Effect of Enogen Feed Corn Inclusion in Conventional and Natural Finishing Cattle Diets

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Summary with Implications

Increasing the extent of starch digestibility during finishing could allow producers to improve cattle efficiency. A finishing performance study was conducted to determine the effect of Enogen Feed Corn inclusion as dry-rolled corn and corn silage in comparison to a control corn hybrid within natural and conventional feeding programs for heifers and steers. Cattle in the conventional feeding program received implants and the ration included feed additives, while cattle on the natural program were not implanted and the ration did not contain feed additives. The inclusion of Enogen Feed Corn had no impact on steer or heifer finishing performance. The use of implants and feed additives in the conventional feeding program increased hot carcass weight 12.2% in steers and 7.0% in heifers. When compared to cattle in the natural program, feeding cattle in a conventional program improved feed conversion by 19.4% in steers and 13.0% in heifers.

Introduction

Inclusion of amylase enzymes in finishing rations can improve starch digestion and improve feed efficiency during the finishing period. Enogen Feed Corn (Syngenta Seeds, Inc.) contains an alpha amylase enzyme trait and improves total tract starch digestion when fed as dry-rolled corn with the inclusion of Sweet Bran (Cargill wet milling, Blair, NE) or modified distillers grains (*2016 Nebraska Beef Cattle Report*, pp. 139–142). The improvement in feed efficiency due to inclusion of Enogen Feed Corn as dry-rolled corn in finishing diets has been variable (*2016 Nebraska Beef Cattle Report*, pp. 135–138; *2016 Nebraska Beef Cattle Report*, pp. 143–145). The objective of this study was to evaluate the impact of feeding Enogen Feed corn as dry-rolled corn and corn silage within natural and conventional programs on steer and heifer finishing performance and carcass characteristics.

Table 1. Dietary treatment composition (DM basis) fed to finishing cattle

	Steers		Heifers	
Ingredient	Conventional[1]	Natural	Conventional[1]	Natural
Dry-Rolled Corn[2]	60	60	60	60
Corn Silage[2]	20	20	20	20
MDGS[3]	14	14	14	14
Supplement	6	6	6	6

[1] Rumensin-90 was formulated in the diet at 30 g/ton

[1] Tylan-100 was formulated in the diet at 8.8 g/ton

[1] MGA was formulated in the conventional heifer treatment diet at 0.5 mg/hd/d

[2]Cattle on the ENO treatment received the Enogen Feed Corn hybrid DRC and corn silage while cattle on the CON treatment received the control corn hybrid as DRC and corn silage

[3]MDGS = Modified distillers grains plus solubles

Procedure

Crossbred steers (n=400; initial BW= 843± 73 lb) and heifers (n=200; initial BW=728 ± 42 lb) were utilized in a 2 × 2 factorial design study at the University of Nebraska Panhandle Research and Extension Center (PREEC) near Scottsbluff, NE. Factors were corn hybrid type and feeding program. The factor of corn hybrid consisted of Enogen Feed Corn (EFC) inclusion as the dry-rolled corn (DRC) and silage source or a control corn hybrid as the DRC and silage source (CON). Each corn hybrid was fed within a natural feeding program, where the diet did not include additives or implants, or in a conventional feeding program where cattle received implants (Component implants; Elanco Animal Health) and the diet included Rumensin (Elanco Animal Health) at 30 g/ton of DM, Tylan (Elanco Animal Health) at 8.8 g/ton of DM, and MGA (Zoetis) fed to heifers only to provide 0.5 mg/heifer daily (Table 1).

Prior to trial initiation, cattle were limit-fed at approximately 2% of body weight for five days to equalize gut fill. The limit fed diet contained 80% alfalfa hay, 14% MDGS and 6% supplement. Cattle were weighed on d -1. Steers and heifers assigned to the conventional program were implanted on days 0 and 1 (Component TE-S and Component TE-H, for steers and heifers, respectively). Cattle were stratified by weight within sex and blocked by weight. Steers were then assigned randomly to pens within 5 weight blocks for a total of 40 pens and 10 replications per treatment. Heifers were assigned randomly to pens within 3 weight blocks for a total of 20 pens and 5 replications per treatment. Pens were assigned randomly to one of four treatments. Steers and heifers in the conventional program were reimplanted with Component TE-200 (Elanco Animal Health) on day 56.

Cattle were harvested by block at Tyson Fresh Meats, at 155, 175, and 183 d on feed. Hot carcass weight (HCW) and liver abscess scores were recorded on the day of slaughter. After a 48-hour chill, USDA marbling score, longissimus muscle (LM) area, and 12th rib fat depth were recorded. Carcass adjusted final body weight (BW), average daily gain (ADG), and feed efficiency were calculated from final BW based on HCW adjusted to a 63% dress. Feed efficiency (G:F) were analyzed, but data are reported as feed conversion (F:G).

The MIXED procedure of SAS was used

Table 2. Simple effect of program within sex on performance and carcass characteristics

	Steers		Heifers			*P*-value			
Item	CONV[1]	NAT[2]	CONV	NAT	SEM	S*P*E[3]	S*P[4]	Sex	Program
Pens	20	20	10	10					
Performance									
Initial BW, lb	844	843	728	728	1.3	0.71	0.74	<0.01	0.86
Final BW, lb[5]	1523	1357	1353	1263	12.5	0.14	<0.01	<0.01	<0.01
DMI, lb/d[5]	23.8	24.3	24.6	24.2	0.28	0.01	0.02	<0.01	<0.01
ADG, lb/d[5]	3.89	2.96	3.66	3.14	0.075	0.20	<0.01	0.49	<0.01
Feed:Gain[5 6]	6.61	8.20	6.71	7.71	-	0.99	<0.01	<0.01	<0.01
Carcass Characteristics									
HCW, lb	959	855	852	796	7.8	0.14	<0.01	<0.01	<0.01
Yield Grade	3.31	3.20	3.45	3.23	0.081	0.15	0.26	0.12	<0.01
Marbling[7]	564	593	583	575	13.8	0.06	0.09	0.82	0.38
LM area, in²	14.4	13.2	13.3	12.9	0.18	0.34	<0.01	<0.01	<0.01
12th Rib Fat, in	0.57	0.52	0.65	0.56	0.021	0.16	0.21	<0.01	<0.01

[1]CONV = Conventional feeding program received implants and feed additives

[2]NAT = Natural feeding program did not receive implants or feed additives

[3]S*P*E = Sex × program × Enogen Feed Corn inclusion interaction

[4]S*P = Sex × program interaction

[5]Calculated using hot carcass weight with a 63% dressing percentage adjustment

[6] Analyzed as Gain:Feed, reciprocal of Feed:Gain

[7]Marbling Score 500=Modest00, 600=Moderate00

to analyze animal performance and carcass characteristics with pen as the experimental unit and block as a fixed effect. Data were analyzed as a 2 × 2 × 2 factorial assessing interactions between sex, program, and Enogen Feed Corn inclusion. When no interactions were detected, the main effects of Enogen Feed Corn inclusion, program, and sex were evaluated. Simple effects of program within each sex were evaluated when a significant interaction occurred.

Results

No significant feeding program × corn hybrid interactions ($P \geq 0.13$), or sex × corn hybrid interactions ($P \geq 0.12$) were observed. A sex × feeding program × corn hybrid ($P = 0.01$; Table 2) interaction was observed for DMI. Inclusion of Enogen Feed Corn in natural heifer diets tended to increase DMI by 0.25 lb/d ($P = 0.10$), while hybrid inclusion had no impact on DMI of heifers in the conventional feeding program. Feeding Enogen Feed Corn in conventional steer diets tended to increase DMI by 0.7 lb/d ($P = 0.06$) when compared to steers consuming the control corn hybrid diet. Corn hybrid had no impact on DMI when fed in natural steer diets ($P = 0.15$).

Significant sex × feeding program interactions were observed for carcass adjusted final BW, DMI, ADG, F:G, HCW, and LM area ($P < 0.01$). Gains of heifers on the natural program were 0.52 lb/d lower in comparison to heifers in the conventional feeding program ($P < 0.01$). Feeding steers in the natural program reduced ADG by 0.93 lb/d when compared to steers in the conventional program ($P < 0.01$). Carcass adjusted final BW decreased by 166 lb in natural steers and 90 lb in natural heifers compared to conventional programs ($P < 0.01$). Dry matter intake was similar between natural and conventional heifers ($P = 0.31$), while natural steers consumed 1.4 lb/d less than steers in the conventional program ($P < 0.01$). Feed conversions of conventional steers and heifers were not significantly different ($P = 0.96$) while feed conversion improved by 6.0% when comparing natural heifers to natural steers ($P < 0.01$). Compared to cattle in the natural program feed conversion improved by 13.0% when heifers were fed in a conventional program ($P < 0.01$) and 19.4% when steers were fed in a conventional program ($P < 0.01$). Hot carcass weights of steers on the conventional program were 104 lb heavier than HCWs of steers on the natural program. Feeding heifers in the conventional program increased HCW by 56 lb compared to heifers in the natural feeding program ($P < 0.01$). Yield grade and fat depth increased when cattle were fed in the conventional program ($P < 0.01$). Steers were leaner than heifers at slaughter, with 12th rib fat depth being significantly less in steers ($P < 0.01$). Inclusion of Enogen Feed Corn as DRC and silage in finishing heifers and steers decreased LM area by 2.3% compared to cattle fed the control DRC and corn silage ($P = 0.05$; Table 3).

Enogen Feed Corn processed as DRC retained 21% more particles than the conventional corn hybrid on the largest screen (6300 µm, whole corn) (Table 4). The control corn hybrid retained 14.9% more particles on the 3350 µm screen than Enogen Feed Corn. These data suggest Enogen Feed Corn may not have been processed to the extent that the control corn hybrid was processed.

Conclusion

The inclusion of Enogen Feed Corn had no effect on feed conversion in natural or conventional feeding programs. The incorporation of implants and feed addi-

Table 3. Main effect of Enogen Feed Corn inclusion as DRC and corn silage on performance and carcass characteristics

Item	CON[1]	EFC[2]	SEM	*P*-value
Pens	30	30		
Performance				
Initial BW, lb	746	745	0.8	0.44
Final BW, lb[3]	1331	1326	8.1	0.58
DMI, lb/d[3]	23.8	24.1	0.18	0.35
ADG, lb[3]	3.37	3.35	0.049	0.71
Feed:Gain[3 4]	7.16	7.28	-	0.22
Carcass Characteristics				
HCW, lb	839	835	5.1	0.57
Yield Grade	3.19	3.25	0.052	0.30
Marbling[5]	572	565	8.9	0.53
LM area, in^2	13.4	13.1	0.12	0.05
12^{th} Rib Fat, in	0.55	0.56	0.014	0.56

[1]CON = Control corn hybrid included in the diet as DRC and corn silage

[2]EFC = Enogen Feed Corn hybrid included in the diet as DRC and corn silage

[3]Calculated using hot carcass weight with a 63% dressing percentage adjustment

[4] Analyzed as Gain:Feed, reciprocal of Feed:Gain

[5]Marbling Score 500=Modest00, 600=Moderate00

Table 4. Corn particle size distribution of CON DRC and EFC DRC with geometric mean diameter (GMD) and geometric standard deviation (GSD)

	CON[1] DRC		EFC[2] DRC	
Screen Size, µm	Percent Retained	CV	Percent Retained	CV
6300	3.07	69.81	24.09	8.48
4750	29.49	28.98	32.45	15.70
3350	44.48	24.66	29.58	22.74
1700	16.01	2.98	9.56	8.47
1410	1.38	21.97	1.08	7.60
850	2.32	28.82	1.44	21.06
600	0.84	6.51	0.72	59.90
<600	2.41	6.85	1.08	32.85
GMD, µm	3478	-	2848	-
GSD, µm	1445	-	722	-

[1]CON = Control corn hybrid included in the diet as DRC

[2]EFC = Enogen Feed Corn hybrid included in the diet as DRC

tives within the finishing period increased carcass adjusted final BW, HCW, and ADG leading to improved feed conversion for both steers and heifers.

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