EFFECTS OF ADDING AND REMOVING DIETARY FAT ON GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF GROWING-FINISHING PIGS[1]

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Summary

We conducted an experiment using 1,050 growing-finishing pigs to determine the carryover effect of adding and removing fat in diets. The experimental treatments consisted of six different sequence arrangements of diets without fat or with 6% added fat. Diets were fed in four phases. During each phase, ADFI and F/G were decreased when fat was added to the diets. Fat inclusion in the diet during one phase had no influence on the response to fat addition during another phase. Back-fat depth was increased and fat-free lean index decreased when fat was added to the diet during all phases, but not when fat was added to the diet during phases 1, 2, and/or 3.

(Key Words: Dietary Fat, Subsequent Performance, Finishing Pigs.)

Introduction

The inclusion of fat and level added to growing-finishing diets are determined by the price of the fat source and by the design of the particular production system. Recent data have indicated a linear improvement in feed efficiency through the growing and finishing phases with increasing additions of fat to the diets. In general, feed efficiency is expected to improve 2% for every percent of added fat.

Based on these results, the addition of fat is recommended whenever it is economical. Therefore, fat could be added or removed from pig diets at different stages of growth based on economics. However, the carryover effect of removing fat from the diet has not been evaluated. Thus, the objective of this study is to determine the carryover effects of removing fat from the diet on growth performance and carcass characteristics of finishing pigs reared in a commercial environment.

Procedures

A total of 525 barrows and 525 gilts (PIC C22 × 337) with an initial weight of 55 lb was used in this experiment. Barrows and gilts were penned separately as they entered the finishing building from the nursery. Pigs were blocked by gender and weight and allotted to one of six dietary treatments in a randomized block design. Pigs were housed in totally slatted concrete pens with 25 pigs/pen and six pens/treatment. Each pen was equipped with a four-hole dry self-feeder (Staco) and one cup waterer. Pen dimensions were 10 ft × 18 ft, providing 7.2 sq ft/pig. The finishing facility is a doubled curtain-sided, deep pit barn and operates on manual ventilation during the summer and on automatic ventilation during the winter.

The corn-soybean meal-based diets (Table 1) without fat or with 6% choice white grease were fed in four phases. The

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

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treatments consisted of six different sequence arrangements of the diets across the four phases (Table 2). The four phases were 55 to 100 lb, 100 to 150 lb, 150 to 200 lb, and 200 to 250 lb. The lysine:calorie ratios of the diets were 3.72, 3.17, 2.42, and 1.90 g lysine/Mcal ME, for phases 1, 2, 3, and 4, respectively. Vitamin and trace mineral levels were similar to KSU recommendations, and all other nutrients met or exceeded the requirements estimates provided by NRC (1998).

Pigs weights by pen and feed disappearance were measured every 14 d to calculate ADG, ADFI, and F/G. Diet phase changes occurred every 28 d. At the termination of the study, pigs were sent to USDA-inspected packing plant for collection of individual carcass data. The pigs in each pen were marked with a different tattoo prior to marketing to allow carcass data to be attributed back to each pen. The experiment was conducted from March to July 1999.

Analysis of variance was used to analyze the data as a randomized block design using GLM procedures of SAS with multiple comparison contrasts for growth performance in all phases, and with least square mean comparisons for the overall and carcass composition data.

Results and Discussion

During phase 1, ADG was not affected (P>.84) by dietary treatments (Table 3). Diets containing 6% added fat decreased (P<.001) ADFI and F/G compared to the diets not containing added fat.

In phase 2, adding 6% fat to the diet increased (P<.002) ADG, decreased (P<.001) F/G, and tended to decrease (P<.12) ADFI compared to diets without added fat.

During phase 3, ADG was not affected (P>.32) by dietary treatment. Pigs fed diets containing added fat had lower (P<.02) ADFI and F/G when compared to pigs fed diets without added fat.

During phase 4, ADG was not affected (P>.53) by dietary treatments. Feeding diets containing 6% choice white grease decreased (P<.02) ADFI and F/G compared to feeding diets without added fat.

For the overall experiment, ADG was not affected (P>.44) by dietary treatment. The treatment with 6% added fat during all four phases had the lowest (P<.05) ADFI. Pigs fed diets containing 6% added fat during phases 1 and 2 or phases 1, 2, and 3 had intermediate feed intake. Pigs that were fed diets containing added fat for the shortest amount of time had the highest feed intake. The response in overall F/G reflected the duration that fat was fed in the diet. Pigs with the lowest F/G were fed diets containing added fat for all phases or at least the first three phases. Pigs fed diets with fat added only during phase 1 or not at all had the poorest F/G.

No differences (P>.65) were observed in carcass yield among the dietary treatments. Back-fat depth was increased (P<.05) and fat-free lean index decreased (P<.05) for the dietary treatments containing 6% added fat in all phases. No differences (P>.50) in back-fat depth or fat-free lean index were observed among the rest of the treatments.

The results from this experiment indicate that adding and removing dietary fat during different phases of growth had no carryover effects. These data suggest that when inclusion of choice white grease in the diet is economical, it should be used during the first three phases (up to 200 lb) and then removed. This will achieve similar growth performance but better carcass characteristics than those resulting from adding fat during all phases.

Table 1. Diet Compositions

Ingredient, %	Phase 1		Phase 2		Phase 3		Phase 4	
	0% Fat	6% Fat	0% Fat	6% Fat	0% Fat	6% Fat	0% Fat	6% Fat
Corn	61.86	52.00	68.47	59.05	77.67	69.05	83.88	75.96
Soybean meal, 46.5%	35.24	39.13	28.70	32.18	19.62	22.26	13.51	15.43
Choice white grease	0	6.0	0	6.0	0	6.0	0	6.0
Monocal. phos., 21% P	1.30	1.28	1.25	1.20	1.20	1.20	1.13	1.13
Limestone	1.03	1.03	1.00	1.00	1.00	.98	.98	.98
Salt	.35	.35	.35	.35	.35	.35	.35	.35
Vitamin premix	.08	.08	.08	.08	.06	.06	.06	.06
Trace mineral premix	.15	.15	.15	.15	.10	.10	.10	.10
Calculated Analysis								
Lysine, %	1.23	1.33	1.05	1.14	.81	.87	.63	.68
Met & cys:lysine ratio, %	59	56	62	58	69	65	78	72
Threonine:lysine ratio, %	68	66	69	67	73	70	78	74
Tryptophan:lysine ratio, %	22	21	22	21	22	21	22	21
Calcium, %	.77	.77	.73	.73	.69	.69	.65	.65
Available phosphorus, %	.35	.35	.33	.33	.31	.31	.29	.29
Lysine:calorie ratio, g/mcal	3.72	3.72	3.17	3.17	2.42	2.42	1.90	1.90

Table 2. Sequence Arrangements of Treatments

Phase	Sequence of Treatments (% Fat Level)					
	A	B	C	D	E	F
1 (55-100 lb)	0	6	6	6	6	0
2 (100-150 lb)	0	6	0	6	6	6
3 (150-200 lb)	0	6	0	0	6	0
4 (200-250 lb)	0	6	0	0	0	6

Table 3. Influence of Adding and Removing Dietary Fat on Growth Performance and Carcass Characteristics of Growing-Finishing Pigs[e]

	Dietary Fat							
Phase 1	0	6	6	6	6	0		
Phase 2	0	6	0	6	6	6		
Phase 3	0	6	0	0	6	0	Added Fat *vs.*	
Phase 4	0	6	0	0	0	6	No Added Fat	
Item							P <	CV, %
Phase I (d 0 to 31)								
ADG	1.52	1.51	1.57	1.53	1.56	1.56	0.912	8.88
ADFI	3.22	2.91	2.98	2.93	2.92	3.32	0.001	7.56
F/G	2.14	1.93	1.90	1.92	1.88	2.13	0.001	5.33
Phase II (d 31 to 58)								
ADG	1.65	1.74	1.65	1.85	1.77	1.96	0.002	9.03
ADFI	4.03	3.74	4.00	3.86	3.62	4.09	0.126	9.31
F/G	2.45	2.15	2.43	2.09	2.04	2.11	0.001	6.84
Phase III (d 58 to 86)								
ADG	1.75	1.82	1.76	1.66	1.70	1.70	0.378	9.58
ADFI	5.21	4.83	5.45	5.06	4.81	5.12	0.002	6.68
F/G	2.99	2.70	3.09	3.08	2.83	3.01	0.003	8.65
Phase IV (d 86 to 121)								
ADG	1.85	1.92	1.80	1.75	1.80	1.85	0.237	11.34
ADFI	5.99	5.54	6.14	6.01	5.89	5.73	0.001	3.98
F/G	3.26	2.90	3.45	3.55	3.28	3.10	0.013	13.07
Overall (d 0 to 121)								
ADG	1.68	1.75	1.70	1.69	1.73	1.77		6.02
ADFI	4.61[a]	4.28[b]	4.66[a]	4.50[ab]	4.39[ab]	4.59[a]		5.35
F/G	2.74[a]	2.45[b]	2.75[a]	2.66[ac]	2.54[bc]	2.61[c]		4.39
Carcass Data[d]								
Live weight, lb	258.3	266.4	262.2	263.0	261.4	263.2		5.25
Carcass yield, %	76.2	76.7	72.9	74.2	76.8	76.5		4.50
Loin eye depth, in	2.21[ab]	2.24[ab]	2.22[ab]	2.20[b]	2.19[b]	2.29[a]		2.86
Back-fat depth, in	0.75[a]	0.81[b]	0.76[a]	0.74[a]	0.76[a]	0.77[a]		4.68
Lean, %	54.0[a]	53.2[b]	53.9[a]	54.1[a]	53.8[a]	53.9[a]		1.03
Fat-free lean index	49.4[a]	48.6[b]	49.3[a]	49.5[a]	49.3[a]	49.1[a]		0.89

[a,b,c]Means in the same row with different superscript differ P<.05.

[d]Carcass weight used as a covariate to analyze the packing plant data.

[e]A total of 1,050 growing pigs with an initial weight of 55 lb.