Effect of Regrinding Dried Distillers Grains with Solubles on Finishing Pig Growth Performance[1]

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Summary

A total of 1,235 barrows and gilts (PIC, 337 × 1050, initially 77.35 lb) were used in a 103-d study to determine the effects of regrinding dried distillers grains with solubles (DDGS) on finishing pig growth performance. Pigs were blocked by weight and randomly assigned to 1 of 2 treatments with 23 replications per treatment. Treatments included: (1) a corn-soybean meal diet with "normal" DDGS (DDGS average particle size of 780 µ), and (2) the same corn-soybean meal diet with reground DDGS (DDGS average particle size of 691 µ). Diets were fed in 4 phases (77 to 117, 117 to 163, 163 to 196, and 196 to 270 lb for Phases 1, 2, 3, and 4, respectively). Phase 1 and 2 diets contained 40% DDGS, and Phase 3 and 4 diets contained 20% DDGS. To achieve uniform lots of DDGS among treatments, semi-loads were split in half and left either as-received or reground. The DDGS was reground using a RMS 9X36 dual roller mill with corrugations set at 6-6 on top and 13-13 on the bottom.

Within each of the individual phases, there were no differences ($P > 0.18$) in ADG, ADFI, or F/G. Similarly for the overall experiment, no differences ($P < 0.24$) in growth performance were found. These data indicate that regrinding DDGS (95 µ reduction in particle size) was not a large enough difference to affect growth performance; however, more research is needed to evaluate a greater reduction in particle size than achieved in the present study.

Key words: DDGS, feed processing, particle size, finishing pig

Introduction

With the increasing price of corn and the associated increased price of DDGS, swine producers are continually looking for ways to make finishing pigs more efficient. One method that has been proven to improve feed efficiency is finely grinding corn to decrease the particle size. For every 100 µ decrease in corn particle size, a 1.2% improvement in feed efficiency is expected. Many finishing pig diets currently include DDGS, which replaces a portion of the corn in the diet, but with the increase in DDGS use, little is known about how reducing DDGS particle size may influence growth in a commercial environment.

Therefore, the objective of this study was to determine the effects of regrinding DDGS on growth performance of finishing pigs from 77 to 270 lb.

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Procedures

This study was approved by and conducted in accordance with the guidelines of the Kansas State University Institutional Animal Care and Use Committee. The experiment was conducted in a commercial research finishing barn in southwestern Minnesota. The barn was naturally ventilated and double-curtain-sided. Pens had completely slatted flooring and deep pits for manure storage. Each pen was equipped with a 5-hole stainless steel dry self-feeder (STACO, Inc., Schaefferstown, PA) and a cup waterer for ad libitum access to feed and water. Daily feed additions to each pen were accomplished through a robotic feeding system (FeedPro; Feedlogic Corp., Willmar, MN) capable of providing and measuring feed amounts for individual pens.

A total of 1,235 barrows and gilts (PIC, 337 × 1050, initially 77.35 lb) were randomly assigned to 1 of 2 dietary treatments balanced by average BW within gender. Treatments included: (1) a corn-soybean meal-based diet with standard DDGS, and (2) a corn-soybean meal-based diet with reground DDGS (Table 1). Phase 1 and 2 diets contained 40% DDGS, and Phase 3 and 4 contained 20% DDGS. Paylean (Elanco Animal Health, Greenfield, IN) was added at 4.5 g/ton in the Phase 4 diet.

The DDGS delivered for each batch of feed were split in half and halves were used for either the control or reground diet. All reground DDGS were processed using an RMS 9X36 dual roller mill with corrugations set at 6-6 on top and 13-13 on the bottom. Samples were taken from each delivered load of DDGS from both the standard and reground form for analysis. Particle size analyses were conducted at the K-State Swine Laboratory using 13 sieves (U.S. standard sieve numbers 6, 8, 12, 16, 20, 30, 40, 50, 70, 100, 140, 200, 270) and a pan.

Average daily gain, ADFI, and F/G were determined by weighing pigs and measuring feed disappearances at d 0, 20, 41, 63, 89, and 103. On d 89, the 3 heaviest pigs from each pen (determined visually) were sold according to the normal marketing procedure of the farm. Remaining pigs were on test until d 103. Data were then analyzed as a direct comparison using the PROC MIXED procedure in SAS (SAS Institute Inc., Cary, NC). Pen was used as the experimental unit in all analyses. Results were considered significant at $P \leq 0.05$ and considered a trend at $P \leq 0.10$.

Results and Discussion

Particle size analysis revealed the standard and reground DDGS to have an average particle size of 787 and 692 μ, respectively (Table 2). Within each of the individual phases, there were no differences ($P > 0.18$) in ADG, ADFI, F/G or final BW among treatments (Table 3). Similarly for the overall experiment, no differences in growth performance were found ($P > 0.24$), although numerically in every period except the last, F/G for pigs fed reground DDGS was better than those fed the standard DDGS. For the overall period, F/G was 1.1% better for pigs fed the reground DDGS. This represents a $.59 per pig reduction in feed cost at an average diet cost of $280/ton.

These data suggest that regrinding DDGS and reducing the average particle size by 95 μ was not sufficient to affect growth performance. Our initial targeted particle size difference between standard and reground DDGS was 200 μ; however, due to the configuration or use of the roller mill in the present study, we were unable to finely grind DDGS.

Thus, roller mill setting and type as well as the potential use of a hammer mill may allow for a greater particle size reduction for regrinding DDGS. More research is needed to determine the effects of a greater reduction in DDGS particle size on finishing pig performance to determine its feasibility for swine producers.

Table 1. Diet composition (as-fed basis)

	Phase			
Item	1	2	3	4
Ingredient, %				
Corn	43.10	47.30	64.60	57.50
Soybean meal (46.5% CP)	14.60	10.5	13.70	20.75
Dried distillers grains with solubles	40.00	40.00	20.00	20.00
Limestone	1.25	1.20	0.95	0.95
Salt	0.35	0.35	0.35	0.35
Vitamin premix	0.10	0.10	0.10	0.10
Biolys	0.595	0.540	0.290	0.340
Phytase[3]	0.005	0.005	0.005	0.005
Paylean, 9 g/lb	-	-	-	0.025
Total	100.00	100.00	100.00	100.00
Calculated analysis				
Standardized ileal digestible (SID) amino acids, %				
Lysine	0.98	0.85	0.75	0.95
Methinoine:lysine	34	37	36	32
Met & Cys:lysine	70	76	75	66
Threonine:lysine	65.3	69	70	65
Tryptophan:lysine	17	17	19	19
Total lysine, %	1.17	1.03	0.89	1.1
ME, kcal/lb	1,524	1,526	1,528	1,527
SID lysine:ME, g/Mcal	2.92	2.53	2.23	2.82
CP, %	21.8	20.2	17.5	20.2
Ca, %	0.55	0.52	0.43	0.45
P, %	0.51	0.49	0.42	0.45
Available P, %	0.33	0.32	0.22	0.23

[1] Treatment diets fed for 103 d.
[2] Phase 1 (77 to 117 lb), Phase 2 (117 to 163 lb), Phase 3 (163 to 196 lb), Phase 4 (196 to 270 lb).
[3] OptiPhos 2000 (Enzyvia LLC, Sheridan, IN).

Table 2. Dried distillers grains with solubles (DDGS) particle size analysis[1]

	DDGS		
Load	Standard	Reground	Reduction
1	852	644	(208)
2	820	732	(88)
3	733	627	(106)
4	772	725	(47)
5	790	732	(58)
6	716	672	(44)
7	775	705	(70)
8	837	697	(140)
Average	787	692	(95)

[1] The DDGS delivered for each batch of feed was split in half and each half was used for either the control or reground diet. Samples were taken from each delivered load of DDGS from both the standard and reground for analysis. Particle size analysis was conducted at the Kansas State University Swine Laboratory using 13 sieves (U.S. standard sieve numbers 6, 8, 12, 16, 20, 30, 40, 50, 70, 100, 140, 200, 270) and a pan.

Table 3. The effects of regrinding dried distillers grains with solubles (DDGS) on growth performance in finishing pigs[1]

	DDGS			
Item	Control	Reground	SEM	Probability, $P <$
d 0 to 20				
ADG, lb	2.00	2.00	0.016	0.83
ADFI, lb	4.50	4.42	0.071	0.32
F/G	2.25	2.21	0.025	0.22
d 20 to 41				
ADG, lb	2.20	2.18	0.023	0.64
ADFI, lb	5.73	5.66	0.060	0.37
F/G	2.61	2.59	0.026	0.57
d 41 to 63				
ADG, lb	1.51	1.52	0.017	0.76
ADFI, lb	4.96	4.95	0.056	0.91
F/G	3.29	3.26	0.038	0.66
d 63 to 89				
ADG, lb	1.67	1.69	0.013	0.18
ADFI, lb	5.31	5.31	0.045	0.92
F/G	3.17	3.13	0.026	0.20
d 89 to 103				
ADG, lb	2.26	2.30	0.040	0.43
ADFI, lb	5.88	5.97	0.073	0.43
F/G	2.61	2.61	0.031	0.87
d 0 to 103				
ADG, lb	1.88	1.89	0.012	0.59
ADFI, lb	5.23	5.20	0.045	0.66
F/G	2.78	2.75	0.016	0.24
Wt, lb				
d 20	117.7	117.76	1.711	0.97
d 41	163.7	163.50	2.073	0.94
d 63	197.0	196.87	2.057	0.96
d 89	240.5	240.82	2.047	0.90
d 103	268.7	269.86	2.171	0.70

[1] A total of 1,235 barrows and gilts (PIC, 337 × 1050, initially 77.35 lb) were used in a 103-d growth trial with 23 pens per treatment and 26 or 27 pigs per pen.