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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 experimental arrangement was a 2 X 2 + 1 factorial with diets containing 15 or 45% corn silage and 20 or 40% MDGS as well as a control containing 5% cornstalks and 40% MDGS. There were no interactions between corn silage and MDGS inclusion for carcass adjusted performance. As corn silage inclusion increased in the diet, there was a modest reduction in ADG and an increase in F:G. When MDGS inclusion was increased, ADG and F:G were improved. Cattle fed 40% MDGS with 15% corn silage instead of 5% cornstalks had 5% improved F:G.

Introduction

Corn silage in beef finishing diets has been shown to be economical especially in times of high priced corn. It was previously reported (*2013 Nebraska Beef Cattle Report*, pp. 74-75) 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, the depression in feed efficiency was not as dramatic as previously reported with elevated levels of corn silage in diets containing no distillers grains (*2000 Nebraska Beef Cattle Report*, pp. 68-71). Despite poorer F:G, feeding elevated levels of corn silage was economical when fed with MDGS (*2013 Nebraska Beef Cattle Report*, pp. 76-77). 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 (766 ± 60 lb) were sorted into three weight blocks and assigned randomly to 25 pens (9 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-XS on day 1. One block (5 pens) of steers was harvested after 134 days on feed. Two blocks (20 pens) were harvested after 148 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. 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 (63%). Marbling score, 12th rib fat thickness, and LM area were recorded after a 48 hour carcass chill.

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. There were no interactions for any of the tested variables; therefore, the interaction term was taken out of the statistical model. The control was compared to all treatments using an overall F-test across all treatments. Treatment differences were considered significant at $P < 0.10$.

Table 1. Diet composition (DM basis) fed to finishing yearlings.

	Treatment[1]				
	Control	15:20	45:20	15:40	45:40
Dry-rolled corn	25.5	30.5	15.5	20.5	5.5
High-moisture corn	25.5	30.5	15.5	20.5	5.5
Corn silage	0.0	15.0	45.0	15.0	45.0
Cornstalks	5.0	0.0	0.0	0.0	0.0
MDGS[2]	40.0	20.0	20.0	40.0	40.0
Supplement[3]	4.0	4.0	4.0	4.0	4.0

[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]MDGS= Modified distillers grains with solubles.
[3]Formulated for 30g/ton of DM Rumensin and to provide 90 mg/steer daily Tylan.

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Table 2. Effect of corn silage and modified distillers grains with solubles (MDGS) inclusion on cattle performance and carcass characteristics.

	Treatment[1]						*P*-value[2]			
	Control	15:20	45:20	15:40	45:40	SEM	F-test	Int.	Silage	MDGS
Performance										
Initial BW, lb	767.5	767.6	765.6	763.7	766.5	1.8	0.51	0.18	0.85	0.40
Final BW, lb[3]	1396	1387	1374	1405	1379	9.6	0.18	0.41	0.01	0.12
DMI, lb/day	27.2	26.1	26.9	26.4	26.7	0.3	0.13	0.41	0.07	0.86
ADG, lb[3]	4.32	4.26	4.19	4.42	4.22	0.06	0.11	0.18	0.01	0.06
Feed:Gain[3]	6.28^{bc}	6.13^{ab}	6.42^{c}	5.98^{a}	6.33^{c}	0.002	<0.01	0.61	<0.01	0.07
Live final BW, lb	1422	1425	1418	1437	1411	9.0	0.35	0.20	0.04	0.75
Carcass Characteristics										
HCW, lb	879	874	866	885	869	6.0	0.18	0.41	0.01	0.12
Dressing percentage, %	61.9	61.3	61.1	61.6	61.6	0.2	0.22	0.54	0.51	0.08
LM area, in^2	13.0	13.1	13.1	13.0	12.7	0.21	0.62	0.39	0.38	0.15
12th-rib fat, in	0.66	0.63	0.63	0.70	0.63	0.03	0.43	0.27	0.25	0.26
Calculated YG	3.81	3.72	3.69	3.96	3.83	0.12	0.54	0.66	0.43	0.09
Marbling score[4]	451	437	455	459	432	17.4	0.74	0.12	0.74	0.99

[1]Control = 5% cornstalks, 40% MDGS; 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 63% dressing percentage.
[4]Marbling score: 400 = Small00, 500 = Modest00
[a-c]Within a row, values lacking common superscripts differ ($P < 0.10$).

Results

There were no interactions between corn silage X MDGS inclusion for any of the tested variables ($P \geq 0.12$; Table 2). Steers fed 45% corn silage instead of 15% had slightly greater DMI (26.8 vs. 26.3; $P = 0.07$) and decreased ADG (4.21 vs. 4.34; $P = 0.01$). This translated to steers fed 45% corn silage being 5.2% less efficient in comparison to steers fed 15% corn silage (6.37 vs. 6.05; $P < 0.01$). The 30% substitution of corn silage for corn (1:1 blend of high-moisture corn:dry-rolled corn) in this experiment resulted in a calculated feeding value for corn silage of 83% of the corn blend. Carcass adjusted final BW and hot carcass weight was 19.3 and 12.2 lb less, respectively, for steers fed 45% corn silage ($P = 0.01$). Unexpectedly, dressing percentage was not different between silage inclusion levels ($P = 0.51$). All other carcass characteristics were similar across corn silage levels ($P > 0.25$).

There was no difference in DMI when steers were fed 20 or 40% MDGS ($P = 0.12$). When MDGS was increased in the diet from 20% to 40%, ADG was increased from 4.22 to 4.32 lb/day ($P = 0.06$). Steers fed 40% MDGS compared to 20% MDGS were 2.3% more efficient, with steers fed 40% MDGS having a F:G of 6.42 in comparison to a F:G of 6.28 for steers fed 20% MDGS ($P = 0.07$). The feeding value for the 20% substitution of MDGS for corn (1:1 blend of high-moisture corn:dry-rolled corn) in this experiment resulted in a calculated feeding value of 110% of corn for MDGS. This feeding value agrees well with previously reported feeding values for MDGS for the 20% substitution of corn between inclusion levels of 20% and 40% MDGS. There was no statistical difference in carcass adjusted final BW ($P = 0.12$) between MDGS levels; however, there was a numerical increase of 11.4 lb for cattle fed 40% in comparison to 20% MDGS. There was a slight increase in dressing percentage and calculated yield grade for cattle fed 40% MDGS in comparison to 20% MDGS ($P = 0.08$ and 0.09, respectively). There were no differences in other carcass characteristics for cattle fed 20 or 40% MDGS ($P \geq 0.15$).

The control treatment (5% cornstalks and 40% MDGS) was compared with all other treatments in the overall F-test. There were no differences in DMI, ADG, or final BW across all treatments ($P > 0.11$). Steers fed the control diet had 5.0% poorer F:G compared to steers fed the 15:40 treatment ($P < 0.01$), but similar F:G compared to the 15:20, 45:20, and 45:40 treatments ($P \geq 0.15$). Using the F-test statistics, steers fed the 15:40 treatment had similar F:G as steers fed 15:20, but improved F:G compared to all other treatments ($P < 0.01$). There were no differences in carcass characteristics according to the overall F-test ($P \geq 0.18$).

In contrast to our hypothesis, results from this study do not suggest additive synergy from elevated levels of both MDGS and corn silage. MDGS included as low as 20% of the diet may promote a more positive rumen environment compared to diets containing no MDGS. As corn silage inclusion increased in the diet, there was a modest reduction in ADG and an increase in F:G. When MDGS inclusion was increased, ADG and F:G were improved. Cattle fed 40% MDGS with the roughage source of 15% corn silage instead of 5% cornstalks had improved F:G.

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