Impact of Constant Inclusion or Decreasing Inclusion of Distillers Grains with High-quality or Low-quality Roughage on Finishing Cattle Performance

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Summary with implications

A finishing trial was conducted to evaluate high-quality or low-quality roughage inclusion in diets containing three concentrations of modified distillers grains plus solubles on finishing cattle performance. In a randomized block design, steers were fed according to a 2x3 factorial arrangement with two roughage sources (6% corn stalks versus 12% corn silage) in three diets containing 0, 15, or decreasing inclusion of distillers (30, 15, then 0% across the feeding period). No interactions were observed between distillers inclusion and roughage source except for intake. Steers fed corn silage consumed less, gained the same, and had slightly better feed conversions. Steers fed 0% distillers grains had lower average daily gain, hot carcass weight, less 12th rib fat, and poorer feed conversion compared with those fed 15% distillers grains. Steers fed 15% distillers continuously had greater intake and gain compared to steers fed decreasing inclusion of distillers from 30% to 0% (average inclusion of 15%), but feed conversion was not impacted.

Introduction

Roughage is included in feedlot diets to improve rumen health and to increase dry matter intake and average daily gain. Previous research suggested that roughage sources can be exchanged if forage neutral detergent fiber (NDF) is maintained, without affecting cattle performance. Results from other experiments also suggested that roughage concentrations may vary without having a negative impact on average daily gain and cattle efficiency when fed with corn gluten feed, but not with distillers grains plus solubles. When fed at 30% distillers grains in the diet, feeding low-quality forages like cornstalks yielded the same performance as feeding higher quality forage (alfalfa hay or corn silage). Under current economic conditions, dietary inclusion of distillers grains average is approximately 15%; thus, a question asked is what is the impact of feeding cornstalks instead of high-quality roughages when distillers supply is reduced?

The objective of this study was to evaluate the effects of feeding high-quality or low-quality roughage in diets containing 0% or 15% distillers or those where distillers inclusion is phased from 30% to 0% on finishing cattle performance and carcass quality.

Table 1. Dietary treatment composition for cattle fed 0% MDGS, 15% MDGS and 30–0 (15)% MDGS with either corn silage or corn stalks as roughage source.

	Treatments[1]					
	Corn silage			Corn stalks		
Ingredient	0	15	30–0 (15)	0	15	30–0 (15)
Dry-rolled corn	41.5	34	Variable	44.5	37	Variable
High-moisture corn	41.5	34	Variable	44.5	37	Variable
Distillers grains	0	15	30-15-0	0	15	30-15-0
Corn silage	12	12	12	-	-	-
Corn stalks	-	-	-	6	6	6
Supplement[2]	5	5	5	5	5	5
Urea	1.2	0	variable	1.2	0.5	Variable

[1] Treatments included 0% MDGS, 15% MDGS, or diets with 30% MDGS fed for the first 1/3 of the feeding period, 15% MDGS fed for the middle 1/3 of the feeding period, and then stepped to 0% MDGS inclusion the last 1/3 of the feeding period.

[2] Supplements provided minerals, vitamins, 30 g/ton monensin (Rumensin, Elanco Animal Health) and to provide 90 mg/steer daily of tylosin (Tylan, Elanco Animal Health)

Procedure

An experiment was conducted at the Eastern Nebraska Research, Extension and Education Center. Crossbred steers (n = 480 steers, initial BW 644 ± 43 lb) were utilized in a randomized block experiment with a 2 ×3 factorial arrangement of treatments, for which 48 pens were used, with 8 pens per treatment and 10 steers per pen. Dietary treatments (Table 1) included two roughage sources (6% corn stalks versus 12% corn silage DM basis) in three diets containing 0, 15%, or decreasing inclusion of distillers (30, 15, then 0% across the feeding period).

Steers were limit-fed at 2% BW for five days to equalize gut fill and were weighed on two consecutive days at the beginning of the trial to determine initial body weight. Steers were assigned randomly to pen and blocked by initial body weight. Steers were implanted with Revalor-IS on day 1 and reimplanted with Revalor-200 on day 78 of the feeding period. Steers were fed ractopamine (Optaflexx, Elanco Animal Health) the last 28 d at 300 mg/steer daily with 2 days removed prior to slaughter. After 196 days on feed, cattle were harvested at a commercial abattoir where hot carcass weight (HCW) and incidence of liver abscesses were recorded. After a 48-hour chill, marbling score, longissimus muscle (LM) area and back fat thickness were recorded, and yield grade was calculated.

Data were analyzed using the Mixed procedure of SAS. Pen was set as the experimental unit and treatment was a fixed effect. Interactions between roughage and distillers treatment were tested. If not

Table 2. Main effects of modified distillers grains plus solubles (MDGS) inclusion on feedlot cattle performance and carcass characteristics

	Distillers grain inclusion[1]					
	0 DGS	15 DGS	30-15-0	SEM	F-test	15 vs 30-15-0
Initial BW, lb	646	645	647	0.8	0.47	0.23
DMI, lb/d	22.2[c]	24.4[a]	23.2[b]	0.17	<0.01	<0.01
ADG, lb	3.73[c]	4.18[a]	4.06[b]	0.045	<0.01	< 0.01
F:G[2]	6.20[a]	5.95[b]	5.85[b]	-	<0.01	0.25
HCW, lb	874[b]	930[a]	916[a]	5.6	<0.01	0.07
LM area[3], in	14.3	14.4	14.5	0.12	0.53	0.99
Fat, in	0.55[b]	0.68[a]	0.65[a]	0.023	<0.01	0.32
Marbling[4]	538[b]	562[a]	544[b]	7.1	0.03	0.06

[a-c] Within a row, means without a common superscript differ ($P < 0.06$)

[1] Treatments included 0% MDGS, 15% MDGS, or diets with 30% MDGS fed for the first 1/3 of the feeding period, 15% MDGS fed for the middle 1/3 of the feeding period, and then stepped to 0% MDGS inclusion the last 1/3 of the feeding period.

[2] Analyzed as G:F, the reciprocal of F:G

[3] LM area = longissimus muscle (ribeye) area

[4] Marbling score 400 = Small00, 500 = Modest00, 600 = Moderate00

Table 3. Main effects of roughage source on feedlot cattle performance and carcass characteristics

	Roughage source			
	Silage	Stalks	SEM	*P*-value
Initial BW, lb	646	646	0.7	0.76
DMI, lb/d	23.1	23.4	0.14	0.12
ADG, lb	4.03	3.96	0.038	0.19
F:G[1]	5.89	6.10	-	<0.01
HCW, lb	911	902	4.7	0.18
LM area[2], in	14.3	14.5	0.10	0.13
Fat, in	0.64	0.62	0.019	0.44
Marbling[3]	554	542	5.9	0.11

[1] Analyzed as G:F, the reciprocal of F:G

[2] LM area = longissimus muscle (ribeye) area

[3] Marbling score 400 = Small00, 500 = Modest00, 600 = Moderate00

significant, then main effects were summarized for either effect of distillers treatment or roughage source. If significant, then simple effect of roughage source within distillers diet were evaluated.

Results

There was an interaction ($P = 0.04$) between roughage source and MDGS inclusion for dry matter intake (DMI). Cattle fed diets with 0% distillers inclusion had the lowest DMI for both roughage sources, which increased by about 2 lb per day over the feeding period when 15% distillers was included. The reason for the interaction is that when distillers decreased from 30% to 0% over the feeding period, intake response was slightly different depending on which roughage source was used. Cattle fed silage had intakes of 22.3, 24.2, and 22.7 lb/d for 0, 15, and 30–0%, respectively. For cattle fed stalks as the roughage source, intakes were 22.0, 24.5, and 23.6 lb/d for 0, 15, 30–0%, respectively. No other significant interactions were observed, so main effects are presented.

Cattle fed the diet with 0% MDGS inclusion (Table 2) had reduced ($P < 0.05$) HCW, ADG, and 12th rib fat, and greater F:G compared to cattle fed diets where MDGS was 15% inclusion continuously or when MDGS decreased from 30% to 0%. Even though the average inclusion of MDGS was 15% for the treatment where MDGS was decreased from 30% to 0%, performance differed from that of cattle fed 15% distillers continuously. Cattle fed decreasing inclusions of MDGS (30–0%) had lower ($P < 0.01$) DMI, ADG and tended ($P = 0.07$) to have lighter HCW. Feed conversion was not ($P = 0.25$) affected when distillers was fed at 15% continuously or when decreased from 30% to 0% inclusion. Marbling score was impacted by distillers inclusion ($P = 0.03$), where cattle fed 15% MDGS had greater ($P = 0.01$) marbling score than 0% inclusion and tended ($P = 0.06$) to be greater than cattle fed 30–0% MDGS. Even though there are differences in marbling score across treatments, all three treatments were within the choice grade (Table 2) and reflects ADG differences across treatments.

Cattle fed silage (Table 3) gained the same, and had better feed conversion ($P < 0.01$) compared to steers fed stalks. Based on numerically lower HCW, ADG, fatness, and marbling, these data suggest that feeding 6% corn stalks did not produce similar performance as feeding 12% corn silage. These data suggest that feeding 15% distillers was not enough to offset lower quality roughage (stalks) compared to silage as roughage which contradicts previous studies when 30% distillers were fed.

Conclusion

Cattle fed no distillers grains in feedlot finishing diets had poorer feedlot performance. Lowering distillers inclusion over the feeding period negatively affected intake and gain. With 0% to 15% distillers inclusion, feeding corn silage as a roughage source improved conversion compared to stalks.

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