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Effects of Modified Distillers Grains Plus Solubles and Condensed Distillers Solubles With and Without Oil Extraction on Finishing Performance

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

Brandon L. Nuttelman
University of Nebraska-Lincoln, bnuttelman2@unl.edu

Dirk Burken Burken
Universitiy of Nebraska--Lincoln, dirk_burken@hotmail.com

Cody J. Schneider
Universitiy of Nebraska--Lincoln

Terry Klopfenstein
Universitiy of Nebraska--Lincoln, tklopfenstein1@unl.edu

See next page for additional authors

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Terry J. Klopfenstein
Galen E. Erickson[1]

Summary

A finishing study was conducted to evaluate the effects of feeding 27% inclusion of condensed distillers solubles (CDS) and 40% inclusion of modified distillers grains plus solubles (MDGS) with and without corn oil removal. De-oiled CDS or MDGS did not impact performance or carcass characteristics compared to normal fat. Cattle fed CDS or MDGS, regardless of fat content, had greater final BW, ADG, and HCW compared to controls. Feed conversion, regardless of fat content, was greatly improved for CDS or MDGS compared to controls. These data suggest that cattle fed de-oiled distillers or solubles have comparable performances to normal fat concentration using the centrifugation process removing oil from solubles.

Introduction

The byproducts produced by ethanol plants are distillers grains plus solubles and solubles (syrup). The corn oil in these byproducts has market value and is being removed from the thin stillage (solubles) portion using centrifugation. Limited data are available for feeding lower fat distillers in finishing diets, and there is no datum with feeding distillers using this new oil removal process. In 2012, approximately 50% of the plants were removing oil. Thus, the objective of this study was to determine the effect of feeding de-oiled corn distillers solubles and modified distillers grains on finishing performance and carcass characteristics.

Procedure

A 179 day finishing experiment was conducted using 225 crossbred, calf fed steers (initial BW = 659 ± 20 lb) in a complete block design, with a 2x2+1 factorial arrangement of treatments. Steers were limit fed for five days at 2% of BW prior to the initiation of the trial and weighed on two consecutive days (0 and 1) to determine initial BW. Steers were implanted with Revalor®-IS d 1 and reimplanted with Revalor®-S on day 83. Steers were blocked by BW, stratified by BW within each block, and assigned randomly to pen. Pens were then assigned randomly to one of five treatments with nine steers per pen and five pens per treatment.

The treatments (Table 1) consisted of a control diet with a 1:1 blend of dry rolled and high moisture corn and 7.5% sorghum silage, 27% de-oiled (6.0% fat) or 27% normal fat (21.1% fat) CDS, and 40% de-oiled (9.2% fat) or 40% normal fat (11.8% fat) MDGS (DM basis). Modified distillers grains plus solubles were procured at the initiation of the experiment from the same plant on two different weeks when the process was running to remove oil or not. Distillers solubles were sourced from the same plant and received approximately every three weeks throughout the experiment on alternating weeks, again with or without the oil process operating in the plants. Soypass™ was included in the control and CDS diets for 38 and 60 days, respectively, to meet or exceed MP requirements. All diets contained 5% supplement which was formulated to include 30g/ton of DM monensin and provide 90 mg/steer Tylan®. All animals were harvested on day 180 at a commercial abattoir (Greater Omaha Packing, Omaha, Neb.) and hot carcass weights (HCW) were recorded at that time. Carcass 12th rib fat, LM area, and USDA marbling score were recorded after a 48-hour carcass 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 dressing percentage of 63%.

Data were analyzed using the MIXED procedure of SAS (SAS Inst. Inc., Cary, N.C.) as a randomized block design with pen as the

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

		27% CDS		40% MDGS	
Ingredient, % of DM	Control[2]	De-Oiled	Normal Fat	De-Oiled	Normal Fat
DRC[1]	43.75	30.25	30.25	23.75	23.75
HMC[1]	43.75	30.25	30.25	23.75	23.75
MDGS[1]: De-Oiled	—	—	—	40	—
MDGS[1]: Normal Fat	—	—	—	—	40
CDS[1]: De-Oiled	—	27	—	—	—
CDS[1]: Normal Fat	—	—	27	—	—
Sorghum Silage	7.5	7.5	7.5	7.5	7.5
Supplement [3]	5	5	5	5	5
Sorghum Silage	7.5	7.5	7.5	7.5	7.5
Analyzed Composition, %					
Fat	4.43	4.72	8.80	6.12	7.19

[1]DRC = dry rolled corn; HMC = high moisture corn; MDGS = Modified distillers grains plus solubles; CDS = condensed distillers solubles.
[2]Soypass was fed in control diet for 38 days and in the CDS diets for 60 days.
[3]Formulated to contain 345 mg/steer daily of Rumensin and 90 mg/steer daily of Tylan.

Table 2. Nutrient composition of MDGS and CDS[1].

	De-oiled CDS	Normal CDS	De-Oiled MDGS	Normal MDGS
Fat	6.0	21.1	9.20	11.8
CP	29.6	27.0	33.7	33.0
S	1.26	0.78	0.65	0.56
NDF	—	—	29.4	31.9
DM	27.0	27.5	46.0	46.5

[1]All values expressed on a DM basis.

experimental unit. Treatment comparisons were made using pair-wise comparisons when the F-test statistic was significant at an alpha level of $P = 0.05$. Pre-planned contrasts were used to test the effect of oil removal within CDS and MDGS.

Results

The fat concentration (Table 2) of the de-oiled CDS and normal CDS were 6.0% and 21.1%, respectively, and 9.2% and 11.8% fat for de-oiled MDGS and normal fat MDGS. Crude protein was increased for both de-oiled CDS and MDGS compared to normal fat CDS and MDGS. Sulfur concentration was increased slightly for both de-oiled CDS and MDGS compared to normal fat CDS and MDGS. Dietary fat was 4.72% for de-oiled CDS, 8.80% for the normal fat CDS, 6.12% for de-oiled MDGS and 7.19% for the normal fat MDGS compared to 4.43% fat for the control treatment.

There were no statistical differences ($P > 0.25$) in performance or carcass traits between de-oiled CDS and normal fat CDS (Table 3), for the main effect of fat content. Cattle fed the de-oiled CDS had numerically greater ADG and lower F:G than the normal CDS values. Compared to the control, cattle fed de-oiled CDS had greater final BW, ADG, and HCW ($P < 0.01$). Cattle fed normal fat CDS were intermediate to control and de-oiled CDS for final BW, ADG, and HCW ($P > 0.36$). Feeding de-oiled and normal fat CDS decreased DMI and improved F:G compared to the control ($P < 0.01$). Feeding values, relative to corn, calculated from G:F were 159 and 147% of corn for de-oiled CDS and normal fat CDS, respectively.

There was no significant difference ($P > 0.44$) due to fat content of MDGS for all traits. Steers fed de-oiled and normal fat MDGS had greater final BW, ADG and HCW than control steers ($P < 0.02$). Feed conversion was improved with feeding MDGS ($P < 0.01$) but there was no difference between de-oiled or normal fat MDGS ($P = 0.80$). The feeding values were 130% of corn for both de-oiled and normal fat MDGS at 40% inclusion. There were no significant differences between treatments for LM area, 12th rib fat, calculated YG, and marbling score; ($P > 0.13$).

The fat content of 27% inclusion of CDS or 40% inclusion of MDGS, as the sole byproduct in the diet, had no impact on performance or carcass characteristics when the oil was removed from the solubles portion using the centrifugation process. These data suggest that cattle fed de-oiled CDS or MDGS perform similar to cattle fed normal fat CDS or MDGS.

[1]Melissa L. Jolly, graduate student; Cody J. Schneider, Brandon L. Nuttelman, Dirk B. Burken research technicians; Terry J. Klopfenstein, professor; Galen E. Erickson, professor, University of Nebraska–Lincoln Department of Animal Science, Lincoln, Neb.

Table 3. Effect of feeding de-oiled and normal fat CDS and MDGS on finishing performance.

		27% CDS		40% MDGS			*P*-value		
	Control	De-oiled	Normal	De-oiled	Normal	SEM	F-Test	CDS[1]	MDGS[2]
Performance									
Initial BW, lb	662	661	663	662	661	1	0.39	0.07	0.68
Final BW, lb	1248[a]	1293[b,c]	1277[a,b]	1308[b,c]	1318[c]	14	0.01	0.43	0.61
DMI, lb/day	20.8[a]	19.4[b]	19.4[b]	20.5[a]	20.8[a]	0.4	0.01	0.97	0.58
ADG, lb	3.28[a]	3.53[b,c]	3.43[a,b]	3.61[b,c]	3.67[c]	0.08	0.02	0.36	0.60
Feed:Gain[3]	6.36[a]	5.49[b]	5.66[b]	5.69[b]	5.67[b]		<0.01	0.29	0.80
Carcass Characteristics									
HCW, lb	786[a]	814[b,c]	805[a,b]	824[b,c]	830[c]	9	0.01	0.43	0.61
LM area, in	12.56	13.19	12.81	12.80	12.65	0.23	0.38	0.25	0.66
12th rib fat, in	0.50	0.50	0.47	0.53	0.56	0.03	0.28	0.47	0.47
Calculated YG	3.21	3.11	3.15	3.37	3.49	0.11	0.13	0.81	0.44
Marbling score[4]	570	579	575	594	599	14	0.50	0.85	0.77

[1]Effect between de-oiled and normal CDS.
[2]Effect between de-oiled and normal MDGS.
[3]Analyzed as G:F, the reciprocal of F:G.
[4]Marbling score: 500 = Small00.
[abc]Means within a row with different superscripts differ ($P < 0.05$)