Evaluation of Fractionated Distillers Grains (High Protein and Bran Plus Solubles) on Performance and Carcass Characteristics in Finishing Diets

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Summary with Implications

A finishing study evaluated the effect of feeding a new, high protein distillers grains along with corn bran plus condensed distillers solubles compared to traditional wet distillers grains, traditional dry distillers grains and a corn-based control. Each byproduct replaced corn at 40% of the diet dry-matter. Intake was not affected by treatment; however gain and carcass weight were greater and feed conversion improved for high protein distillers and corn bran plus solubles than either type of traditional distillers grains or corn. Based on feed efficiency, the feeding values of high protein distillers grains and corn bran plus solubles are 121% and 125% that of corn, respectively. These new byproducts appear to be viable options for producers to utilize in finishing diets.

Introduction

Traditional wet distillers grains have approximately 130% the energy value of corn (*2011 Nebraska Beef Cattle Report*, p. 40). The positive performance observed with distillers grains has largely been attributed to the protein fraction (*2016 Nebraska Beef Cattle Report*, pp. 124–127). Recent technological advancements (ICM Inc., Colwich, KS) have allowed ethanol plants to fractionate products during the ethanol production process. Corn fiber (also referred to as corn bran) removal further concentrates other components of distillers grains—most notably the protein. This isolation process allows for greater ethanol production, but creates a distillers product with differing composition than what is currently produced. Furthermore, some of the isolated bran can be combined with condensed distillers solubles (CDS) to create another new feed byproduct. How the new ethanol byproducts impact animal performance has not been evaluated for this process. Therefore, the objective of this study was to evaluate the effect of feeding high protein distillers grains, as well as corn bran plus solubles, on animal performance and carcass characteristics in finishing cattle.

Table 1. Nutrient composition of high protein dry distillers grains (HiPro DDGS), corn bran plus solubles (Bran + Solubles), traditional wet distillers grains plus solubles (WDGS), and traditional dry distillers grains plus solubles (DDGS) fed in beef finishing diets

Nutrient[1]	HiPro DDGS	Bran + Solubles	WDGS	DDGS
DM, %	91.8	40.7	32.8	91.4
CP, %	36.0	33.5	30.1	32.5
NDF, %	32.0	32.3	30.2	31.6
Fat, %	9.4	9.8	11.6	6.2

[1]Nutrients expressed on a dry-matter basis

Procedure

A 190-day finishing study was conducted at the University of Nebraska feedlot near Mead, NE utilizing 300 cross-bred calf-fed steers (initial BW = 621 ± 21 lb) to evaluate the effect of feeding a new distillers grains that have undergone a pre-fermentation fiber separation process. Steers were limit fed a common diet of 50% Sweet Bran (Cargill, Blair, NE) and 50% alfalfa hay at two percent of BW for 5 days prior to initiation of the trial to equalize gut fill. Animals were weighed on two consecutive days (d 0 and d 1) to establish average initial BW. Steers were blocked by initial BW into one of three blocks, stratified within block and assigned randomly to pen. Pens were assigned randomly to one of five treatments with 10 steers/pen and 6 pens/treatment. Treatments were arranged in a randomized block design, and included high protein dry distillers grains (HIPRO), corn bran plus solubles (BRAN+SOL), traditional dry distillers grains (DDGS), traditional wet distillers grains (WDGS), and a corn-based control (CON). High protein distillers grains and Bran + Solubles were produced from the same process and were sourced from the same ethanol plant (Corn Plus, Winnebago, MN). Traditional dry and wet distillers were sourced from E Energy (Adams, NE) and KAAPA Ethanol (Ravenna, NE), respectively. The nutrient composition of each byproduct is provided in Table 1. Byproducts replaced a 50:50 blend of high-moisture and dry-rolled corn at 40% diet (DM; Table 2). All diets contained 15% corn silage and 5% supplement. Supplements were formulated to provide 30 g/ton Rumensin® (Elanco Animal Health, Greenfield, IN) and 8.8 g/ton Tylan® (Elanco Animal Health, Greenfield, IN). Soypass® (LignoTech USA, INc., Rothschild, WI) was phase fed in the control diet to meet metabolizable protein requirements.

Steers were implanted with Revalor XS® (Merck Animal Health, DeSoto, KS) on day one, and were harvested at a commercial packing plant (Greater Omaha, Omaha, NE) where HCW and liver scores were collected on the day of slaughter. Ribeye area, marbling score, and 12th rib fat thickness were recorded after a 48 h chill. Final BW, ADG, and F:G were adjusted by HCW using a 63% dress.

Data were analyzed using the MIXED procedure of SAS (SAS Inst. Inc., Cary, NC) as a randomized block design. Pen was used as the experimental unit while block was analyzed as a fixed effect.

Table 2. Composition of dry-rolled and high-moisture corn finishing diets with dry distillers grains plus solubles (DDGS), high protein dry distillers grains (HIPRO), wet distillers grains plus solubles (WDGS), or corn bran plus solubles (BRAN+SOL)

	Treatment[1]				
	CON[2]	DDGS	HIPRO	WDGS	BRAN+SOL
Ingredients					
High-moisture Corn	39.25	20.50	20.50	20.50	20.50
Dry-rolled Corn	39.25	20.50	20.50	20.50	20.50
Corn Silage	15.00	15.00	15.00	15.00	15.00
HiPro DDG	-	-	40.00	-	-
DDGS		40.00	-	-	-
WDGS	-	-	-	40.00	-
Bran + Solubles	-	-	-	-	40.00
Supplement					
Fine Ground Corn	-	1.8875	1.8875	1.8875	1.8875
Limestone	1.6600	1.6200	1.6200	1.6200	1.6200
Tallow	0.1625	0.1000	0.1000	0.1000	0.1000
Urea	1.2900	-	-	-	-
Soybean Meal	3.0000	-	-	-	-
Salt	0.3000	0.3000	0.3000	0.3000	0.3000
Beef Trace Min.	0.0500	0.0500	0.0500	0.0500	0.0500
Vit. ADE	0.0150	0.0150	0.0150	0.0150	0.0150
Rumensin-90	0.0165	0.0165	0.0165	0.0165	0.0165
Tylan-40	0.0110	0.0110	0.0110	0.0110	0.0110

[1]CON: Corn-based control diet with 50:50 blend of high-moisture and dry-rolled corn; DDGS: Dry distillers grains plus solubles; HiPRO: High Protein distillers grains; WDGS: Wet distillers grains plus solubles; BRAN+SOL: Corn bran plus condensed distillers solubles

[2]Soy-Pass was phase fed to meet MP requirements

Table 3. Performance and carcass characteristics for calf-fed steers fed a corn-based control (CON), traditional dry distillers grains plus solubles (DDGS), high protein distillers grains (HIPRO), wet distillers grains plus solubles (WDGS), or corn bran plus solubes (BRAN+SOL) in finishing diets

	Treatment						
	CON	DDGS	HIPRO	WDGS	BRAN+SOL	SEM	*P*-Value
Performance							
Initial BW, lb	604	604	602	604	605	1.8	0.70
Final BW, lb	1316[b]	1347[ab]	1365[a]	1314[b]	1385[a]	17.3	0.03
DMI, lb/d	21.6	21.4	21.2	21.0	21.3	0.28	0.62
ADG, lb	3.76[b]	3.93[ab]	4.03[a]	3.75[b]	4.11[a]	0.089	0.02
F:G	5.71[c]	5.46[bc]	5.26[ab]	5.59[c]	5.18[a]	-	0.02
Carcass Characteristics							
HCW, lb	829[b]	849[ab]	860[a]	828[b]	872[a]	10.9	0.03
LM Area, in²	13.2	13.5	13.3	13.3	13.6	0.26	0.84
Marbling[1]	463	480	461	453	454	14.5	0.69
Fat Depth, in		0.51	0.50	0.48	0.50	0.022	0.92
Calc YG[2]		3.2	3.3	3.1	3.2	0.11	0.86

[abc] Values within rows with unique superscripts are different ($P < 0.10$)

[1]400 = Small[0], 500 = Modest[0]

[2]Calculated as 2.5 + (2.5 x 12[th] rib fat, in) + (0.2 x 2.5 (KPH, %)) + (.0038 x HCW, lb)–(0.32 x REA, in²)

Feeding values were calculated using the following equation: $\{((((G{:}F_{TRT-}G{:}F_{CON})/G{:}F_{CON}) / \text{byproduct inclusion, \%}) + 1\} * 100$. Feed efficiency of treatment is denoted as $G{:}F_{TRT}$, and $G{:}F_{CON}$ represents the feed efficiency of the control treatment.

Results

Intakes were not affected by treatment ($P = 0.62$; Table 3). Average daily gain (ADG) was impacted by dietary treatment ($P = 0.02$) with steers fed HIPRO or BRAN+SOL having the greatest ADG. Steers fed CON or WDGS had similar ($P = 0.96$) gains to one another, but were lowest among all treatments. Dry distillers grains steers were intermediate, but not different ($P > 0.14$) from any other treatments. Similar intakes and improved ADG resulted in the HIPRO and BRAN+SOL treatments having improved ($P < 0.05$) F:G compared to CON and WDGS. The DDGS treatment was again intermediate and not different ($P > 0.20$) than HIPRO, CON, or WDGS. Feeding BRAN+SOL tended ($P = 0.09$) to improve F:G over DDGS. Hot carcass weight and final BW followed a similar trend to ADG. The HIPRO and BRAN+SOL cattle had the greatest HCW, but were not different ($P > 0.41$) from each other. Steers fed CON or WDGS had the lightest weights, while DDGS again was intermediate. No other performance or carcass characteristics were affected by dietary treatment ($P \geq 0.62$).

Feeding HIPRO resulted in a seven percent improvement in feed efficiency over CON while feeding BRAN+SOL resulted in a nine percent improvement. Based on the feed efficiencies of these new byproducts, the feeding value of high protein distillers grains was 121% of corn and the isolated bran plus solubles is 126% that of corn.

Conclusion

Feeding both high protein distillers grains and isolated corn bran plus solubles to finishing cattle improved ADG and F:G over a corn-based control diet. The fiber isolation process separates bran, which concentrates crude protein in the resulting distillers grains product. These two new ethanol byproducts appear to be viable feeds for finishing cattle. With feeding values of 121% and 126% respectively, high protein distillers grains and corn bran plus solubles fit well will values for traditional distillers grains.

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