INFLUENCE OF LYSINE CONCENTRATION ON GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF FINISHING PIGS[1]

S. S. Dritz[2], R. D. Goodband, M. D. Tokach, and J. L. Nelssen

Summary

We used a total of 11,653 pigs to examine the influence of a lysine phase-feeding regimen on growth performance and carcass characteristics in finishing pigs. We found that the lysine regimen did not affect ADG. Also, the low-lysine regimen was adequate for maximizing growth performance and carcass characteristics of barrows. However, the low-lysine regimen was inadequate to optimize feed efficiency in gilts. Further analysis indicated that the largest differences in feed efficiency were for the 115 to 160 lb period in gilts. Later in the growth period, feed efficiency of gilts was similar across dietary lysine regimens.

(Key Words: Lysine Requirement, Finishing Pigs.)

Introduction

Research from the University of Illinois suggests that the dietary lysine requirement for maximizing loin eye area and minimizing carcass backfat is considerably lower than the concentration fed to pigs in many production systems. These lower concentrations result in lower diet cost per ton and will decrease feed cost per lb of gain, if feed efficiency is not affected. However, reduction in diet cost should not be the only criterion for decision making in pork production. Improvements in feed efficiency or carcass lean content can result in improvements in economic returns, if higher-cost diets are fed. Our objective was to examine the effect of lysine phase-feeding regimens on growth performance and carcass characteristics of finishing pigs raised under commercial production conditions.

Procedures

A total of 11,653 high-health status pigs (PIC Terminal Crosses) derived from a segregated early-weaning production system was used. Pigs were housed in 1,200-head barns. Each barn had one or two rooms. Each room contained pigs with a maximum age spread of 1 week. Also, each room was filled with pigs from a single sow farm. Each room was managed on an all in, all out basis. The finishing barns were fully slatted, curtain sided, and all of similar design with each pen containing approximately 25 pigs. Pigs were allowed ad libitum access to feed and water.

Gilts and barrows were housed separately on each side of the room with a separate feed line and bulk bin providing feed for each side of the room. A group of barrows and a group of gilts were housed in each room. Both genders were fed either a high- or a low-lysine regimen, with three rooms per regimen. Gilts and barrows were fed the high- and low-lysine regimens, respectively, in three barns. In the three remaining barns, gilts and barrows were fed the low- and high-lysine regimens, respectively. All treatment combinations were represented to allow for

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[2]Food Animal Health and Management Center.

the detection of treatment differences within barn and negating the barn to barn variation. Therefore, each half room was considered an experimental unit. All pigs were marketed to a single packer, and the trial was conducted from May, 1995 through February, 1996.

All diets fed were corn-soybean meal based and formulated to achieve the desired lysine concentrations by altering the corn and soybean meal ratio without the use of lysine HCl. Examples of the diet composition for the 1.00 and .50% lysine diets are listed in Table 1. Lysine concentrations of the diets used to make up the high- or low-lysine phase-feeding regimens are listed in Table 2. The high-lysine regimen was similar to the regimen the producers were feeding at the beginning of the experiment. The low-lysine regimen concentrations for the diets fed from 115 lb to market were determined by using the following regression equations at the average weight for each phase.

$$\text{Barrow Dietary Lysine, \%} = 1.0300 - .002 \times \text{Weight, lb}$$

$$\text{Gilt Dietary Lysine, \%} = 1.14035 - .0236 \times \text{Weight, lb}$$

We derived these equations from experiments performed at the University of Illinois. The first diet contained 1.15 or 1.10% lysine for the gilts and barrows, respectively, and was fed from the time pigs were placed in the barns until they weighed approximately 115 lb. The amount of the first diet fed per half room was determined using the KSU feed budget. Pigs then were fed 133, 132, and 177 lb per pig of the 115 to 160, 160 to 200, and the 200 to 250 lb diets, respectively. The pigs then were fed the 250 to Mkt diet until market. A random sampling of three pens per half room was weighed and the feed in the bins was inventoried just prior to the day that the diet for the next phase was to be delivered. The mean pig weight of the three pens was averaged and used as an indicator of the average pig weight on the day of feed inventory. The intermediate weights and feed inventory were used to calculate cumulative feed intake vs body weight curves.

Data were analyzed as a randomized complete block design in a 2 × 2 factorial arrangement with the main effects of lysine regimen (high or low) and gender (barrow or gilt). Half room was considered the experimental unit for all response criteria. Analysis of variance was performed using the GLM procedure of SAS with initial weight used as a covariate.

Results and Discussion

Gender by diet interactions ($P < .02$) were observed for ADFI, F/G, backfat, and lean percentage. The barrows fed the low-lysine regimen had lower ADFI and similar ADG resulting in better feed efficiency when compared to those fed the high-lysine regimen. Similarly, backfat was lower and lean percentage was higher for barrows fed the low-lysine regimen compared to the high-lysine regimen. Conversely, gilts fed the high-lysine regimen had lower ADFI, better feed efficiency, less backfat, and a higher lean percentage compared to gilts fed the low-lysine regimen. Average daily gain was similar across dietary lysine regimen but higher for gilts than barrows. Loin depth was greater for gilts compared to barrows and for pigs fed the high- compared to low-lysine regimen, regardless of gender.

A further analysis of feed efficiency is presented in Figures 1 and 2. Pig weight vs. cumulative feed intake is plotted and a trend line fit to the data for each lysine phase-feeding regimen. Therefore, if feed efficiency is improved as weight increases, cumulative feed intake will be lower.

A comparison of the cumulative feed intakes for barrows fed the high- and low-lysine regimens is presented in Figure 1. The fitted curves are similar for barrows fed the two regimens, whereas the means listed in Table 3 indicate a significant difference. We offer two explanations for this seemingly contradictory data. The first is that the difference between lysine regimens did not occur until very late in the growth period. Therefore, the fitted line is influenced only by relatively few data points, and the fitted trend line would not diverge between the two treatments. The second explanation is that, although the differences in market weight were not significant (Table 3), barrows fed the high-lysine regimen had heavier market weight compared to those fed the low-lysine regimen. Nevertheless, both explanations indicate that the low-lysine regimen was adequate to optimize feed efficiency.

Similar curves are presented in Figure 2. for the gilts. In contrast to the curves for barrows, the two gilt curves diverge early in the growth phase. This indicates that during the 115 to 160 lb period, the low-lysine regimen was inadequate to optimize feed efficiency. However, in the later phases, the slopes of the lines are similar, indicating that the feed efficiency from 160 lb to market was similar for gilts fed the high- and low-lysine regimen. This analysis indicates the importance of examining the curves over the growth period as opposed to means.

In conclusion, these results indicate that under commercial production conditions, the low-lysine regimen was adequate for barrows but inadequate for gilts during the early finishing phase to optimize growth performance and carcass characteristics.

Table 1. Diet Composition, % (As-Fed)[a]

	Dietary Lysine, %	
Ingredient	1.00	.50
Corn	67.225	85.765
Soybean meal, 46.5% CP	27.63	12.14
Fat, choice white grease	3.00	--
Limestone	.84	.80
Monocalcium phosphate, 21% P	.63	.62
Salt	.35	.35
Vitamin premix	.1	.1
Trace mineral premix	.15	.15
Copper sulfate	.075	.075

[a]The corn:soybean meal ratio was adjusted to provide the dietary lysine levels used in the various weight ranges.

Table 2. Dietary Lysine Concentrations (High and Low Regimens), %[a]

	Barrows		Gilts	
Phase, lb	High	Low	High	Low
Entry to 115	1.00	1.00	1.15	1.15
115 to 160	.95	.75	1.00	.82
160 to 200	.80	.67	.90	.72
200 to 250	.70	.58	.80	.61
250 to Mkt	.60	.50	.70	.52

[a]Diets fed from entry to 115 lb, 115 to 160 lb, and 160 to 200, contained 4%, 3%, and 2% added fat, respectively.

Table 3. Influence of Lysine Phase-Feeding Regimen (High or Low) on Growth Performance and Carcass Characteristics

Item	Barrows		Gilts		Gender × Diet	
	High	Low	Low	High	P<	CV
ADG, lb[b]	1.72	1.70	1.63	1.65	.99	4.4
ADFI, lb	5.32[d]	5.10[e]	4.92[e]	4.66[f]	.01	3.8
F/G	3.11[d]	3.01[e]	3.02[e]	2.82[f]	.01	3.1
Back fat, in	.75[d]	.71[e]	.65[g]	.61[f]	.02	5.9
Loin depth, in[c]	2.17	2.12	2.19	2.24	.95	3.1
Lean, %	53.8[d]	54.3[e]	55.3[g]	56.1[f]	.01	1.0
Market weight, lb	261.5	253.0	254.8	251.2	.17	4.1

[a]Each number is the mean of six half-barns housing 300 to 600 pigs. A total of 11,653 pigs was used. Initial weight (60.7 lb) was used as a covariate.
[b]Main effect of gender ($P<.04$).
[c]Main effect of gender ($P<.02$) and lysine regimen ($P<.07$).
[d,e,f,g]Means lacking a common superscript differ ($P<.05$).

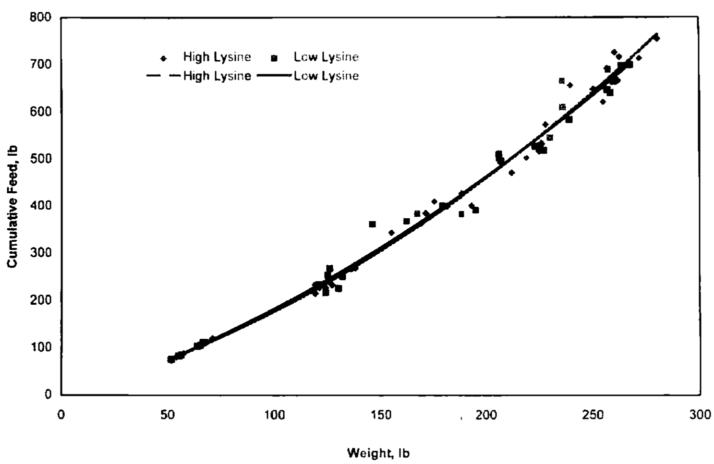

Figure 1. Effect of Lysine Phase-Feeding Regimen on Cumulative Feed Intake of Barrows

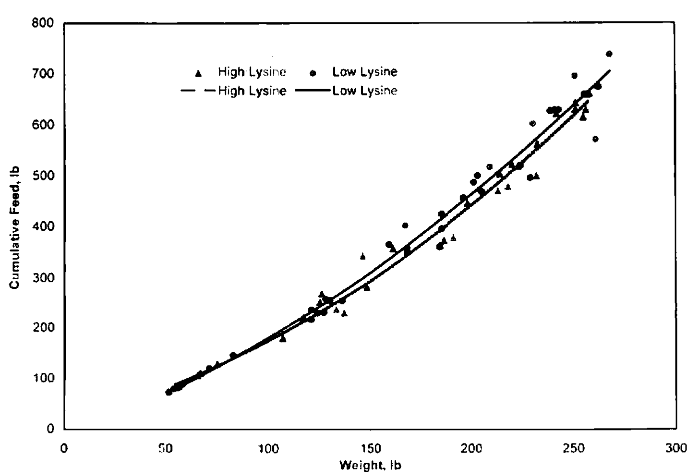

Figure 2. Effect of Lysine Phase-Feeding Regimen on Cumulative Feed Intake of Gilts