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Anna C. Pesta
University of Nebraska-Lincoln

Brandon L. Nuttelman
University of Nebraska-Lincoln

William A. Griffin
University of Nebraska-Lincoln, wgriffin2@unl.edu

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

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

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Summary

Effects of adding 0, 7, 14, or 21% condensed distillers solubles (CDS) to diets containing either 20% modified distillers grains (MDGS) or 20% Synergy (a combination of modified distillers grains and wet corn gluten feed) were evaluated. A byproduct by CDS level interaction was observed for final BW, hot carcass weight, and ADG. Cattle fed Synergy had greater DMI than cattle fed MDGS. In MDGS diets at 14% CDS and in Synergy diets at 21% CDS, ADG was maximized. Increasing CDS level in both types of diets improved F:G linearly.

Introduction

Previous research (*2012 Nebraska Beef Cattle Report,* pp. 64-65) indicates that up to 36% inclusion of condensed distillers solubles (CDS) can replace a portion of corn in the diet while improving finishing performance. However, these data were collected for diets in which CDS was the sole byproduct in corn-based diets. The majority of finishing rations used today contain either distillers grains or wet corn gluten feed to replace a portion of corn. Adding high levels of CDS to finishing diets, in addition to another byproduct, has not been studied. Thus, the objective of the current study was to evaluate adding increasing levels of CDS to diets that contain MDGS or Synergy.

Procedure

A 180 day finishing study was conducted using 400 crossbred steer calves (BW = 748 ± 33 lb) in a randomized complete block design, with a 2 × 4 factorial arrangement of treatments. Steers were limit fed at 2.0% of BW for five days prior to trial initiation and then weighed on two consecutive days (day 0 and 1) to establish an initial BW. Cattle were blocked by day 0 BW, stratified by BW within block, and assigned randomly to pen. Pens were assigned randomly to one of eight treatments with 10 steers per pen and five pens per treatment.

Dietary treatments (Table 1) consisted of 20% MDGS (ADM, Columbus, Neb.) or Synergy (a combination of modified distillers grains and wet corn gluten feed; ADM, Columbus, Neb.) and 0, 7, 14, or 21% condensed corn distillers solubles (CDS), which replaced urea and a 1:1 blend of dry-rolled corn (DRC) and high-moisture corn (HMC). The CDS (BioFuel Ethanol Energy Corp., Wood River, Neb.) used in this study contained 35.0% DM and 18.6% ether extract. All diets contained 6% wheat straw and 5% dry supplement, which was formulated to provide 338 mg/steer daily Rumensin®, 90 mg/steer daily Tylan®, and 130 mg/steer daily thiamine. Dietary fat increased from 4.6 to 8.8% as CDS inclusion increased from 0 to 21%.

Steers were implanted on day 1 with Revalor®-IS and reimplanted on day 83 with Revalor®-S (Intervet, Millsboro, Del.). All animals were harvested on day 181 at Greater Omaha Pack (Omaha, Neb.), at which time hot carcass weights (HCW) and liver scores were recorded. Fat thickness, loin muscle LM area, and USDA marbling score were recorded after a 48 hour chill. Yield grade was calculated using HCW, fat thickness, LM area, and an assumed 2% KPH. Final BW, ADG, and F:G were calculated using HCW adjusted to a common (63%) dressing percentage.

Performance and carcass data were analyzed as a 2 × 4 factorial using the MIXED procedure of SAS (SAS Inst., Inc., Cary, N.C.) as a randomized complete block design with pen as the experimental unit. Weight block was included as a random effect.

Table 1. Diet composition for diets containing CDS with either MDGS or Synergy.[1,2]

	CDS Inclusion, %			
Ingredient, %	0	7	14	21
MDGS Diets				
DRC	34.5	31.0	27.5	24.0
HMC	34.5	31.0	27.5	24.0
MDGS	20.0	20.0	20.0	20.0
CDS	—	7.0	14.0	21.0
Straw	6.0	6.0	6.0	6.0
Supplement	5.0	5.0	5.0	5.0
Analyzed Composition				
Ether Extract	5.1	6.3	7.6	8.8
Synergy Diets				
DRC	34.5	31.0	27.5	24.0
HMC	34.5	31.0	27.5	24.0
Synergy	20.0	20.0	20.0	20.0
CDS	—	7.0	14.0	21.0
Straw	6.0	6.0	6.0	6.0
Supplement	5.0	5.0	5.0	5.0
Analyzed Composition				
Ether Extract	4.6	5.8	7.1	8.3

[1] All values expressed on a DM basis.
[2] CDS = condensed distillers solubles; MDGS = modified distillers grains; DRC = dry-rolled corn; HMC = high-moisture corn.

Table 2. Effects of CDS inclusion on performance and carcass characteristics.

	20% MDGS				20% Synergy				*P*-value	
CDS level:	0	7	14	21	0	7	14	21	Bypr[1]	Int[2]
Performance										
Initial BW, lb	767	766	767	766	768	767	768	766	0.57	0.98
Final BW, lb[3,4]	1441	1456	1504	1476	1470	1478	1473	1498	0.27	0.09
DMI, lb/day	24.2	23.8	25.2	23.4	24.8	24.6	24.7	24.3	0.06	0.16
ADG, lb[4]	3.74	3.83	4.10	3.94	3.89	3.95	3.91	4.07	0.31	0.08
Feed:Gain[5]	6.45	6.17	6.13	5.92	6.37	6.25	6.29	5.95	0.48	0.67
Carcass Characteristics										
HCW, lb[4]	908	917	948	930	926	931	928	944	0.27	0.09
LM area, in^2	13.6	13.8	13.7	13.8	13.9	14.0	14.0	14.0	0.12	0.99
12th rib fat, in	0.52	0.57	0.59	0.59	0.55	0.57	0.56	0.59	0.95	0.64
Calculated YG	3.39	3.49	3.71	3.60	3.47	3.50	3.46	3.60	0.58	0.46
Marbling score[6]	583	570	570	567	583	586	561	580	0.52	0.70

[1]Bypr = Main effect of byproduct type.
[2]Int = Effect of byproduct type and CDS level interaction.
[3]Calculated from hot carcass weight, adjusted to a common 63% dressing percentage.
[4]Quadratic effect of CDS within MDGS diets ($P = 0.10$).
[5]Linear main effect of CDS ($P < 0.01$).
[6]500 = Small^0; 600 = Modest^0.

Orthogonal contrasts were used to test the effect of CDS inclusion level within each byproduct type when an interaction occurred, or for the main effect of CDS when no interaction was observed. Treatment differences were considered significant at $P \leq 0.10$.

Results

Significant byproduct type by CDS level interactions were observed for final BW, HCW, and ADG ($P < 0.10$). Byproduct type affected DMI only, as cattle fed Synergy consumed 1.9% more DM than cattle fed MDGS ($P = 0.06$). Addition of CDS to the diet impacted DMI, ADG, F:G, final BW, and HCW ($P < 0.05$) (Table 2). A cubic response in DMI to increasing CDS level was observed ($P = 0.01$) in both MDGS and Synergy diets. A quadratic response was observed for ADG as CDS increased ($P = 0.09$) in diets containing MDGS, with ADG being maximized at 14% CDS and then decreasing slightly at 21% CDS. As level of CDS increased in Synergy diets, ADG increased numerically. This lack of significant ADG response to CDS in Synergy diets is consistent with previous research (*2009 Nebraska Beef Cattle Report*, p. 64) in which addition of 20% CDS to a diet containing 35% WCGF had no significant impacts on ADG. A linear improvement in F:G ($P < 0.01$) due to increasing CDS level was observed regardless of byproduct type, as cattle fed 21% CDS were approximately 8% more efficient than those receiving no CDS. Final BW and HCW responded quadratically to increasing CDS level in MDGS diets ($P = 0.10$); increasing with CDS levels up to 14%, then decreasing slightly when 21% CDS was added. No effect on final BW or HCW due to CDS was observed in Synergy diets. No differences due to either byproduct type or CDS level were observed for LM area, 12th rib fat thickness, calculated YG, or marbling score.

Previous research (*2012 Nebraska Beef Cattle Report,* pp. 64-65) showed improved performance in cattle fed diets containing up to 9% dietary fat, when supplied by CDS as the only byproduct ingredient. In the current study, when 8.8% dietary fat was supplied by a combination of CDS and MDGS, ADG, final BW, and HCW were slightly lower than diets containing CDS and Synergy (8.3% fat). Even so, F:G continued to improve with addition of CDS up to 21% in both types of diets, suggesting that the upper threshold for adding dietary fat from CDS and either MDGS or Synergy has not been reached.

Condensed distillers solubles can effectively be fed in combination with other byproducts as a partial replacement for dry-rolled and high-moisture corn. Average daily gain was maximized in MDGS diets at 14% CDS. However, feed conversion continued to improve up to 21% CDS in both diets, so inclusions of at least 21% CDS may be optimal, regardless of byproduct type.

[1] Anna C. Pesta, graduate student; Brandon L. Nuttelman, research technician; Will A. Griffin, research technician; Terry J. Klopfenstein, professor; Galen E. Erickson, professor, University of Nebraska–Lincoln Department of Animal Science, Lincoln, Neb.