Evaluating Syngenta Enhanced Feed Corn Processed as Dry- Rolled or High- Moisture Corn on Cattle Performance and Carcass Characteristics

Melissa L. Jolly- Breithaupt
University of Nebraska-Lincoln, melissa_jolly_brethaupt@unl.edu

Curtis J. Bittner
University of Nebraska-Lincoln, curtis.bittner@unl.edu

Dirk Burken Burken
University of Nebraska-Lincoln, dburken2@unl.edu

Galen E. Erickson
University of Nebraska-Lincoln, gerickson4@unl.edu

Jim C. MacDonald
University of Nebraska-Lincoln, jmacdonald2@unl.edu

See next page for additional authors

Authors
Melissa L. Jolly- Breithaupt, Curtis J. Bittner, Dirk Burken Burken, Galen E. Erickson, Jim C. MacDonald, and Matt K. Luebbe

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Summary

A finishing trial was conducted as a 2x2x2 factorial to determine the effect of Syngenta Enhanced Feed Corn™ containing an alpha amylase enzyme trait (SYT-EFC) compared with the parental isoline control corn without the amylase enzyme trait (Negative Isoline) on cattle performance and carcass characteristics. The two types of corn grain were processed as either dry-rolled corn (DRC) or high-moisture corn (HMC) and fed with either 18% modified distillers grains plus solubles (MDGS) or 35% Sweet Bran. Cattle fed SYT-EFC DRC with MDGS had a 3.9% improvement in feed conversion compared to Negative Isoline DRC. However, this difference was 2.1% when processed as HMC. Cattle fed SYT-EFC DRC with Sweet Bran had a 1.5% improvement in feed conversion compared to Negative Isoline. However, when processed as HMC a decrease of 2.1% was observed. Feeding SYT-EFC corn that has been processed as DRC improves feed conversion in finishing diets.

Introduction

For cattle to maximize feed conversion, starch digestion must be optimized. The degree of corn processing, different corn hybrids, and kernel characteristics have been reported to improve animal performance and digestibility (Theurer, 1986; Harrelson et al., 2009; Jaeger et al., 2006). Two finishing trials have been conducted to compare feeding SYT-EFC corn grain (Syngenta Seeds, Inc.) containing an alpha amylase enzyme trait and a commercially available corn grain without the alpha amylase enzyme trait on animal performance and carcass characteristics (*2016 Nebraska Beef Report* pp. 135). In those experiments, feeding SYT-EFC corn improved F:G when fed as DRC. The objective of this study was to compare SYT-EFC corn to an isoline parental corn without the alpha amylase enzyme trait (Negative Isoline) fed as either DRC or HMC with Sweet Bran or MDGS on cattle performance and carcass characteristics.

Procedure

A 173-d finishing trial was conducted utilizing 384 crossbred steers (initial BW = 685, SD = 46 lb) in a randomized block design, with a 2×2×2 factorial arrangement of treatments. Steers were limit fed a diet at 2% BW consisting of 47.5% alfalfa hay, 47.5% Sweet Bran (Cargill; Blair, NE), and 5% supplement (DM basis) for 5 d prior to the initiation of the experiment. Two-day initial weights were recorded on d 0 and 1 and averaged to determine initial BW. Along with measuring initial BW on d 1, steers were implanted with Revalor-XS. The steers were blocked by BW into light and heavy BW blocks (n =4 and 2 pen replicates, respectively) based on d 0 BW, stratified by BW and assigned randomly to pen. Pens were assigned randomly to 1 of 8 dietary treatments with 8 steers/pen and 6 replications/treatment.

Dietary treatments (Table 1) were arranged in a 2×2×2 factorial with factors including corn processing method (DRC or HMC), corn trait [SYT-EFC or Negative Isoline (NEG)], and byproduct type (MDGS or Sweet Bran). The byproducts utilized in this trial were provided as either a protein source (18% MDGS) or as a means of acidosis control (35% Sweet Bran). Steers were adapted to the finishing diets over a 21-d period with corn replacing alfalfa hay, while inclusion of sorghum silage, Sweet Bran or MDGS, and supplement remained the same in all diets. Diets were formulated to meet or exceed NRC requirements for MP and minerals. The final finishing diets provided 330 mg/steer daily of Rumensin (30 g/ton of DM; Elanco Animal Health, Greenfield, IN), and 90 mg/steer daily of Tylan (8.18 g/ton of DM; Elanco Animal Health, Greenfield, IN).

All steers were harvested on d 174 at a commercial abattoir (Greater Omaha, Omaha, NE). Feed offered on d 173 was 50% of the previous day DMI. Steers were removed from pens and weighed by pen at 1600 h. Steers were shipped to the commercial abattoir and held until the next d for slaughter. Hot carcass weights and livers scores were recorded on the d of slaughter with 12th rib fat thickness, LM area, and USDA marbling score being recorded after a 48-h chill. Yield grade was calculated using the USDA YG equation [YG = 2.5 + 2.5 (fat thickness, in)–0.32 (LM area, in^2) + 0.2 (KPH fat, %) + 0.0038 (HCW, lb)]. Final BW, ADG, and F:G were calculated using HCW adjusted to a common 63% dressing percentage.

Performance and carcass characteristics were analyzed using the MIXED procedure of SAS (SAS Institute, Inc., Cary, N.C.). Pen was used as the experimental unit and BW block was included as a fixed effect. Data were analyzed as a 2×2×2 factorial with main factors including corn processing, corn trait, and byproduct type. The model included the main effects with all 2-way and 3-way interaction terms.

Results

No 3-way interactions were observed *(P* ≥ 0.21; Table 2) between corn processing, corn trait, and byproduct type for all performance and carcass data. However, cattle fed SYT-EFC DRC with MDGS had a 3.9% improvement in feed conversion compared to NEG DRC. When fed as HMC, feed conversion between SYT-EFC and NEG with MDGS differed by 2.1%. Cattle fed SYT-EFC DRC with Sweet Bran had a 1.5%

Table 1: Diet composition on a DM basis fed to finishing steers

Ingredient, % DM	SYT-EFC[a]				Negative Isoline			
	MDGS[b]		Sweet Bran		MDGS[b]		Sweet Bran	
SYT-EFC DRC	69.5	—	52.5		—	—	—	—
SYT-EFC HMC	—	69.5	—	52.5	—	—	—	—
Negative Isoline DRC	—	—	—	—	69.5	-	52.5	—
Negative Isoline HMC	—	—	—	—	—	69.5	-	52.5
Sweet Bran	—	—	35.0	35.0	—	—	35.0	35.0
MDGS[1]	18.0	18.0	—	—	18.0	18.0	—	—
Sorghum Silage	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Meal Supplement[c]	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Fine ground corn	2.223	2.223	2.806	2.806	2.223	2.223	2.806	2.806
Limestone	1.710	1.710	1.677	1.677	1.710	1.710	1.677	1.677
Urea	0.55	0.55	—	—	0.55	0.55	—	—
Salt	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Tallow	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125
Trace mineral premix	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Rumensin-90	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165
Vitamin ADE premix	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Tylan-40	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102	0.0102
Analyzed Nutrient Composition, %								
Starch	47.56	49.08	39.06	40.21	47.14	48.74	38.74	39.95
CP	13.5	13.4	13.7	13.7	13.6	13.4	13.9	13.7
Fat	4.35	4.98	3.19	3.66	4.35	5.19	3.19	3.82
NDF	15.5	14.9	20.0	19.5	16.2	15.4	20.5	19.9
S	0.22	0.22	0.21	0.16	0.22	0.21	0.21	0.21
P	0.38	0.39	0.53	0.53	0.34	0.35	0.50	0.51
K	0.47	0.48	0.68	0.68	0.45	0.45	0.66	0.66
Mg	0.17	0.17	0.24	0.24	0.16	0.16	0.23	0.23

[a]SYT-EFC = Syngenta enhanced feed corn containing the alpha amylase enzyme trait provided by Syngenta under identity-preserved procedures, stored, processed as dry rolled corn (DRC) or high moisture corn (HMC), and fed separately.
[b]MDGS = Modified distillers grains plus solubles
[c]Supplement included 30 g/ton Rumensin and 9 g/ton Tylan

improvement in feed conversion compared to NEG corn. However, when processed as HMC, feed conversion was decreased by 2.1% for cattle fed SYT-EFC compared to NEG corn with Sweet Bran.

There were no byproduct x trait interactions ($P \geq 0.36$) for final BW, DMI, or ADG (Table 2). The main effect of corn trait was not significantly different ($P \geq 0.21$) for all performance measurements. However, a tendency for a byproduct x trait interaction ($P = 0.13$) for feed conversion was observed. Regardless of corn processing, cattle that were fed SYT-EFC corn with MDGS had a 3.0% improvement in feed conversion compared to cattle fed NEG corn. When accounting for concentration of corn grain in the diet, the difference for the grain was 4.3%. However, feed conversions were reduced by less than 1% for cattle fed SYT-EFC compared to NEG corn with Sweet Bran. A tendency for a byproduct x trait interaction for LM area and calculated YG ($P = 0.12$ and $P = 0.12$, respectively) were observed. Cattle that were fed MDGS had a greater magnitude of difference between SYT-EFC and NEG corn for LM area and calculated yield grade than cattle fed Sweet Bran.

A corn processing x corn trait interaction was observed for final BW and ADG ($P = 0.02$ and $P = 0.04$, respectively; Table 3). Cattle that consumed SYT-EFC corn that was processed as DRC had the greatest final BW and ADG with NEG HMC being intermediate and NEG DRC and SYT-EFC HMC being the lowest. A corn processing x corn trait interaction was not observed for DMI ($P = 0.43$). However, cattle fed HMC had lower DMI than cattle fed DRC ($P < 0.01$). This reduction in DMI in cattle fed HMC resulted in those steers having lower F:G ($P < 0.01$) compared to cattle fed DRC. Biologically, there appears to be a tendency ($P = 0.15$) for a corn processing x corn trait interaction for feed conversion. Steers that were fed SYT-EFC DRC had better conversions than steers fed NEG DRC. In contrast, cattle that were fed either type of HMC were not different. An explanation for lack of efficiency improvement for SYT-EFC when processed as HMC is that ruminal starch digestion of HMC is so rapid that the alpha amylase enzyme trait may not be utilized. A tendency for a corn processing x corn trait interaction occurred for HCW ($P = 0.08$), marbling score ($P = 0.09$), and 12th rib fat thickness ($P = 0.07$). Steers that were fed SYT-EFC DRC had greater HCW and marbling score compared to NEG DRC. However, HCW and marbling scores were lower for steers fed SYT-EFC HMC compared to NEG HMC. Based on 12th rib fat thickness, cattle fed SYT-EFC DRC were leaner compared to NEG DRC however, the opposite was true for steers fed SYT-EFC and NEG as HMC. No corn processing x corn trait interactions were observed for LM area or calculated yield grade ($P = 0.45$ and $P = 0.30$, respectively).

These data would suggest an improvement was observed when feeding SYT-EFC corn when processed as DRC compared to Negative Isoline. When processed as HMC, corn grain containing the alpha amylase enzyme trait did not improve ADG or feed conversions most likely because starch digestion is already rapid and complete with HMC. When fed with MDGS, SYT-EFC DRC had a slight improvement in feed conversion compared to Negative Isoline,

Table 2: Effects of processed hybrid corn with MDGS or Sweet Bran on finishing cattle performance

	DRC[a]				HMC[a]					*P*-values						
	MDGS[b]		Sweet Bran		MDGS[b]		Sweet Bran									
	SYT-EFC	NEG[c]	SYT-EFC	NEG[c]	SYT-EFC	NEG[c]	SYT-EFC	NEG[c]	SEM	Process	By product	Trait	P*T[d]	B*T[e]	P*B[f]	P*B*T[g]
Performance																
Initial BW, lb	700	698	700	700	699	698	698	699	1.45	0.31	0.60	0.78	0.39	0.21	0.54	0.71
Final BW, lb[h]	1439	1419	1462	1446	1430	1435	1432	1459	10.3	0.71	0.01	0.90	0.02	0.38	0.44	0.52
DMI, lb/d	23.3	23.7	24.2	23.9	21.6	22.1	22.5	22.9	0.31	< 0.01	< 0.01	0.23	0.43	0.36	0.56	0.41
ADG, lb[h]	4.27	4.18	4.43	4.31	4.22	4.23	4.24	4.41	0.07	0.64	0.01	0.87	0.04	0.51	0.66	0.34
F:G[h]	5.45	5.67	5.46	5.54	5.11	5.22	5.30	5.19	—	< 0.01	0.83	0.21	0.15	0.13	0.28	0.74
Carcass Characteristics																
HCW, lb	903	896	921	912	902	903	904	920	29.1	0.82	0.01	0.97	0.08	0.44	0.40	0.36
Marbling[i]	490	492	520	493	486	495	500	520	15.2	0.84	0.03	0.89	0.09	0.55	0.85	0.21
LM area, in^2	14.4	13.9	14.3	14.1	14.4	14.0	13.9	14.2	0.29	0.69	0.66	0.19	0.45	0.12	0.43	0.39
Fat Depth, in	0.54	0.59	0.55	0.58	0.58	0.59	0.62	0.58	0.03	0.12	0.61	0.36	0.07	0.17	0.65	0.60
Cal. YG[j]	3.18	3.42	3.29	3.41	3.24	3.43	3.53	3.40	0.12	0.31	0.21	0.17	0.30	0.12	0.57	0.52

[a]DRC = Dry rolled corn; HMC = High moisture corn
[b]MDGS = Modified distillers grains plus solubles
[c]NEG = Negative Isoline, parental isoline control corn without the amylase enzyme trait
[d]P*T = *P*-value for the interaction of corn processing by corn trait
[e]B*T = *P*-value for the interaction of byproduct by corn trait
[f]P*B = *P*-value for the interaction of corn processing by byproduct
[g]P*B*T = *P*-value for the interaction of corn processing by byproduct type by corn trait
[h]Calculated from HCW adjusted to a common 63% dressing percentage.
[i]Marbling Score: 400 = Small^{00}; 500 = Modest^{00}
[j]Calculated as 2.5 + (2.5 × 12th rib fat) + (0.2 × 2.5 [KPH]) + (0.0038 × HCW)–(0.32 × LM area)

Table 3: Effects of SYT-EFC corn trait and corn processing on finishing cattle performance

	DRC[a]		HMC[a]		SEM	*P*-Values		
	SYT-EFC[b]	NEG[c]	SYT-EFC[b]	NEG[c]		Processing[d]	Trait[e]	P*T[f]
Performance								
Initial BW, lb	700	699	698	699	1.03	0.31	0.78	0.39
Final BW, lb[g]	1451[k]	1433[j]	1431[j]	1447[k]	7.35	0.71	0.90	0.02
DMI, lb/d	23.7	23.8	22.1	22.5	0.22	< 0.01	0.23	0.43
ADG, lb[g]	4.36[k]	4.25[jk]	4.23[j]	4.33[jk]	0.05	0.64	0.87	0.04
F:G[g]	5.43	5.60	5.22	5.20	-	< 0.01	0.21	0.15
Carcass Characteristics								
HCW, lb	912	904	903	911	28.8	0.82	0.97	0.08
Marbling[h]	505	492	493	507	13.0	0.84	0.89	0.09
LM area, in^2	14.3	14.0	14.2	14.1	0.25	0.69	0.19	0.45
Fat Depth, in	0.55	0.59	0.60	0.58	0.02	0.12	0.36	0.07
Cal. YG[i]	3.24	3.41	3.39	3.41	0.10	0.31	0.17	0.30

[a]DRC = Dry rolled corn; HMC = High moisture corn
[b]SYT-EFC = Syngenta enhanced feed corn containing the alpha amylase enzyme trait
[c]NEG = Negative Isoline, parental isoline control corn without the amylase enzyme trait
[d]Processing = *P*-value for the main effect of corn processing
[e]Trait = *P*—value for the main effect of trait
[f]P*T = *P*-value for the interaction between corn processing and corn trait
[g]Calculated from HCW adjusted to a common 63% dressing percentage
[h]Marbling Score: 400 = Small^{00}; 500 = Modest^{00}
[i]Calculated as 2.5+ (2.5 × 12th rib fat) + (0.2 × 2.5 [KPH]) + (0.0038 × HCW)–(0.32 × LM area)
[j,k]Means within a row with unlike superscripts differ ($P < 0.05$)

whereas there was no difference in feed conversion when fed with Sweet Bran.

Results from this trial along with data from a current study (*2016 Nebraska Beef Report*, pp 135), suggest that cattle producers who utilize the Syngenta Enhanced Feed Corn hybrid with the alpha amylase enzyme trait can expect to see an improvement in feed conversion compared to corn that does not contain the alpha amylase enzyme trait if that corn is processed and fed as DRC. However, the results have been variable when DRC has been fed with Sweet Bran or distillers grains plus solubles.

Melissa L. Jolly-Breithaupt, research technician

Curt J. Bittner, research technician

Dirk B. Burken, former research technician

Galen E. Erickson, professor

James C. MacDonald, associate professor, Animal Science, Lincoln

Matt K. Luebbe, assistant professor, Animal Science, Panhandle Research and Extension Center, Scottsbluff, NE.