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EFFECTS OF DIETARY LYSINE LEVEL ON GROWING PIG PERFORMANCE

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Summary

A growth trial utilizing 120 pigs (avg initial wt 43.4 lb) was conducted to investigate the lysine requirement for pigs weighing 45 to 75 lb. Pigs were fed a corn-soybean meal diet containing .65, .75, .85, .95, or 1.05% lysine. Average daily gain (ADG) and feed/gain (F/G) were determined weekly, and plasma urea concentration was determined at the end of the first and last week of the experiment. At d 14, ADG was increased and F/G improved with increasing lysine level. Gain was best for pigs fed the .95% lysine diet at d 14 and for those fed .85% lysine at d 28. Feed efficiency was optimized for pigs fed diets containing .95% lysine at d 14 and 28 of the experiment. Plasma urea concentration on d 7 indicated that .85% lysine was optimum. However, by d 28, plasma urea concentration indicated that .75% lysine was adequate. Our results indicate that growth performance of pigs weighing 45 to 75 lb was optimized by a diet containing at least .85% lysine.

(Key Words: Lysine, Performance, Growing Pig.)

Introduction

Lysine is usually the first limiting amino acid in swine diets and the determination of reliable requirement data is economically important to the swine industry. The NRC (1988) lists lysine requirements of .95% of the diet for 22- to 44-lb pigs and .75% of the diet for 44- to 110-lb pigs. The value of .70% was listed in the eighth edition (1979). In many commercial units, there is a "lag" in performance when pigs are moved from the nursery to the grower. This may be partly diet-related, since lysine levels usually drop from 1.15 to .75% at this time. Therefore, there is a need to review the lysine requirement for pigs weighing from 45 to 75 lb. The objective of the present research was to evaluate the lysine requirement of 45 to 75 lb pigs fed a corn-soybean meal diet following a two-phase starter program.

Experimental Procedures

A total of 120 crossbred (Hampshire × Yorkshire × Duroc) pigs (initial wt of 43.4 lb) was utilized to investigate effects of different lysine levels on growing pig performance. Pigs were allotted to one of five treatments (six pens/treatment, four pigs/pen), based on weight, sex, and litter. Pigs were housed in pens with woven-wire floors in an environmentally regulated nursery. Feed and water were supplied ad libitum. Pig weights and feed consumption were determined weekly during the 28-d trial.

All pigs were bled at the end of the first and fourth week and plasma was collected for determination of urea concentrations. Composition of the experimental diets is shown in Table 1.

Table 1. Diet Composition[a]

Ingredient, %	Lysine .65%	.75%	.85%	.95%	1.05%
Ground corn	81.17	77.74	74.41	71.09	67.47
Soybean meal (48.5%)	14.30	17.80	21.20	24.60	28.30
Monocalcium (18% Ca, 21% P)	1.79	1.75	1.68	1.63	1.55
Limestone	.99	.96	.96	.93	.93
Salt	.30	.30	.30	.30	.30
Trace mineral[b]	.10	.10	.10	.10	.10
Vitamin premix[c]	.25	.25	.25	.25	.25
Copper sulfate	.05	.05	.05	.05	.05
Selenium premix	.05	.05	.05	.05	.05
Carbadox	1.00	1.00	1.00	1.00	1.00
Total	100	100	100	100	100

[a]All diets formulated to contain .8% Ca and .7% P.
[b]Provided the following in the complete diet (ppm): Zn, 70; Fe, 50; Mn, 25; Cu, 5; Co, .5; I, .7; Se, .3.
[c]Provided the following per kg of complete diet: Vitamin A, 4,400 IU; vitamin D3, 44 IU; vitamin E, 14.7 IU; vitamin K, 2.9 mg; riboflavin, 4.4 mg; niacin, 26.5 mg; d-pantothenic acid, 17.6 mg; vitamin B 12, 17.6 μg .
[d]Supplied complete diet with 125 ppm supplemental copper.

Results and Discussion

During the first week of the experiment (d 0 to 7), ADG increased (quadratic, P<.06) and F/G was improved (quadratic, P<.06) with increasing lysine level (Table 2). Plasma urea concentration increased (P<.05) when dietary lysine level was increased to .95%, indicating that pigs of this age and weight require .85 to .95% lysine.

During the first 2 wk of the experiment (d 0 to 14), ADG increased (quadratic, P<.06) and F/G was improved (linear, P<.05; quadratic, P<.06) with increasing lysine level (Table 2). Average daily gain was maximized for pigs fed the .95% lysine diet, at 9.9% greater than ADG of pigs fed the .75% lysine diet. Feed efficiency was optimized at a lysine level of .95%, which was 12.3% better than the F/G of pigs fed the .75% lysine diet.

During d 14 to 28 and d 0 to 28 of the experiment, ADG and F/G were optimized at a lysine level of .85%. However, plasma urea concentration at d 28 of the experiment was lowest (P<.05) at .75% lysine and then increased as dietary lysine increased. The reduction of plasma urea concentration presumably reflected more efficient nitrogen utilization and less urea synthesis. On d 28, as dietary lysine level increased above .85%, plasma urea concentration increased dramatically, indicating that the pig's amino acid requirement was met and that now excess amino acids were being deaminated, resulting in increased plasma urea.

Our data indicate that for pigs weighing 45 to 75 lb, growth performance was optimized by a diet containing .95% lysine and plasma urea concentration was optimized by a diet containing .85% lysine. Therefore, pigs weighing 45 to 75 lb require .85 to .95% dietary lysine.

Table 2. Effects of Lysine Levels on Growing Pig Performance[a]

Item	Lysine, %					SE
	.65	.75	.85	.95	1.05	
Avg initial wt	43.40	43.50	43.40	43.40	43.40	3.10
Avg final wt	78.70	82.30	84.40	84.10	81.80	5.40
d 0 to 7						
ADG, lb[b]	1.02	1.22	1.24	1.18	1.15	.37
ADFI, lb[b]	2.09	2.11	2.21	2.15	2.06	.20
F/G[b]	2.37	2.01	1.84	1.95	2.29	1.10
Plasma urea, mg/100 ml	20.2	21.2	21.0	23.3	23.8	4.20
d 0 to 14						
ADG, lb[b]	1.16	1.28	1.38	1.42	1.39	.25
ADFI, lb	3.56	3.49	3.48	3.51	3.35	.20
F/G[bc]	3.20	2.85	2.56	2.50	2.50	.54
d 14 to 28						
ADG, lb[b]	1.36	1.49	1.55	1.48	1.35	.26
ADFI, lb[bc]	3.43	3.65	3.64	3.52	3.31	.30
F/G[b]	2.55	2.47	2.37	2.40	2.45	.59
d 0 to 28						
ADG, lb[bc]	1.26	1.39	1.46	1.45	1.37	.15
ADFI, lb[bc]	3.50	3.57	3.55	3.51	3.33	.23
F/G[bc]	2.82	2.61	2.44	2.43	2.45	.31
Plasma urea, mg/100 ml[bc]	23.7	21.4	22.9	27.6	31.8	5.27

[a]Six replications per treatment, four pigs per pen.
[b]Quadratic effect, (P<.06).
[c]Linear effect, (P<.05).