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Feeding DDGS to Finishing Pigsin Deep-Bedded Hoop Barns

Mark S. Honeyman
Iowa State University, honeyman@iastate.edu

David R. Stender
Iowa State University, dstender@iastate.edu

Wayne B. Roush
Iowa State University, wroush@iastate.edu

Don Hummel
Iowa State University

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Abstract
The ethanol industry in Iowa has rapidly expanded in the last several years. A major coproduct of ethanol production is dried distillers grains with solubles(DDGS). Higher prices for corn and ample supplies of DDGS has generated interest in feeding DDGS to finishing pigs. Challenges in feeding DDGS supplemented diets to finishing swine include problems of feed flowability in bulk bins and feeders, reduced feed intake, and softer, oilier fat in pork carcasses. Pelleted diets have improved flowability and may stimulate feed intake, but thus far no studies have examined feeding DDGS-supplemented dietsin pelletted form to pigs. The objective of this study was to evaluate pelletted DDGS-based diets fed to finishing pigs.

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Feeding DDGS to Finishing Pigs in Deep-Bedded Hoop Barns

Mark Honeyman, professor
Department of Animal Science
Dave Stender, extension field specialist
Wayne Roush, farm superintendent
Don Hummel, ag specialist

Introduction

The ethanol industry in Iowa has rapidly expanded in the last several years. A major coproduct of ethanol production is dried distillers grains with solubles (DDGS). Higher prices for corn and ample supplies of DDGS has generated interest in feeding DDGS to finishing pigs. Challenges in feeding DDGS-supplemented diets to finishing swine include problems of feed flowability in bulk bins and feeders, reduced feed intake, and softer, oilier fat in pork carcasses. Pelleted diets have improved flowability and may stimulate feed intake, but thus far no studies have examined feeding DDGS-supplemented diets in pelletted form to pigs. The objective of this study was to evaluate pelletted DDGS-based diets fed to finishing pigs.

Materials and Methods

Crossbred finishing pigs (n = 120) were allocated to six pens with five barrows and five gilts per pen for two trials. Trial 1 was conducted during January, February, and March 2007 at the ISU Western Research Farm, Castana, IA. Trial 2 was conducted during April, May, and June 2007. The pens were in small hoop barns with two pens per barn. Each pen had a self-feeder and an automatic waterer and was bedded with straw.

Each pen was assigned to one of three dietary treatments—corn-soy, 20% DDGS, and 40% DDGS. The diets were pelletted and fed ad libitum. The diets were formulated to be equal in total lysine, apparent digestible lysine, and total tryptophan (Table 1). Diets were supplied by Arcadia Co-op, Arcadia IA, using DDGS from the Amaizing Energy ethanol plant, Denison IA. All diets were delivered simultaneously at the beginning of the trial for the entire trial. DDGS values used in diet formulation were the recent average analysis values provided by the plant. DDGS nutrient values used were 28% CP, 0.62% total lysine, 0.29% apparent digestible lysine, 0.25% tryptophan, 0.03% Ca, 0.52 available P, 7.0% CF, 9.5% EE, and 1,656 kcal/lb ME. All other values were from the ISU Lifecycle Swine Nutrition program.

The pellets were evaluated for quality (durability) by DFS, Newell, IA. Evaluation consisted of tumbling 1.1 lb of pellets for 10 minutes with four 3/4-in. steel nuts. Quality was recorded as the amount of pellets remaining (relative to the amount of fines) compared with the initial amount of pellets. Durability of pellets was expressed as percentage of whole pellets left after the test.

The pigs were allowed one week of adjustment to their pen and diet. The pigs were then continued in their respective pens on the assigned diets for six weeks. Feed intake and weight gain were recorded. At the end of the trial the pigs were scanned for backfat and loin muscle area and harvested at the Farmland plant, Denison, IA.

Two carcasses (one barrow and one gilt) from each pen in Trial 2 were randomly selected for fatty acid and iodine value analyses. Fat samples were analyzed for eight fatty acids and the iodine value. Because of the small data set (four pigs per treatment), no statistical analysis was performed on the fat analyses.

Results and Discussion

Pellet durability decreased as the percentage of DDGS increased. The diets had 78.9%, 66.8%, and 47.4% durability for the corn-soy, 20%

DDGS, 40% DDGS diets, respectively. The fines were noticeable in the feeders, but did not cause a problem in the feeders or for the pigs.

The pigs consumed the diets readily with no apparent problems with transitioning to the diets. Results are shown in Table 2. Feed intake (ADFI) ($P < 0.05$) and growth (ADG) ($P < 0.10$) was depressed on the 40% DDGS diet. The feed intake was depressed more than the growth, probably because of the greater energy density of the DDGS. The 40% DDGS-fed pigs required less feed per liveweight gain (F/G) ($P < 0.05$) and less feed per lean gain ($P < 0.10$) than the pigs fed the other diets. Again, this response is explained by the greater energy density of the 40% DDGS diet. No differences were noted in backfat (BF), loin muscle area (LMA), carcass yield, or fat free lean percentage.

Fatty acid and iodine values are reported in Table 3. As DDGS in the diet increased, levels of palmitic and stearic fatty acids decreased and linoleic fatty acid increased (Table 3). Iodine value, a measure of fat saturation, increased about 15% when 20% DDGS was added to the corn-soy diet, and 24% when 40% DDGS was added. A larger iodine value indicates a softer, oiler fat with shorter shelf life. Iodine values greater than 75 are generally considered unacceptable. The 40% DDGS diets had iodine value of 80.5 indicating the 40% DDGS diets produced pork carcasses that would be unacceptable (Table 3).

This study demonstrated that pelleting DDGS-based diets was feasible and resulted in no problems with feed flowability. However, pellet durability decreased as the amount of DDGS increased. Feed intake of 20% DDGS-based pelleted diets did not differ from pelletted corn-soy diets. Pigs fed 20% DDGS-based diets had softer but acceptable carcass fat. Pelletting may be a viable method to aid in the feeding of DDGS to pigs.

Table 1. Composition and calculated analysis of diets, as-fed basis.

Ingredient	Corn/soy	DDGS20	DDGS40
Corn	804.00	670.70	537.40
DDGS	0.00	200.00	400.00
Soybean meal	175.00	108.00	40.00
Dical. phos.	8.00	3.30	0.00
Limestone	8.50	11.70	14.50
Salt	3.60	3.60	3.60
Vit. mix	0.40	0.40	0.40
TM mix	0.50	0.50	0.50
Lysine	0.00	1.80	3.60
Total	1,000.00	1,000.00	1,000.00
Calculated Analysis			
Total lysine, %	0.74	0.78	0.82
App. dig. lysine, %	0.59	0.59	0.59
Cr. protein, %	15.00	16.50	17.90
Met. energy, kcal/lb	1,515.00	1,537.00	1,557.00
Calcium, %	0.58	0.58	0.59
Total P, %	0.50	0.46	0.45
Avail. phos., %	0.21	0.21	0.24
Tryptophan, %	0.16	0.16	0.16
Apparent Digestible Lysine Calculations			
Total Lysine %		Digestible %	App. Dig. Lysine %
DDGS	0.62	0.47	0.29
Corn	0.26	0.66	0.17
SBM	3.02	0.86	2.60

Table 2. Pig performance of finishing pigs fed DDGS-based diets in bedded hoop barns.

C-S	DDGS20	DDGS40		SEM	P-value
Start wt, lb	161	164	164	1	0.18
End wt, lb	268	268	263	3	0.36
ADFI, lb/d	7.5$_{c}$	7.4$_{c}$	5.8$_{d}$	0.4	0.04
ADG, lb/d	2.68$_{a}$	2.61$_{a,b}$	2.45$_{b}$	0.07	0.09
F/G	2.78$_{c}$	2.83$_{c}$	2.38$_{d}$	0.12	0.05
BF, in.	0.78	0.79	0.72	0.05	0.54
LMA, sq in.	6.74	6.57	6.65	0.11	0.58
Yield, %	76.0	75.6	75.5	0.40	0.67
FFL, %	51.7	51.2	52.3	0.7	0.50
Eff. lean gain, lb feed/lb gain	7.7$_{a}$	8.1$_{a}$	6.4$_{b}$	0.5	0.08

[a,b]Values in the same row with differing superscripts differ ($P < 0.05$).
[c,d]Values in the same row with differing superscripts differ ($P < 0.10$).

Table 3. Fatty acid and iodine values of fat samples from pigs fed DDGS-based diets.

Corn-soybean	DDGS20		DDGS40
Myristic (14:1)	1.2	1.2	1.1
Palmitic (16:0)	23.9	22.4	20.8
Palmitoleic (16:1)	1.6	1.4	1.3
Stearic (18:0)	15.0	12.9	10.8
Oleic (18:1)	38.3	34.9	35.1
Vaccenic (18:1)	1.9	1.7	1.7
Linoleic (18:2)	14.8	22.1	25.1
Linolenic (18:3)	0.6	0.7	0.7
Iodine value	64.7	74.6	80.5