Kansas Agricultural Experiment Station Research Reports

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

Article 731

1998

Added dietary fat improves growth performance and feed efficiency in growing-finishing pigs under commercial conditions (1998)

S S. Dritz

Michael D. Tokach

Robert D. Goodband

See next page for additional authors

Added dietary fat improves growth performance and feed efficiency in growing-finishing pigs under commercial conditions (1998)

Authors

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

ADDED DIETARY FAT IMPROVES GROWTH PERFORMANCE AND FEED EFFICIENCY IN GROWING-FINISHING PIGS UNDER COMMERCIAL CONDITIONS

M. D. Tokach [1], S. S. Dritz [2], R. D. Goodband, and J. L. Nelssen

Summary

A total of 480 pigs was used in an experiment conducted in a commercial research facility to determine the influence of fat additions to the growing-finishing diet on pig performance and carcass composition. Adding fat to the diet from 80 to 265 lb increased ADG and F/G by 1 and 2%, respectively, for each 1% added fat. The growth response was greatest during the initial phase of the trial (80 to 130 lb) and declined as the trial progressed. The feed efficiency response was consistent throughout the trial. After adjusting for the greater carcass weight of pigs consuming the high fat diets, carcass parameters were not influenced by fat addition to the diet.

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

Introduction

Several experiments have been conducted to determine the influence of fat additions to growing-finishing diets on pig performance and carcass composition. In general, average daily gain is expected to increase 1% for every percent added fat, and feed efficiency is expected to improve 2% for every percent added fat. However, several questions arise with this simplistic rule of thumb. First, is the response to added fat the same at all levels of addition (i.e., is the response from increasing dietary fat from 0 to 2% the same as increasing fat from 4 to 6%)? Second, is the response the same for all phases during growing-finishing? Because pigs are more energy deficient in the early finisher period, we would expect a greater response during this period; however, this actual level of response is not well characterized. Third, recent trials in university research settings demonstrate a much smaller response to fat additions to grain-soybean meal diets than those in the rule of thumb presented above. The reason is probably the fact that feed intake is normally 25 to 40% higher in university research settings than under field conditions. Therefore, the objective of this research was to determine the influence of graded levels of added fat on carcass composition and growth performance of growing-finishing pigs in a research facility closely approximating field conditions.

Procedures

The experiment was conducted in a commercial research unit holding 24 pens with 20 pigs per pen. Pigs (PIC) were allotted randomly to pens each having an initial average pig weight of 80 lb. There were 12 pens of barrows and 12 pens of gilts (3 pens of each sex per treatment). Pens had totally slatted floors and were 8 ft by 18 ft to provide 7.2 sq ft per pig. Pens were equipped with a cup waterer and 4-hole feeder.

The four dietary treatments were based on level of added dietary fat (0, 2, 4, or 6%). Diets were fed in three phases with the lysine:calorie ratio decreasing with each phase. The dietary phases and corresponding lysine:ME ratios and lysine levels are shown

[1]Northeast Area Extension Office, Manhattan, KS.
[2]Food Animal Health and Management Center.

in Table 2. Diets were switched by sex, with all pens within a sex being switched on the same day. Diets were switched when the average pen weight for all pigs of that sex reached 130 and 205 lb. All diets were formulated to a constant lysine to energy ratio within phase. All diets were corn-soybean meal based with similar levels of vitamins, and minerals. Lysine levels were altered in the diets by adjusting the corn-soybean meal ratio. The diets did not contain any synthetic amino acids. Tylan was fed at 40 g/ton during phase 1, 20 g/ton during phase 2, and 10 g/ton during phase 3.

All pens were weighed on a weekly basis to determine average daily gain. Feed delivery was recorded daily, and feed remaining in the feeders weighed weekly to determine feed intake and feed efficiency.

Pigs were marketed by treatment to obtain carcass data. Three pigs per pen were marketed 3 weeks prior to the final marketing of the whole barn, with each treatment on a separate close out. Pens were weighed just prior to and just after marketing the three pigs per pen. Feed intake also was recorded to that point to ensure proper data collection. Data were analyzed for linear and quadratic effects, with pen serving as the experimental unit for all data analysis. Because no treatment × sex interactions occurred, data were pooled for analysis.

Table 1. Lysine to Calorie Ratio (g lys/Mcal ME) and Lysine Level for Each Diet

			Added Dietary Fat, %			
Phase	Weight	Lysine: ME	0	2	4	6
1	80 to 130	3.67	1.21	1.24	1.27	1.30
2	130 to 205	2.67	.875	.90	.925	.95
3	205 to market	1.97	.655	.67	.685	.70

Results and Discussion

During phase 1 (80 to 130 lb), ADG and F/G improved linearly (P<.05) as dietary fat increased from 0 to 6% (Table 2). Average daily feed intake was not influenced by fat additions. During phase 2 (130 to 210 lb), the response in ADG was not as great (linear, P<.13); however, the response in F/G (linear, P<.05) was similar. During phase 3 (210 to 265 lb), ADFI and F/G decreased linearly (P<.05) as fat was added to the diet. Added dietary fat did not influence ADG. For the overall period, ADG and F/G improved linearly (P<.05) as additional fat was added to the diet. A trend for lower ADFI (P<.13) also occurred as dietary fat increased.

Carcass data were analyzed without and with adjustment for a common carcass weight (Table 3). When the data were not adjusted for the increased weight gain for pigs fed the diets with added fat, carcass weight, backfat, and sort loss increased linearly (P<.05). Lean percentage and premium per pig decreased linearly (P<.05) with increasing dietary fat. After the data were adjusted to a common market weigh, no differences occurred in any of the carcass or sale price parameters. These data demonstrate the importance of adjusting the data to a common market weight to demonstrate the true treatment effects. Under the circumstances of this trial, fat level of up to 6% can be added to corn-soybean meal-based diets for growing-finishing pigs without negatively influencing standard carcass parameters or premiums received.

For a more complete understanding of the change in growth response from one phase to the next, the influence of added fat on pig performance is listed as the percentage improvement over the control diet in Table 4. The influence of fat level on ADG was greater (1.5% for every 1% fat) and more consistent during phase 1 than during subsequent phases. Overall, addition of each

1% fat resulted in approximately a 1% increase in ADG. The negative influence of added fat on ADFI became greater as the trial progressed, with approximately 1% reduction in ADFI for every 1% added fat. The most consistent response to dietary fat was the improvement in F/G. Every 1% addition of fat resulted in approximately 2% improvement in F/G, and the response was consistent for each further addition of fat to the diet.

Using the economic scenario presented in Table 2, adding fat to the diet will not consistently reduce feed cost per pound of gain. Any economic calculations, however, also must include the impact of the improvement in ADG. The value of the extra gain will depend on the availability of growing-finishing space. For systems that have excess space or can easily contract additional space, the advantage in ADG is worth only the reduced number of days in the facility. For example, adding 6% fat to the diet during phases 1 and 2 reduces the number of days needed to grow from 80 to 210 lb from 78 to 73 d. If the space is worth only $.10/day, the extra gain is worth only $.50 per pig. For systems with limited space (i.e., systems with difficulty reaching the desired market weight), the advantage in ADG is worth the extra pounds sold at market. In this example, adding 6% fat to the diet during phases 1 and 2 increases the weight per pig by 8.6 lb (130 vs. 138.6 lb gain) with the same number of days. If market price was $40/cwt, the extra weight would be worth an additional $3.44. Therefore, the economics of whether fat should be added to the growing-finishing diet depend on the design of the production system as well as the prices of corn, soybean meal, and fat. These results demonstrated that pigs in this production system were energy deficient during phases 1 and 2, leading to the large growth response.

Table 2. Influence of Level of Added Dietary Fat on Pig Performance and Feed

	Added Dietary Fat, %				
Item	0	2	4	6	CV
Phase 1 (80 to 130 lb)					
ADG, lb[a]	1.79	1.83	1.89	1.97	4.5
ADFI, lb	4.12	4.02	4.00	3.99	6.9
F/G[a]	2.30	2.20	2.12	2.02	4.6
Feed cost, $/lb[c]	.164	.164	.165	.163	
Phase 2 (130 to 210 lb)					
ADG, lb[b]	1.59	1.58	1.67	1.67	6.6
ADFI, lb	4.83	4.68	4.71	4.56	8.5
F/G[a]	3.04	2.97	2.81	2.72	4.6
Feed cost, $/lb[c]	.207	.211	.209	.210	
Phase 3 (210 to 265 lb)					
ADG, lb	1.54	1.54	1.62	1.58	6.1
ADFI, lb[a]	5.64	5.45	5.49	5.15	5.9
F/G[a]	3.67	3.53	3.38	3.25	4.4
Feed cost, $/lb[c]	.217	.220	.222	.224	
Overall					
ADG, lb[a]	1.63	1.63	1.72	1.72	4.0
ADFI, lb[b]	4.87	4.72	4.75	4.58	6.3
F/G[a]	2.99	2.88	2.76	2.65	3.7

[a]Linear effect of added fat (P<.05).
[b]Linear effect of added fat (P< .13).
[c]Prices used to figure cost per lb of gain include $2.50/bu corn, $200/ton SBM, and $.19/lb fat.

Table 3. Influence of Level of Added Dietary Fat on Carcass Parameters and Market Price

	Added Dietary Fat, %				
Item	0	2	4	6	CV
Backfat, in[a]	.66	.72	.67	.75	7.1
Loin depth, in	2.26	2.31	2.30	2.29	3.1
Lean, %[a]	55.5	54.7	55.5	54.2	1.3
Yield, %	76.3	76.6	76.3	76.7	.9
Carcass weight, lb[a]	189.9	194.8	200.1	201.0	4.1
Live weight, lb[a]	248.8	254.3	262.0	262.3	3.9
Price info					
Live price, $/cwt	58.20	57.03	56.66	57.01	4.3
Premium, $/cwt[a]	4.54	3.91	4.45	3.70	11.2
Sort, $/cwt[a]	.18	.40	.70	.75	75
Adjusted to common carcass weight (196.6 lb)[b]					
Backfat, in	.68	.73	.65	.73	5.8
Loin depth, in	2.29	2.32	2.29	2.27	2.7
Lean, %	55.2	54.6	55.6	54.5	1.2
Yield, %	76.5	76.7	76.2	76.5	.9
Price info					
Live price, $/cwt	56.84	56.70	57.37	57.94	3.2
Premium, $/cwt	4.38	3.87	4.54	3.81	10.4
Sort, $/cwt	.39	.45	.59	.61	56.4

[a]Linear effect of dietary fat (P<.05)
[b]No Significant differences when adjusted to a common carcass weight.

Table 4. Influence of Added Dietary Fat on Percentage Response in Pig Performance

	Added Dietary Fat, %				Response per
Item	0	2	4	6	1% Fat
Average daily gain					
Phase 1 (80 to 130 lb)	0	2.2%	5.5%	10.1%	1.5%
Phase 2 (130 to 210 lb)	0	-0.9%	5.2%	4.9%	0.8%
Phase 3 (210 to 265 lb)	0	0.4%	5.5%	2.7%	0.6%
Overall	0	0.4%	5.3%	5.7%	0.83%
Average daily feed intake					
Phase 1 (80 to 130 lb)	0	-2.2%	-2.7%	-3.1%	-0.8%
Phase 2 (130 to 210 lb)	0	-3.2%	-2.4%	-5.8%	-1.1%
Phase 3 (210 to 265 lb)	0	-3.4%	-2.8%	-8.7%	-1.3%
Overall	0	-3.1%	-2.5%	-6.1%	-1.1%
Feed efficiency					
Phase 1 (80 to 130 lb)	0	-4.3%	-7.8%	-12.0%	-2.0%
Phase 2 (130 to 210 lb)	0	-2.5%	-7.5%	-10.5%	-1.6%
Phase 3 (210 to 265 lb)	0	-3.7%	-7.9%	-11.2%	-1.9%
Overall	0	-3.5%	-7.6%	-11.3%	-1.84%