Kansas Agricultural Experiment Station Research Reports

Volume 0
Issue 10 *Swine Day (1968-2014)*

Article 805

1999

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Michael D. Tokach

Robert D. Goodband

Jim L. Nelssen

See next page for additional authors

Recommended Citation

Tokach, Michael D.; Goodband, Robert D.; Nelssen, Jim L.; and Dritz, Steven S. (1999) "Influence of lysine level fed from 40 to 80 lb on growth performance and carcass composition of barrows and gilts (1999)," *Kansas Agricultural Experiment Station Research Reports*: Vol. 0: Iss. 10. https://doi.org/10.4148/2378-5977.6645

Influence of lysine level fed from 40 to 80 lb on growth performance and carcass composition of barrows and gilts (1999)

Authors
Michael D. Tokach, Robert D. Goodband, Jim L. Nelssen, and Steven S. Dritz

INFLUENCE OF LYSINE LEVEL FED FROM 40 TO 80 LB ON GROWTH PERFORMANCE AND CARCASS COMPOSITION OF BARROWS AND GILTS[1]

S. S. Dritz[2], M. D. Tokach[3], R. D. Goodband, and J. L. Nelssen

Summary

A total of 1,200 pigs was used to determine the influence of lysine level fed from 40 to 80 lb on growth performance and carcass composition. Barrows and gilts were fed corn-soybean meal-based diets with 6% added fat formulated to .80, .95, 1.10, 1.25, or 1.40% total lysine. Increasing dietary lysine improved ADG and F/G in a linear and quadratic manner with optimal ADG at 1.10% lysine and optimal F/G at 1.40% lysine. Economic returns over feed costs were similar at 1.10, 1.25, and 1.40% lysine.

(Key Words: Lysine, Growing-Finishing Pig, Growth.)

Introduction

Numerous trials have examined the lysine requirements of PIC barrows and gilts. The lysine requirement estimates for the growing phase range from .95% to 1.4% in various research trials. Lysine predictions from ultrasound scans consistently estimate requirements of 1.3% at 50 lb and 1.1% or above at 100 lb. Another concern is whether any benefit from reducing backfat or increasing protein deposition from 40 to 80 lb will be maintained at market weight. Thus, the objective of this trial was to determine the most cost-effective lysine level to feed from 40 to 80 lb for PIC barrows and gilts.

Procedures

A total of 600 barrows and 600 gilts (PIC C-22 × 337) was used in this experiment. Pigs were penned by gender and housed in a 1,200-head finishing barn equipped with 48 pens (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 41.7 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. Floor was totally slatted concrete. Pens were equipped with one four-hole self-feeder and one cup waterer. Pen dimensions were 10 ft × 18 ft providing 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 phases were changed, and the remaining amounts of feed recorded. All pigs in a pen 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 depth, loin depth, lean percentage, and fat-free lean index.

[1]Appreciation is expressed to Global Ventures for the use of pigs and facilities; Pipestone Research Partners for partial financial support; and Steve Rops, Marty Heintz, and Robert Powell for technical assistance.

[2]Food Animal Health and Management Center.

[3]Northeast Area Extension Office, Manhattan, KS.

The trial was arranged with a split plot design. Gender served as the whole plot, and dietary treatments were assigned within the subplot for the first 28 days of the experiment (approximately 40 to 80 lb). Diets were corn-soybean meal-based and were formulated to contain 6% added choice white grease (Table 1). Total lysine levels tested in the experiment were .80, .95, 1.10, 1.25, and 1.40%. The corn and soybean meal levels in the diet were altered to achieve the dietary lysine levels. Diets contained no more than .05% crystalline lysine to ensure that lysine was first liminting in all diets. All pigs were fed the same nursery diet containing 1.40% lysine prior to the start of the experiment. All pigs were fed a common diet in a subsequent 28-d phase. This diet was formulated to 1.25% lysine for gilts and 1.10% lysine for barrows. The diets contained 6% added fat. All other nutrients met or exceeded the requirement estimates provided by NRC (1998). Vitamin and trace mineral concentrations were similar to KSU recommendations.

Results and Discussion

Increasing dietary lysine from .80 to 1.40% increased ADG and F/G in a linear and quadratic manner ($P<.01$; Table 2). The greatest response in ADG occurred when lysine was increased from .80 to 1.10%, and a small further numeric increase occurred for 1.40% lysine. The greatest response in F/G occurred when lysine was increased from .80 to .95%, and further steady reductions in F/G occurred with every incremental increase in lysine.

At the end of the 28-d study, all pigs were scanned ultrasonically for loin area and 10th rib fat depth. Loin area was unaffected by dietary treatment; however, 10th rib fat depth decreased in a linear ($P<.01$) and quadratic ($P<.02$) manner as dietary lysine increased. The largest reduction in fat depth was observed as dietary lysine increased from .80 to .95%.

Subsequent performance from d 28 to 58 was not influenced by dietary lysine level fed from d 0 to 28 of the experiment.

An analysis was conducted to determine the dietary lysine level that provided the greatest economic return (Table 3). When examining cost per lb of gain, diets formulated to .95, 1.10, 1.25, or 1.40% provided similar values ($.092 to $.093). A slightly different answer resulted when a value was placed on the extra weight gain. Diets formulated to 1.10, 1.25 or 1.40% lysine provided an extra $1 to $1.35 return over feed cost compared to the diet formulated to .95% lysine and an additional $2.11 to $2.44 return over feed cost compared to the diet formulated to .80% lysine. Note that in the return over feed cost analysis, the value of gain was fixed at $.40 per lb and did not take into account any potential changes in carcass characteristics as a result of dietary lysine level fed from 40 to 80 lb. Additional research needs to be conducted to determine if these differences in fat depth and loin area would be maintained at market. If these differences were maintained, the higher dietary lysine levels would be even more cost competitive.

In summary, the results of this experiment indicate that diets for pigs weighing 40 to 80 lb can be formulated with 1.10 to 1.40% lysine with similar economic benefits. The slight improvement in F/G at higher lysine levels offset the increase in diet cost to result in a similar return over feed cost. We should note that high-energy diets (6% choice white grease) were used in this experiment. The lysine:calorie ratios would be 3.07 to 3.90 g/Mcal ME for the 1.10 and 1.40% lysine levels, respectively.

Table 1. Compositions of Experimental Diets

	Total Dietary Lysine, %				
Ingredient, %	.80	.95	1.10	1.25	1.40
Corn	72.15	66.75	61.38	55.65	49.98
Soybean meal, 46.5%	18.98	24.40	29.85	35.64	41.40
Choice white grease	6.00	6.00	6.00	6.00	6.00
Monocalcium phos, 21% P	1.30	1.28	1.25	1.20	1.13
Limestone	0.95	0.95	0.95	0.95	0.95
Salt	0.35	0.35	0.35	0.35	0.35
Vitamin premix[a]	0.08	0.08	0.08	0.08	0.08
Trace mineral premix	0.15	0.15	0.10	0.10	0.10
L-Lysine HCl	0.05	0.05	0.05	0.04	0.03
Total	100.00	100.00	100.00	100.00	100.00
Calculated analysis					
Lysine, %	.80	.95	1.10	1.25	1.40
Isoleucine:lysine ratio, %	72%	72%	71%	72%	72%
Leucine:lysine ratio, %	176%	164%	155%	148%	144%
Methionine:lysine ratio, %	31%	29%	28%	27%	26%
Met & Cys:lysine ratio, %	66%	62%	58%	56%	55%
Threonine:lysine ratio, %	70%	68%	66%	66%	65%
Tryptophan:lysine ratio, %	21%	21%	21%	21%	21%
Valine:lysine ratio, %	89%	86%	83%	82%	81%
ME, kcal/lb	1,627	1,626	1,626	1,626	1,626
Protein, %	15.0	17.0	19.1	21.3	23.5
Ca, %	0.69	0.70	0.71	0.72	0.72
Available P, %	0.33	0.33	0.33	0.33	0.32
Lysine:calorie ratio, g/mcal ME	2.23	2.65	3.07	3.49	3.90

[a]The vitamin premix inclusion at 1.5 lb/ton provides same vitamin concentrations as 3 lb/ton of KSU vitamin premix.

Table 2. Influence of Dietary Lysine Level Fed from 40 to 80 lb on Growth Performance and Ultrasound Measurements

	Total Dietary Lysine, %						P <	
Item	.80	.95	1.10	1.25	1.40	SE	Linear	Quad.
Day 0 to 28								
ADG	1.24	1.33	.146	1.45	1.49	.02	.01	.01
ADFI	2.25	2.16	2.29	2.23	2.19	.03	NS	NS
F/G	1.84	1.63	1.58	1.53	1.48	.02	.01	.01
Weight on d 28	76.4	78.9	82.5	82.2	83.7	.7	.01	.03
Ultrasound measurements[a]								
Loin area, sq. in.	2.63	2.66	2.72	2.79	2.75	.08	NS	NS
10th rib fat depth, in.	.16	.13	.14	.13	.13	.01	.01	.02
Subsequent performance, d 28 to 58								
ADG	1.83	1.72	1.83	.173	1.80	.03	NS	NS
ADFI	4.10	3.95	4.05	4.13	4.28	.09	.06	.08
F/G	2.24	2.31	2.21	2.38	2.37	.07	NS	NS

[a]Final weight (d 28) was used as a covariate for ultrasound measurements.

Table 3. Economic Value of Increasing the Dietary Lysine Level for Pigs from 40 to 80 lb

	Total Dietary Lysine, %				
Economic Calculations	.80	.95	1.10	1.25	1.40
Diet cost, $/ton	$109	$113	$117	$121	$125
Feed cost, $/pig	$3.44	$3.42	$3.76	$3.77	$3.83
Wt gain in 28 d, lb	34.6	37.3	40.9	40.7	41.7
Feed cost, $/lb gain	$0.099	$0.092	$0.092	$0.093	$0.092
Value of gain at $.40/lb, $/pig	$13.83	$14.91	$16.35	$16.27	$16.67
Return over feed cost, $/pig	$10.40	$11.49	$12.60	$12.50	$12.84
Extra return over .8% lysine		$1.09	$2.20	$2.11	$2.44