass chill. The longer chill was equal across treatments and was due to scheduling at the plant.

Performance and carcass data were analyzed as a 2 X 2 + 1 factorial in a randomized block design using the mixed procedure of SAS (SAS Institute, Inc., Cary, N.C.). Pen was the experimental unit, and BW block was included as a fixed effect. Main effects of corn silage and MDGS inclusion were tested as well as the interaction of corn silage and MDGS. The control was included for the analysis of an overall F-test across all treatments. Treatment differences were considered significant at $P < 0.10$.

Results

There was no difference in DMI across treatments ($P = 0.48$; Table 2). There was a corn silage by MDGS interaction for final BW, ADG, and F:G ($P < 0.10$). For cattle fed 15% corn silage diets, ADG was 0.31 lb greater for cattle fed 20% MDGS in comparison to 40% MDGS ($P = 0.11$). There was no statistical difference in final BW ($P = 0.11$) or F:G ($P = 0.13$) for cattle fed 15% corn silage diets with

Table 1. Diet composition (DM basis).

	Treatment[1]				
	Control	15:20	15:40	45:20	45:40
DRC[2]	25.0	30.0	20.0	15.0	5.0
HMC[3]	25.0	30.0	20.0	15.0	5.0
Corn Silage	0.0	15.0	15.0	45.0	45.0
Cornstalks	5.0	0.0	0.0	0.0	0.0
MDGS[4]	40.0	20.0	40.0	20.0	40.0
Supplement[5]	5.0	5.0	5.0	5.0	5.0

[1]15:20 = 15% Corn Silage, 20% MDGS; 15:40 = 15% Corn Silage, 40% MDGS; 45:20 = 45% Corn Silage, 20% MDGS; 45:40 = 45% Corn Silage, 40% MDGS
[2]DRC = Dry-rolled corn.
[3]HMC = High-moisture corn.
[4]MDGS = Modified distillers grains with solubles.
[5]Formulated for 30 g/ton of DM for Rumensin and to provide 90 mg/steer daily for Tylan®.

Table 2. Effect of corn silage and MDGS inclusion on cattle performance and carcass characteristics.

	Treatment[1]						*P*-value[2]			
	Control	15:20	15:40	45:20	45:40	SEM	F-test	Int.	Silage	MDGS
Performance										
Initial BW, lb	1036	1032	1032	1034	1034	2.2	0.17	0.30	0.09	0.72
Final BW, lb[3]	1393	1415	1385	1367	1385	11.0	0.12	0.09	0.08	0.58
DMI, lb/day	29.1	29.5	28.7	29.5	29.8	0.4	0.48	0.24	0.34	0.47
ADG, lb[3]	3.70[ab]	3.95[a]	3.64[b]	3.44[b]	3.62[b]	0.11	0.09	0.08	0.06	0.59
Feed:Gain[3]	7.87[ab]	7.46[a]	7.87[ab]	8.55[c]	8.20[bc]		0.01	0.08	<0.01	0.71
Live final BW, lb	1433	1455	1422	1433	1440	13.2	0.48	0.18	0.84	0.34
Carcass Characteristics										
HCW, lb	864	877	858	849	858	6.6	0.12	0.09	0.08	0.57
Dressing percentage, %	60.3[a]	60.3[a]	60.3[a]	59.1[b]	59.6[b]	0.3	0.01	0.37	<0.01	0.40
LM area, in^2	13.9[a]	14.0[a]	13.4[b]	13.5[b]	13.5[b]	0.1	0.04	0.09	0.27	0.11
12th-rib fat, in	0.47	0.47	0.50	0.47	0.48	0.02	0.65	0.82	0.65	0.20
Calculated YG	3.01	3.03	3.20	3.06	3.14	0.08	0.38	0.58	0.84	0.15
Marbling Score[4]	540[b]	583[a]	548[b]	554[b]	532[b]	11.0	0.03	0.54	0.05	0.02

[1]15:20 = 15% Corn Silage, 20% MDGS; 15:40 = 15% Corn Silage, 40% MDGS; 45:20 = 45% Corn Silage, 20% MDGS; 45:40 = 45% Corn Silage, 40% MDGS

[2]F-test= *P*-value for the overall F-test of all diets. Int. = *P*-value for the interaction of corn silage X MDGS. Silage = *P*-value for the main effect of corn silage inclusion. MDGS = *P*-value for the main effect of MDGS inclusion.

[3]Calculated from hot carcass weight, adjusted to a common 62% dressing percentage.

[4]Marbling Score: 400 = Slight00, 500 = Small00.

[abcd]Within a row, values lacking common superscripts differ ($P < 0.10$).

20 or 40% MDGS; however cattle fed 20% MDGS had numerically greater final BW and improved F:G. For diets containing 45% corn silage, there were numerical improvements for final BW, ADG, and F:G ($P \geq 0.31$) for cattle fed 40% MDGS compared to 20% MDGS. When cattle were fed 20% MDGS diets with 15% corn silage in contrast to 45% corn silage, there was an improvement in ADG (0.51 lbs; $P = 0.01$), F:G (13% more efficient; $P < 0.01$), and an increase of 48 lb of final BW ($P = 0.02$). For cattle fed 40% MDGS diets, there was no difference in final BW, ADG, or F:G ($P \geq 0.33$) across corn silage inclusions; however, numerically the cattle fed 15% corn silage were 4% more efficient. The overall F-test including the control indicated cattle on 15:20 had greater ADG than cattle on 15:40, 45:20, and 45:40 ($P \leq 0.08$). Cattle fed the control diet were not different in regards to ADG compared with all other treatments ($P \geq 0.14$). Control, 15:20, and 15:40 cattle had the most favorable F:G ($P \leq 0.04$). Feed:gain ($P \geq 0.24$) were not different between cattle on control, 15:40, and 45:40 treatments. Feed:gain did not differ between cattle on 45:20 or 45:40 treatments ($P = 0.27$); however, cattle fed 45% corn silage with 20% MDGS had poorer F:G than control, 15:20, and 15:40 ($P \leq 0.04$). Feeding values relative to corn were calculated from G:F (the inverse of F:G). For the 30% replacement of corn by corn silage, the feeding value of corn silage was 58% in 20% MDGS diets and 70% in 40% MDGS diets.

There was an interaction for HCW ($P = 0.09$), which parallels previously mentioned carcass adjusted performance. There was no difference in live final BW across treatments ($P = 0.48$). These cattle were fed during a wet winter and consequently went to slaughter with a high degree of mud and tag on the cattle, but these should be equal across all treatments. Cattle fed 45% corn silage had a 0.97 percentage unit lower dressing percent than cattle fed 15% corn silage (59.32% vs. 60.29%; $P < 0.01$). Cattle fed the control diet had a dressing percentage that was not different from cattle fed 15% corn silage diets ($P \geq 0.97$). These differences in dressing percentage illustrate the need to make conclusions for ADG and F:G based on carcass-adjusted performance. When forage is increased in the diet, live final BW is inflated due to gut fill. There was no difference in 12th-rib fat thickness or calculated yield grade ($P \geq 0.15$). Replacement of corn with either corn silage or MDGS decreased marbling scores ($P \leq 0.05$). Cattle on the 15:20 treatment had higher marbling scores ($P = 0.07$) than all other treatments.

Data from this experiment suggest that feeding higher levels of corn silage (45% instead of 15%) results in poorer ADG and F:G when fed in combination with 20% MDGS; however, when the elevated level of corn silage is fed with 40% MDGS, there is not as much depression in ADG and F:G. Cattle on higher levels of corn silage (or any roughage) will have lower dressing percentages due to gut fill.

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