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Abstract

These results suggest that feeding a complex starter diet improves initial (d 0 to 7 postweaning) growth performance of segregated early-weaned pigs. Feeding either a simple or complex diet with added Turbozyme 160 improves feed efficiency from day 0 to 14 postweaning. However, for the overall experimental period, neither a complex diet nor added Turbozyme 160 had any effect on growth performance.; Swine Day, Manhattan, KS, November 16, 1995

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THE INTERACTIVE EFFECTS OF TURBOZYME 160 AND DIET COMPLEXITY ON STARTER PIG GROWTH PERFORMANCE

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Summary

These results suggest that feeding a complex starter diet improves initial (d 0 to 7 postweaning) growth performance of segregated early-weaned pigs. Feeding either a simple or complex diet with added Turbozyme 160 improves feed efficiency from day 0 to 14 postweaning. However, for the overall experimental period, neither a complex diet nor added Turbozyme 160 had any effect on growth performance.

(Key Words: Starter, Performance, Diet Complexity, Enzyme.)

Introduction

Technology for the feeding and care of the early-weaned pig has improved immensely in the last 10 years. As producers have moved to weaning at a younger age, the industry has evolved from feeding simple corn-soybean meal diets from weaning to market to a phase feeding system using numerous diets tailored to the changing needs of the pig. However, because of the high cost of these diets, feed additives that could reduce the need for complex protein and(or) carbohydrate sources would have a substantial economic impact on the swine industry. Recently, Oklahoma State University found one such feed additive, Turbozyme 160, to produce promising improvements in swine growth and feed efficiency. Research at the University of Illinois with 21-d-old pigs suggested that Turbozyme 160 addition enhanced performance of pigs fed a simple diet so it was comparable to that of pigs fed a more complex diet. If including Turbozyme 160 in the diet would allow for similar pig performance on a less complex diet formulation, this additive would be adopted widely in commercial swine production. Therefore, the objective of this experiment was to evaluate the effects of Turbozyme in complex (industry standard) and simple (low cost) starter diet programs for pigs weaned at 13 to 14 days of age.

Procedures

Two hundred and thirteen weanling crossbred pigs (PIC C15 × L 326) with an average initial weight of 7.9 lb and 13 +/- 2 days of age were used in a 28-day growth assay to determine the interactive effects of diet complexity (complex vs simple) and enzyme addition (control or .10% Turbozyme 160) on starter pig growth performance. Pigs were blocked by initial weight, randomized across treatments by sex, and allotted to each of four dietary treatments. Treatments were arranged in a 2 × 2 factorial with main effects including diet complexity (complex or simple) and the addition of an enzyme to the diet (control or Turbozyme 160). There were eight to 10 pigs/pen in a block and six pens/treatment.

From d 0 to 14 postweaning, pigs were fed either a typical diet formulated for pigs weaned at 10 to 14 days of age or a less complex diet (Table 1). The complex diet contained 25% dried whey, 5% lactose, 7.5% spray-dried plasma protein, 4% select menhaden fish meal, and 1.75% spray-dried blood meal and was formulated to contain

[1]Northeast Area Extension Office.

1.6% lysine, .44% methionine, and 1.08% threonine. The simple diet contained 20% dried whey, 2.5% spray-dried plasma protein, 2.5% select menhaden fish meal, and 2.5% spray-dried blood meal. It also was formulated to contain 1.6% lysine, .44% methionine, and 1.08% threonine. Turbozyme 160 (.10%) replaced corn in the control diets to provide the additional dietary treatments, and all diets were pelleted through a pellet mill equipped with a 3/32" die.

From d 14 to 28 (phase II), all pigs were fed a diet containing 10% dried whey and 2.5% spray-dried blood meal and formulated to 1.35% lysine and .37% methionine with or without Turbozyme 160. Pigs continued to be fed their respective control or added Turbozyme 160 (.10%) diet as previously fed from d 0 to 14 postweaning.

Pigs were weighed and feed disappearance was determined on d 0, 7, 14, 21, and 28 postweaning to determine ADG, ADFI, and feed efficiency (F/G). Statistical analysis was conducted as a 2 × 2 factorial with evaluation of main effects of diet complexity and enzyme addition and their interactions.

Results and Discussion

No diet complexity by enzyme interactions were observed for d 0 to 14 or cumulative (d 0 to 28) growth performance ($P > .10$), suggesting that Turbozyme 160 addition did not differentially improve performance of pigs fed the simple diet vs those fed the complex diet. Main effect means are presented in Table 2, and interactive treatment means are presented in Table 3. Unlike previous research at the University of Illinois, pigs fed the simple diet with added Turbozyme 160 did not have a greater response to Turbozyme 160 than pigs fed the complex diets, i.e., pigs fed either complex or simple diets responded identically to the added Turbozyme 160. In fact, the greatest response to added Turbozyme 160 was observed in ADG from d 7 to 14 postweaning in pigs fed the complex diets. Perhaps differences in weaning age, Turbozyme 160 level, or diet formulation account for the differences observed between the two studies.

From d 0 to 7 postweaning, Turbozyme 160 addition had no effect on ADG, ADFI, or F/G (Table 2). However, from d 0 to 14 postweaning, addition of Turbozyme 160 tended ($P < .12$) to numerically improve ADG by approximately 8%. During the same period, a 6% improvement occurred in feed efficiency ($P < .05$) for pigs fed diet with added Turbozyme 160. From d 7 to 14 postweaning, a diet complexity by enzyme interaction was observed ($P < .08$) for ADG. Although pigs fed Turbozyme 160 had greater ($P < .02$) ADG than those fed the control diets, the improvement in ADG was greater in those pigs fed the complex diets (18%) compared with pigs fed the simple diets (2%). In addition, pigs fed the diets with added Turbozyme 160 had better F/G ($P < .07$) than those fed the control diets. From d 14 to 28, addition of Turbozyme 160 had no effect on growth performance. Studies at Oklahoma State University have shown a more consistent response to added Turbozyme 160 in that the improvements were observed throughout the entire trial. Possible reasons for differences between the two studies are mentioned above.

Feeding pigs a complex, segregated early weaning diet compared with a simple, transition diet improved ADG, ADFI, and F/G during the first week of the trial. Average daily gain and ADFI also were improved ($P < .05$) for pigs fed the complex diet from d 0 to 14 postweaning, but no differences occurred for the overall trial. This response suggests that, for very young pigs (13 to 17 days of age), a complex starter diet is necessary to stimulate feed intake and ADG. As indicated by the similar growth performance between pigs fed complex or simple diets from d 7 to 14 postweaning, diet complexity can be decreased quickly. As the pig becomes older and its digestive system is better developed, the pig can be switched to a simpler diet to lower feed cost per lb of gain without adversely affecting performance.

In conclusion, these results suggest that feeding either a simple or complex diet with added Turbozyme 160 improves feed efficiency from day 0 to 14 postweaning. Feeding a complex starter diet improves initial (d 0 to 7 postweaning) growth performance of segregated early-weaned pigs.

Table 1. Diet Composition

	Phase I[a]		
Ingredient, %	Complex[b]	Simple[b]	Phase II[bc]
Corn	35.65	37.97	53.78
Dried whey	25.00	20.00	10.00
Soybean meal (46.5% CP)	12.52	27.52	25.87
Plasma protein	7.50	2.50	--
Lactose	5.00	--	--
Soy oil	5.00	5.00	3.00
Fish meal, select menhaden	4.00	--	--
Blood meal, spray-dried	1.75	2.50	2.5
Medication[d]	1.00	1.00	1.00
Monocalcium phosphate	.95	1.52	1.89
Limestone	.56	.75	.84
Zinc oxide	.38	.38	.25
Vitamin premix	.25	.25	.25
Trace mineral premix	.15	.15	.15
DL-methionine	.125	.15	.075
L-lysine·HCl	.075	.15	.15
L threonine	--	.07	--
Salt	.10	.10	.25
Total	100.00	100.00	100.00

[a]Phase I diets were fed from d 0 to 14 postweaning and formulated to contain 1.60% lysine, .44% methionine, 1.08% threonine, .90% Ca, and .80% P.
[b]Turbozyme replaced corn (.10%) in each of the diets to provide the additional treatments
[c]Phase II diets were fed from d 14 to 28 postweaning and formulated to contain 1.35% lysine, .37% methionine, .90% Ca, and .80% P.
[d]Provided 55 g/ton carbadox.

Table 2. Main Effects of Turbozyme and Diet Complexity on Starter Pig Performance[ab]

	Diet complexity		Enzyme			Probability value		
Item	Control	Simple	Control	Turbozyme	CV	Enzyme	Diet	Enzyme × diet
D 0 to 7								
ADG, lb	.33	.24	.28	.29	21.9	.63	.01	.69
ADFI, lb	.43	.36	.39	.40	14.4	.55	.01	.69
F/G	1.30	1.52	1.39	1.39	13.4	.89	.02	.85
D 7 to 14								
ADG, lb	.53	.55	.51	.57	9.5	.02	.57	.08
ADFI, lb	.67	.63	.65	.66	13.4	.83	.28	.53
F/G	1.25	1.14	1.25	1.14	10.8	.07	.06	.66
D 0 to 14								
ADG, lb	.43	.38	.39	.42	11.7	.12	.05	.40
ADFI, lb	.54	.48	.51	.52	12.2	.60	.04	.88
F/G	1.27	1.25	1.30	1.22	6.9	.05	.77	.51
D 14 to 28								
ADG, lb	.79	.79	.81	.78	8.3	.26	.93	.57
ADFI, lb	1.14	1.17	1.19	1.12	8.7	.13	.57	.83
F/G	1.43	1.47	1.47	1.43	7.5	.53	.47	.33
D 0 to 28								
ADG, lb	.61	.59	.60	.60	7.5	1.0	.26	.40
ADFI, lb	.84	.82	.85	.82	8.0	.33	.56	.93
F/G	1.36	1.41	1.41	1.36	6.0	.19	.50	.25

[a]A total of 213 pigs with an average age of 13 ± 2 d and average initial weight of 7.9 lb.
[b]Pigs were fed either a complex (SEW) or simple (transition) diet with or without Turbozyme from d 0 to 14 postweaning. From d 14 to 28, pigs were fed a phase II diet (2.5% spray-dried blood meal, 10% dried whey) with or without Turbozyme.

Table 3. Interactive Effects of Turbozyme and Diet Complexity on Starter Pig Performance[ab]

	Complex		Simple			Probability value		
Item	Control	Turbozyme	Control	Turbozyme	CV	Enzyme	Diet	Enzyme × diet
D 0 to 7								
ADG, lb	.32	.34	.23	.25	21.9	.63	.01	.99
ADFI, lb	.43	.43	.34	.37	14.4	.55	.01	.69
F/G	1.30	1.28	1.52	1.52	13.4	.89	.02	.85
D 7 to 14								
ADG, lb	.49	.58	.54	.55	9.5	.02	.57	.08
ADFI, lb	.65	.69	.64	.62	13.4	.83	.28	.53
F/G	1.33	1.18	1.18	1.10	10.8	.07	.06	.66
D 0 to 14								
ADG, lb	.40	.45	.37	.39	11.7	.12	.05	.40
ADFI, lb	.53	.55	.48	.49	12.2	.60	.04	.88
F/G	1.32	1.22	1.28	1.23	6.9	.05	.77	.51
D 14 to 28								
ADG, lb	.80	.79	.82	.77	8.3	.26	.93	.57
ADFI, lb	1.18	1.10	1.20	1.14	8.7	.13	.57	.83
F/G	1.47	1.39	1.45	1.47	7.5	.53	.47	.33
D 0 to 28								
ADG, lb	.60	.62	.60	.58	7.5	1.0	.26	.40
ADFI, lb	.86	.83	.84	.81	8.0	.33	.56	.93
F/G	1.43	1.33	1.41	1.39	6.0	.19	.50	.25

[a]A total of 213 pigs with an average age of 13 ± 2 d and average initial weight of 7.9 lb.
[b]Pigs were fed either a complex (SEW) or simple (transition) diet with or without Turbozyme from d 0 to 14 postweaning. From d 14 to 28, pigs were fed a phase II diet (2.5% spray-dried blood meal, 10% dried whey) with or without Turbozyme.