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Impact of Feeding *Aspergillus* Subspecies Blend and Different Corn Processing Methods on Finishing Beef Cattle Performance and Carcass Characteristics

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Summary with Implications

A feedlot study utilizing 320 crossbred calf-fed steers (initial body weight 588 lb) compared the effect of feeding an Aspergillus additive in either dry-rolled corn or high-moisture corn finishing diets on cattle performance and carcass characteristics. Steers were fed 0 g/steer daily or 10 g/steer daily Aspergillus for both corn processing methods. There were no significant interactions between corn processing method and Aspergillus. Feeding finishing cattle Aspergillus did not impact performance compared to feeding none. Cattle fed dry-rolled corn had greater final body weight, dry matter intake, and gain compared to high-moisture corn diets. But cattle fed high-moisture corn had a 6.25% decrease in feed-to-gain compared to dry-rolled corn. These data suggest that feeding Aspergillus does not affect performance. The lower dry matter intake and average daily gain observed would suggest a potential acidosis problem for high-moisture corn compared to dry-rolled corn-based finishing diets.

Introduction

Aspergillus ssp. blend (Dried aspergillus ssp. fermentation product [SSF – Starch]; Provita Supplements) is a feed supplement that contains dry powdered *Aspergillus oryzae* and fermentation product to significantly increase the presence of alpha-amylase enzyme in cattle rumen. This increased enzyme activity and fungal/bacterial growth could increase starch digestion potentially leading to an improvement in animal performance. In addition, *Aspergillus oryzae* increases the growth rate of *Megasphaera elsdenii*, thereby increasing lactate utilization in the rumen. The increase in lactate utilization could slow the decline of ruminal pH post-feeding, preventing ruminal acidosis. Previous research has observed an increase in dry matter intake (DMI) and average daily gain (ADG) in the initial 28-d on feed for dry cracked and high-moisture corn diets. A 7.2% decrease in feed to gain ratio (F:G) was observed when *Aspergillus* was added to a dry whole-shelled corn diet fed to finishing steers. However, no decrease in F:G was observed when finishing steers were fed high-moisture corn with *Aspergillus*. The response of *Aspergillus* has been variable over studies, dependent on grain processing method and researched without the utilization of distillers grains.

Therefore, the objective of this study was to evaluate the effect of feeding *Aspergillus* in dry-rolled corn (DRC) and high-moisture corn (HMC) based finishing diets on performance and carcass characteristics of beef cattle in diets with 25% modified distillers grains plus solubles (MDGS).

Procedure

Crossbred calf-fed steers (n = 320; 588 lb. ± 20 lb.) were limit-fed a diet consisting of 50% alfalfa hay and 50% Sweet Bran (Cargill Wet Milling; Blair, NE) at 2% BW for five consecutive days to equalize gut fill. Steers were weighed across two consecutive days (d0 and d1) to establish the initial weight (588 lb. ± 20). Cattle were assigned to pens following the first day weight and stratified based on that weight to ensure equal, yet random allotment to pens. Pens were assigned randomly to treatment. Cattle were started on treatments following the 2-day limit fed weighing. A 21-d adaptation period was utilized with alfalfa hay decreasing and corn increasing, while MDGS and supplement amounts remained unchanged.

Four treatments were evaluated as a 2 × 2 factorial design. One factor included two corn processing methods in the diets as either DRC or HMC. The second factor included feeding 0 or 10 g/steer daily of Aspergillus ssp. blend (aspergillus ssp. fermentation product [SSF – Starch]; Provita Supplements). Treatment diets are provided in Table 1. The trial evaluated four treatments, with 80 steers and 8 pens per treatment. The study consisted of three weight blocks and eight replications within each treatment for a total of thirty-two pens on trial with 10 steers/pen.

Steers were poured with Permectrin CD (Boehringer Ingelheim Vetmedica, Inc.) and weighed individually on d52 and d92. Steers were implanted with Revalor IS (Merck Animal Health) on d1 and re-implanted with Revalor-200 (Merck Animal Health) on d92. On d96 a lower inclusion of *Aspergillus* ssp. blend (12.2 g/steer daily to 10 g/steer daily) was utilized as dry matter intakes were at the targeted 22 lb/d. On d164 Optaflexx (Elanco Animal Health) was included in the diet at 300 mg/steer daily until d196.

After 197 days, cattle were pen weighed, and loaded in the afternoon after feeding 50% of the previous day's intake. Ending live weight was based on live body weight collected on the afternoon prior to slaughter. On the day of harvest, kill order, liver abscess scores and HCW were recorded and carcass-adjusted final BW was calculated from a common 63% dressing percentage. Carcass-adjusted final BW was used to determine ADG and F:G. Carcass characteristics included marbling score, longissimus muscle area and yield grade; which were recorded after a 48-hr chill.

Data were analyzed using the MIXED procedure of SAS (SAS Institute, Inc., Cary, N.C.) as a generalized randomized block design, with pen as the experimental unit and block as a fixed effect. Data were analyzed as a 2 × 2 factorial, evaluating an interaction between grain processing and feeding Aspergillus ssp. blend. If no interaction was detected, then main effects of corn processing and inclusion of Aspergillus ssp. blend were evaluated.

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Table 1. Dietary treatment composition (DM basis) for finishing steers fed dry-rolled corn or high-moisture corn with or without *Aspergillus*

	Treatments			
Corn Processsing:	DRC	DRC	HMC	HMC
Aspergillus:	0 g/d	10 g/d	0 g/d	10 g/d
Dry-rolled corn (DRC)	64	64	-	-
High-moisture corn (HMC)	-	-	64	64
Grass Hay	6	6	6	6
Modified distillers grains (MDGS)	25	25	25	25
Supplement	5	5	5	5
Fine Ground Corn	2.62	2.52	2.62	2.52
Limestone	1.5	1.5	1.5	1.5
Aspergillus	--	0.122 or 0.10	--	0.122 or 0.10
Commercial Grade Dye	+	-	+	-
Urea	0.5	0.5	0.5	0.5
Salt	0.3	0.3	0.3	0.3
Trace Mineral	0.05	0.05	0.05	0.05
Vitamin ADE	0.015	0.015	0.015	0.015
Rumensin-90[1]	0.0165	0.0165	0.0165	0.0165
Tylan-40[2]	0.009	0.009	0.009	0.009

[1] Supplement formulated to provide 30 g/ton Rumensin® (Elanco Animal Health, DM basis)

[2] Supplement formulated to provide 8.8 g/ton Tylan® (Elanco Animal Health, DM basis)

Table 2. Main effect of feeding *Aspergillus* at either 0 or 10 g/d on cattle performance and carcass characteristics

	Treatment			
	0 g/d	10 g/d	SEM	P-Value
Pens, *n*	8	8	--	--
Initial BW, lb	588	588	0.5	0.81
Carcass-Adjusted Performance				
Final BW, lb[1]	1289	1275	8.1	0.24
DMI, lb/d	21.6	21.2	0.16	0.14
ADG, lb[1]	3.56	3.49	0.042	0.25
F:G[1]	6.06	6.06	--	0.78
Carcass Characteristics				
HCW, lb	812	803	5.1	0.24
LM area, in[2]	13.3	13.2	0.10	0.20
Marbling[2]	461	470	6.6	0.38
12th Rib Fat, in	0.47	0.52	0.017	0.05
USDA YG	3.0	3.1	0.07	0.07

[1]Calculated from HCW adjusted to a common 63.0% dress

[2]Marbling score: 400 = Small[00], 500 = Modest[00]

[3]CON = 0 g/hd/d *Aspergillus*

[4]ASP = 10 g/hd/d *Aspergillus*

Results

There were no significant interactions ($P \geq 0.23$) observed between corn processing methods and *Aspergillus* in the diet; therefore, only main effects are presented. For the main effect of *Aspergillus* (Table 2); there were no differences observed for carcass-adjusted final BW, DMI, and ADG leading to no difference in F:G ($P \geq 0.14$) for cattle fed 0 or 10 g/d of *Aspergillus*. There were no differences ($P \geq 0.20$) observed for HCW, LM area or marbling due to *Aspergillus* feeding. Cattle fed *Aspergillus* had a greater amount of 12th rib fat ($P = 0.05$) compared to cattle fed 0 g/d. There was a tendency for cattle fed *Aspergillus* to have a greater USDA YG ($P = 0.07$) compared to cattle fed none.

For the main effects of grain processing, there was an effect of corn processing method on carcass adjusted final BW with steers fed DRC being heavier than steers fed HMC ($P = 0.04$). There also was an effect of processing method on DMI with steers fed DRC eating significantly more than steers fed HMC ($P < 0.01$). Steers fed DRC had a greater ADG than steers fed HMC ($P = 0.05$). However, steers fed HMC had the lower F:G compared to steers fed DRC ($P < 0.01$). There was an effect of processing method on HCW, with steers fed DRC being heavier than steers fed HMC ($P = 0.04$). There was an effect of processing method on ribeye area with steers fed DRC having a larger ribeye area than steers fed HMC ($P = 0.04$). No significant differences were observed for steers fed the different processing methods for initial BW, marbling, 12th rib fat and yield grade ($P \geq 0.13$; Table 2).

Conclusion

Feeding finishing cattle *Aspergillus* in diets with either DRC or HMC did not statistically improve any of the growth performance or carcass characteristics measured. Cattle fed DRC diets had a greater final BW, DMI and ADG compared to cattle fed HMC. However, cattle fed HMC had a 6.25% decrease in F:G compared to DRC diets. These data suggest that feeding *Aspergillus* does not affect F:G for finishing diets containing 25% MDGS. The lower DMI and ADG observed would suggest a potential acidosis problem for cattle fed HMC compared to DRC based finishing diets.

Table 3. Main effect of corn processing method on cattle performance and carcass characteristics

	Corn Processing[3]			
	DRC	HMC	SEM	P-Value
Pens, *n*	8	8	--	--
Initial BW, lb	589	588	0.5	0.13
Carcass-Adjusted Performance				
Final BW, lb[1]	1295	1270	8.1	0.04
DMI, lb/d	22.4	20.4	0.16	< 0.01
ADG, lb[1]	3.58	3.46	0.042	0.05
F:G[1]	6.25	5.88	--	< 0.01
Carcass Characteristics				
HCW, lb	816	800	5.1	0.04
LM area, in[2]	13.4	13.1	0.10	0.04
Marbling[2]	466	466	6.6	0.98
12th Rib Fat, in	0.50	0.49	0.017	0.87
USDA YG	3.0	3.1	0.07	0.34

[1]Calculated from HCW adjusted to a common 63.0% dress

[2]Marbling score: 400 = Small[00], 500 = Modest[00]

[3]DRC and HMC included in the diet at 64%, 25% MDGS, 6% Grass Hay, and 5% supplement

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