Evaluation of Corn Bran Plus Solubles on Performance and Carcass Characteristics in Finishing Diets

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Summary with Implications

A finishing study was conducted to determine the effect of feeding corn bran plus solubles, a new feed resulting from a pre-fermentation fiber removal process, compared to wet distillers grains plus solubles at two levels of inclusion (20% and 40% of diet DM). Intake increased with inclusion of byproduct, and steers fed 20% wet distillers had the greatest intakes numerically. Byproduct inclusion, regardless of type, increased daily gain over the corn-based control. Feed conversions were improved with increased inclusion of both Bran + Solubles and wet distillers, and both were superior to the control. Increased inclusion of both byproducts resulted in a linear increase in carcass weight. Feeding Bran+Solubles resulted in performance and carcass characteristics similar to wet distillers at both 20% and 40% inclusion.

Introduction

Recent changes to the ethanol production process have allowed for the production of cellulosic ethanol from fiber separation technologies. Fiber can be separated pre-fermentation to allow for increased starch utilization, and an increase in ethanol yields. Currently, the removed fiber component may be utilized in combination with condensed distillers solubles (CDS) to make a feed termed Bran + Solubles. Feeding Bran + Solubles at 40% of the diet resulted in greater average daily gain (ADG; $P = 0.02$) and improved feed to gain (F:G; $P = 0.02$) than feeding a high-moisture corn (HMC) and dry-rolled corn (DRC) blend, or distillers grains at 40% of diet DM (*2019 Nebraska Beef Cattle Report*, pp. 94–96). An understanding of how inclusion level effects performance when this new byproduct is utilized is necessary. Thus, our objective was to evaluate the feeding value of Bran + Solubles and compare that to wet distillers grains plus solubles (WDGS) fed at differing inclusions.

Table 1. Composition of dry-rolled and high-moisture corn finishing diets with corn bran plus solubles (BRAN+SOL) or wet distillers grains (WDG) at 20 or 40% DM inclusion

	Treatment[1]				
	CON	20BRAN+SOL	40BRAN+SOL	20WDG	40WDG
Ingredients					
High Moisture Corn	44	34	24	34	24
Dry Rolled Corn	44	34	24	34	24
Grass Hay	7	7	7	7	7
Wet Distillers Grains + Solubles	-	-	-	20	40
Bran + Solubles	-	20	40	-	-
Supplement					
Fine Ground Corn	1.553	2.153	2.753	2.153	2.753
Limestone	1.730	1.730	1.730	1.730	1.730
Tallow	0.125	0.125	0.125	0.125	0.125
Urea	1.200	0.600	-	0.600	-
Salt	0.300	0.300	0.300	0.300	0.300
Beef Tr. Min.	0.050	0.050	0.050	0.050	0.050
Vit. ADE	0.015	0.015	0.015	0.015	0.015
Rumensin-90	0.017	0.017	0.017	0.017	0.017
Tylan-40	0.011	0.011	0.011	0.011	0.011
Nutrient Composition					
DM	77.69	69.80	61.87	69.61	61.48
CP	11.34	12.67	14.00	13.81	16.29

[1]CON: Corn-based control diet with 50:50 blend of high-moisture and dry-rolled corn; 20BRAN+SOL: Bran + Solubles fed at 20% diet DM; 40BRAN+SOL: Bran + Solubles fed at 40% diet DM; 20WDG: Wet distillers grains fed at 20% diet DM; 40WDG: Wet distillers grains fed at 40% diet DM

Procedure

A 120-day finishing study was conducted at the University of Nebraska feedlot near Mead, NE utilizing 300 cross-bred yearling steers (initial BW = 912 ± 80 lb) to evaluate the effect of feeding corn bran plus solubles in comparison to wet distillers grains. Steers were limit fed a common diet 5 days prior to initiation of the trial to equalize gut fill. Steers 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 four blocks, stratified within block and assigned randomly to pen. Pens were randomly assigned to one of five treatments with 10 steers/pen and 6 pens/treatment. Treatments were arranged in a 2 × 2 + 1 factorial with byproduct type (WDGS or Bran + Solubles) and byproduct inclusion level (20% or 40% diet (DM)) being the factors, plus a corn-based control (CON; Table 1). To produce the new feed byproduct, a counter-current washing system is utilized to separate the bran from starch. The starch is then further processed

Table 2. Performance and carcass characteristics for yearling steers fed a corn-based control (CON), corn bran plus solubles (BRAN+SOL) or wet distillers grains (WDG) at 20 or 40% DM inclusion in finishing diets

	Treatment							*P*-values			
								BRAN+SOL		WDG	
	CON	20BRAN+ SOL	40BRAN+ SOL	20WDG	40WDG	SEM	F-test	Lin.	Quad	Lin.	Quad
Performance											
Initial BW, lb	915	914	913	917	914	1.4	0.34	0.39	0.92	0.93	0.14
Final BW, lb	1362[b]	1420[a]	1428[a]	1428[a]	1434[a]	12.1	<0.01	<0.01	0.10	<0.01	0.05
DMI, lb/d	27.0[c]	29.0[ab]	29.4[ab]	29.8[a]	28.4[b]	0.36	<0.01	<0.01	0.08	0.01	<0.01
ADG, lb	3.73[b]	4.22[a]	4.29[a]	4.26[a]	4.33[a]	0.100	<0.01	<0.01	0.10	<0.01	0.06
F:G	7.19[b]	6.85[ab]	6.85[ab]	6.94[b]	6.54[a]	-	0.07	0.10	0.42	<0.01	0.62
Carcass characteristics											
HCW, lb	862[b]	895[a]	907[a]	903[a]	907[a]	7.9	<0.01	<0.01	0.27	<0.01	0.06
Marbling [1]	507[ab]	524[ab]	499[b]	489[b]	535[a]	12.4	0.09	0.64	0.17	0.12	0.04
Fat depth, in	0.50[b]	0.55[ab]	0.55[ab]	0.59[a]	0.58[a]	0.017	0.07	0.29	0.62	0.03	0.06
REA, in^2	12.9	12.7	13.1	12.6	12.9	0.19	0.36	0.88	0.09	0.77	0.27
Calc YG [2]	3.27[c]	3.58[ab]	3.51[b]	3.73[a]	3.64[ab]	0.078	<0.01	0.04	0.06	<0.01	<0.01

Values within rows with unique superscripts are different ($P \leq 0.05$)

[1]300 = Slight, 400 = Small, 500 = Modest

[2]Calculated as 2.5 + (2.5 x 12th rib fat, in) + (0.2 x 2.5(KPH, %))–(0.32 x REA, in^2) + (0.0038 x HCW, lb)

to produce ethanol. Bran is combined with condensed distillers solubles (CDS) in approximately a 50:50 blend to make Bran + Solubles (ICM Inc., Colwich, KS). Bran + Solubles is approximately 40% DM, 31% CP, and 32% NDF. Byproducts replaced a 50:50 blend of high-moisture and dry-rolled corn. All diets contained 7% grass hay 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).

Steers were implanted with Component TE-200® (Elanco Animal Health, Greenfield, IN) on day 22, 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 based on 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 the experimental unit while block was analyzed as a fixed effect. Orthogonal contrasts were used to analyze linear and quadratic effects of inclusion of each byproduct. Feeding values were calculated based on feed efficiency (G:F) using the following equation: {((($G:F_{TRT-}G:F_{CON}$)/$G:F_{CON}$) / 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

Dry matter intake quadratically ($P < 0.01$) increased with greater inclusion of WDGS, and tended ($P = 0.08$) to increase quadratically when BRAN+SOL inclusion was increased (Table 2). Steers fed 20% WDGS numerically had the greatest DMI, but were not statistically different ($P > 0.15$) than steers fed either inclusion of BRAN+SOL. Inclusion of both WDGS and BRAN+SOL linearly increased ADG ($P < 0.01$), and both byproducts resulted in better gains than corn alone. A linear ($P < 0.01$) improvement in F:G was observed with increasing levels of WDGS while a tendency ($P = 0.10$) occurred with increasing levels of BRAN+SOL. Feed conversion was numerically best when feeding 40% WDGS, but was not statistically different ($P > 0.13$) than feeding either 20% or 40% BRAN+SOL.

Carcass weight linearly ($P < 0.01$) increased with inclusion of BRAN+SOL and tended ($P \leq 0.06$) to increase in a quadratic fashion with inclusion of WDGS. Marbling score was numerically greatest with the 40% WDGS treatment, but was not different ($P > 0.11$) than the control or 20% BRAN+SOL treatments. Byproduct-fed cattle tended to ($P = 0.09$) have more backfat than CON cattle although CON steers were not statistically different ($P > 0.24$) than either of the BRAN+SOL treatments. Calculated YG was greatest for the 20% WDGS treatment, but not significantly different ($P > 0.18$) than 40% WDGS or 20% BRAN+SOL treatments. Control cattle had the lowest calculated YG ($P < 0.04$) of all treatments and 40% BRAN+SOL cattle were intermediate. Ribeye area was not affected by dietary treatment.

Feeding BRAN+SOL and WDGS resulted in similar effects to one another for performance and carcass characteristics. Based on feed conversion, BRAN+SOL has a feeding value of 125% and 113% that of corn when fed at 20% and 40% of diet (DM), respectively. In this study, WDGS had a feeding value of 118% and 125% that of corn when fed at 20% and 40% of the diet (DM), respectively.

Conclusion

Feeding both BRAN+SOL and WDGS to finishing cattle improved ADG and F:G over a corn-based control diet. Byproduct

inclusion tended to increase fat depth as well as calculated YG over the corn-fed cattle as well. Feeding BRAN+SOL appears to be similar to WDGS for finishing cattle with feeding values of 113 to 125% of corn but varies with inclusion.

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