

Effects of an Enzyme Blend (Livestock Answer) in Diets Containing Dried Distillers Grains with Solubles on Growth Performance of Nursery and Finishing Pigs

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Summary

Two trials were conducted to determine the effects of an enzyme blend (Livestock Answer; Environmental Care and Share, Golden, CO) on growth performance of nursery and wean-to-finish pigs. Livestock Answer contains amylases, cellulases, proteases, lipases, and phytases. In Exp. 1, a total of 180 pigs (PIC TR4 × 1050, initially 12.3 lb and 21 d old) were used in a 28-d trial. Pigs were blocked by weight and allotted at weaning to 1 of 3 enzyme levels (0%, 0.125%, and 0.175%). There were 6 pigs per pen and 10 replications per treatment. Diets were corn-soybean meal based and contained 15% dried distillers grains with solubles (DDGS) during Phase 1 (d 0 to 14) and 25% DDGS during Phase 2 (d 14 to 28). From d 0 to 14, increasing enzyme level improved ADG (quadratic; $P = 0.04$) and F/G (linear; $P = 0.05$) and tended to improve ($P < 0.07$) ADFI and pig weight on d 14. From d 14 to 28, enzyme level had no effect ($P > 0.20$) on ADG or ADFI but worsened F/G (quadratic; $P = 0.04$). Pigs fed an enzyme blend for the first 14 d after weaning had improved growth performance. However, over the entire 28-d nursery period, enzyme level had no effect ($P > 0.22$) on pig performance. In Exp. 2, a total of 224 nursery pigs (PIC TR4 × 1050, initially 13.4 lb and 21 d of age) were blocked by weight and allotted to 1 of 4 treatments. There were 8 pigs per pen and 7 pens per treatment. Livestock Answer was added at 0.125% to either the nursery or finisher stage or both in a 2 × 2 factorial arrangement (with and without in nursery and with and without in finisher). Diets were corn-soybean meal based and contained 15% DDGS from d 0 to 14, 25% DDGS from d 14 to 35, and 30% DDGS from d 35 to d 126. On d 126, pigs were harvested and carcass data were collected. Adding the enzyme to nursery, finishing, and nursery and finishing combined diets containing DDGS did not influence ($P > 0.20$) ADG, ADFI, F/G, or any of the carcass criteria measured in Exp 2.

Key words: dried distillers grains with solubles, enzyme

Introduction

With recent feed price volatility, greater emphasis has been placed on improving feed efficiency. Enzymes have been used extensively in European swine diets, which contain more fibrous feedstuffs than traditional corn-based diets in the United States. Dried distillers grains with solubles (DDGS) have been incorporated into swine diets to reduce cost. Because DDGS are more fibrous than corn, feeding enzymes in DDGS-containing diets may be beneficial. Livestock Answer (Environmental Care and Share, Golden, CO) is a blend of 17 enzymes including amylases, lipases, proteases, cellulases,

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and phytases. Because limited data are available on the impact of this enzyme blend on pig performance, we conducted 2 experiments to determine the effect of Livestock Answer on growth performance of nursery and wean-to-finish pigs.

Procedures

Experiment 1

A total of 180 nursery pigs (12.3 lb and 21 d of age) were blocked by weight at weaning and allotted to 1 of 3 dietary treatments. There were 6 pigs per pen and 10 pens per treatment. The 3 dietary treatments were a control diet without enzyme and the control diet with 0.125% or 0.25% Livestock Answer. Corn-soybean meal-based diets were fed in 2 phases; Phase 1 diets contained 15% DDGS, and Phase 2 diets contained 25% DDGS (Table 1). Phases 1 and 2 were from d 0 to 14 and d 14 to 28, respectively. Diets did not contain an antibiotic and were fed in meal form.

Each pen contained 1 self-feeder and 1 nipple waterer to provide ad libitum access to feed and water. Pens were 5 × 5 ft. Pigs were weighed and feed disappearance was determined on d 0, 7, 14, 21, and 28 to calculate ADG, ADFI, and F/G.

Experiment 2

A total of 224 nursery pigs (13.4 lb and 21 d of age) were blocked by weight and allotted to 1 of 4 dietary treatments. There were 8 pigs per pen and 7 pens per treatment. Livestock Answer (0.125%) was added to the diets in either the nursery or finisher stage or both to complete the 2 × 2 factorial arrangement of treatments (with and without in nursery and with and without in finisher).

Diets were corn-soybean meal based and contained 15% DDGS from d 0 to 14, 25% DDGS from d 14 to 35, and 30% DDGS from d 35 to d 145 (end of the trial; Table 2). Diets did not contain an antibiotic and were fed in meal form.

Pigs were housed in a nursery in 5- × 5-ft pens from d 0 to 35. On d 35, pigs were moved to a finishing facility, where they were housed in 8- × 10-ft pens for the remainder of the trial. Feed delivery to each pen was measured daily. Pigs and feeders were weighed on d 7, 14, 21, 28, and 35 in the nursery and every 2 wk in the finisher to calculate ADG, ADFI, and F/G. On d 126, the heaviest 2 pigs from each pen were removed and marketed. Remaining pigs were marketed on d 145 after weaning. Carcass data including HCW, yield, backfat, loin depth, and percentage lean were collected.

Data were analyzed using the PROC MIXED procedure of SAS (SAS Institute Inc., Cary, NC) with pen as the experimental unit for all analysis. In Exp. 1, the linear and quadratic effect of Livestock Answer was tested. In Exp. 2, there were 14 replications of the 2 dietary treatments being fed during the nursery portion of the trial (d 0 to 35) and 7 replications during the finishing phase.

Results

Experiment 1

From d 0 to 14, increasing the level of enzyme improved ADG (quadratic; $P = 0.04$) and F/G (linear; $P = 0.05$) and tended to improve ADFI (quadratic; $P = 0.06$) and d 14 BW (quadratic; $P = 0.07$; Table 3). From d 14 to 28, enzyme level had no effect

($P > 0.31$) on ADG or ADFI but worsened F/G (quadratic; $P < 0.05$). Overall (d 0 to 28), the enzyme had no effect ($P > 0.24$) on ADG, ADFI, F/G, or d-28 BW; however, the tendency for improved BW at d 14 was maintained at d 28, resulting in a 1.5 lb heavier pig.

Experiment 2

Adding the enzyme to nursery, finishing, and nursery and finishing combined diets containing DDGS did not influence ADG, ADFI, F/G, or any of the carcass criteria measured in the study (Table 4).

Similar to results from previous research at Kansas State University, adding the enzyme blend to corn-soybean meal based diets containing DDGS did not result in improvements in overall pig performance. Additional trials are needed in commercial facilities to understand the variable growth response related to feeding this enzyme blend.

Table 1. Composition of nursery diets in Exp. 1 and 2 (as-fed basis)^{1,2}

Ingredient, %	Phase 1	Phase 2
Corn	40.86	47.36
Soybean meal (46.5% CP)	23.02	23.94
Corn DDGS ³	15.00	25.00
Select menhaden fish meal	3.00	---
Spray-dried whey	15.00	---
Monocalcium P (21% P)	0.70	1.00
Limestone	0.75	1.20
Salt	0.30	0.35
Zinc oxide	0.38	---
Vitamin premix	0.25	0.25
Trace mineral premix	0.15	0.15
Lysine-HCl	0.40	0.55
DL-methionine	0.10	0.08
L-threonine	0.10	0.13
Total	100.00	100.00
Calculated analysis		
SID ⁴ amino acids, %		
Lysine, %	1.35	1.30
Isoleucine:lysine	61	62
Leucine:lysine	129	139
Methionine:lysine	33	31
Met & Cys:lysine	57	58
Threonine:lysine	62	63
Tryptophan:lysine	17	17
Valine:lysine	68	71
SID lysine:ME, g/Mcal	4.10	3.92
Total lysine, %	1.49	1.43
CP, %	22.5	22.7
ME, kcal/lb	1,546	1536
Ca, %	0.80	0.79
P, %	0.73	0.70
Available P, %	0.48	0.41

¹ Phase 1 diets were fed from d 0 to 14 in both experiments. Phase 2 diets were fed from d 14 to 28 in Exp. 1 and d 14 to 35 in Exp. 2.

² Livestock Answer was substituted for corn.

³ Dried distillers grains with solubles.

⁴ Standardized ileal digestible.

Table 2. Composition of finishing diets in Exp. 2 (as-fed basis)¹

Ingredient	Weight range, lb				
	40 to 80	80 to 120	120 to 165	165 to 215	> 215
Corn	48.12	54.51	59.84	63.87	65.91
Soybean meal (46.5% CP)	19.58	13.24	8.06	4.08	2.09
DDGS ²	30.0	30.0	30.0	30.0	30.0
Monocalcium P (21% P)	0.40	0.30	0.20	0.15	0.15
Limestone	1.00	1.00	0.95	0.95	0.95
Salt	0.35	0.35	0.35	0.35	0.35
Vitamin premix	0.10	0.10	0.10	0.10	0.08
Trace mineral premix	0.10	0.10	0.10	0.10	0.08
Lysine HCl	0.35	0.40	0.40	0.40	0.40
Total	100.0	100.0	100.0	100.0	100.0
Calculated values					
SID ³ amino acids, %					
Lysine	1.05	0.93	0.80	0.70	0.65
Isoleucine:lysine	73	71	71	72	72
Methionine:lysine	31	32	34	37	38
Met & Cys:lysine	64	65	70	75	78
Threonine:lysine	63	62	63	64	65
Tryptophan:lysine	19	18	18	17	17
Valine:lysine	85	85	88	91	93
SID Lysine:ME, g/Mcal	3.14	2.77	2.38	2.08	1.93
Total lysine, %	1.18	1.04	0.90	0.79	0.73
Protein, %	21.8	19.5	17.5	16.0	15.3
ME, kcal/lb	1,519	1,522	1,525	1,527	1,528
Ca, %	0.60	0.56	0.50	0.48	0.48
P, %	0.58	0.54	0.50	0.47	0.46
Available P, %	0.28	0.25	0.22	0.21	0.21

¹ Livestock Answer was substituted for corn.² Dried distillers grains with solubles.³ Standardized ileal digestible.

Table 3. Effect of Livestock Answer on growth performance (Exp. 1)¹

Item	Dietary enzyme, %			SEM	<i>P</i> <	
	0	0.125	0.175		Linear	Quadratic
d 0 to 14						
ADG, lb	0.40	0.50	0.45	0.02	0.04	0.04
ADFI, lb	0.51	0.59	0.54	0.02	0.16	0.06
F/G	1.28	1.19	1.20	0.03	0.04	0.05
d 14 to 28						
ADG, lb	0.79	0.76	0.80	0.03	0.87	0.31
ADFI, lb	1.20	1.23	1.24	0.04	0.36	0.99
F/G	1.53	1.61	1.55	0.03	0.21	0.05
d 0 to 28						
ADG, lb	0.59	0.63	0.63	0.02	0.24	0.61
ADFI, lb	0.85	0.91	0.89	0.03	0.25	0.44
F/G	1.44	1.44	1.42	0.02	0.50	0.33
Weight, lb						
d 14	17.8	19.2	18.6	0.61	0.07	0.07
d 28	28.6	30.4	29.8	0.90	0.22	0.31

¹ A total of 224 pigs (initial BW 12.3 lb) were used with 6 pigs per pen and 10 pens per treatment.

Table 4. Effects of Livestock Answer (LA) on growth performance and carcass criteria (Exp. 2)^{1,2}

d 0 to 35:	Control	Control	0.125% LA	0.125% LA	
d 35 to 145:	Control	0.125% LA	Control	0.125% LA	SEM
d 0 to 35					
ADG, lb		0.90		0.86	0.01
ADFI, lb		1.27		1.23	0.01
F/G		1.41		1.43	0.01
d-35 wt, lb		44.9		43.4	0.64
d 35 to 126					
ADG, lb	2.18	2.18	2.20	2.16	0.05
ADFI, lb	5.65	5.61	5.64	5.60	0.19
F/G	2.60	2.58	2.56	2.59	0.04
d 126 to 145					
ADG, lb	2.17	2.31	2.36	2.35	0.17
ADFI, lb	7.42	7.19	7.64	7.63	0.43
F/G	3.43	3.16	3.24	3.26	0.19
d 35 to 145					
ADG, lb	2.18	2.19	2.22	2.18	0.05
ADFI, lb	5.89	5.83	5.91	5.87	0.21
F/G	2.71	2.66	2.66	2.69	0.05
Carcass characteristics					
Weight, lb	203.5	205.0	206.8	204.2	5.8
Yield, %	73.2	72.9	72.9	73.2	0.39
Backfat, mm	21.9	21.8	22.1	22.0	1.72
Loin depth, mm	59.7	58.4	59.8	58.5	1.18
Lean, %	51.8	51.6	51.7	51.6	0.8

¹ A total of 224 pigs (initial BW 13.4 lb) were used with 8 pigs per pen and 14 pens per treatment from d 0 to 35 and 6 pens per treatment from d 35 to 145.

² The 2 heaviest pigs in each pen were removed on d 126.