LACK OF INTERACTION BETWEEN LYSINE LEVELS FED IN GROWING AND FINISHING DIETS[1]

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Summary

A total of 1,200 pigs were used to determine whether dietary lysine level fed in the growing phase influenced the response to lysine level fed in the finishing phase. Pigs were fed either an adequate or low lysine level during the growing (60 to 170 lb) and/or finishing phase (170 to 265 lb). Feeding a deficient lysine level decreased ADG and F/G during the phase when the deficient diet was fed; however, lysine level fed in the growing phase did not influence the response in the finishing phase. Carcass parameters were influenced more by the lysine level fed in the finishing diets.

(Key Words: Lysine, Growing-Finishing Pigs, Compensatory Gain, Growth.)

Introduction

Several experiments have been conducted to determine the optimal lysine level for each phase of the growing-finishing period. Three of those experiments are presented in other articles in this report. An important and unanswered question relates to whether the response to lysine level in one phase is influenced by the level fed in a previous phase of growth. For example: If we feed a deficient lysine level in the growing diet, will the pigs respond differently to graded lysine levels in the finishing diet? Thus, the objective of this experiment was to determine whether the growth response to various lysine levels fed in the growing period carries over to affect response to the lysine level fed in the finishing period.

Procedures

A total of 600 barrows and 600 gilts (PIC C-22 × 337) was used. Pigs were penned by gender and housed in a 1,200-head finishing barn equipped with 48 pens. Thus, there were 25 pigs per pen. Pigs were sorted by sex as they were moved into the nursery. When moved from the nursery into the finishing barn, pigs were allotted randomly to pens within their gender group. Average initial weight was 62.6 lb.

The finishing barn was a double curtain-sided, deep pit barn. It operates on manual ventilation during warm weather and is equipped with automatic ventilation for cold weather. The trial was conducted from January to June, 1999. The floor was totally slatted concrete. Pens were equipped with one four-hole self-feeder (Staco) and one cup waterer. Pen dimensions were 10 ft × 18 ft to provide 7.2 sq ft per pig.

Group weights of all the pigs in each pen were obtained every 2 weeks. Diet phase changes occurred at 4-week intervals. Feeders were vacuumed on the day that diet

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phases were changed, and the remaining amounts of feed recorded. Pigs in all pens were weighed at market before shipping to the processing plant. The pigs in each pen were marked with a different tattoo prior to marketing to allow carcass data to be collected and attributed back to each pen. Standard carcass criteria were measured including carcass weight, fat and loin depth, lean percentage, and fat-free lean index.

The trial was arranged with a split plot design. Gender served as the whole plot, and dietary treatments were the subplots. Dietary treatments were arranged as a 2 × 2 factorial to provide an adequate or low level of lysine (total protein) during the growing and finishing phases (Table 1). Diets were formulated in four phases (60 to 115 lb, 115 to 170 lb, 170 to 215 lb, and 215 lb to market). The actual lysine levels used for the adequate and low diets were slightly lower for the barrows compared to the gilts (Table 2). The adequate lysine levels were chosen based on the results of previous lysine titration studies conducted in the same facilities with pigs of the same genetics. The low levels were selected to be approximately 20% lower than the adequate levels.

All diets were corn-soybean meal based. Diets fed during phases 1 and 2 contained 6% added choice white grease. Diets fed during phases 3 and 4 did not contain any added fat. All other nutrients met or exceeded the requirement estimates provided by NRC (1998). Vitamin and trace mineral levels were similar to KSU recommendations.

Results and Discussion

No interactions occurred between dietary lysine levels fed in the growing and finishing phases. In other words, the lysine level fed in the growing phase had no influence on the response to the lysine level fed in the finishing phase. No carryover effects were found in this trial. Therefore, only main effect means are shown in Table 4.

The differences in performance and carcass composition between barrows and gilts were as expected. Barrows consumed more feed and grew faster than gilts during phases 1, 2, and 3 and for the overall trial. Gilts had better F/G during phases 2 and 3 and for the overall trial. Barrows had heavier carcass weights, more fat depth, and a lower percentage lean and fat free lean index. Although the expected differences between barrows and gilts were found, they responded similarly to dietary treatments.

Feeding a deficient lysine level in the growing phases (1 and 2) resulted in poorer ADG and F/G. Pigs fed the deficient lysine level during phases 1 and 2 weighed 3.3 lb less ($P<.10$) at the end of phase 2 than pigs fed the adequate lysine diet. This difference was maintained to the end of the trial (3.4 lb); however, the difference was not significant because of greater weight variation at the end of the trial. Lysine level fed in the growing diet did not influence carcass traits except for a small increase in fat-free lean percent for pigs fed the adequate lysine diets.

Feeding a deficient lysine level in the finishing phases (3 and 4) resulted in poorer ADG and F/G. The magnitude of the response was much greater than found with feeding deficient lysine levels in the growing phase. All carcass traits were improved by feeding the adequate lysine diets compared to the low lysine diets.

The results of this trial do not support the theory that lysine levels fed during one phase of production influence the response to lysine levels in another phase. Therefore, the lysine levels that are most economical during each individual phase of growth should be fed. Another view of these data is that pigs fed the low lysine diets during the growing phase did not demonstrate compensatory growth during the finishing phase. Further research is required to determine whether offering a lysine level above that fed in the adequate diet would have supported compensatory growth.

Table 1. Arrangement of Dietary Treatments[a]

	Adequate (G)[b]		Low (G)		
Phase	Adequate (F)	Low (F)	Adequate (F)	Low (F)	Wt. Range, lb
1	Adequate	Adequate	Low	Low	60 to 115
2	Adequate	Adequate	Low	Low	115 to 170
3	Adequate	Low	Adequate	Low	170 to 215
4	Adequate	Low	Adequate	Low	215 to 265

[a]Adequate and low refer to dietary lysine levels relative to the pigs estimated requirements.
[b]G = growing phase, F = finishing phase.

Table 2. Dietary Lysine Sequence, %

	Barrow		Gilt		
Phase	Adequate	Low	Adequate	Low	Wt. Range, lb
1	1.17	0.99	1.26	1.08	60 to 115
2	0.92	0.80	1.05	0.89	115 to 170
3	0.65	0.50	0.75	0.60	170 to 215
4	0.60	0.43	0.70	0.50	215 to 265

Table 3. Lysine:Calorie Ratio for Each Phase

	Barrow		Gilt		
Phase	Adequate	Low	Adequate	Low	Wt. Range, lb
1	3.24	2.76	3.50	3.01	60 to 115
2	2.56	2.23	2.92	2.48	115 to 170
3	1.95	1.50	2.25	1.80	170 to 215
4	1.80	1.27	2.10	1.50	215 to 265

Table 4. Main Effects of Gender and Adequate or Low Lysine Level during Each Phase

Item	Gender		Phases 1 and 2		Phases 3 and 4		
	Barrows	Gilts	Adequate	Low	Adequate	Low	SEM
Phase 1							
ADG, lb	1.87^{a}	1.78^{b}	1.84	1.81	1.81	1.85	0.02
ADFI, lb	3.26^{a}	3.06^{b}	3.13	3.19	3.13	3.19	0.03
FG	1.74	1.72	1.70^{a}	1.76^{b}	1.73	1.73	0.02
Phase 2							
ADG, lb	2.01^{a}	1.94^{b}	2.02^{a}	1.94^{b}	1.96	2.00	0.02
ADFI, lb	4.44^{a}	4.07^{b}	4.23	4.28	4.23	4.27	0.04
FG	2.21^{a}	2.10^{b}	2.10^{a}	2.20^{b}	2.16	2.14	0.03
Phase 3							
ADG, lb	1.45	1.48	1.47	1.46	1.58^{a}	1.35^{b}	0.03
ADFI, lb	4.84	4.56	4.77	4.64	4.68	4.72	0.06
FG	3.43^{a}	3.13^{b}	3.32	3.23	2.98^{a}	3.58^{b}	0.09
Phase 4							
ADG, lb	1.57	1.54	1.56	1.56	1.66^{a}	1.45^{b}	0.04
ADFI, lb	5.53	5.16	5.38	5.32	5.27	5.43	0.07
FG, lb	3.55	3.44	3.51	3.48	3.19^{a}	3.81^{b}	0.09
Phases 1 and 2							
ADG, lb	1.94^{a}	1.86^{b}	1.93^{a}	1.88^{b}	1.88	1.92	0.02
ADFI, lb	3.83^{a}	3.55^{b}	3.66	3.72	3.67	3.71	0.03
FG	1.98^{a}	1.91^{b}	1.90^{a}	1.98^{b}	1.95	1.94	0.02
Phases 3 and 4							
ADG, lb	1.51	1.51	1.52	1.51	1.62^{a}	1.40^{b}	0.03
ADFI, lb	5.19^{a}	4.87^{b}	5.08	4.98	4.98	5.08	0.05
FG	3.47^{a}	3.26^{b}	3.38	3.34	3.08^{a}	3.65^{b}	0.06
Overall							
ADG, lb	1.72^{a}	1.68^{b}	1.71	1.68	1.75^{a}	1.65^{b}	0.01
ADFI, lb	4.52^{a}	4.21^{b}	4.38	4.35	4.33	4.40	0.03
FG	2.63^{a}	2.51^{b}	2.56	2.59	2.48	2.67	0.02
Weight, lb							
Initial	62.6	62.6	62.7	62.5	62.8	62.4	1.1
End of phase 1	116.9	114.2	116.2	114.9	115.2	115.9	1.3
End of phase 2	173.3^{a}	168.7^{b}	172.6^{c}	169.3^{d}	170.2	171.8	1.3
End of phase 3	215.3^{c}	211.5^{d}	215.2	211.6	215.9^{a}	210.9^{b}	1.5
Final	262.6	258.4	262.2	258.8	266.6^{a}	254.5^{b}	2.3
Carcass data							
Live wt, lb	264.2^{a}	257.6^{b}	262.2	259.6	264.7^{a}	257.1^{b}	1.71
Carcass	199.4^{a}	194.9^{b}	198.3	196.1	201.4^{a}	192.9^{b}	1.16
Fat depth, in	0.78^{a}	0.61^{b}	0.69	0.70	0.67^{a}	0.72^{b}	0.01
Loin depth, in	2.27	2.30	2.29	2.28	2.35^{a}	2.22^{b}	0.01
Lean, %	53.8^{a}	56.4^{b}	55.2	55.0	55.6^{a}	54.5^{b}	0.12
Fat free lean, %	49.0^{a}	50.9^{b}	50.0^{c}	49.8^{d}	50.4^{a}	49.5^{b}	0.08
Optimal wt, %	88.4%	84.5%	87.3%	85.7%	88.8%^{a}	84.1%^{b}	1.7%

Different superscripts within the main effect signify differences ^{a,b}($P<.05$) and ^{c,d}($P<.10$).