

Optimum Levels of Protein for Growing Boars

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Story in Brief

A trial was conducted involving 108 growing boars to measure the effect of protein level on rate of gain, feed conversion, daily feed intake, backfat thickness, and loin eye area. The boars were fed either a 16, 18, or 20 percent crude protein ration from approximately 55 to 120 lbs. Then the protein level was reduced 2 percent for each treatment (14, 16, and 18 percent) from 120 lb. to approximately 220 lb.

The results indicate that a 16 percent crude protein ration from 55 to 120 lb. (Phase 1) and a 14 percent crude protein ration from 120 to 220 lb. (Phase 2) is inadequate for growing boars. Boars fed either a 18 or 20 percent crude protein ration during Phase 1 and a 16 or 18 percent ration during Phase 2 had a significant improvement in rate of gain, feed conversion, backfat thickness and loin eye area.

No significant differences were noted between the boars fed a 18 or 20 percent crude protein ration during Phase 1 and then decreased to a 16 or 18 percent, respectively, during Phase 2. However, the boars fed the higher levels (20-18 percent) tended to have slightly higher average daily gains.

Introduction

Oklahoma is a major state in the production of purebred breeding swine. The production of boars to sell to commercial producers or other purebred breeders is an important part of their business. Personal communication with many of these breeders reveals a certain amount of indecision on the level of crude protein to feed growing boars. The amount normally fed varies from 14 to 18 percent of the total ration. Likewise, a recent survey of boar testing stations in the United States shows that the levels of crude protein fed to growing boars also varies from 14 to 18 percent. The available literature indicates that very little research has been

conducted in the area of levels of protein for growing boars. Thus, it was deemed feasible to conduct a trial to measure the effect of protein level on rate of gain, feed conversions, daily feed intake, backfat thickness and loin eye area in growing boars from approximately 55 to 220 lb. These traits measured plus soundness and conformation are the main items evaluated on growing boars by seedstock producers and swine test stations.

Experimental Procedure

One hundred and forty four Duroc, Hampshire, Yorkshire, and Duroc X Hampshire boars were used in this study. The boars averaging 55.2 pounds were randomly allotted within breed and litter to three experimental treatments. Each experimental treatment consisted of four replicates containing nine boars each. The boars were housed and group fed in an open-front concrete finishing floor equipped with self-feeders and automatic waterers.

Phase 1

Phase 1 included the period from the time the boars started test at 55.2 pounds to an average weight of 121.6 lbs. The boars on treatments 1, 2, and 3 were fed a 16, 18 and 20 percent crude protein ration, respectively. Composition of the experimental rations are shown in Table 1. At the end of Phase 1, average daily gain, feed per pound gain, and average daily feed intake was determined.

Table 1. Composition of Experimental Rations.

Ingredients %	Ration Designation			
	14% C.P.	16% C.P.	18% C.P.	20% C.P.
Yellow corn	75.00	69.50	64.00	58.30
Soybean meal (44%)	16.50	22.10	27.75	33.50
Wet Molasses	5.00	5.00	5.00	5.00
Salt	0.50	0.50	0.50	0.50
Dicalcium carbonate	1.75	1.65	1.50	1.40
Calcium carbonate	0.70	0.70	0.70	0.75
Vitamins-trace mineral mix ¹	0.50	0.05	0.05	0.05
Aureomycin 50	0.05	0.05	0.05	0.05
TOTAL	100.00	100.00	100.00	100.00
% crude protein, calculated	14.01	15.99	17.99	20.02
% calcium, calculated	0.71	0.71	0.69	0.69
% phosphorus, calculated	0.61	0.61	0.61	0.60

¹ Supplied 3,000,000 I.U. vitamin A, 300,000 I.U. vitamin D, 4 gm. riboflavin, 20 gm. pantothenic acid, 30 gm. niacin, 1,000 gm. choline chloride, 15 mg. vitamin B₁₂, 6,000 I.U. vitamin E, 20 gm menadione, 0.2 gm. iodine, 90 gm. iron, 20 gm. manganese, 10 gm. copper and 90 gm. zinc per ton of feed.

Phase 2

The boars were started on Phase 2 immediately upon completion of Phase 1. The boars on treatments 1, 2, and 3 were fed 14, 16, and 18 percent crude protein rations, respectively. This was 2 percent less crude protein than fed in Phase 1 for each treatment. Composition of the experimental rations are shown in Table 1. The boars were individually removed from test on Phase 2 when they weighed 220 lbs. Average daily gain, feed per lb. gain, average daily feed intake, and probed backfat thickness was determined. In addition, ultrasonic estimates of backfat thickness and loin eye area were obtained by the use of the Ithaco Scano-gram Model 721 instrument.

The scanogram readings for estimated backfat thickness were taken at the midline at three locations (the first rib, last rib, and last lumbar vertebra). Loin eye area estimates were made at the tenth rib. All probe and scanogram estimates were adjusted to a 220 lb. basis for each boar using the National Association of Swine Records standards.

Results and Discussion

Phase 1

The results are shown in Table 2. The boars on treatment 1 (16 percent crude protein ration) had the lowest average daily gain of 1.67 lb. as compared to gains of 1.79 and 1.81 for boars on treatments of 2 and 3 respectively. Treatments 1 and 3 were significantly different ($P < .05$). Boars on treatment 1 required 2.33 lb. of feed per lb. of gain as compared to 2.18 and 2.27 for those on treatments 2 and 3 respectively. Treatment 2 was significantly lower than treatments 1 and 3 ($P < .05$). No significant differences were noted in average daily feed intake but boars on treatment 3 (20 percent crude protein) tended to consume more.

The results in Phase 1 indicates that a 16 percent crude protein ration based primarily on yellow corn and soybean meal is inadequate for growing boars from approximately 55 to 120 lbs. if optimum performance is to be obtained. The growing boars on the 18 or 20 percent crude protein ration had marked improvement in average daily gains and feed conversion as compared to those fed the 16 percent crude ration.

Phase 2

The results are shown in Table 2. The boars on treatment 1 (14 percent crude protein ration) had the lowest average daily gain of 1.81 lb. as compared to gains of 1.94 and 2.05 lb. for boars on treatments 2 and 3

Table 2. Optimum Levels of Protein for Growing Boars.

	Treatments		
	1 (16-14%) ¹	2 (18-16%) ¹	3 (20-18%) ¹
Pens per treatment, no.	4	4	4
Boars per pen, no.	9	9	9
<i>Phase 1</i>			
Av. initial wt. lb.	55.0	54.7	55.9
Av. final wt., lb.	119.5	123.4	122.0
Av. daily gain, lb. ²	1.67 ¹	1.79 ^{1,2}	1.81 ²
Feed per lb. gain, lb. ²	2.33 ¹	2.18 ²	2.27 ¹
Av. daily feed intake, lb.	3.90	3.92	4.10
<i>Phase 2</i>			
Av. initial wt., lb.	119.5	123.4	122.0
Av. final wt., lb.	219.5	222.8	223.6
Av. daily gains, lb. ²	1.81 ¹	1.94 ^{1,2}	2.05 ²
Feed per lb. gain, lb. ²	3.24 ¹	2.98 ^{1,2}	2.90 ²
Av. daily feed intake, lb.	5.84	5.76	5.98
<i>Total Period</i>			
Av. daily gain, lb. ²	1.75 ¹	1.87 ^{1,2}	1.94 ²
Feed per lb. gain, lb. ²	2.88 ¹	2.65 ²	2.66 ²
Av. daily feed intake, lb.	5.04	4.95	5.18
Scanned backfat thickness, in. ³	1.00 ¹	0.93 ²	0.92 ²
Scanned loin eye, sq. in. ³	5.47 ¹	5.75 ²	5.72 ²

¹ Phase 1 treatments were a 16, 18, and 20% crude protein ratios for treatments 1, 2, and 3 respectively. Phase 2 treatments were a 14, 16, and 18% crude protein ratios for treatments 1, 2, and 3 respectively.

² Means with different superscripts are significantly different ($P < .05$).

³ Means with different superscripts are significantly different ($P < .01$).

respectively. Treatments 1 and 3 were significantly different ($P < .05$). Boars on treatment 1 required 3.24 lb. of feed per lb. of gain as compared to 2.98 and 2.90 for those on treatments 2 and 3 respectively. Treatments 1 and 3 were significantly different ($P < .05$). No significant differences were noted in average daily feed intake but boars on treatment 3 (18 percent crude protein ration) tended to consume more.

The results in Phase 2 may have been influenced by the previous protein levels fed in Phase 1. Nevertheless, the results indicate that growing boars from approximately 120 to 220 lb. required a higher level of crude protein than 14 percent. The highest average daily gain and lowest feed conversion was obtained for the boars fed the 18 percent crude protein ration.

Total period

Performance data was computed for the total feeding period. Boars on treatment 3 (20-18 percent crude protein ration) had the highest average daily gain of 1.94 lb. as compared to 1.75 and 1.87 lb. for boars on treatments 1 and 2 respectively. Treatments 1 and 3 were significantly different ($P < .05$). Boars on treatment 1 required 2.88 pounds of feed per

pound of gain which was significantly higher ($P < .05$) than the 2.65 and 2.66 lb. required by those fed treatments 2 and 3 respectively. No significant differences were noted in average daily feed intake but boars on treatment 3 tended to consume more.

Boars on treatment 1 had significantly more backfat thickness than those on treatments 2 and 3. Boars on treatment 1 also had significantly less ($P < .01$) loin eye area than those on treatments 2 and 3.

These results indicate that a 16 percent crude protein ration from approximately 55 to 120 lb. and a 14 percent crude protein ration from approximately 120 to 220 lb. is inadequate for growing boars. Boars fed the 20-18 percent crude protein rations or the 18-16 percent during the same weight periods generally had a significant improvement in rate of gain, feed conversion, backfat thickness and loin eye area. No significant differences were noted between the boars fed a 18 percent or 20 percent crude protein ration from 55 to 120 lbs. and then decreased to a 16 percent and 18 percent respectively from 120 to 220 pounds. However, the boars fed the higher levels (20-18 percent) tended to have higher average daily gains.

Feedlot Performance and Carcass Merit of Purebred and Two-Breed Cross Pigs

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Story in Brief

The feedlot records of 2111 barrows and gilts and the carcass records of 392 barrows representing all possible crossbreds and purebreds from crossing Duroc, Hampshire and Yorkshire breeds were analyzed to evaluate heterosis, differences among straightbreds, differences among reciprocal crosses and differences among crossbred groups.

Straightbred Durocs had the highest average daily gain, were fatter and produced carcasses that had more marbling and were firmer than Hampshires and Yorkshires. Yorkshires were the most efficient straightbred while Hampshires had the largest loin eyes and leanest carcasses followed by the Yorkshires.