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EVALUATION OF DEOILED CORN DRIED DISTILLERS GRAINS WITH SOLUBLES (SOLVENT EXTRACTED) ON GROWTH PERFORMANCE OF NURSERY PIGS[1]

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Summary

A total of 210 pigs (initially 22.0 lb) were used in a 28-d study to evaluate the effects of increasing deoiled corn dried distillers grains with solubles, solvent extracted (dDGS) on nursery pig growth performance. Pigs were blocked on the basis of pen weight and randomly allotted to 1 of 5 dietary treatments containing 0, 5, 10, 20, or 30% dDGS. There were 7 pens per treatment and 6 pigs per pen. All diets were formulated to equivalent ME and standardized ileal digestible lysine concentrations. Soybean oil was added to the dDGS diets as an energy source to equalize dietary ME of the 5 treatments. Pigs from each pen were weighed as a group and feed consumption was obtained on d 0, 14, and 28 to determine ADG, ADFI, and F/G. Overall, feeding diets with increasing dDGS had no effect ($P > 0.46$) on nursery pig ADG, ADFI, and F/G. In conclusion, dDGS can be included at levels up to 30% in nursery pig diets for pigs weighing between 22 to 50 lb without affecting growth performance provided fat is added to the diet to offset the low energy content of dDGS.

Key words: deoiled corn dried distillers grains with solubles, feed ingredient, growth, nursery pig

Introduction

Because of recent increases in corn and soybean prices, the swine industry is seeking alternatives to these major feed ingredients. Coproducts of ethanol production such as dried distillers grains with solubles (DDGS) are widely available for use in livestock diets, and traditional DDGS are used frequently. As a result of increased ethanol production, the volume of DDGS as well as other coproducts is increasing. One such coproduct is deoiled corn DDGS, solvent extracted, (dDGS), which has higher CP, fiber, and mineral content than traditional DDGS. However, the energy value of dDGS is lower than that of traditional DDGS, a result of the deoiling process.

In a previous experiment conducted at Kansas State University, we were able to establish the amino acid digestibility coefficients and energy values of dDGS for swine. These values, aimed to provide reference values for diet formulation, were validated in a growth performance trial in growing and finishing pigs. Although use of dDGS in growing and finishing pig diets has been researched, the potential for using this coproduct in nursery diets has not been examined. Therefore, the objective of this trial was to evaluate the

[1] Appreciation is expressed to Verasun Energy Inc., Brookings, SD, for partial funding of the study.
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effects of the dDGS on growth performance of nursery pigs.

Procedures

Experimental procedures used in this study were approved by the South Dakota State University Animal Care and Use Committee.

A total of 210 pigs (initially 22.0 lb) were blocked on the basis of pen weights and randomly allotted to 1 of 5 dietary treatments with 7 pens per treatment and 6 pigs per pen. Barrows and gilts were housed in separate mechanically ventilated barns. Both barns have completely slatted flooring; barrows were housed in 4-ft × 4-ft pens, gilts in 4-ft × 5-ft pens. Each pen was equipped with nipple waterers and 3-hole feeders. All pigs were fed similar starter diets until the start of the experiment.

The dDGS utilized in this experiment was analyzed for DM, CP, amino acids, crude fat, NDF, ADF, Ca and P (Table 1). Metabolizable energy and standardized ileal digestible (SID) amino acids values were determined from a previous study (Jaycela et al., 2007 Swine Day Report of Progress, p. 137). These values were then used in diet formulation. The 5 dietary treatments contained dDGS at 0, 5, 10, 20, or 30% (Table 2). All diets were formulated to contain equal ME and SID lysine concentrations. Soybean oil was added to the dDGS diets as an energy source to equalize dietary ME levels of the 5 treatments. To determine ADG, pigs from each pen were weighed as a group on d 0, 14, and 28. Feed consumption for each pen was also obtained during these times to determine ADFI and calculate F/G.

Data were analyzed as a randomized complete block design by using the PROC MIXED procedure of SAS. Pen served as the experimental unit. Linear and polynomial contrasts were used to determine the effects of increasing dDGS. Contrast coefficients were determined for unequally spaced treatments by using the IML procedure of SAS.

Results and Discussion

The analyzed nutrient content of dDGS was similar to values anticipated for this new ethanol coproduct. The CP was 28.3%, and the lysine concentration was 0.84%, giving a lysine:CP ratio of 2.97, indicating this is a high quality ethanol coproduct source.

Overall (d 0 to 28), nursery pigs fed increasing dDGS had similar ($P > 0.46$) ADG, ADFI, and F/G. These data indicate that increasing dietary dDGS up to 30% did not affect growth performance for nursery pigs weighing 22 to 50 lb when diets were balanced for both SID amino acids and ME.

Previous research evaluating the effects of traditional DDGS on nursery pig growth performance has shown that DDGS can be fed at levels up to 25% without negatively affecting growth performance. In this study, dDGS was added at levels up to 30%, and the resulting growth performance in nursery pigs was comparable to that of pigs fed diets without dDGS.

In conclusion, dDGS can be added to nursery diets for pigs weighing 22 to 50 lb without influencing growth performance provided fat is added to the diets to offset the decreased ME content of dDGS. In addition, these results further validate the accuracy of previously determined ME (1,137 kcal/lb) and SID amino acid values for dDGS.

Table 1. Analyzed nutrient composition content of deoiled corn dried distillers grains with solubles, solvent extracted (dDGS)

Item	Nutrient composition[1]	SID, %[2]
Proximate analysis, %		
DM	90.7	
CP	28.3	
Crude fat	4.1	
ADF	15.6	
NDF	34.2	
Ca	0.14	
P	0.69	
ME, kcal/lb[3]	1,137	
Amino acids, %		
Arginine	1.21	82.70
Histidine	0.74	74.63
Isoleucine	1.05	74.52
Leucine	3.26	83.79
Lysine	0.84	50.38
Methionine	0.58	80.41
Phenylalanine	1.37	80.77
Threonine	1.02	68.91
Tryptophan	0.19	77.96
Valine	1.43	73.75
Alanine	1.96	79.12
Aspartic acid	1.76	64.58
Cysteine	0.48	66.94
Glutamic acid	4.07	79.01
Glycine	1.09	64.63
Proline	2.01	87.79
Serine	1.21	76.86
Tyrosine	1.03	82.35

[1] As-fed basis.

[2] Standardized ileal digestibility (SID) values were determined in a previous study (Jacela et al., 2007 Swine Day Report of Progress, p. 137).

[3] Used in diet formulation and determined in a previous study (Jacela et al., 2007 Swine Day Report of Progress, p. 137).

Table 2. Experimental nursery diet composition (as-fed basis)[1]

	dDGS[2], %				
Item	0	5	10	20	30
Corn	63.76	59.08	54.46	45.18	35.88
Soybean meal (46.5% CP)	32.57	31.39	30.21	27.84	25.48
dDGS	---	5.00	10.00	20.00	30.00
Soybean oil	---	0.90	1.75	3.50	5.25
Monocalcium phosphate (21% P)	1.65	1.50	1.40	1.15	0.90
Limestone	0.95	1.05	1.10	1.23	1.38
Salt	0.35	0.35	0.35	0.35	0.35
Vitamin premix	0.05	0.05	0.05	0.05	0.05
Trace mineral premix	0.15	0.15	0.15	0.15	0.15
L-lysine HCl	0.30	0.33	0.35	0.40	0.45
DL-methionine	0.12	0.11	0.10	0.08	0.06
L-threonine	0.10	0.10	0.09	0.08	0.06
Total	100.00	100.00	100.00	100.00	100.00
Calculated analysis					
Standardized ileal digestible amino acids					
Lysine, %	1.25	1.25	1.25	1.25	1.25
Methionine:lysine ratio, %	33	33	33	33	33
Met & Cys:lysine ratio, %	58	58	58	58	58
Threonine:lysine ratio, %	62	62	62	62	62
Tryptophan:lysine ratio, %	18	18	18	17	17
Total lysine, %	1.38	1.40	1.42	1.45	1.48
CP, %	21.0	21.6	22.2	23.5	24.7
SID Lysine:calorie ratio, g/Mcal ME	3.79	3.79	3.79	3.79	3.79
ME, kcal/lb	1,496	1,496	1,496	1,496	1,496
Ca, %	0.80	0.80	0.80	0.80	0.80
P, %	0.75	0.73	0.73	0.71	0.69
Available P, %	0.42	0.42	0.42	0.42	0.42

[1] Fed from approximately 22 to 50 lb.
[2] Deoiled corn dried distillers grains with solubles, solvent extracted.

Table 3. Effects of increasing deoiled corn dried distillers grains with solubles, solvent extracted (dDGS) on nursery pig growth performance[1]

	dDGS, %						Probability, *P* <
Item	0	5	10	20	30	SE	Linear	Quadratic
Weight, lb								
d 0	22.0	22.0	21.1	21.9	21.9	1.0	0.94	0.70
d 28	50.0	50.3	49.0	49.4	49.2	1.2	0.56	0.77
d 0 to 28								
ADG, lb	1.00	1.01	1.00	0.98	0.97	0.04	0.50	0.97
ADFI, lb	1.65	1.70	1.67	1.66	1.68	0.02	0.99	0.89
F/G	1.66	1.70	1.72	1.70	1.75	0.08	0.46	0.93

[1] A total of 210 pigs with 6 pigs per pen and 7 replications per treatment.