SOYBEAN MEAL IS NECESSARY IN DIETS FOR EARLY-WEANED (12 D OF AGE) PIGS[1]

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Summary

A total of 192 pigs (initially 8.0 lb and 12 d of age) was used to determine the optimal soybean meal level to be included in starter diets for the 12-d-old weaned pig. The trial was a 28 d growth assay. Pigs were allotted by weight to six replicates of four treatments with six or 10 pigs per pen. From d 0 to 14 postweaning, pigs were fed a common diet or experimental diets containing 5, 10, and 15% soybean meal. These high nutrient dense diets were formulated to contain 1.7% lysine. All pigs were fed a common transition diet from d 14 to 21 postweaning formulated to contain 1.4% lysine and a common phase II diet from d 21 to 28 postweaning formulated to contain 1.25% lysine. Linear improvements in average daily gain (ADG) and average daily feed intake (ADFI) were observed in the d 0 to 14 postweaning period as soybean meal increased from 0 to 15% of the diet. No differences in growth performance were observed when pigs were fed the common transition and phase II diets from d 14 to 21 postweaning and d 21 to 28 postweaning, respectively. Pig weights on d 14, 21, and 28 postweaning improved linearly. Thus, the improvements in ADG and ADFI for the cumulative (d 0 to 28 postweaning) period were a result of the performance in the d 0 to 14 postweaning period. The advantage in pig weight on d 14 postweaning was maintained through d 28 postweaning. In conclusion, soybean meal can replace skim milk and be included at a level between 10 and 15% in the diet of pigs weaned at 12 d of age.

(Key Words: Starter, Soybean Meal, Skim Milk.)

Introduction

Early weaning is becoming a common practice in the commercial swine industry in disease elimination programs and to increase productivity. Weaning pigs at 5 to 10 d of age requires diets that are highly digestible and palatable. Previous research at Kansas State University has suggested that decreased growth performance during the first week postweaning of pigs weaned at 21 d of age can be attributed to an immune (allergic) reaction to soybean meal proteins in the small intestine. This reaction is thought to occur after the piglets immune system is exposed to small amounts of soybean meal protein preweaning. Further research indicated that feeding pigs weaned at 21 d of age a diet without soybean meal postweaning followed by a diet with soybean meal results in a similar decreased growth performance. This indicates that some soy protein is required in the first diet postweaning for the development of tolerance. Thus, the objective of this experiment was to determine the optimal level of soybean meal in the diet for early-weaned (12 d of age) pigs.

Procedures

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A total of 192 pigs (initially 8.0 lb and 12 d of age) was used to determine the optimal soybean meal level to be included in starter diets for the early-weaned pig (12 d of age). The trial was a 28 d growth assay. From d 0 to 14 postweaning, pigs were fed a control diet of experimental diets containing 5, 10, and 15% soybean meal (Table 1). Soybean meal and lactose replaced dried skim milk to provide the three soybean meal diets. The diets were formulated to contain 1.7% lysine and .49% methionine. Lactose was added to ensure that all four diets were equal in lactose content. From d 14 to 21 postweaning, all pigs were fed a common transition diet formulated to contain 1.4% lysine .40% methionine (Table 1). This diet contained 20% dried whey, 2.5% spray-dried porcine plasma, and 2.5% spray-dried blood meal. From d 21 to 28 postweaning, all pigs were fed a common phase II diet formulated to contain 1.25% lysine and .36% methionine (Table 1). This diet contained 10% dried whey and 2.5% spray-dried blood meal. Pigs were housed in an environmentally controlled nursery with ad libitum access to feed and water. Pigs were housed 6 or 10 pigs per pen and six replicate pens per treatment. Weekly pig weights and feed consumption were collected to determine ADG, ADFI, and feed efficiency (F/G).

Results and Discussion

For the d 0 to 14 postweaning period, ADG and ADFI increased (linear, $P<.01$) as the level of soybean meal was increased from 0 to 15% (Table 2). For the transition (d 14 to 21 postweaning) and phase II periods, no differences occurred in ADG, ADFI, and F/G, indicating no effect of diet fed from d 0 to 14 postweaning on subsequent performance in the transition or phase II periods. This resulted in a linear ($P<.02$) improvement in pig weights on d 14, 21, and 28 postweaning (Table 3). Pigs fed 10% soybean meal were 14% heavier than pigs fed control diet on d 14 postweaning. Cumulative (d 0 to 28 postweaning) ADG improved (linear, $P<.02$) and ADFI tended to improve (quadratic, $P<.08$, linear, $P<.07$) as the level of soybean meal increased from 5 to 15% of the diet. Thus, the improvements in ADG and ADFI for the cumulative period (d 0 to 28 postweaning) were a result of the performance in the d 0 to 14 postweaning period.

Results of this experiment indicate that no adverse immune reaction to soybean meal protein occurred when compared to dried skim milk. Two possible explanations are the pigs had been weaned before they were sensitized to soybean meal protein or the young pigs' immune system had not developed enough to cause an adverse reaction. The results also suggest a negative influence of skim milk on the feed intake of pigs weaned at 12 d of age. In conclusion, soybean meal can be included at a level between 10 and 15% in the diet of pigs weaned at 12 d of age.

Table 1. Diet Composition[a]

		Soybean Meal, % - Phase I				
Item, %	Control	5	10	15	Transition	Phase II
Corn	32.53	30.20	27.88	25.55	44.86	61.12
Dried skim milk	20.24	14.33	8.42	2.51	--	--
Soybean meal, (48% CP)	--	5.00	10.00	15.00	20.91	21.94
Lactose	--	3.00	6.00	9.00	--	--
Dried whey , edible grade	25.00	25.00	25.00	25.00	20.00	10.00
Spray-dried porcine plasma	7.50	7.50	7.50	7.50	2.50	--
Fish meal, select menhaden	4.50	4.50	4.50	4.50	--	--
Spray-dried blood meal	1.75	1.75	1.75	1.75	2.50	2.50
Soybean oil	6.00	6.00	6.00	6.00	5.00	--
Monocalcium phosphate (21% P)	.80	.96	1.13	1.29	1.79	1.92
Limestone	.05	.10	.16	.21	.70	.85
Antibiotic[b]	1.00	1.00	1.00	1.00	1.00	1.00
Trace mineral premix	.15	.15	.15	.15	.15	.15
Vitamin premix	.25	.25	.25	.25	.25	.25
DL-methionine	.11	.13	.15	.17	.15	.05
L-lysine HCl	.05	.05	.05	.05	.10	.15
Copper sulfate	.075	.075	.075	.075	.075	.075
Total	100	100	100	100	100	100

[a]The Control and 5, 10, and 15% soybean meal diets were formulated to contain 1.7% lysine and .49% methionine. The transition diet was formulated to contain 1.4% lysine and .40% methionine, and the phase II diet was formulated to contain 1.25% methionine and .36% methionine. All diets were formulated to contain .9% calcium and .8% phosphorus.

[b]Provided 150 g/ton apramycin for the Control and 5, 10, and 15% soybean meal diets. Provided 50 g/ton carbadox in the transition and phase II diets.

Table 2. The Effect of Soybean Meal Level (d 0 to 14 postweaning) on Growth Performance in Diets for Early-weaned Pigs (12 d of age)[a]

		Soybean Meal, %			
Item	Control	5	10	15	CV
d 0 to 14					
ADG, lb[b]	.26	.30	.36	.35	14.4
ADFI, lb[b]	.37	.40	.44	.44	9.4
F/G	1.46	1.36	1.27	1.27	14.7
d 14 to 21					
ADG, lb	.42	.46	.39	.39	11.0
ADFI, lb	.71	.79	.73	.70	11.2
F/G	1.73	1.80	2.06	1.91	18.6
d 21 to 28					
ADG, lb	.93	.98	1.00	1.03	12.9
ADFI, lb	1.57	1.67	1.71	1.69	8.0
F/G	1.69	1.69	1.73	1.66	8.7
d 0 to 28					
ADG, lb[c]	.46	.51	.53	.53	8.3
ADFI, lb[d,e]	.75	.82	.83	.82	6.5
F/G	1.62	1.60	1.60	1.55	5.7

[a]Each number represents the mean of six pens (6 or 10 pigs/pen) with an average initial weight of 8.1 lb and 12 d of age.
[b,c,d]Linear effect (P<.01,.02, and .07 respectively).
[e]Quadratic effect (P<.08).

Table 3. The Effect of Soybean Meal Level from d 0 to 14 Postweaning on Pig Weights[a]

		Soybean Meal, %			
Weight, lb	Control	5	10	15	CV
d 0	8.1	8.1	8.1	8.1	--
d 14[b]	11.7	12.3	13.3	12.9	5.3
d 21[b]	14.7	15.5	16.0	15.7	4.6
d 28[b]	21.2	22.3	23.0	22.9	5.0

[a]Each number represents the mean of six pens (6 or 10 pigs/pen) with an average initial weight of 8.1 lb and 12 d of age.
[b]Linear effect (P<.02).