

1970

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Recommended Citation

Wahlstrom, Richard C.; Libal, George W.; and Fredrikson, Jacob F., "Effect of Environment, Sex and Protein Level of Ration on Performance and Carcass Characteristics of Growing-Finishing Swine" (1970). *South Dakota Swine Field Day Proceedings and Research Reports, 1970*. Paper 4.

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A.S. Series 70-31

Effect of Environment, Sex and Protein Level
of Ration on Performance and Carcass Characteristics
of Growing-Finishing Swine

Richard C. Wahlstrom, George W. Libal and Jacob F. Fredrikson

Research conducted at the Southeast South Dakota Experiment Farm during the winter of 1968-69 and reported at the 1969 Swine Field Day (A.S. Series 69-38) indicated that the performance of pigs fed rations containing 15% protein to about 115 lb. and 12% protein to market weight was equal to that of pigs fed a ration of 17% protein to 115 lb. and reduced to 14% protein from 110 lb. to market weight. In the previous trial about 9% more feed was required for those pigs fed in the uncontrolled environment; however, rate of gain was not affected by the type of housing. The present experiment was conducted to obtain further information on the protein needs of barrows and gilts and their performance when fed in a controlled environment building or an open-front building with feeders and waterers outside.

Experimental Procedure

One hundred twelve crossbred pigs were allotted into four groups of barrows and four groups of gilts with 14 pigs per group. The barrows averaged approximately 35 lb. and the gilts 33 lb. One group of barrows and one group of gilts were assigned to each of the following treatments:

1. Controlled environment, high protein diet
2. Controlled environment, low protein diet
3. Uncontrolled environment, high protein diet
4. Uncontrolled environment, low protein diet

The high protein diet was calculated to contain 16% protein until the pigs averaged approximately 115 lb. when it was reduced to 13% and the low protein diets were calculated to contain 14 and 11% protein during the same two periods. However, chemical analyses indicated these diets contained slightly less protein than the calculated levels. These values and the composition of the diets used are shown in table 1.

The controlled environment house was a fully insulated, ventilated, slotted floor house. The temperature was maintained between approximately 50 and 60° F. The uncontrolled environment consisted of an open-front, pole type building with concrete floor and outside concrete feeding floor where self-feeders and automatic waterers were located. A partition, approximately three feet high, confined the pigs to a sleeping area at the rear of the house. This area was bedded with straw. The experiment was conducted during the winter months from November 14 to late February.

Forty-three barrows were slaughtered at the termination of the experiment and carcass data were obtained for carcass length, backfat, loin eye area and ham-loin percent.

Results

A summary of the results of this experiment is shown in table 2. The average daily gains of all eight treatments are shown in table 3. During the first phase of the experiment the only significant difference in rate of gain was due to protein level of the diet. Pigs fed the 15.4% protein diet gained significantly faster than those fed the 13.7% protein diet. For the entire trial, pigs fed the high protein diets gained significantly faster than those fed the low protein diets (1.69 vs. 1.49 lb. per day), barrows gained faster than gilts and slightly faster gains were observed for pigs fed in the controlled environment than those in the open housing. However, the data in table 3 indicate that these differences in gain due to environment are due to the poor performance of the barrows fed the high protein diet in the uncontrolled environment as the gilts and the other group of barrows gained equally as well in the uncontrolled environment. This lot of pigs gained 1.65 lb. per day up to a weight of 135 lb. and then gained only 1.37 lb. per day the remainder of the trial for an average of 1.55 lb. per day for the entire trial. The reason for the poor growth during the latter period is not known. One might expect a low order infection as a possibility although the pigs appeared normal at all times.

Feed efficiency was improved 8.7% when pigs were fed in the controlled environment. The difference of 31 lb. of feed required per 100 lb. of gain is similar to that reported in 1969 when pigs were fed under similar environmental conditions. Barrows required about 6% more feed than gilts and pigs fed the low protein diets required about 6% more feed than those fed the high protein diets.

Carcass data of the barrows did not reveal any significant treatment differences. However, there did appear to be a trend for slightly leaner carcasses when pigs were fed the high protein diet.

Summary

This experiment indicated that from 35 lb. to market weight pigs gain at a similar rate but much more efficiently if housed in a controlled environment building rather than an open-front building during the winter period. Barrows gained faster than gilts but also required slightly more feed per unit of gain. A diet containing 13.7% protein fed to pigs from 35 to 115 lb. followed by a 10.9% protein diet to market weight was not adequate for either barrows or gilts. Significantly faster gains and also more efficient gains were obtained when the diet contained 15.4% and 12.8% protein during the growing and finishing phases, respectively.

Table 1. Composition of Diets (Percent)

	High protein		Low protein	
	To 115 lb.	115 lb. to market	To 115 lb.	115 lb. to market
Ground yellow corn	77.1	85.1	83.0	90.0
Soybean meal (44%)	20.0	12.5	14.0	7.5
Dicalcium phosphate	1.7	1.2	1.8	1.3
Limestone	0.5	0.5	0.5	0.5
Trace mineral salt	0.5	0.5	0.5	0.5
Vitamin-antibiotic premix ^a	0.2	0.2	0.2	0.2
Calculated analysis				
Crude protein, %	16	13	14	11
Calcium, %	0.65	0.55	0.66	0.56
Phosphorus, %	0.64	0.52	0.64	0.52
Chemical analysis				
Crude protein, %	15.4	12.8	13.7	10.9

^a Provided 1,500 I.U. vitamin A, 150 I.U. vitamin D, 1 mg. riboflavin, 2.5 mg. calcium pantothenate, 7.5 mg. niacin, 50 mg. choline, 5 mcg. vitamin B₁₂ and 5 mg. oxytetracycline per pound of ration.

Table 2. Effects of Environment, Sex and Protein Level on Performance of Growing-Finishing Swine

	Environment		Sex		Protein level	
	Con- trolled	Uncon- trolled	Barrows	Gilts	16-13	14-11
No. of pigs ^a	54	53	53	54	54	53
Avg. initial wt., lb.	34.0	34.4	35.0	33.3	34.3	34.1
Avg. final wt., lb.	191.8	199.4	199.4	191.8	203.2	188.0
Avg. daily gain, lb.						
To 115 lb.	1.56	1.56	1.58	1.54	1.70 ^c	1.42
Total exp.	1.63 ^b	1.55	1.63 ^b	1.54	1.69 ^c	1.49
Avg. feed/gain, lb.	3.27 ^b	3.58	3.52	3.33	3.32	3.53
Carcass data						
Avg. length, in.	29.9	29.5			29.8	29.6
Avg. backfat, in.	1.64	1.56			1.56	1.63
Avg. loin eye area, sq. in.	3.87	3.96			4.05	3.79
Avg. ham-loin, %	36.6	37.8			37.6	36.8

^a Two lots of barrows and two lots of gilts per treatment, 14 pigs per lot. Five pigs removed and data not included.

^b Significant difference (P < .05).

^c Significant difference (P < .01).

Table 3. Average Daily Gain by Treatment

	Controlled environment	Uncontrolled environment
Barrows, high protein	1.85	1.55
Barrows, low protein	1.55	1.52
Gilts, high protein	1.65	1.69
Gilts, low protein	1.40	1.41