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## Abstract

One hundred twenty crossbred gilts were used in a growth trial to evaluate the effects of increasing dietary energy density and lysine:calorie ratio on growing pig growth performance and subsequent finishing performance. Feeding 3% choice white grease and 3.45 g lysine:Mcal ME maximized growth performance of growing gilts. Choice white grease additions and increasing lysine:calorie ratio during growing (65 to 160 lb) did not affect carcass back fat or loin depth at 235 lb.; Swine Day, Manhattan, KS, November 20, 1997



## Keywords

Swine day, 1997; Kansas Agricultural Experiment Station contribution; no. 98-142-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 795; Swine; Feed:gain ratio; Energy density; Lysine:calorie ratio; Growing-finishing pigs





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# EFFECTS OF DIETARY ENERGY DENSITY AND LYSINE:CALORIE RATIO ON THE GROWTH PERFORMANCE OF GROWING PIGS AND SUBSEQUENT FINISHING PERFORMANCE

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## Summary

One hundred twenty crossbred gilts were used in a growth trial to evaluate the effects of increasing dietary energy density and lysine:calorie ratio on growing pig growth performance and subsequent finishing performance. Feeding 3% choice white grease and 3.45 g lysine:Mcal ME maximized growth performance of growing gilts. Choice white grease additions and increasing lysine:calorie ratio during growing (65 to 160 lb) did not affect carcass backfat or loin depth at 235 lb.


(Key Words: Feed:Gain Ratio, Energy Density, Lysine:Calorie Ratio, Growing-Finishing Pigs.)

## Introduction

Research reported in the 1996 KSU Swine Day showed that increasing choice white grease and lysine:calorie ratio improved the growth performance of pigs fed from 20 to 55 lb. Additional research from our laboratory indicated that increasing fat additions to diets fed to pigs from 100 to 160 lb improved feed utilization. However, this research did not examine the effects of lysine:calorie ratio on growth performance of growing pigs. With this in mind, the objective of this research trial was to examine the effects of increasing energy density and lysine:calorie ratio on growing pig growth and subsequent finishing growth performance.

## Procedu es

One hundred twenty crossbred gilts (PIC L326 × C22, initially 65 lb) were used in a growth assay. Pigs were blocked by weight and ancestry and allotted to one of the seven dietary treatments. During the growing phase (65 to 160 lb), pigs were fed increasing levels of choice white grease (CWG; 0, 3, and 6%) and lysine: calorie ratio (2.75, 3.10, 3.45, and 3.80 g lysine:Mcal ME; Table 1). Growing diets were formulated to contain .70% Ca and .60 %P. The lysine:calorie ratio of the experimental diets was achieved by adjusting the corn:soybean meal ratio. When mean block weight reached 160 lb, pigs were switched to a common finishing diet until mean block weight reached 200, then a second common finishing diet was fed. The common diet fed during early finishing (160 to 200 lb) was formulated to contain .90% lysine, .65% Ca, .55% P, and 2.72 g lysine:Mcal ME. The diet fed from 200 to 235 lb was formulated to contain .70% lysine, .55% P, .50% Ca, and 2.10 g lysine:Mcal ME.

The pigs were housed in an environmentally controlled finishing barn with 4 ft × 4 ft totally slatted pens. Each pen had two pigs and contained a single-hole feeder and a nipple waterer to allow ad libitum access to feed and water. Pigs and feeders were weighed every 14 days to calculate ADG, ADFI, and F/G. When mean block weight reached 235 lb, pigs were slaughtered in a commercial packing facility to collect carcass data.

The data from this trial were analyzed with the GLM procedure of SAS. The statistical model included main and interactive effects of CWG and lysine:calorie ratio. Linear and quadratic polynomials also were used to determine the effects of increasing additions of CWG and lysine:calorie ratio.

## Results and Discussion

During the growing phase, increasing CWG and lysine:calorie ratio improved ADG (linear, $P<.05$ and .01, respectively). Additionally, increasing CWG decreased ADFI and improved F/G (linear, $P<.01$). Lysine and ME intakes increased as lysine:calorie ratio increased (linear, $P<.01$, and .10, respectively). This was due to increased ADFI as the lysine:calorie ratio increased (linear, $P<.10$).

When a common diet was fed from 160 to 200 lb, increasing CWG and lysine:calorie during the grower period had a detrimental effect on ADG (linear, $P<.05$). This was due to decreased ADFI, lysine intake, and ME intake for pigs that previously were fed diets containing increased CWG during the growing phase (linear, $P<.05$). Additionally, pigs previously fed increasing lysine: calorie ratio during the growing period had poorer F/G (linear, $P<.01$). This response appears to be the result of compensatory gain by pigs fed diets with lower lysine:calorie ratios during the growing phase.

The level of CWG or lysine:calorie ratio fed during the growing phase did not affect ADG, ADFI, and F/G during late finishing (200 to 236). However, for the entire growing-finishing period, pigs fed increasing CWG during the growing phase consumed less feed (linear, $P<.05$) and tended (linear, $P<.10$) to convert feed more efficiently.

The level of CWG and lysine:calorie fed from 65 to 160 lb did not affect fat depth, loin depth, or carcass yield of pigs fed common diets during early and late finishing.

The results of this experiment indicate that feeding 3% CWG and a lysine:calorie ratio of 3.45 g lysine:Mcal ME from 65 to 160 lb maximizes growth of crossbred gilts during the growing phase of production. However, for the entire trial, growth rate and feed efficiency were not affected by the lysine: calorie ratio fed from 65 to 160 lb. Increasing fat additions from 65 to 160 lb improved feed efficiency for the entire growth trial.

**Table 1. Compositions of Diets[a]**

| Item, % | Basal Growing[b] | Finishing I[c] | Finishing II[d] |
|---|---|---|---|
| Corn | 72.77 | 73.52 | 81.07 |
| Soybean meal, 46.5% | 24.19 | 23.80 | 16.52 |
| Monocalcium phosphate | 1.14 | .90 | .79 |
| Limestone | 1.07 | 1.05 | .89 |
| Salt | .35 | .35 | .35 |
| Vitamin premix | .20 | .15 | .15 |
| Trace mineral premix | .15 | .10 | .10 |
| Antibiotic[e] | .13 | .13 | .13 |
| Choice white grease | — | — | — |

[a]Diets were formulated to 2.26 g lysine/Mcal ME, .60% Ca, and .50% P. Dietary lysine levels ranged from .75 to .81%.
[b]The experimental growing diets were formulated to contain .70% P and .60% Ca.
[c]The common finishing I diet was formulated to contain .65% P, .55% Ca, and 2.72 g lysine:Mcal ME.
[d]The common finishing II diet was formulated to contain .55% P, .50% Ca, and 2.10 g lysine:Mcal ME.
[e]Provided 50 mg tylosin/lb.

**Table 2. Effects of Increasing Energy Density and Lysine:Caloie Ratio in the Diet on Pig Performance**

| | CWG, % | | | g Lysine/Mcal ME | | | | | Main Effects | | | Fat | | Lysine | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Item | 0 | 3 | 6 | 2.75 | 3.10 | 3.45 | 3.80 | CV | Fat | Lysine | Fat × Lysine | Lin. | Quad | Lin. | Quad |
| Growing (66 to 160 lb) | | | | | | | | | | | | | | | |
| ADG, lb | 2.00 | 2.07 | 2.08 | 1.99 | 2.00 | 2.11 | 2.11 | 6.4 | .0917 | .0164 | .1665 | .0486 | .3390 | .0042 | .9150 |
| ADFI, lb | 4.91 | 4.75 | 4.56 | 4.65 | 4.61 | 4.89 | 4.82 | 7.5 | .0124 | .1153 | .4683 | .0062 | .8944 | .0666 | .9002 |
| F/G | 2.47 | 2.29 | 2.19 | 2.34 | 2.32 | 2.32 | 2.29 | 5.1 | .0001 | .6812 | .4240 | .0001 | .2207 | .2529 | .9322 |
| Lysine intake, g/d | 24.19 | 24.31 | 24.31 | 19.95 | 22.28 | 26.30 | 28.57 | 7.5 | .9717 | .0001 | .4276 | .8444 | .8925 | .0001 | .9531 |
| ME intake, Mcal/d | 7.37 | 7.41 | 7.39 | 7.25 | 7.18 | 7.63 | 7.51 | 7.5 | .9719 | .1091 | .4277 | .8991 | .8410 | .0655 | .8782 |
| Finishing I (160 to 200 lb) | | | | | | | | | | | | | | | |
| ADG, lb | 2.38 | 2.23 | 2.15 | 2.30 | 2.41 | 2.14 | 2.16 | 13.1 | .0639 | .0429 | .7605 | .0213 | .6930 | .0435 | .5113 |
| ADFI, lb | 6.59 | 6.36 | 6.14 | 6.25 | 6.48 | 6.32 | 6.41 | 8.6 | .0422 | .6738 | .9390 | .0124 | .9526 | .5843 | .6298 |
| F/G | 2.82 | 2.90 | 2.90 | 2.77 | 2.73 | 3.00 | 3.01 | 10.4 | .6412 | .0184 | .6227 | .4235 | .6243 | .0063 | .7350 |
| Lysine intake, g/d | 26.93 | 25.68 | 25.10 | 25.52 | 26.46 | 25.83 | 26.21 | 8.6 | .0422 | .6738 | .9390 | .0124 | .9526 | .5843 | .6298 |
| ME intake, Mcal/d | 9.89 | 9.54 | 9.21 | 9.37 | 9.71 | 9.48 | 9.62 | 8.6 | .0422 | .6738 | .9390 | .0124 | .9526 | .5843 | .6298 |
| Finishing II (200 to 236 lb) | | | | | | | | | | | | | | | |
| ADG, lb | 2.02 | 2.12 | 2.03 | 2.08 | 2.01 | 1.97 | 2.18 | 19.2 | .6783 | .5243 | .2987 | .9326 | .3832 | .5586 | .7989 |
| ADFI, lb | 7.38 | 7.27 | 7.79 | 7.58 | 7.47 | 7.48 | 7.38 | 13.4 | .2457 | .9583 | .2272 | .2062 | .2691 | .6085 | .9844 |
| F/G | 3.57 | 3.44 | 4.22 | 3.69 | 3.56 | 4.23 | 3.45 | 35.1 | .1432 | .3439 | .1943 | .1260 | .2083 | .9909 | .3130 |
| Lysine intake, g/d | 23.45 | 23.12 | 24.74 | 24.10 | 23.75 | 23.78 | 23.46 | 13.4 | .2457 | .9583 | .2272 | .2062 | .2691 | .6085 | .9844 |
| ME intake, Mcal/d | 11.14 | 10.98 | 11.76 | 11.45 | 11.28 | 11.30 | 11.15 | 13.4 | .2457 | .9583 | .2272 | .2062 | .2691 | .6085 | .9844 |
| Overall | | | | | | | | | | | | | | | |
| ADG, lb | 2.09 | 2.12 | 2.09 | 2.08 | 2.10 | 2.08 | 2.13 | 6.0 | .6545 | .6517 | .8119 | .9259 | .3623 | .3361 | .6652 |
| ADFI, lb | 5.81 | 5.64 | 5.59 | 5.62 | 5.65 | 5.74 | 5.72 | 5.9 | .1046 | .7631 | .3849 | .0423 | .5406 | .3498 | .7676 |
| F/G | 2.78 | 2.66 | 2.69 | 2.71 | 2.70 | 2.76 | 2.68 | 6.1 | .0612 | .5392 | .2952 | .0784 | .1069 | .9480 | .3913 |
| Carcass (236 lb) | | | | | | | | | | | | | | | |
| Skinned fat depth, in | .57 | .59 | .59 | .59 | .58 | .56 | .60 | 13.9 | .7383 | .4087 | .9089 | .5108 | .6807 | .9884 | .1336 |
| Loin depth, in | 2.25 | 2.61 | 2.21 | 2.23 | 2.23 | 2.28 | 2.28 | 7.1 | .1800 | .6586 | .8397 | .4776 | .0875 | .2442 | .9665 |
| Carcass yield | 64.42 | 64.58 | 64.20 | 64.60 | 63.92 | 64.52 | 64.56 | 1.8 | .6021 | .3442 | .1253 | .5708 | .4072 | .7386 | .2381 |

[a]Means derived from 84 pigs housed at two per pen with six replicate pens per treatment.